

Department of Homeland Security

Science and Technology Directorate

Budget Overview



Fiscal Year 2024

Congressional Justification

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Science and Technology Directorate

Appropriation Organization Structure

	Level	Fund Type (* Includes Defense Funding)
Science and Technology Directorate	Component	
Operations and Support	Appropriation	
Mission Support	PPA	Discretionary - Appropriation
Laboratory Facilities	PPA	Discretionary - Appropriation
Acquisition and Operations Analysis	PPA	Discretionary - Appropriation
Procurement, Construction, and Improvements	Appropriation	
Construction and Facility Improvements	PPA	
Critical Repair/Replacement Requirement	Investment,PPA Level II	Discretionary - Appropriation
Plum Island Closure and Support	Investment,PPA Level II	Discretionary - Appropriation
Detection Sciences Testing and Applied Research Center	Investment,PPA Level II	Discretionary - Appropriation
Research and Development	Appropriation	
Research, Development and Innovation	PPA	
Border Security Thrust Area	R&D Project,PPA Level II	Discretionary - Appropriation
Chemical, Biological, and Explosive Defense Thrust Area	R&D Project,PPA Level II	Discretionary - Appropriation
Counter Terrorist Thrust Area	R&D Project,PPA Level II	Discretionary - Appropriation
Cyber Security / Information Analysis Thrust Area	R&D Project,PPA Level II	Discretionary - Appropriation
First Responder / Disaster Resilience Thrust Area	R&D Project,PPA Level II	Discretionary - Appropriation
Innovation Research and Foundational Tools Thrust Area	R&D Project,PPA Level II	Discretionary - Appropriation
Physical Security and Critical Infrastructure Resilience Thrust Area	R&D Project,PPA Level II	Discretionary - Appropriation
University Programs	PPA	
Centers of Excellence	R&D Project,PPA Level II	Discretionary - Appropriation
Minority Serving Institutions (MSI)	R&D Project,PPA Level II	Discretionary - Appropriation

Science and Technology Directorate Budget Comparison and Adjustments

Appropriation and PPA Summary

(Dollars in Thousands)

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget
Operations and Support	\$330,590	\$384,107	\$372,045
Mission Support	\$133,966	\$164,210	\$165,497
Laboratory Facilities	\$123,691	\$127,522	\$128,828
Acquisition and Operations Analysis	\$72,933	\$92,375	\$77,720
Procurement, Construction, and Improvements	\$12,859	\$55,216	\$78,579
Construction and Facility Improvements	\$12,859	\$55,216	\$78,579
Critical Repair/Replacement Requirement	-	\$35,750	\$10,000
Plum Island Closure and Support	\$12,859	\$13,466	\$33,579
Detection Sciences Testing and Applied Research Center	-	\$6,000	\$35,000
Research and Development	\$542,954	\$461,218	\$436,545
Research, Development and Innovation	\$477,417	\$407,681	\$385,508
Border Security Thrust Area	\$115,298	\$83,007	\$101,330
Chemical, Biological, and Explosive Defense Thrust Area	\$32,592	\$21,510	\$27,400
Counter Terrorist Thrust Area	\$69,361	\$60,983	\$60,894
Cyber Security / Information Analysis Thrust Area	\$60,600	\$48,567	\$37,500
First Responder / Disaster Resilience Thrust Area	\$77,715	\$55,950	\$28,750
Innovation Research and Foundational Tools Thrust Area	\$80,793	\$95,106	\$92,106
Physical Security and Critical Infrastructure Resilience Thrust Area	\$41,058	\$42,558	\$37,528
University Programs	\$65,537	\$53,537	\$51,037
Centers of Excellence	\$57,880	\$45,880	\$45,880
Minority Serving Institutions (MSI)	\$7,657	\$7,657	\$5,157
Total	\$886,403	\$900,541	\$887,169

Science and Technology Directorate
Comparison of Budget Authority and Request
(Dollars in Thousands)

	FY 2022 Enacted			FY 2023 Enacted			FY 2024 President's Budget			FY 2023 to FY 2024 Total Changes		
	Pos.	FTE	Amount	Pos.	FTE	Amount	Pos.	FTE	Amount	Pos.	FTE	Amount
Operations and Support	530	511	\$330,590	572	544	\$384,107	574	565	\$372,045	2	21	(\$12,062)
Procurement, Construction, and Improvements	-	-	\$12,859	-	-	\$55,216	-	-	\$78,579	-	-	\$23,363
Research and Development	-	-	\$542,954	-	-	\$461,218	-	-	\$436,545	-	-	(\$24,673)
Total	530	511	\$886,403	572	544	\$900,541	574	565	\$887,169	2	21	(\$13,372)
Subtotal Discretionary - Appropriation	530	511	\$886,403	572	544	\$900,541	574	565	\$887,169	2	21	(\$13,372)

Component Budget Overview

The FY 2024 Budget includes \$887.2M; 574 positions; and 565 FTE for the Science and Technology Directorate (S&T). This funding level represents a decrease of \$13.4M from the FY 2023 enacted.

S&T's Research, Development, Test, and Evaluation (RDT&E) efforts are critical to maintaining threat awareness, delivering mitigation strategies, and creating novel technology and approaches for the Department of Homeland Security's (DHS) Components and partners in the homeland security enterprise (HSE). S&T's enduring research provides the essential building blocks for incremental scientific advances in collaboration with public and private sector research partners. S&T conducts this vital work with public and private sector research partners in collaboration with our Office of National Laboratories, Office of University Programs/Centers of Excellence, Technology Centers and Small Business Innovation Research (SBIR) program. S&T seeks to meet future needs by expanding capabilities in advanced computing, information security, and communications to better understand the next generation of computing capabilities and their impacts to the full spectrum of homeland security operations. S&T's budget supports Component capability gap requirements and aligns with Administration and DHS priorities.

S&T focuses its resources on rapidly transitioning existing and new technology capabilities to operations in order to help the HSE respond more quickly to emerging threats. S&T leverages existing technologies to expedite the development of vital capabilities critical to mission operations. Advanced technologies, knowledge products, technical analyses, laboratories, and university-based research contributes to the effectiveness and efficiency of DHS operations and the safety and interoperability of the first responder community.

Science and Technology Directorate Budget Authority and Obligations

(Dollars in Thousands)

	FY 2022	FY 2023	FY 2024
Enacted/Request	\$886,403	\$900,541	\$887,169
Carryover - Start of Year	\$212,871	\$309,504	\$216,170
Recoveries	\$26,788	-	-
Rescissions to Current Year/Budget Year	(\$111)	(\$142)	(\$900)
Net Sequestered Resources	-	-	-
Reprogramming/Transfers	(\$3,465)	\$142	-
Supplementals	-	-	-
Total Budget Authority	\$1,122,486	\$1,210,045	\$1,102,439
Collections - Reimbursable Resources	\$79,325	\$96,525	\$96,525
Collections - Other Sources	-	-	-
Total Budget Resources	\$1,201,811	\$1,306,570	\$1,198,964
Obligations (Actual/Estimates/Projections)	\$892,024	\$1,090,368	\$1,010,732
Personnel: Positions and FTE			
Enacted/Request Positions	530	572	574
Enacted/Request FTE	511	544	565
Onboard and Actual FTE			
Onboard (Actual/Estimates/Projections)	488	547	-
FTE (Actual/Estimates/Projections)	477	524	-

**Science and Technology Directorate
Collections – Reimbursable Resources**
(Dollars in Thousands)

	FY 2022 Enacted			FY 2023 Enacted			FY 2024 President's Budget		
	Pos.	FTE	Amount	Pos.	FTE	Amount	Pos.	FTE	Amount
Canada	-	-	\$300	-	-	\$300	-	-	\$300
Department of Agriculture	-	-	\$3,600	-	-	\$3,600	-	-	\$3,600
Department of Defense	-	-	\$6,000	-	-	\$13,500	-	-	\$13,500
Department of Energy	-	-	\$700	-	-	\$700	-	-	\$700
Department of Health and Human Services - Food and Drug Administration	-	-	\$300	-	-	\$2,650	-	-	\$2,650
Department of Homeland Security - U.S. Citizenship and Immigration Services	-	-	\$1,070	-	-	\$1,070	-	-	\$1,070
Department of Homeland Security - Countering Weapons of Mass Destruction	-	-	\$2,400	-	-	\$3,500	-	-	\$3,500
Department of Homeland Security	-	-	\$500	-	-	\$500	-	-	\$500
Department of Homeland Security - Federal Emergency Management Agency	-	-	\$2,770	-	-	\$2,770	-	-	\$2,770
Department of Homeland Security - Federal Law Enforcement Training Centers	-	-	\$10	-	-	\$10	-	-	\$10
Department of Homeland Security - Management Directorate	-	-	\$2,100	-	-	\$2,100	-	-	\$2,100
Department of Homeland Security - Transportation Security Administration	-	-	\$4,195	-	-	\$13,345	-	-	\$13,345
Department of Homeland Security - U.S. Customs and Border Protection	-	-	\$20,600	-	-	\$9,100	-	-	\$9,100
Department of Homeland Security - U.S. Immigration and Customs Enforcement	-	-	\$430	-	-	\$430	-	-	\$430
Department of Homeland Security - United States Coast Guard	-	-	\$1,950	-	-	\$1,950	-	-	\$1,950
Department of Homeland Security - United States Secret Service	-	-	\$1,700	-	-	\$1,700	-	-	\$1,700
Department of Justice - Federal Bureau of Investigation	-	-	\$26,250	-	-	\$22,000	-	-	\$22,000
Department of State	-	-	\$200	-	-	\$200	-	-	\$200
Intelligence Community Management Account	-	-	\$800	-	-	\$800	-	-	\$800
Library of Congress	-	-	\$500	-	-	\$500	-	-	\$500
Netherlands	-	-	\$300	-	-	\$300	-	-	\$300
Sweden	-	-	\$200	-	-	\$200	-	-	\$200
Department of Homeland Security - Cybersecurity and Infrastructure Security Agency	-	-	\$2,450	-	-	\$13,300	-	-	\$13,300
Department of Homeland Security - Office of Biometric Identity Mangement (OBIM)	-	-	-	-	-	\$2,000	-	-	\$2,000
Total Collections	-	-	\$79,325	-	-	\$96,525	-	-	\$96,525

Science and Technology Directorate Personnel Compensation and Benefits

Pay Summary

(Dollars in Thousands)

	FY 2022 Enacted				FY 2023 Enacted				FY 2024 President's Budget				FY 2023 to FY 2024 Total			
	Pos.	FTE	Amount	Rate	Pos.	FTE	Amount	Rate	Pos.	FTE	Amount	Rate	Pos.	FTE	Amount	Rate
Operations and Support	530	511	\$104,725	\$199.78	572	544	\$118,247	\$208.76	574	565	\$129,718	\$220.92	2	21	\$11,471	\$12.16
Total	530	511	\$104,725	\$199.78	572	544	\$118,247	\$208.76	574	565	\$129,718	\$220.92	2	21	\$11,471	\$12.16
Subtotal Discretionary - Appropriation	530	511	\$104,725	\$199.78	572	544	\$118,247	\$208.76	574	565	\$129,718	\$220.92	2	21	\$11,471	\$12.16

Pay by Object Class

(Dollars in Thousands)

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget	FY 2023 to FY 2024 Change
11.1 Full-time Permanent	\$67,263	\$74,920	\$82,807	\$7,887
11.3 Other than Full-time Permanent	\$6,195	\$6,450	\$6,775	\$325
11.5 Other Personnel Compensation	\$2,083	\$2,347	\$2,596	\$249
11.8 Special Personal Services Payments	\$2,639	\$4,684	\$4,898	\$214
12.1 Civilian Personnel Benefits	\$26,545	\$29,846	\$32,642	\$2,796
Total - Personnel Compensation and Benefits	\$104,725	\$118,247	\$129,718	\$11,471
Positions and FTE				
Positions - Civilian	530	572	574	2
FTE - Civilian	511	544	565	21

Science and Technology Directorate
Non Pay Budget Exhibits

Non Pay Summary
(Dollars in Thousands)

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget	FY 2023 to FY 2024 Change
Operations and Support	\$225,865	\$265,860	\$242,327	(\$23,533)
Procurement, Construction, and Improvements	\$12,859	\$55,216	\$78,579	\$23,363
Research and Development	\$542,954	\$461,218	\$436,545	(\$24,673)
Total	\$781,678	\$782,294	\$757,451	(\$24,843)
Subtotal Discretionary - Appropriation	\$781,678	\$782,294	\$757,451	(\$24,843)

Non Pay by Object Class*(Dollars in Thousands)*

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget	FY 2023 to FY 2024 Change
21.0 Travel and Transportation of Persons	\$2,156	\$2,105	\$2,141	\$36
22.0 Transportation of Things	\$78	\$126	\$126	-
23.1 Rental Payments to GSA	\$613	\$613	\$613	-
23.2 Rental Payments to Others	\$230	\$2,315	\$2,315	-
23.3 Communications, Utilities, & Miscellaneous	\$1,021	\$1,408	\$1,554	\$146
24.0 Printing and Reproduction	\$154	\$382	\$382	-
25.1 Advisory & Assistance Services	\$207,117	\$231,814	\$211,242	(\$20,572)
25.2 Other Services from Non-Federal Sources	\$4,401	\$7,948	\$7,993	\$45
25.3 Other Purchases of goods and services	\$44,006	\$43,682	\$42,017	(\$1,665)
25.4 Operations & Maintenance of Facilities	\$33,119	\$23,959	\$23,971	\$12
25.5 Research & Development Contracts	\$401,002	\$338,511	\$314,856	(\$23,655)
25.7 Operation & Maintenance of Equipment	\$11,339	\$12,829	\$10,425	(\$2,404)
25.8 Subsistence and Support of Persons	-	\$4	\$4	-
26.0 Supplies & Materials	\$2,149	\$2,867	\$4,897	\$2,030
31.0 Equipment	\$12,442	\$34,269	\$39,130	\$4,861
32.0 Land and Structures	\$7,000	\$30,470	\$45,920	\$15,450
41.0 Grants, Subsidies, and Contributions	\$54,851	\$48,953	\$49,826	\$873
42.0 Insurance Claims and Indemnities	-	\$39	\$39	-
Total - Non Pay Budget Object Class	\$781,678	\$782,294	\$757,451	(\$24,843)

Science and Technology Directorate
Supplemental Budget Justification Exhibits

FY 2024 Counter Unmanned Aerial Systems (CUAS) Funding

Appropriation and PPA	(Dollars in Thousands)
Science and Technology Directorate Total	\$24,996
Research and Development	\$24,996
Research, Development and Innovation	\$24,996
Border Security Thrust Area	\$24,996

Narrative description of how the above funding will be used can be found in the associated Chapter of this Budget.

Science and Technology Directorate
FY 2022 – FY 2024 Cyber Security Funding
(Dollars in Thousands)

NIST Framework	FY 2022 Actual	FY 2023 Enacted	FY 2024 President's Budget
Detect	\$50	\$77	\$736
Identify	\$3,997	\$4,310	\$5,234
Protect	\$59,065	\$60,077	\$52,784
Recover	\$-	\$93	\$93
Respond	\$-	\$898	\$792
Grand Total	\$63,112	\$65,455	\$59,639

Science and Technology Directorate
Status of Congressionally Requested Studies, Reports and Evaluations

Fiscal Year	Due Date	Reference/Citation	Requirement	Status
2022	2/13/2022	House Report 117-87	Critical Infrastructure Security and Resilience Research, Development, Test, & Evaluation Spend Plan	Transmitted – 4/25/2022
2022	5/16/2022	House Report 117-87	DHS Emeritus Centers of Excellence	Transmitted – 11/16/2022
2022	6/13/2022	Senate Report & Joint Explanatory Statement	Detection Canine Program	Transmitted – 11/15/2022
2022	6/13/2022	House Report 117-87	Biosurveillance and Security Test Capability	Transmitted – 11/15/2022
2022	6/13/2022	Senate Report & Joint Explanatory Statement - Division F	S&T Bioaerosol Threat Detection Capability Improvements	Transmitted – 11/15/2022
2022	6/13/2022	Senate Report & Joint Explanatory Statement - Division F	Research and Prototyping for IED Defeat (RAPID) Program Funding	Transmitted – 11/15/2022
2022	9/12/2022	Senate Report & Joint Explanatory Statement - Division F	Investments in Border Security - Initial Report	Pending
2022	9/12/2023	Senate Report	Investments in Border Security - Final Report	Pending
2023	3/29/2023	Joint Explanatory Statement – Division F	Border Security Capabilities and Performance Measurement Initial Report	Pending
2023	6/27/2023	House Report 117-396 & Joint Explanatory Statement – Division F	Transportation Security Laboratory (TSL) DSTAR Center	Pending
2023	6/27/2023	House Report 117-396 & Joint Explanatory Statement – Division F	Opioid and Fentanyl Detection	Pending
2023	12/24/2023	Joint Explanatory Statement – Division F	Border Security Capabilities and Performance Measurement Final Report	Pending

**Science and Technology Directorate
Authorized/Unauthorized Appropriations**

Budget Activity <i>Dollars in Thousands</i>	Last year of Authorization	Authorized Level	Appropriation in Last Year of Authorization	FY 2024 President's Budget
	Fiscal Year	Amount	Amount	Amount
Operations and Support	N/A	N/A	N/A	\$372,045
Mission Support	N/A	N/A	N/A	\$165,497
Laboratory Facilities	N/A	N/A	N/A	\$128,828
Acquisition and Operations Analysis	N/A	N/A	N/A	\$77,720
Procurement, Construction, and Improvements	N/A	N/A	N/A	\$78,579
Construction and Facility Improvements	N/A	N/A	N/A	\$78,579
Critical Repair/Replacement Requirement	N/A	N/A	N/A	\$10,000
Plum Island Closure and Support	N/A	N/A	N/A	\$33,579
Detection Sciences Testing and Applied Research Center	N/A	N/A	N/A	\$35,000
Research and Development	N/A	N/A	N/A	\$436,545
Research, Development and Innovation	N/A	N/A	N/A	\$385,508
Border Security Thrust Area	N/A	N/A	N/A	\$101,330
Chemical, Biological, and Explosive Defense Thrust Area	N/A	N/A	N/A	\$27,400
Counter Terrorist Thrust Area	N/A	N/A	N/A	\$60,894
Cyber Security / Information Analysis Thrust Area	N/A	N/A	N/A	\$37,500
First Responder / Disaster Resilience Thrust Area	N/A	N/A	N/A	\$28,750

Department of Homeland Security**Science and Technology Directorate**

Innovation Research and Foundational Tools Thrust Area	N/A	N/A	N/A	\$92,106
Physical Security and Critical Infrastructure Resilience Thrust Area	N/A	N/A	N/A	\$37,528
University Programs	N/A	N/A	N/A	\$51,037
Centers of Excellence (COE)	N/A	N/A	N/A	\$45,880
Minority Serving Institutions (MSI)	N/A	N/A	N/A	\$5,157
Total Direct Authorization/Appropriation	N/A	N/A	N/A	\$887,169

Science and Technology Directorate Proposed Legislative Language

Operations and Support

For necessary expenses of the Science and Technology Directorate for operations and support, including the purchase or lease of not to exceed 5 vehicles, [\$353,107,000] *\$372,045,000*, of which [\$201,397,000] *\$206,548,000* shall remain available until September 30, [2024]2025: Provided, that not to exceed \$10,000 shall be for official reception and representation expenses.

Language Provision	Explanation
... [\$353,107,000] <i>\$372,045,000</i>	Dollar change only. No substantial change proposed.
... [\$201,397,000] <i>\$206,548,000</i>	Dollar change only. No substantial change proposed.
... [2024] 2025	<p>Fiscal year change; updated period of availability. No substantial change proposed. S&T continues two-year funding for Acquisition and Operations Analysis (AOA) and Laboratory Facilities PPAs in O&S appropriation. AOA supports the multi-year Research, Development, and Innovation PPA within the Research and Development appropriation. The activities such as test and evaluation, systems engineering, technology transition and international cooperative programs, support R&D projects that span multiple fiscal years. Two-year funding in this PPA is necessary to ensure S&T's R&D programs ability to access these resources when needed, enabling timely program execution – for example. test and evaluation of systems used for screening by TSA and CBP. In effort to support DHS operational Components effectively for systems engineering, and test and evaluation it is vital that AOA is two-year funding.</p> <p>Laboratory Facilities PPA supports the operations and facility maintenance of S&T's aging laboratories. The funding requirements for S&T's laboratory facilities are unique due to the nature of the assets and their complex operational needs. S&T's facility maintenance can only be planned to a certain point, and many unforeseen costs arise as part of maintaining laboratory facilities and operations. Some of S&T's facilities are 40 to 50 years old, including The Transportation Security Laboratory (TSL), and require replacement of failing equipment. S&T's bio-safety laboratories often costly have repairs including water tank and pipe leakages in decontamination areas, and two-year funding allows S&T to maintain contingency funding for these types of repairs.</p>

Procurement, Construction, and Improvements

For necessary expenses of the Science and Technology Directorate for Procurement, Construction, and Improvements, [\$89,466,000] *\$78,579,000*, to remain available until September 30, [2027] 2028.

Language Provision	Explanation
... [\$89,466,000] \$78,579,000	Dollar change only. No substantial change proposed.
... [2027] 2028	Fiscal year change only. No substantial change proposed.

Research and Development

For necessary expenses of the Science and Technology Directorate for research and development, [\$458,718,000] \$436,545,000, to remain available until September 30, [2025] 2026.

Language Provision	Explanation
... [\$458,718,000] \$436,545,000	Dollar change only. No substantial change proposed.
... [2025] 2026	<p>Fiscal year change. S&T continues three-year funding for both its R&D PPAs, University Programs and Research, Development and Innovation.</p> <p>The nature of University Programs mission is to look at problems with uncertain outcomes through an innovative and fresh lens. Three-year funding allows time for team formulation, business/contract establishment between lead and subs, and experimentation and refinement of the technical approaches. This allows the Office of University Programs to make lower-risk determinations on whether a project and its resulting information will generate useful outcomes.</p> <p>In Research, Development, and Innovation PPA, S&T conducts basic, applied and developmental research to support DHS Components and First Responders. Concepts must be developed, tested and validated to ensure that acquisition results in purpose-driven outcomes that lead to increased effectiveness, efficiency and safety for departmental missions. Depending to the capability gap efforts to identify technologies, concepts and processes that can be incorporated into environments for the purpose of increasing the effectiveness, efficiency and safety of operations, R&D efforts can take months or years.</p>

Department of Homeland Security

Science and Technology Directorate

Strategic Context



Fiscal Year 2024

Congressional Justification

Science and Technology Directorate Strategic Context

Component Overview

The Science and Technology Directorate (S&T) is the primary research and development arm of the Department. It provides Federal, state, and local officials with the technology and capabilities to protect the homeland.

The strategic context presents the performance budget by tying together programs with performance measures that gauge the delivery of results to our stakeholders. DHS has integrated a mission and mission support programmatic view into a significant portion of the Level 1 Program, Project, or Activities (PPAs) in the budget. A mission program is a group of activities acting together to accomplish a specific high-level outcome external to DHS, and includes operational processes, skills, technology, human capital, and other resources. Mission support programs are those that are cross-cutting in nature and support multiple mission programs. Performance measures associated with S&T's mission support program are presented in two measure sets, strategic and management measures. Strategic measures communicate results delivered for our agency mission and are considered our Government Performance and Results Act Modernization Act (GPRAMA) measures. Additional supporting measures, known as management measures, are displayed to enhance connections to resource requests. The measure tables indicate new measures and those being retired, along with historical data if available.

Research, Development, and Innovation: The Research, Development, and Innovation program provides state-of-the-art solutions to meet the needs of DHS Components and the first responder community. This includes customer-focused and output-oriented Research, Development, Test, and Evaluation (RDT&E) programs that balance risk, cost, impact, and time to delivery.

Strategic Measure

Measure Name:	Percent of technology or knowledge products transitioned to customers for planned improvements in the Homeland Security Enterprise						
Strategic Alignment:	6.3 : Harness Data and Technology to Advance Mission Delivery						
Description:	This measure reflects the percent at which the Science and Technology Directorate (S&T) meets its planned fiscal year transitions of technology or knowledge products for research and development funded programs/projects. A successful transition is the ownership and/or operation of a technology or knowledge product by a customer within the Homeland Security Enterprise. Technology product is a piece of equipment, system, or component of a system, such as an algorithm to be embedded into a piece of software. Knowledge products may be assessments, standards, training, or documents for decision support. The transition of technology or knowledge products reflects the value that S&T provides in delivering solutions to secure key assets, enhance operational efficiencies and effectiveness, and enable the Department and first responders to do their jobs safer, better, and smarter.						
Fiscal Year:	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Targets:	---	---	75%	75%	75%	72%	72%
Results:	---	---	66%	72%	68%	TBD	TBD

Science and Technology Directorate

Strategic Context

Explanation of Result:	This measure tracks transitions of research and development (R&D) funded programs/projects. A successful transition is the ownership and operation of a technology or knowledge product by a customer within the Homeland Security Enterprise. In FY 2022, S&T completed 120 of 176 planned transitions. S&T completed validation of integrated urban airflow and dispersion models and transition of CBP pilot Counter-UAS kit. S&T delivered: flood preparedness, response, tools, and best practices; COVID-19 related research outputs targeted to first responder communities and other government agencies; decision support tools to FEMA for deployment to Federal, State, local users; and a 5G security study to inform the investment of DHS R&D funds that address risk mitigation for 5G network security, cybersecurity, and supply chain security. These transitions indicate the value that S&T provides to improve homeland security operations and assist customers to execute their mission.
Corrective Action:	In FY 2022, S&T was unable to meet its target to complete 176 transitions of R&D funded programs/projects as first identified. The original planned transitions were not completed due to postponements related to privacy assessment processes, evolving leadership priorities, changes in components/recipients' schedules, and staff availability. S&T produced multiple knowledge products and introduced innovative operational processes and technologies for DHS Components and the interagency, which were not part of the original planned transitions due to changing and emerging issues affecting the homeland security enterprise. S&T continues to review internal processes to ensure efficient planning and use of resources for upcoming fiscal years. S&T also plans to continue collaboration with its customers and stakeholders, including Congress as well as Office of Management and Budget, to ensure efficient processes and regulations required to execute R&D programs and projects are in place.

Management Measures

Measure Name:	Percent of research, development, and innovation program milestones that are met, as established in the fiscal year's budget execution plan						
Strategic Alignment:	6.3 : Harness Data and Technology to Advance Mission Delivery						
Description:	This measure reflects the percent at which S&T meets its research, development, and innovation (RD&I) milestones planned for the fiscal year. A milestone is defined as a scheduled point or event in a project signifying the completion of a major deliverable or a phase of work. The research, development, and innovation (RD&I) program refers to the Program, Project, and Activity (PPA) funding area for the Science and Technology Directorate (S&T) within the DHS Common Appropriations Structure. RD&I provides state-of-the-art technology and/or solutions to meet the needs of DHS Components and the first responder community. Completing these milestones indicate satisfactory progress toward advancing technology within the Department and its stakeholders.						
Fiscal Year:	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Targets:	---	75%	75%	75%	75%	75%	75%
Results:	---	70%	69%	76%	69%	TBD	TBD
Explanation of Result:	The result of this measure consists of the Science and Technology Directorate (S&T) meeting its fiscal year budget milestones, which reflect the programmatic and technical events, accomplishments, or intermediate goals of programs and projects funded under the research, development, and innovation program. In FY 2022, S&T completed 302 out of 403 planned milestones, including: developed Augmented Reality and Virtual Reality modeling capabilities in collaboration with FLETC; transitioned sensor technology to CBP to improve the detection and tracking of illegal border activity; and conducted an evaluation of locally based prevention programs in support of the Center for Prevention Programs and Partnerships. Completing these milestones indicate S&T's progress towards providing state of the art technology and/or solutions to meet the needs of DHS Components and its stakeholders. Shifting priorities and budget fluctuations impacted S&T's ability to meet its FY target.						

Corrective Action:	In FY 2022, S&T was unable to meet its 75% target for completing milestones related to R&DI funded programs/projects as first identified. The original planned milestones were not completed due to postponements related to privacy assessment processes, shifting leadership priorities, and budget fluctuations. S&T produced multiple knowledge products and introduced innovative operational processes and technologies for DHS Components and the interagency, which were not part of the original planned transitions due to changing and emerging issues affecting the homeland security enterprise. S&T continues to review internal processes to ensure efficient planning and use of resources for upcoming fiscal years. S&T also plans to continue collaboration with its customers and stakeholders, including Congress as well as Office of Management and Budget, to ensure efficient processes and regulations required to execute R&D programs and projects are in place.
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Measure Name:	Percent of stakeholder counterdrug related requests fulfilled						
Strategic Alignment:	6.3 : Harness Data and Technology to Advance Mission Delivery						
Description:	This measure reflects the percent at which S&T fulfills requests from its stakeholders for counterdrug-related research and development program outputs and accomplishments. Stakeholder requests are information, data, or technology needs related to the detection, identification, and investigation of narcotics, such as opioids/fentanyl, and trafficking networks. Outputs and accomplishments encompass the delivery, demonstration, transfer, or transition of knowledge or technology products. Knowledge products include, but are not limited to, standards, technology assessments, test and evaluation results, training, data, and documents for decision support. Technology product is a piece of equipment, system, or component of a system, such as an algorithm to be embedded into a piece of software. This measure reflects the value that S&T provides in delivering capabilities to meet critical needs to support and improve homeland counterdrug missions.						
Fiscal Year:	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Targets:	---	---	---	65%	65%	70%	70%
Results:	---	---	---	100%	100%	TBD	TBD
Explanation of Result:	This measure reflects the percent at which the Science and Technology Directorate (S&T) fulfills requests from its stakeholders for counterdrug-related research and development program outputs and accomplishments. Fulfilling such requests reflects the value that S&T provides in delivering capabilities to meet critical needs to support and improve homeland counterdrug missions. Since FY 2022 started, S&T had three FY 2022 counterdrug-related research outputs. The Opioid Detection Project successfully completed each of the research outputs. A test event and data collection were completed in FY 2022 Q3, and the final report and briefing to CBP of those results was completed and delivered in FY 2022 Q4. Reaching this target indicates substantial progress toward achieving long-term counterdrug-related performance goals as well as Department-wide goals and objectives.						

University Programs: University Programs supports critical homeland security-related research and education at U.S. colleges and universities to address high-priority DHS-related issues and to enhance homeland security capabilities over the long term. University Programs includes DHS Centers of Excellence and Minority Serving Institutions, creating a consortium of universities generating groundbreaking ideas for new technologies and critical knowledge for the homeland security enterprise.

Management Measure

Measure Name:	Percent of university programs milestones that are met, as established in the fiscal year's budget execution plan						
Strategic Alignment:	6.3 : Harness Data and Technology to Advance Mission Delivery						
Description:	This measure reflects the percent of university programs milestones that meet the programmatic and technical events, accomplishments, or intermediate goals in the life of programs and projects. A milestone is defined as a scheduled point or event in a project signifying the completion of a major deliverable or a phase of work. The Office of University Programs (OUP) engages the academic community to conduct research and analysis, provides education and training to enhance homeland security capabilities, works closely with its stakeholders to identify requirements, set goals for milestones and deliverables, discuss the status of projects, and plan for the allocation of resources. The percent of milestones met reflects the programmatic and technical events, accomplishments, or intermediate goals in the life of projects and programs. These milestones indicate satisfactory progress toward achieving long-term S&T performance goals and Department-wide goals and objectives.						
Fiscal Year:	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Targets:	75%	75%	75%	75%	75%	75%	75%
Results:	78%	83%	88%	86%	71%	TBD	TBD
Explanation of Result:	The result of this measure consists of the Office of University Programs (OUP) meeting its fiscal year budget milestones, which reflect OUP's work to streamline access to the expertise of the Nation's colleges and universities to address pressing homeland security needs. In FY 2022, OUP completed 24 of 34 program milestones, including completion of the design, fabrication, and testing of an additional sensor capability for a Long Range Autonomous Underwater Vehicle; development of an early prototype to support DHS Components in better understanding migration data, the technology transfer and transition of the ADCIRC Prediction System TM ; and launch of two DHS mission related RDTE research projects. However, OUP did not meet its FY 2022 target because of schedule delays due to administrative roadblocks as well as other circumstances including the shifting of personnel resources in OUP and the development of more ambitious milestones in FY 2022 compared to previous fiscal years.						
Corrective Action:	In FY 2022, S&T was unable to meet its 75% target for the Office of University Program's (OUP) fiscal year budget milestones. OUP's 71% result for FY 2022 was the outcome of more deliberate and ambitious research focused milestones compared to previous fiscal years, as well as personnel resource shifts occurring during the fiscal year. OUP is now fully staffed and the personnel shifts that occurred in FY 2022 are now complete. OUP leadership will continue to collaborate with project managers to mitigate the risk of schedule delays and ensure that their programs meet the 75% target for FY 2023.						

Department of Homeland Security

Science and Technology Directorate

Operations and Support



Fiscal Year 2024

Congressional Justification

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Operations and Support

Budget Comparison and Adjustments

Comparison of Budget Authority and Request

(Dollars in Thousands)

	FY 2022 Enacted			FY 2023 Enacted			FY 2024 President's Budget			FY 2023 to FY 2024 Total Changes		
	Pos.	FTE	Amount	Pos.	FTE	Amount	Pos.	FTE	Amount	Pos.	FTE	Amount
Mission Support	397	378	\$133,966	439	411	\$164,210	441	432	\$165,497	2	21	\$1,287
Laboratory Facilities	133	133	\$123,691	133	133	\$127,522	133	133	\$128,828	-	-	\$1,306
Acquisition and Operations Analysis	-	-	\$72,933	-	-	\$92,375	-	-	\$77,720	-	-	(\$14,655)
Total	530	511	\$330,590	572	544	\$384,107	574	565	\$372,045	2	21	(\$12,062)
Subtotal Discretionary - Appropriation	530	511	\$330,590	572	544	\$384,107	574	565	\$372,045	2	21	(\$12,062)

The Operations and Support (O&S) appropriation for the Science and Technology Directorate (S&T) provides funding to ensure delivery of advanced technology solutions to Department of Homeland Security (DHS) Components and first responders. This appropriation also supports Systems Engineering, Standards, and Test and Evaluation (T&E) to ensure that S&T and DHS Components develop effective technologies that work in the operational environment. This includes costs necessary for operations and support activities to advance S&T's mission, as well as salaries and benefits, and operating costs for five laboratory facilities.

The O&S appropriation has three Programs, Projects, and Activities (PPA):

Mission Support: The Mission Support PPA supports all S&T corporate-level functions enabling technical divisions to manage the Research, Development, Test, and Evaluation (RDT&E) programs and provides funding for salaries and benefits, training and travel requirements, financial management, facility planning, maintenance, and other administrative functions. Offices supported under Mission Support include the Finance and Budget Division, Administration and Support Division, Contract Acquisition Program Support, Program Support Office, Communications and Outreach, Office of the Under Secretary, Chief Scientist, Office of Strategy and Policy, Office of Strategic Engagement and Analysis, Chief Information Office, and Compliance. Additionally, this appropriation finances Diversity, Equity, Inclusion, & Access efforts, and the Office of General Counsel requirements including Intellectual Property (IP) and trademark rights for DHS and its Components.

Laboratory Facilities: The Laboratory Facilities PPA provides funding for the operations and maintenance of S&T's five laboratory facilities and salaries and benefits expenses. These laboratory facilities provide the Nation with a coordinated, enduring core of productive science, technology and engineering laboratories that produce knowledge products and technologies required to secure our Homeland. Additionally, Laboratory Facilities coordinates the delivery of long-term capabilities vital to the homeland security mission through utilization of a coordinated network of S&T laboratories and Department of Energy (DOE) national laboratories.

Acquisition and Operations Analysis: The Acquisition and Operations Analysis (AOA) PPA provides resources that support expert assistance to entities across the Homeland Security Enterprise (HSE) to ensure that the transition, acquisition, and deployment of technologies, information, and procedures improve the efficiency and effectiveness of the operational capabilities across the HSE mission.

Operations and Support
Budget Authority and Obligations
(Dollars in Thousands)

	FY 2022	FY 2023	FY 2024
Enacted/Request	\$330,590	\$384,107	\$372,045
Carryover - Start of Year	\$30,179	\$34,209	\$22,364
Recoveries	\$7,946	-	-
Rescissions to Current Year/Budget Year	(\$111)	(\$142)	(\$900)
Net Sequestered Resources	-	-	-
Reprogramming/Transfers	(\$158)	\$142	-
Supplementals	-	-	-
Total Budget Authority	\$368,446	\$418,316	\$393,509
Collections - Reimbursable Resources	\$34,325	\$73,125	\$73,125
Collections - Other Sources	-	-	-
Total Budget Resources	\$402,771	\$491,441	\$466,634
Obligations (Actual/Estimates/Projections)	\$368,279	\$469,045	\$446,757
Personnel: Positions and FTE			
Enacted/Request Positions	530	572	574
Enacted/Request FTE	511	544	565
Onboard and Actual FTE			
Onboard (Actual/Estimates/Projections)	488	547	-
FTE (Actual/Estimates/Projections)	477	524	-

Operations and Support
Collections – Reimbursable Resources
(Dollars in Thousands)

	FY 2022 Enacted			FY 2023 Enacted			FY 2024 President's Budget		
	Pos.	FTE	Amount	Pos.	FTE	Amount	Pos.	FTE	Amount
Department of Agriculture	-	-	\$3,100	-	-	\$3,100	-	-	\$3,100
Department of Defense	-	-	\$1,500	-	-	\$9,000	-	-	\$9,000
Department of Energy	-	-	\$500	-	-	\$500	-	-	\$500
Department of Health and Human Services - Food and Drug Administration	-	-	\$300	-	-	\$2,650	-	-	\$2,650
Department of Homeland Security - U.S. Citizenship and Immigration Services	-	-	\$70	-	-	\$70	-	-	\$70
Department of Homeland Security - Countering Weapons of Mass Destruction	-	-	\$1,300	-	-	\$2,300	-	-	\$2,300
Department of Homeland Security	-	-	\$500	-	-	\$500	-	-	\$500
Department of Homeland Security - Federal Emergency Management Agency	-	-	\$320	-	-	\$320	-	-	\$320
Department of Homeland Security - Federal Law Enforcement Training Centers	-	-	\$10	-	-	\$10	-	-	\$10
Department of Homeland Security - Transportation Security Administration	-	-	\$1,195	-	-	\$10,345	-	-	\$10,345
Department of Homeland Security - U.S. Customs and Border Protection	-	-	\$600	-	-	\$7,100	-	-	\$7,100
Department of Homeland Security - U.S. Immigration and Customs Enforcement	-	-	\$280	-	-	\$280	-	-	\$280
Department of Homeland Security - United States Coast Guard	-	-	\$450	-	-	\$450	-	-	\$450
Department of Homeland Security - United States Secret Service	-	-	\$1,500	-	-	\$1,500	-	-	\$1,500
Department of Justice - Federal Bureau of Investigation	-	-	\$21,000	-	-	\$21,000	-	-	\$21,000
Department of State	-	-	\$200	-	-	\$200	-	-	\$200
Library of Congress	-	-	\$500	-	-	\$500	-	-	\$500
Department of Homeland Security - Cybersecurity and Infrastructure Security Agency	-	-	\$1,000	-	-	\$11,300	-	-	\$11,300
Department of Homeland Security - Office of Biometric Identity Management (OBIM)	-	-	-	-	-	\$2,000	-	-	\$2,000
Total Collections	-	-	\$34,325	-	-	\$73,125	-	-	\$73,125

Operations and Support Summary of Budget Changes

(Dollars in Thousands)

	Positions	FTE	Pay Amount	Non-Pay Amount	Amount
FY 2022 Enacted	530	511	\$104,725	\$225,865	\$330,590
FY 2023 Enacted	572	544	\$118,247	\$265,860	\$384,107
FY 2024 Base Budget	572	544	\$118,247	\$265,860	\$384,107
Total Technical Changes	-	-	-	-	-
Annualization of MS-Compliance Division	-	16	\$3,265	-	\$3,265
Annualization of System of Systems Operational Analytics (SoSOA) Positions	-	3	\$1,691	\$609	\$2,300
Annualization of Zero Trust Implementation	-	1	\$271	-	\$271
Non-recur of MS-Fill Critical Positions	-	-	(\$12)	(\$77)	(\$89)
Total Annualizations and Non-Recurs	-	20	\$5,215	\$532	\$5,747
Civilian Pay Raise Total	-	-	\$4,862	-	\$4,862
Annualization of Prior Year Pay Raise	-	-	\$1,211	-	\$1,211
FPS Fee Adjustment	-	-	-	\$11	\$11
Investment Cost Savings	-	-	-	(\$1,408)	(\$1,408)
Laboratory Facilities IT Investment	-	-	-	\$42	\$42
Total Pricing Changes	-	-	\$6,073	(\$1,355)	\$4,718
Total Adjustments-to-Base	-	20	\$11,288	(\$823)	\$10,465
FY 2024 Current Services	572	564	\$129,535	\$265,037	\$394,572
Total Transfers	-	-	-	-	-
AOA-Acquisition Support	-	-	-	(\$9,806)	(\$9,806)
AOA-Federally Funded Research and Development Centers	-	-	-	(\$1,291)	(\$1,291)
AOA-SAFETY Act	-	-	-	(\$850)	(\$850)
AOA-Technology Transition Support	-	-	-	(\$2,708)	(\$2,708)
MS FFRDC PMO Positions	2	1	\$183	\$100	\$283
MS-Enterprise Shared Services	-	-	-	(\$8,155)	(\$8,155)
Total Program Changes	2	1	\$183	(\$22,710)	(\$22,527)
FY 2024 Request	574	565	\$129,718	\$242,327	\$372,045
FY 2023 TO FY 2024 Change	2	21	\$11,471	(\$23,533)	(\$12,062)

Operations and Support Justification of Pricing Changes

(Dollars in Thousands)

	FY 2024 President's Budget				
	Positions	FTE	Pay Amount	Non-Pay Amount	Amount
Pricing Change 1 - Civilian Pay Raise Total	-	-	\$4,862	-	\$4,862
Mission Support	-	-	\$3,872	-	\$3,872
Laboratory Facilities	-	-	\$990	-	\$990
Pricing Change 2 - Annualization of Prior Year Pay Raise	-	-	\$1,211	-	\$1,211
Mission Support	-	-	\$948	-	\$948
Laboratory Facilities	-	-	\$263	-	\$263
Pricing Change 3 - FPS Fee Adjustment	-	-	-	\$11	\$11
Laboratory Facilities	-	-	-	\$11	\$11
Pricing Change 4 - Investment Cost Savings	-	-	-	(\$1,408)	(\$1,408)
Mission Support	-	-	-	(\$1,408)	(\$1,408)
Pricing Change 5 - Laboratory Facilities IT Investment	-	-	-	\$42	\$42
Laboratory Facilities	-	-	-	\$42	\$42
Total Pricing Changes	-	-	\$6,073	(\$1,355)	\$4,718

Pricing Change 1 – Civilian Pay Raise Total

Base Activity Funding: This pricing change impacts civilian pay funding in the Base and Annualizations, which totals \$118.2M.

Pricing Change Explanation: This pricing change represents the costs of the first three quarters of the calendar year 2024 with a 5.2 percent civilian pay increase. It is calculated by adding \$118.2M in Base pay and the Annualization of Prior Year Pay Raise pricing change, multiplying by the pay rate increase (5.2 percent) and then by three-fourths to account for nine months of the 2024 calendar year.

Pricing Change 2 – Annualization of Prior Year Pay Raise

Base Activity Funding: This pricing change accounts for the last quarter of civilian pay funding from the FY 2023 enacted, which totals \$118.2M.

Pricing Change Explanation: This pricing change represents the costs of the fourth quarter of the calendar year 2023 4.6 percent civilian pay increase. It is calculated by adding of FY 2022 enacted base pay and the FY 2023 Annualization of Prior Year Pay Raise pricing change, multiplying by the pay rate increase (4.6 percent) and then by one-fourth to account for three months of the 2023 calendar year.

Pricing Change 3 –FPS Fee Adjustment

Base Activity Funding: This pricing change impacts the fees paid for services from the Federal Protective Services (FPS) in the Base and Annualizations, which total \$0.3M.

Pricing Change Explanation: This pricing represents an increase in the FPS support provided to S&T. This increase is a result of non-pay inflationary increases in basic security services at S&Ts building-specific locations.

Pricing Change 4 – Investment Cost Savings for Non-Major Investment Sustainment

Base Activity Funding: This pricing change represents costs savings for S&Ts non-major investments, which totals \$1.41M..

Pricing Change Explanation: This pricing change represents cost savings from S&Ts Federal Financial Management System (FFMS) and S&T Analytical Tracking System (STATS) investments. Efficiencies realized from FFMS directly correspond to S&T streamlining processes to ensure clean financial system records. Non-pay base funding in FY 2023 enacted for FFMS is \$4.9M and the FY 2024 President’s Budget includes \$4.5M for FFMS, resulting in a savings of \$0.5M. Additionally, STATS, funding in the FY 2023 non-pay base of \$3.6M enables S&T to transition enhanced modules from a development to production phase in FY 2024, resulting in costs savings of \$1.0M, and non-pay base funds of \$2.6M in the FY 2024 President’s Budget.

Pricing Change 5 – Laboratory Facilities IT Investment

Base Activity Funding: This pricing change represents costs increases for S&Ts non-major investments, which totals \$.042M

Pricing Change Explanation: This pricing change reflects costs associated with contractual non-pay inflation increases for the Laboratory Facility Investments for Genomic Data, Network and Analysis (GDNA) System, National Biodefense and Countermeasures Center (NBACC) Security Management System, and Safety Act Management System (SAMS).

Operations and Support Justification of Program Changes

(Dollars in Thousands)

	FY 2024 President's Budget				
	Positions	FTE	Pay Amount	Non-Pay Amount	Amount
Program Change 1 - AOA-Acquisition Support	-	-	-	(\$9,806)	(\$9,806)
Acquisition and Operations Analysis	-	-	-	(\$9,806)	(\$9,806)
Program Change 2 - AOA-Federally Funded Research and Development Centers	-	-	-	(\$1,291)	(\$1,291)
Acquisition and Operations Analysis	-	-	-	(\$1,291)	(\$1,291)
Program Change 3 - AOA-SAFETY Act	-	-	-	(\$850)	(\$850)
Acquisition and Operations Analysis	-	-	-	(\$850)	(\$850)
Program Change 4 - AOA-Technology Transition Support	-	-	-	(\$2,708)	(\$2,708)
Acquisition and Operations Analysis	-	-	-	(\$2,708)	(\$2,708)
Program Change 5 - MS FFRDC PMO Positions	2	1	\$183	\$100	\$283
Mission Support	2	1	\$183	\$100	\$283
Program Change 6 - MS-Enterprise Shared Services	-	-	-	(\$8,155)	(\$8,155)
Mission Support	-	-	-	(\$8,155)	(\$8,155)
Total Program Changes	2	1	\$183	(\$22,710)	(\$22,527)

Program Change 1 – AOA-Acquisition Support:

<i>(\$ in thousands)</i>	Pos	FTE	Amount
Base: Current Services & Transfers	-	-	\$47.2M
Program Change	-	-	-\$9.8M

Description

The FY 2024 President's Budget provides 47.2M, a decrease of \$9.8M for the transformation of System of Systems Operational Analytics (SoSOA) and implementation of the Evidence Act with evaluation activities as well as enhances operational analysis.

Justification

SoSOA has transformed into an enterprise-level capability to increase the effectiveness and efficiency of DHS data analytics and enables the analysis of highly complex systems of interdependent components (system of systems) for Components, Headquarter Offices including the Joint Requirements Council (JRC), Program Analysis and Evaluation (PA&E) within the DHS Chief Financial Officer, and the Office of Immigration Statistics (OIS). Starting from several earlier proof-of-concept projects to the highly visible Migrant Model Integration (MMI) capability, the demand for a fully mature, enterprise-wide SoSOA capability is strong amongst the HSE. SoSOA provides Components an Enterprise-level capability with common analytic frameworks, tools, and training. Increasing the collaborative analysis capability for DHS results in cost and time savings - freeing up operators and resources for mission-critical operations execution. Planned capabilities include:

- Assimilated visualization and analytic tools with fused data from disparate sources to improve decision support and reporting efficiency.
- Faster delivery of analyses to support decision making.
- Reduce costs for data-driven analysis by ensuring DHS Components leverage, share, reuse, and repurpose previously developed analyses.
- Enterprise analytic applications that include business analytics and visualization, statistical packages, modeling and simulation, decision analysis tools, and a library of online SoSOA analytics training manuals for 1000 users across DHS.

Operations and Requirements Analysis Division (ORA) provides direct support to S&T's designated Evaluation Officer (EO) and requests FY 2024 funding to continue building evidence to inform DHS and S&T decision-making and organizational learning in line with Evidence Act. ORA will lead the implementation, dissemination/communication, and monitoring and assisting in compliance with an S&T Policy 04-007-000 Evaluation and Evidence-Building Activities and related procedures that meet OMB guidance and DHS policy, and address findings in the DHS FY 2021 Capacity Assessment. S&T EO will expand evaluation capacity and develop, execute, and/or disseminate results of formal S&T program evaluations within the current DHS FY 2022-2026 Learning Agenda. This includes continuing a multi-year Test and Evaluation/Independent Test Agent outcome evaluation and a multi-year Support Anti-Terrorism by Fostering Effective Technologies (SAFETY) Act foundational fact finding and process/implementation evaluation effort. Funding also supports related activities preceding S&T program evaluations, and required by OMB and DHS, including the following: Logical Model/Theory of Change development, evaluation study plan development and publication of "DHS PA&E evidence overview templates and evaluability assessments." The evidence overviews assist with integrating evidence and evaluation in S&T financial assistance program planning and design. With the requested funding, the S&T EO will be able to meet the DHS's FY 2024 reporting requirements and timelines for the annual "DHS Learning Agenda and Annual Evaluation Plan Development and Update Cycle" as specified by DHS EO and the annual DHS Strategic Review process. S&T EO will establish guidelines to foster and steward S&T data management for evaluation and to make S&T evaluation data available for secondary use. S&T EO will continue supporting S&T Office of Science and Engineering FY 2022-2026 strategy key activities related to operationalizing the EO, Scientific Integrity Officer, Chief Data Officer, and Statistical Official roles at S&T.

Operational analysis activities include but are not limited to definition of one or more proposed R&D solution paths, identification of real-world constraints, assessment of benefits and risks, and application of advanced cost modeling techniques to estimate direct and indirect costs. The Operational Analysis Branch will review homeland security operations to identify ways to prioritize DHS capability gaps and duplications, as well as identify cost effective solutions for Component operations and process inefficiencies.

Performance

Funding for SoSOA provides capabilities and resources to address operational analytics needs of DHS Components including the CBP, ICE, and Headquarters offices OIS, PA&E and JRC. SoSOA is developed to scope and solve complex problems across multiple DHS components, systems, or mission areas. Although FY 2024 funding is a decrease, the program will look to build on its current successes by leveraging the operational, policy, and resourcing expertise gained through the various analytic projects. SoSOA provides this subject matter expertise (SME) to analysts from across DHS. This support has contributed to the success of major DHS efforts to include Operations Allies Welcome. Additionally, these efforts have led to the development of the MMI capability which is a decision support tool that captures the end-to-end process of all agencies involved in a migrant's movement through the immigration system, including how resource, policy, or process changes impact the flow of migrants from apprehension to removal. The funding requested would allow SoSOA to increase its SME support with the addition of time and contract staff.

This funding will also allow improvements on the environment's stability and scalability by augmenting investment in its cloud infrastructure and improving system integration. This will allow SoSOA to continue to serve its growing user base without any service disruption due capacity or other system limitations.

The reduced funding for evaluation activities will still enable S&T to adequately support Evidence Act implementation activities, including implementation of S&T's Evaluation Policy, compliance with OMB guidance and DHS policy, and building evaluation capacity. As specific benefits, the funding will allow ORA to fully support one ongoing outcome evaluation in FY 2024 and promptly initiate a process/implementation evaluation (both studies designated as significant efforts for the DHS Annual Evaluation Plan and Learning Agenda) while rigorously planning and coordinating for new, priority evidence building activities for FY 2025 and forward. This can include planning one foundational fact finding and one program evaluation to start in FY 2025. FY 2024 funding will allow the S&T EO to support at least one evaluability assessment for an S&T financial assistance program and continue to support the integration evidence and evaluation in S&T notice of funding opportunity (NOFO) programs' planning and design. This funding will enable S&T to meet the DHS PA&E expectations of conducting one or more formal program evaluation per fiscal year as well as the annual reporting requirements and timelines for the "DHS Learning Agenda and Annual Evaluation Plan Development and Update Cycle." Funding increases to operational analysis will generate impacts that reduce S&T operational costs and risks, and identifies process data that supports decision analysis, while decreasing the manual integration of data across organizations.

Program Change 2 – AOA-Federally Funded Research and Development Centers:

<i>(\$ in thousands)</i>	Pos	FTE	Amount
Base: Current Services & Transfers	-	-	\$6.7M
Program Change	-	-	-\$1.3M

Description

The FY 2024 President's Budget provides \$5.4M, a decrease of \$1.3M for operations of the Federally Funded Research and Development Center (FFRDC) Program Management Office (PMO).

Justification

Over the past several years, DHS significantly expanded interest in leveraging FFRDCs to help solve some of their most significant engineering and operational challenges as evidenced by: a 67 percent increase of Indefinite-Delivery, Indefinite-Quantity (IDIQ) contract award value from \$515.0M (FY 2014 contract) to \$862.0M (FY 2020 contract); and the recent award of Homeland Security Operational Analysis Center (HSOAC) IDIQ contract at \$495.0M to continue operational studies and analysis research. DHS has increased its demand for the unique services of the FFRDCs. In FY 2022 there were 115 task orders for a total of \$290.8M, compared to the 106 new task orders in FY 2021 at a value of \$264.0M. The growing demand for subject matter expertise in R&D also has increased the demand for FFRDC PMO services. With a funding reduction of \$1.3M, the PMO will implement a FFRDC Rapid Response program that aligns to the DHS priority to "Increase our effectiveness through transformational, cross-cutting initiatives" and will enable the FFRDCs to provide senior leaders, e.g., the DHS Secretary, with expert guidance to inform their imminent decisions. The PMO will implement a plan for managing these funds and providing DHS leadership this unique service. Leveraging a governance model employed in other Departments that sponsor FFRDCs, the PMO will closely coordinate with S&T leadership to obligate funds based on a pre-established criteria set that aligns with the Administration and/or DHS priorities. With each rapid response effort, a subset of the overall funding pool is used to obtain analysis and recommendations from experts in the FFRDCs to inform decisions. Each effort includes a tangible output that leadership can use for evidence-based decision making.

The President's Budget also funds a contract support position necessary to handle the increasing quantity of tasks related to the growing demand of FFRDC services. The staff member will support PMO services to DHS Contracting Officers, Program Managers, and Contracting Officer Representatives (COR). Specifically, the funding reduction will have minimal impact on services provided by the contractor provide in support of task order management operations (e.g., IT enclave management, requirements reviews, procurement package construction and coordination, COR duties, task order closeouts), strategic operations (e.g., DHS and FFRDC strategic communications development, rapid response planning, knowledge management preparation and execution), and the Federal Acquisition Regulation-required comprehensive review of Homeland Security Systems Engineering and Development Institute's (HSSEDI) effectiveness and performance. The comprehensive review, which requires a minimum of three dedicated staff for more than 12 months, determines whether the FFRDC's services are still needed, recommends if and how services should be modified, and leads to a new acquisition. This staff member also will assist the subsequent multi-month acquisition activities in FY 2024 for the multi-faceted, \$1.0B IDIQ contract with HSSEDI.

Performance

DHS leadership's ability to make critical decisions will benefit from the PMO's rapid response deployment of FFRDC resources. The reduced funding will have minimal impact on these entities ability to obtain guidance and data from FFRDC experts on several key efforts because the quick entry and exit of the FFRDC experts. There is no other means to access such a unique resource that is well positioned to provide quality information in such a short amount of time. Additionally, funding supports one management analyst contractor, which will enable the FFRDC to balance work and allow PMO leadership to take on other impact-focused activities. The PMO will transfer a portion of tactical day-to-day responsibilities (e.g., coordinating tasker responses, assembling procurement packages, facilitating public release requests, processing invoices and deliverables, processing suitability requests) to this junior staff member, and the FFRDC leads will focus on efforts to improve services to stakeholders (e.g., discussions with DHS users for how to maximize output from the FFRDC via task orders and expanded outreach beyond our 12 events per year minimum).

Program Change 3 – AOA-SAFETY Act:

<i>(\$ in thousands)</i>	Pos	FTE	Amount
Base: Current Services & Transfers	-	-	\$18.8M
Program Change	-	-	-\$0.9M

Description

The FY 2024 President's Budget provides \$18.8M, a decrease of \$0.9M in support of SAFETY Act.

Justification

The volume of SAFETY Act applications has risen steadily every year since FY 2014. Initially, the program averaged 60 to 75 applications a year. As projected in FY 2022 it now averages 120 to 130 applications a year – with 148 new submissions in 2022. Based on increased engagement efforts, Office of SAFETY Act Implementation (OSAI) anticipates a 30- to 40-percent surge in application submissions over the next 18 to 24 months as organizations resume normal operations, specifically for large-scaled venues. This anticipated increase is forecast by industry interest indicators and is further validated by the uptick (~55 percent increase) in the number of pre-applications, consultation requests, and inquiries OSAI received in FY 2022

With a decrease in funding, OSAI will employ steps to mitigate the effects of rising application amounts through the implementation of the following mission essential elements:

- **Program and Technical Contractor Support:** To increase technical expertise for application evaluation, refresh, and supplement evaluation guidelines, increase engagement with applicant community to support successful application submissions, increase support for post-award application activities, and ability to surge during peak application periods. Program support will be provided for case managers and the program office in processing applications and overall program management activities such as change management, program planning, and communications management.
- **SME Support:** To lead OSAI evaluation policy development and analysis initiatives for specific content areas and technology types such as artificial intelligence, insurance modeling, and other emerging technologies. IPAs are program funded Federal staff with specialized skills on temporary assignment (not to extend beyond four years) which are not accounted against Federal billets.

SAFETY Act has the potential to be a critical driver of innovation and change across multiple industry sectors to secure the nation's critical infrastructure from terrorist attacks. In order to fully sustain the growth anticipated over the next three years and execute its mission, will use the FY 2024 President's Budget funding level to keep the program operational and functioning as intended by Congress.

Performance

The reduction in funding will have minimal impact on OSAI's ability to address the backlog rate with the goal of processing at least 85-90 percent of applications in accordance with regulatory timelines. OSAI will continue to address critical programmatic gaps, implement business process improvements, and update evaluation and programmatic policy to support repeatable, consistent standards and guidelines. Program and technical contractor staff will support OSAI's effort to reduce the average processing time from 368 days to less than 180 days. Funding will allow the SAFETY Act program to maintain its critical function toward defending our homeland and enhance its ability to interact with Stakeholders who develop groundbreaking anti-terrorism technologies for the protection of critical infrastructure, national economic security, and public safety.

Program Change 4 – AOA-Technology Transition Support:

<i>(\$ in thousands)</i>	Pos	FTE	Amount
Base: Current Services & Transfers	-	-	\$13.4M
Program Change	-	-	-\$2.7M

Description

The FY 2024 President's Budget provides \$13.4M, a decrease of \$2.7M in Technology Transition Support for Technology Scouting and Transition (TST) activities and the Partnership Intermediary Agreement (PIA) Program.

Justification

TST conducts activities that inform and support R&D decisions and the transition and knowledge sharing of solutions to meet DHS's customer requirements through Technology Scouting (TS), Operational Experimentation (OpEx), Technology Transition (TT) and the Technology Clearinghouse (TCH). The TS capability identifies alternative options for key R&D efforts to ensure the most relevant available solutions are considered, increases speed of project execution through a repetitive streamlined scouting process, and reduces costs for select projects by using refined and efficient processes to provide services. TT provides centralized support management in planning for and executing the transition of knowledge products, capabilities, and technologies to DHS Components. The OpEx program facilitates and conducts operational experimentations with S&T program managers and DHS Component customers to evaluate the technical capabilities and operational use of new and emerging technologies. Discussion based activities can be used to explore end user requirements for emerging technologies and the implication for technology transition to mission operations. Technology demonstrations can expose end users to commercially available technologies to evaluate if these available technologies meet end user requirements. Field assessments allow end users to deploy emerging technologies in simulated operational scenarios to develop an in-depth understanding of how these technologies perform. TST maintains the DHS Technology Clearinghouse that serves as the Congressionally mandated repository for S&T program and project reports and artifacts to aid in knowledge sharing to enhance the successful development and deployment of innovative homeland security technology solutions.

A PIA is an agreement between the government and a Partnership Intermediaries (PI), which are State or local government agencies or nonprofit organizations, to assist the Federal agency with its technology transfer and commercialization function. PIs perform services for Federal laboratories that increase the likelihood of success in the conduct of cooperative or joint activities of such Federal laboratories with small business firms and institutions of higher learning. PI's assists, counsels, evaluates or otherwise cooperates with small businesses, educational institutions, or institutions of higher learning making use of Federal laboratories. The PI may analyze alternative business practices, models, commercially applied or emerging processes, and tools to enhance technology transfer opportunities for federally-funded DHS-relevant technologies. Funding represents a continued commitment to expand the DHS PIA network to increase technology marketing and outreach, ensuring DHS is making use of individual partnership intermediaries' skillset.

Performance

The reduced funding will allow TST to effectively and efficient provide resources for capabilities to support program and project managers resulting in more informed decisions, increased risk management to avoid R&D efforts that are not needed and accelerate the integration of innovative technologies into operational "front line" use.

- OpEx will maintain a multi-disciplinary capability to conduct technology demonstrations, field assessments, and discussion-based activities. These activities include collaboration to integrate DHS requirements into Federal partner experimentation activities, technology demonstrations, field assessments, and facilitated discussions such as tabletop exercises. Funding will allow for TST to plan and conduct a limited number of prioritized activities to gather data on operational requirements, the operational utility of a technology, or identification of gaps in tactics, techniques, or procedures (TTPs) in support of DHS Operational Component's requirements. This will enable operators to understand how these technologies will fundamentally shift the way they do business and execute their missions.
- Tech Scouting will coordinate and facilitate activities to identify relevant shareable information on ongoing R&D projects, identify emerging cutting-edge technologies, and foster collaboration with other USG tech scouting programs. These collaboration and information exchange efforts will generate impact for customers by facilitating resource savings by reducing redundant efforts, helping initiate acquisitions/R&D collaboration discussions, and informing decisions with department-wide implications and the current state of technology.
- This funding will allow the Technology Clearinghouse to maintain the TCH 2.0 web portal and existing knowledge products currently in the portal.
- Transition Planning will collaborate across S&T to understand the factors that will shape the transition effort and delivery of new solutions to customers and identify opportunities to accelerate successful fielding of solutions or manage and mitigate risks to transition.

Although the PIA Program's funding was reduced, PIA will have a continued commitment to the mission area while executing efficiently. S&T will develop a network of qualified PI organizations to increase the maturity and market readiness of DHS funded technologies to prepare them for transition and commercialization to meet DHS' operational needs and the needs of the wider HSE.

Program Change 5 – MS-FFRDC PMO Positions:

<i>(\$ in thousands)</i>	Pos	FTE	Amount
Base: Current Services & Transfers	5	5	\$3.8M
Program Change	2	1	\$0.3M

Description

The FY 2024 President’s Budget provides \$3.8M, an increase of 2 positions, 1 FTE, and \$0.3M to support the Federally Funded Research Centers (FFRDC).

Justification

The FFRDC PMO manages two strategically sourced IDIQ contracts exceeding \$1.0B and ensure that the systems engineering FFRDC and studies and analysis FFRDC expertise are available to S&T, DHS Components, and the HSE. The two FFRDCs managed by the PMO HSSEDI and HSOAC, and over the past several years, DHS significantly expanded interest in leveraging the FFRDCs to help solve some of their most significant engineering and operational challenges. DHS has increased its demand for the unique services of the FFRDCs. In FY 2022 there were 115 task orders for a total of \$290.8M in FY 2022, compared to the 106 new task orders in FY 2021 at a value of \$264.0M. The PMO will increase its current federal footprint of five staff by two ladder positions (i.e., GS 11/12/13), and those staff will serve as contracting officer representatives (COR) for the two FFRDCs (i.e., HSOAC and HSSEDI).

As the long-tenured central hub for FFRDC-related services, the PMO performs its COR responsibilities efficiently because of its familiarity with FFRDC-specific contracting rules as well as a deep understanding of the FFRDC operating posture. With a relatively small federal footprint of five staff, the two additional CORs will alleviate the growing set of responsibilities for the PMO.

Performance

Additional dedicated COR positions for each FFRDC supports the PMO’s ability to focus more on value-add activities for DHS by appropriately distributing COR responsibilities and freeing the PMO’s FFRDC leads to focus on strategic outcomes. Additionally, staff will benefit from the additional dedicated CORs providing more in-depth tactical and strategic guidance for obtaining the best possible service from the FFRDCs both before and after task order award.

Program Change 6 – MS-Enterprise Shared Services:

<i>(\$ in thousands)</i>	Pos	FTE	Amount
Base: Current Services & Transfers	57	57	\$24.5M
Program Change	-	-	-\$8.1M

Description

The FY 2024 President's Budget provides \$24.5M, a decrease of \$8.1M for the Chief Information Office and the Contract Acquisition Support Office.

Justification

This funding decrease is in the area of IT services and acquisition support services.

Chief Information Office (CIO):

Funding levels provides direct support to S&T's Chief Information Office (CIO) with the ability to deliver Information Technology (IT) infrastructure, systems, and services to provide a foundation for S&T's R&D mission, directly supporting the entire mission, and assisting in the transition of S&T IT solutions to its internal and external customers. The CIO provides oversight and governance of IT acquisitions to make sure that they are in line with statutory, regulatory, and Departmental policy and guidance.

Contract Acquisition Program Support (CAPS):

Funding levels provide direct support to Program and Project Managers throughout S&T and facilitates the development of common repeatable standards, guidance, and program and project management (PM) processes to maximize the value S&T delivers to its customers. These services provide program and project management support, governance and administrative services, documentation, methodology, and professional development services in accordance with departmental acquisition policy S&T has over 700 contracts annually to meet Component requirements at various levels to all mission goals and objectives.

Performance

S&T will maintain current services and support operations that link to the strategic R&D priorities of S&T, as well as to establish and sustain standardized PM practices, governance, and oversight.

This decrease will enable S&T to efficiently manage investments below the PC&I threshold through streamlining its portfolios to gain efficiencies and fund the investments made to modernize and secure S&T's IT environments. S&T will make efforts available to meet the compulsory directions assigned by White House Executive Order 14028: *Improving the Nations' Cybersecurity*, and its subsequent requirements, and OMB Directive M-22-09 "*Moving the U.S. Government Toward Zero Trust Cybersecurity Principles*".

Currently, Federal employees within the CAPS office manage approximately half of S&T contracts. This decrease will allow S&T to continue providing direct support as contracting officer representatives, preparing and reviewing procurement packages and assisting in S&T contract closeouts.

Operations and Support Personnel Compensation and Benefits

Pay Summary (Dollars in Thousands)

	FY 2022 Enacted				FY 2023 Enacted				FY 2024 President's Budget				FY 2023 to FY 2024 Total			
	Pos.	FTE	Amount	Rate	Pos.	FTE	Amount	Rate	Pos.	FTE	Amount	Rate	Pos.	FTE	Amount	Rate
Mission Support	397	378	\$81,992	\$210.17	439	411	\$93,106	\$218.87	441	432	\$103,324	\$231.53	2	21	\$10,218	\$12.66
Laboratory Facilities	133	133	\$22,733	\$170.23	133	133	\$25,141	\$177.50	133	133	\$26,394	\$186.47	-	-	\$1,253	\$8.96
Total	530	511	\$104,725	\$199.78	572	544	\$118,247	\$208.76	574	565	\$129,718	\$220.92	2	21	\$11,471	\$12.16
Subtotal Discretionary - Appropriation	530	511	\$104,725	\$199.78	572	544	\$118,247	\$208.76	574	565	\$129,718	\$220.92	2	21	\$11,471	\$12.16

Pay by Object Class (Dollars in Thousands)

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget	FY 2023 to FY 2024 Change
11.1 Full-time Permanent	\$67,263	\$74,920	\$82,807	\$7,887
11.3 Other than Full-time Permanent	\$6,195	\$6,450	\$6,775	\$325
11.5 Other Personnel Compensation	\$2,083	\$2,347	\$2,596	\$249
11.8 Special Personal Services Payments	\$2,639	\$4,684	\$4,898	\$214
12.1 Civilian Personnel Benefits	\$26,545	\$29,846	\$32,642	\$2,796
Total - Personnel Compensation and Benefits	\$104,725	\$118,247	\$129,718	\$11,471
Positions and FTE				
Positions - Civilian	530	572	574	2
FTE - Civilian	511	544	565	21

Operations and Support
Permanent Positions by Grade – Appropriation
(Dollars in Thousands)

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget	FY 2023 to FY 2024 Change
SES	22	22	22	-
EX	1	1	1	-
GS-15	192	212	212	-
GS-14	158	165	165	-
GS-13	80	89	89	-
GS-12	42	44	44	-
GS-11	6	2	4	2
GS-9	3	7	7	-
GS-8	1	1	1	-
GS-7	1	-	-	-
GS-5	1	-	-	-
Other Grade Positions	23	29	29	-
Total Permanent Positions	530	572	574	2
Total Perm. Employment (Filled Positions) EOY	488	547	549	2
Unfilled Positions EOY	42	25	25	-
Position Locations				
Headquarters Civilian	395	437	439	2
U.S. Field Civilian	133	133	133	-
Foreign Field Civilian	2	2	2	-
Averages				
Average Personnel Costs, ES Positions	\$195,584	\$212,131	\$220,404	\$8,273
Average Personnel Costs, GS Positions	\$146,972	\$206,185	\$227,417	\$21,232
Average Grade, GS Positions	14	14	14	-

Operations and Support
Non Pay Budget Exhibits

Non Pay Summary
(Dollars in Thousands)

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget	FY 2023 to FY 2024 Change
Mission Support	\$51,974	\$71,104	\$62,173	(\$8,931)
Laboratory Facilities	\$100,958	\$102,381	\$102,434	\$53
Acquisition and Operations Analysis	\$72,933	\$92,375	\$77,720	(\$14,655)
Total	\$225,865	\$265,860	\$242,327	(\$23,533)
Subtotal Discretionary - Appropriation	\$225,865	\$265,860	\$242,327	(\$23,533)

Non Pay by Object Class*(Dollars in Thousands)*

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget	FY 2023 to FY 2024 Change
21.0 Travel and Transportation of Persons	\$1,102	\$1,241	\$1,261	\$20
22.0 Transportation of Things	\$78	\$126	\$126	-
23.1 Rental Payments to GSA	\$613	\$613	\$613	-
23.2 Rental Payments to Others	-	\$2,090	\$2,090	-
23.3 Communications, Utilities, & Miscellaneous	\$755	\$1,163	\$1,305	\$142
24.0 Printing and Reproduction	\$154	\$382	\$382	-
25.1 Advisory & Assistance Services	\$127,089	\$164,167	\$145,083	(\$19,084)
25.2 Other Services from Non-Federal Sources	\$2,603	\$6,402	\$6,389	(\$13)
25.3 Other Purchases of goods and services	\$39,326	\$37,965	\$36,719	(\$1,246)
25.4 Operations & Maintenance of Facilities	\$33,119	\$23,959	\$23,971	\$12
25.7 Operation & Maintenance of Equipment	\$10,186	\$11,836	\$9,397	(\$2,439)
25.8 Subsistence and Support of Persons	-	\$4	\$4	-
26.0 Supplies & Materials	\$1,176	\$1,461	\$1,476	\$15
31.0 Equipment	\$9,164	\$13,710	\$12,770	(\$940)
32.0 Land and Structures	-	\$20	\$20	-
41.0 Grants, Subsidies, and Contributions	\$500	\$682	\$682	-
42.0 Insurance Claims and Indemnities	-	\$39	\$39	-
Total - Non Pay Budget Object Class	\$225,865	\$265,860	\$242,327	(\$23,533)

Mission Support – PPA**Budget Comparison and Adjustments****Comparison of Budget Authority and Request***(Dollars in Thousands)*

	FY 2022 Enacted			FY 2023 Enacted			FY 2024 President's Budget			FY 2023 to FY 2024 Total Changes		
	Pos.	FTE	Amount	Pos.	FTE	Amount	Pos.	FTE	Amount	Pos.	FTE	Amount
Mission Support	397	378	\$133,966	439	411	\$164,210	441	432	\$165,497	2	21	\$1,287
Total	397	378	\$133,966	439	411	\$164,210	441	432	\$165,497	2	21	\$1,287
Subtotal Discretionary - Appropriation	397	378	\$133,966	439	411	\$164,210	441	432	\$165,497	2	21	\$1,287

PPA Level 1 Description

Mission Support provides funding for financial management and procurement operations, IT management and critical infrastructure support, human capital and personnel security, real estate and facilities management, internal and external mission and research centric communications, and compliance support and oversight. Mission Support also funds compliance assurance, export controls, legal intellectual property services for R&D projects, and oversight of intellectual property and trademark rights for all of DHS. The administrative activities of non-laboratory personnel and offices have the important role of implementing RDT&E activities are supported by Mission Support resources.

The 432 FTE included in the FY 2024 President's Budget will support S&T's policy analysis, planning, financial management, and guidance formulation. These FTE also manage and oversee IT and intellectual property, conduct program management, execution, oversight, and analysis, as well as operations and maintenance support for all S&T R&D programs in the RD&I, University Programs (UP), and AOA PPAs.

Mission Support – PPA
Budget Authority and Obligations
(Dollars in Thousands)

	FY 2022	FY 2023	FY 2024
Enacted/Request	\$133,966	\$164,210	\$165,497
Carryover - Start of Year	-	-	-
Recoveries	-	-	-
Rescissions to Current Year/Budget Year	-	-	-
Net Sequestered Resources	-	-	-
Reprogramming/Transfers	\$153	-	-
Supplementals	-	-	-
Total Budget Authority	\$134,119	\$164,210	\$165,497
Collections - Reimbursable Resources	\$2,225	\$34,075	\$34,075
Collections - Other Sources	-	-	-
Total Budget Resources	\$136,344	\$198,285	\$199,572
Obligations (Actual/Estimates/Projections)	\$136,061	\$198,253	\$199,158
Personnel: Positions and FTE			
Enacted/Request Positions	397	439	441
Enacted/Request FTE	378	411	432
Onboard and Actual FTE			
Onboard (Actual/Estimates/Projections)	371	419	-
FTE (Actual/Estimates/Projections)	361	403	-

Mission Support – PPA
Collections – Reimbursable Resources
(Dollars in Thousands)

	FY 2022 Enacted			FY 2023 Enacted			FY 2024 President's Budget		
	Pos.	FTE	Amount	Pos.	FTE	Amount	Pos.	FTE	Amount
Department of Defense	-	-	\$500	-	-	\$500	-	-	\$500
Department of Health and Human Services - Food and Drug Administration	-	-	\$300	-	-	\$2,650	-	-	\$2,650
Department of Homeland Security - U.S. Citizenship and Immigration Services	-	-	\$20	-	-	\$20	-	-	\$20
Department of Homeland Security - Countering Weapons of Mass Destruction	-	-	\$350	-	-	\$350	-	-	\$350
Department of Homeland Security - Federal Emergency Management Agency	-	-	\$70	-	-	\$70	-	-	\$70
Department of Homeland Security - Federal Law Enforcement Training Centers	-	-	\$10	-	-	\$10	-	-	\$10
Department of Homeland Security - Transportation Security Administration	-	-	\$45	-	-	\$45	-	-	\$45
Department of Homeland Security - U.S. Customs and Border Protection	-	-	\$500	-	-	\$7,000	-	-	\$7,000
Department of Homeland Security - U.S. Immigration and Customs Enforcement	-	-	\$30	-	-	\$30	-	-	\$30
Department of Homeland Security - United States Coast Guard	-	-	\$350	-	-	\$350	-	-	\$350
Department of Justice - Federal Bureau of Investigation	-	-	-	-	-	\$21,000	-	-	\$21,000
Department of Homeland Security - Cybersecurity and Infrastructure Security Agency	-	-	\$50	-	-	\$50	-	-	\$50
Department of Homeland Security - Office of Biometric Identity Mangement (OBIM)	-	-	-	-	-	\$2,000	-	-	\$2,000
Total Collections	-	-	\$2,225	-	-	\$34,075	-	-	\$34,075

Mission Support – PPA
Summary of Budget Changes
(Dollars in Thousands)

	Positions	FTE	Pay Amount	Non-Pay Amount	Amount
FY 2022 Enacted	397	378	\$81,992	\$51,974	\$133,966
FY 2023 Enacted	439	411	\$93,106	\$71,104	\$164,210
FY 2024 Base Budget	439	411	\$93,106	\$71,104	\$164,210
Total Technical Changes	-	-	-	-	-
Annualization of MS-Compliance Division	-	16	\$3,265	-	\$3,265
Annualization of System of Systems Operational Analytics (SoSOA) Positions	-	3	\$1,691	\$609	\$2,300
Annualization of Zero Trust Implementation	-	1	\$271	-	\$271
Non-recur of MS-Fill Critical Positions	-	-	(\$12)	(\$77)	(\$89)
Total Annualizations and Non-Recurs	-	20	\$5,215	\$532	\$5,747
Civilian Pay Raise Total	-	-	\$3,872	-	\$3,872
Annualization of Prior Year Pay Raise	-	-	\$948	-	\$948
Investment Cost Savings	-	-	-	(\$1,408)	(\$1,408)
Total Pricing Changes	-	-	\$4,820	(\$1,408)	\$3,412
Total Adjustments-to-Base	-	20	\$10,035	(\$876)	\$9,159
FY 2024 Current Services	439	431	\$103,141	\$70,228	\$173,369
Total Transfers	-	-	-	-	-
MS FFRDC PMO Positions	2	1	\$183	\$100	\$283
MS-Enterprise Shared Services	-	-	-	(\$8,155)	(\$8,155)
Total Program Changes	2	1	\$183	(\$8,055)	(\$7,872)
FY 2024 Request	441	432	\$103,324	\$62,173	\$165,497
FY 2023 TO FY 2024 Change	2	21	\$10,218	(\$8,931)	\$1,287

Mission Support – PPA

Personnel Compensation and Benefits

Pay Summary

(Dollars in Thousands)

	FY 2022 Enacted				FY 2023 Enacted				FY 2024 President's Budget				FY 2023 to FY 2024 Total			
	Pos.	FTE	Amount	Rate	Pos.	FTE	Amount	Rate	Pos.	FTE	Amount	Rate	Pos.	FTE	Amount	Rate
Mission Support	397	378	\$81,992	\$210.17	439	411	\$93,106	\$218.87	441	432	\$103,324	\$231.53	2	21	\$10,218	\$12.66
Total	397	378	\$81,992	\$210.17	439	411	\$93,106	\$218.87	441	432	\$103,324	\$231.53	2	21	\$10,218	\$12.66
Subtotal Discretionary - Appropriation	397	378	\$81,992	\$210.17	439	411	\$93,106	\$218.87	441	432	\$103,324	\$231.53	2	21	\$10,218	\$12.66

Pay by Object Class

(Dollars in Thousands)

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget	FY 2023 to FY 2024 Change
11.1 Full-time Permanent	\$51,445	\$58,428	\$65,482	\$7,054
11.3 Other than Full-time Permanent	\$5,747	\$5,983	\$6,285	\$302
11.5 Other Personnel Compensation	\$1,600	\$1,844	\$2,067	\$223
11.8 Special Personal Services Payments	\$2,546	\$3,151	\$3,304	\$153
12.1 Civilian Personnel Benefits	\$20,654	\$23,700	\$26,186	\$2,486
Total - Personnel Compensation and Benefits	\$81,992	\$93,106	\$103,324	\$10,218
Positions and FTE				
Positions - Civilian	397	439	441	2
FTE - Civilian	378	411	432	21

Pay Cost Drivers

		FY 2022 Enacted			FY 2023 Enacted			FY 2024 President's Budget		FY 2023 to FY 2024 Total Changes		
	FTE	Amount	Rate	FTE	Amount	Rate	FTE	Amount	Rate	FTE	Amount	Rate
Mission Support Personnel	378	\$79,446	\$210.17	411	\$89,955	\$218.87	432	\$100,020	\$231.53	21	\$10,065	\$12.66
Other PC&B Costs	-	\$2,546	-	-	\$3,151	-	-	\$3,304	-	-	\$153	-
Total - Pay Cost Drivers	378	\$81,992	\$210.17	411	\$93,106	\$218.87	432	\$103,324	\$231.53	21	\$10,218	\$12.66

Explanation of Pay Cost Drivers

Mission Support Personnel: These costs support personnel compensation, benefits, and performance awards for non-laboratory personnel supporting S&T's operations and mission. The FY 2024 President's Budget supports 441 positions, 432 FTE, to maintain S&T's current staffing and an increase of 2 positions and 21 FTE in support of the FFRDC. This increase also provides annualized pay inflation, annualized pay for second year for new positions requested in the FY 2023 enacted, and two new positions in the FY 2024 President's Budget.

Other PC&B Costs: These costs support subject matter experts that S&T uses from other government agencies on a reimbursable detailee basis.

Mission Support – PPA Non Pay Budget Exhibits

Non Pay Summary

(Dollars in Thousands)

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget	FY 2023 to FY 2024 Change
Mission Support	\$51,974	\$71,104	\$62,173	(\$8,931)
Total	\$51,974	\$71,104	\$62,173	(\$8,931)
Subtotal Discretionary - Appropriation	\$51,974	\$71,104	\$62,173	(\$8,931)

Non Pay by Object Class

(Dollars in Thousands)

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget	FY 2023 to FY 2024 Change
21.0 Travel and Transportation of Persons	\$665	\$716	\$736	\$20
23.3 Communications, Utilities, & Miscellaneous	\$755	\$1,149	\$1,291	\$142
24.0 Printing and Reproduction	\$140	\$140	\$140	-
25.1 Advisory & Assistance Services	\$28,715	\$42,896	\$37,425	(\$5,471)
25.2 Other Services from Non-Federal Sources	\$941	\$1,729	\$1,716	(\$13)
25.3 Other Purchases of goods and services	\$6,762	\$4,842	\$4,585	(\$257)
25.4 Operations & Maintenance of Facilities	\$1,048	\$321	\$333	\$12
25.7 Operation & Maintenance of Equipment	\$6,671	\$11,235	\$8,796	(\$2,439)
26.0 Supplies & Materials	\$491	\$760	\$775	\$15
31.0 Equipment	\$5,786	\$7,316	\$6,376	(\$940)
Total - Non Pay Budget Object Class	\$51,974	\$71,104	\$62,173	(\$8,931)

Non Pay Cost Drivers

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget	FY 2023 to FY 2024 Total Changes
Contract Support Services	\$28,073	\$42,896	\$37,425	(\$5,471)
Other Costs	\$18,057	\$20,892	\$18,372	(\$2,520)
Information Technology Equipment	\$5,844	\$7,316	\$6,376	(\$940)
Total - Non-Pay Cost Drivers	\$51,974	\$71,104	\$62,173	(\$8,931)

Explanation of Non-Pay Cost Drivers

Contract Support Services: This cost driver reflects pay for contractor staff supporting the execution of headquarters functions including financial management, facility planning, personal property, maintenance, and other administrative functions. Through streamlining its portfolios to gain efficiencies, this decrease enables S&T to support the various IT services to include networks, enterprise architecture, information assurance and service delivery support. This decrease also funds current service levels for acquisition support services, program support and engagement, and a range of legislative analysis, strategic messaging, and advocacy support services.

Other Costs: This cost driver supports S&T's headquarters operational functions including business utilities, travel, training, office supplies, printing services, legal services, consolidated subscriptions, government-wide mandated services, non-major Investments, and DHS FOIA system. This funding decrease supports the reduced requirements in support of S&T Analytical Tracking System (STATS) investments.

Information Technology Equipment: This cost driver includes data centers, security and compliance software, the purchase and maintenance of IT equipment, including hardware (e.g., laptops, monitors, printers, etc.) and software (e.g., Microsoft Office, McAfee) as well as upgrades of this equipment. This funding decrease maintains current service levels for various IT services, acquisition support services, program support and engagement, and strategic engagement and analysis in FY 2024.

Laboratory Facilities – PPA**Budget Comparison and Adjustments****Comparison of Budget Authority and Request***(Dollars in Thousands)*

	FY 2022 Enacted			FY 2023 Enacted			FY 2024 President's Budget			FY 2023 to FY 2024 Total Changes		
	Pos.	FTE	Amount	Pos.	FTE	Amount	Pos.	FTE	Amount	Pos.	FTE	Amount
Laboratory Facilities	133	133	\$123,691	133	133	\$127,522	133	133	\$128,828	-	-	\$1,306
Total	133	133	\$123,691	133	133	\$127,522	133	133	\$128,828	-	-	\$1,306
Subtotal Discretionary - Appropriation	133	133	\$123,691	133	133	\$127,522	133	133	\$128,828	-	-	\$1,306

PPA Level I Description

The Laboratory Facilities PPA provides funding to support operations, infrastructure capabilities, maintenance, and personnel requirements at S&T's laboratory facilities. Laboratory Facilities is managed by the Office of National Laboratories (ONL) which oversees the continued operations of S&T's laboratory facilities to include the National Biodefense Analysis and Countermeasures Center (NBACC), Plum Island Animal Disease Center (PIADC), Transportation Security Laboratory (TSL), National Urban Security Transportation Laboratory (NUSTL), and Chemical Security Analysis Center (CSAC) to meet mission requirements while maintaining safe, secure, compliant, and efficient operations. ONL also maintains capabilities vital to DHS and the national homeland security mission through a coordinated network of S&T and DOE national laboratories. This network of laboratories houses some of the most advanced scientific expertise and capabilities in the world, enabling the HSE to leverage, apply, and share knowledge that helps to inform policy, improve operations, and advance research in support of homeland security.

ONL is a crucial contributor to technology efforts and is a key resource in S&T's matrixed organization providing scientifically based RDT&E to deliver solutions. ONL provides an enduring capability of subject matter expertise and dedicated technical infrastructure critical to the success in each of S&T's RD&I thrust areas.

The following operations and facilities are supported in this PPA:

National Biodefense Analysis and Countermeasures Center Operations: NBACC provides the capability to characterize current and future biological threats, assess their impacts, and inform the development of countermeasures and vaccines in response to events and identified threats. NBACC is part of the National Interagency Biodefense Campus, located at Ft. Detrick, MD. NBACC also collaborates closely with the Federal Bureau of Investigation (FBI) and national security agencies. The unique missions of threat characterization and bioforensics enhance the Nation's overall biodefense capabilities. Maintaining this cutting-edge capability and technology at NBACC has allowed S&T to quickly pivot to emerging events like the COVID-19 pandemic. For example, NBACC added an online calculator tool that estimates the natural decay of SARS-CoV-2 (the virus that causes COVID-19) in the air, under various environmental conditions, to assist response efforts and minimize person-to-person transmission by analyzing environmental factors that may impact the ability of the virus to spread.

NBACC is also utilized across the Federal Government and private sector through its "Work for Others" program. The "Work for Others" program conducts work for Federal agencies and non-Federal entities on a reimbursable basis. NBACC examines opportunities for the cooperative use of existing capacity to perform R&D for other Federal agencies. S&T operates NBACC as a FFRDC, which plans, manages, and executes the NBACC research programs and operates the facility. Some of the major operational costs include safety, security, addressing and maintaining regulatory compliance, IT and IT upgrades, utility and garrison support costs, and major facility and equipment upgrades. NBACC is a certified and registered biosafety level (BSL) 2, 3, and 4 laboratory and has completed the triennial Biological Select Agents and Toxins registration inspection.

Plum Island Animal Disease Center Operations: PIADC has an interagency mission to protect U.S. agriculture from the threat of high-consequence, foreign animal diseases such as Foot and Mouth Disease (FMD). In carrying out this mission, PIADC provides a host of high-impact, indispensable preparedness, and response capabilities to include vaccine R&D, diagnostics, training, and bio forensics. The biological countermeasures development at PIADC supports S&T's agro-terrorism countermeasures program. Research at the facility occurs in BSL-2 and BSL-3 agricultural laboratory spaces and stores the North American FMD Vaccine Bank. S&T is responsible for the management, operations, and maintenance of the complex which is comprised of numerous structures that provide office space, laboratory facilities, warehousing, waste processing, and storage. PIADC operations are largely self-sustaining and include a power plant, boiler plant, chiller facility, fuel storage, fire protection, waste handling, security systems, and other critical infrastructure. S&T provides the only ferry transport to and from the island and is responsible for operation and maintenance of the ferries, docks, and harbor. S&T also manages day-to-day operational support, including the operations and maintenance workforce and emergency response capabilities (fire, rescue, emergency medical). Major operational costs at PIADC include bio safety, security, operations and maintenance contract management, IT, and periodic upgrades to meet regulatory requirements and equipment replacement to ensure safe, compliant facility operations. PIADC will be heavily involved in support of the safe and efficient transfer of the United States Department of Agriculture (USDA) biorepository to the National Bio and Agro-Defense Facility.

Transportation Security Laboratory Operations: The TSL is responsible for researching, developing, testing, and evaluating technologies to detect and mitigate the threat of explosives and other weapons that may be used against our Nation's transportation systems and infrastructure. All TSA threat detection systems are certified by TSL's Independent Test and Evaluation Division. TSL supports TSA as its primary customer, but also provides test and evaluation services to the U.S. Customs and Border Protection (CBP), United States Coast Guard (USCG), United States Secret Service (USSS), and other government organizations. TSL's main campus is located at the Federal Aviation Administration's (FAA) William J. Hughes Technical Center in Atlantic City, NJ. A remote test facility located at Tyndall Air Force Base, FL, collects homemade explosive detection data supporting transportation security equipment developmental testing and certification testing, while another TSL capability, the Detection Technology Center at Redstone Arsenal in Huntsville, AL, co-locates S&T alongside the FBI within the FBI Terrorist Explosive Device Analytical Center Improvised Explosive Detection and Synthesis Center, to conduct rapid home-made explosive characterization and assessment of detection system performance against emerging threats. Major operational costs include rent, operation support contracts, certification testing support, building maintenance, utilities, security, and IT.

National Urban Security Transportation Laboratory: NUSTL's capabilities in T&E and R&D help first responders prepare, protect, and respond to, and recover from homeland security challenges, threats, and hazards. NUSTL provides independent technology evaluations and assessments, thereby enabling informed acquisition and deployment decisions to ensure first responders have the best tools and technologies available to do their jobs safely and effectively. NUSTL is a preferred and trusted resource for first responder agencies across all levels of the government and works with end-users to promote the successful deployment of both commercial and emerging technologies into field use for law enforcement, fire, and other emergency response agencies. Staff experts work side-by-side with the Nation's first responders to effectively plan and execute tests, evaluations, and assessments in operational scenarios, assist with the fielding of technologies, sponsor Radiological/Nuclear Response and Recovery R&D, support the development of Concept of Operations (CONOPS), and provide post-deployment advisory support. Major operational costs include rent and security for its laboratory facility, T&E equipment purchase, maintenance, and upgrades such as radiation detectors and radiation sources, contractor support, and IT. NUSTL is located in Manhattan, New York due to the criticality of the partnership with the first responder community and access to complex urban test environments.

Chemical Security Analysis Center Operations: CSAC is the Nation's only Federal studies, analysis, and knowledge management center for assessing the threat or hazard associated with an accidental or intentional large-scale chemical event, or chemical terrorism event, in the United States. CSAC is co-located at the DOD U.S. Army Combat Capabilities Development Command Chemical Biological Center at Aberdeen Proving Ground-Edgewood in Maryland. CSAC conducts studies and analyses for assessing the threat and hazards associated with an accidental or intentional large-scale chemical event or chemical terrorism event and supports a variety of customers within DHS, the Federal Government, and the HSE, to include but not limited to S&T's Chemical and Biological work, DHS Components such as CISA, CWMD, USSS, TSA, and other Federal agencies, as well as the National Security Council. The CSAC provides science- and technology-based quality assured information and experimental capabilities for acquiring, storing, indexing, evaluating, and making strategically available cheminformatic data, technical reports, and other knowledge products across the chemical threat spectrum to support the unified effort to secure the Nation. Operational costs for this facility include rent, security, utilities, shared laboratory space, and IT. In FY 2022, leading a matrixed team with the Probabilistic Analysis for National Threats Hazards and Risk (PANTHR) program, CSAC completed studies on the organoleptic properties of chemicals in food and beverage matrices and the dermal toxicity of chemicals of interest. CSAC also maintained and enhanced data repositories for Non-Traditional and Fourth Generation Agents, as well as traditional chemical agents and other chemical hazards. In FY 2023, CSAC continues international engagements in Chemical Forensics to include participation in U.S-Sweden bilateral meetings organized by the S&T International Cooperative Programs Office (ICPO) to identify reciprocal areas of interest and in aerosol release risk mitigation during airplane travel with the United Kingdom using the U.S.-UK airplane model developed by CSAC and the UK's Defense Science and Technology Laboratory (Dstl) to support ongoing Gas Forming Reaction work. CSAC continues to respond to multiple Requests for Information on the chemical supply chain, illicit drugs, and international accidents involving toxic chemicals and to advance the presumptive cyanide exposure detection innovation, to include performing laboratory testing and planning field trial testing using a prototype instrument. Utilizing CSAC's chemical security laboratory core capability, CSAC is evaluating emerging wearable sensors to detect chemical exposure for food protection and chemicals sensing in various settings in order to develop a sensors fusion network capable of providing rapid and accurate and user-friendly detection information of various high priority chemicals concurrently. In FY 2024, CSAC plans to study organ on a chip technologies and construct custom-based platforms to generate exposure information and compare with published animal testing data.

Laboratory Facilities – PPA
Budget Authority and Obligations
(Dollars in Thousands)

	FY 2022	FY 2023	FY 2024
Enacted/Request	\$123,691	\$127,522	\$128,828
Carryover - Start of Year	\$19,602	\$25,467	\$13,128
Recoveries	\$5,410	-	-
Rescissions to Current Year/Budget Year	(\$111)	(\$142)	(\$900)
Net Sequestered Resources	-	-	-
Reprogramming/Transfers	(\$563)	\$142	-
Supplementals	-	-	-
Total Budget Authority	\$148,029	\$152,989	\$141,056
Collections - Reimbursable Resources	\$26,400	\$33,350	\$33,350
Collections - Other Sources	-	-	-
Total Budget Resources	\$174,429	\$186,339	\$174,406
Obligations (Actual/Estimates/Projections)	\$148,962	\$173,211	\$162,955
Personnel: Positions and FTE			
Enacted/Request Positions	133	133	133
Enacted/Request FTE	133	133	133
Onboard and Actual FTE			
Onboard (Actual/Estimates/Projections)	117	128	-
FTE (Actual/Estimates/Projections)	116	121	-

Laboratory Facilities – PPA
Collections – Reimbursable Resources
(Dollars in Thousands)

	FY 2022 Enacted			FY 2023 Enacted			FY 2024 President's Budget		
	Pos.	FTE	Amount	Pos.	FTE	Amount	Pos.	FTE	Amount
Department of Agriculture	-	-	\$3,100	-	-	\$3,100	-	-	\$3,100
Department of Defense	-	-	\$1,000	-	-	\$8,500	-	-	\$8,500
Department of Homeland Security - Countering Weapons of Mass Destruction	-	-	\$50	-	-	\$1,050	-	-	\$1,050
Department of Homeland Security - Federal Emergency Management Agency	-	-	\$200	-	-	\$200	-	-	\$200
Department of Homeland Security - Transportation Security Administration	-	-	\$850	-	-	\$10,000	-	-	\$10,000
Department of Justice - Federal Bureau of Investigation	-	-	\$21,000	-	-	-	-	-	-
Department of State	-	-	\$200	-	-	\$200	-	-	\$200
Department of Homeland Security - Cybersecurity and Infrastructure Security Agency	-	-	-	-	-	\$10,300	-	-	\$10,300
Total Collections	-	-	\$26,400	-	-	\$33,350	-	-	\$33,350

Laboratory Facilities – PPA
Summary of Budget Changes
(Dollars in Thousands)

	Positions	FTE	Pay Amount	Non-Pay Amount	Amount
FY 2022 Enacted	133	133	\$22,733	\$100,958	\$123,691
FY 2023 Enacted	133	133	\$25,141	\$102,381	\$127,522
FY 2024 Base Budget	133	133	\$25,141	\$102,381	\$127,522
Total Technical Changes	-	-	-	-	-
Total Annualizations and Non-Recurs	-	-	-	-	-
Civilian Pay Raise Total	-	-	\$990	-	\$990
Annualization of Prior Year Pay Raise	-	-	\$263	-	\$263
FPS Fee Adjustment	-	-	-	\$11	\$11
Laboratory Facilities IT Investment	-	-	-	\$42	\$42
Total Pricing Changes	-	-	\$1,253	\$53	\$1,306
Total Adjustments-to-Base	-	-	\$1,253	\$53	\$1,306
FY 2024 Current Services	133	133	\$26,394	\$102,434	\$128,828
Total Transfers	-	-	-	-	-
Total Program Changes	-	-	-	-	-
FY 2024 Request	133	133	\$26,394	\$102,434	\$128,828
FY 2023 TO FY 2024 Change	-	-	\$1,253	\$53	\$1,306

Laboratory Facilities – PPA

Personnel Compensation and Benefits

Pay Summary

(Dollars in Thousands)

	FY 2022 Enacted				FY 2023 Enacted				FY 2024 President's Budget				FY 2023 to FY 2024 Total			
	Pos.	FTE	Amount	Rate	Pos.	FTE	Amount	Rate	Pos.	FTE	Amount	Rate	Pos.	FTE	Amount	Rate
Laboratory Facilities	133	133	\$22,733	\$170.23	133	133	\$25,141	\$177.50	133	133	\$26,394	\$186.47	-	-	\$1,253	\$8.96
Total	133	133	\$22,733	\$170.23	133	133	\$25,141	\$177.50	133	133	\$26,394	\$186.47	-	-	\$1,253	\$8.96
Subtotal Discretionary - Appropriation	133	133	\$22,733	\$170.23	133	133	\$25,141	\$177.50	133	133	\$26,394	\$186.47	-	-	\$1,253	\$8.96

Pay by Object Class

(Dollars in Thousands)

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget	FY 2023 to FY 2024 Change
11.1 Full-time Permanent	\$15,818	\$16,492	\$17,325	\$833
11.3 Other than Full-time Permanent	\$448	\$467	\$490	\$23
11.5 Other Personnel Compensation	\$483	\$503	\$529	\$26
11.8 Special Personal Services Payments	\$93	\$1,533	\$1,594	\$61
12.1 Civilian Personnel Benefits	\$5,891	\$6,146	\$6,456	\$310
Total - Personnel Compensation and Benefits	\$22,733	\$25,141	\$26,394	\$1,253
Positions and FTE				
Positions - Civilian	133	133	133	-
FTE - Civilian	133	133	133	-

Pay Cost Drivers

		FY 2022 Enacted			FY 2023 Enacted			FY 2024 President's Budget		FY 2023 to FY 2024 Total Changes		
	FTE	Amount	Rate	FTE	Amount	Rate	FTE	Amount	Rate	FTE	Amount	Rate
Laboratory Personnel	133	\$22,640	\$170.23	133	\$23,608	\$177.50	133	\$24,800	\$186.47	-	\$1,192	\$8.96
Other PC&B Costs	-	\$93	-	-	\$1,533	-	-	\$1,594	-	-	\$61	-
Total - Pay Cost Drivers	133	\$22,733	\$170.23	133	\$25,141	\$177.50	133	\$26,394	\$186.47	-	\$1,253	\$8.96

Explanation of Pay Cost Drivers

Laboratory Personnel: These costs support personnel compensation, benefits, and performance awards for laboratory personnel overseeing the operations, core capabilities, and maintenance requirements at S&T's laboratory facilities. The FY 2024 President's Budget supports 133 positions, 133 FTE to maintain S&T's current staffing from FY 2023 enacted . This increase also provides funding for annualized pay inflation.

Other PC&B Costs: These costs support subject matter experts from other government agencies on a reimbursable detailee basis.

Laboratory Facilities – PPA Non Pay Budget Exhibits

Non Pay Summary

(Dollars in Thousands)

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget	FY 2023 to FY 2024 Change
Laboratory Facilities	\$100,958	\$102,381	\$102,434	\$53
Total	\$100,958	\$102,381	\$102,434	\$53
Subtotal Discretionary - Appropriation	\$100,958	\$102,381	\$102,434	\$53

Non Pay by Object Class

(Dollars in Thousands)

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget	FY 2023 to FY 2024 Change
21.0 Travel and Transportation of Persons	\$222	\$228	\$228	-
22.0 Transportation of Things	-	\$17	\$17	-
23.1 Rental Payments to GSA	\$613	\$613	\$613	-
23.2 Rental Payments to Others	-	\$2,090	\$2,090	-
23.3 Communications, Utilities, & Miscellaneous	-	\$14	\$14	-
24.0 Printing and Reproduction	-	\$222	\$222	-
25.1 Advisory & Assistance Services	\$50,744	\$51,738	\$51,780	\$42
25.2 Other Services from Non-Federal Sources	\$501	\$2,316	\$2,316	-
25.3 Other Purchases of goods and services	\$9,585	\$14,334	\$14,345	\$11
25.4 Operations & Maintenance of Facilities	\$32,071	\$23,587	\$23,587	-
25.7 Operation & Maintenance of Equipment	\$3,465	\$533	\$533	-
26.0 Supplies & Materials	\$634	\$634	\$634	-
31.0 Equipment	\$3,123	\$6,055	\$6,055	-
Total - Non Pay Budget Object Class	\$100,958	\$102,381	\$102,434	\$53

Non Pay Cost Drivers

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget	FY 2023 to FY 2024 Total Changes
Other Goods and Services from Federal Sources	\$44,630	\$45,697	\$43,783	(\$1,914)
Laboratory Contract Support	\$44,422	\$45,484	\$42,765	(\$2,719)
Laboratory Supplies and Materials	\$2,863	\$2,150	\$8,145	\$5,995
Laboratory Facilities Operations and Maintenance	\$4,013	\$4,109	\$4,073	(\$36)
Other Costs	\$2,930	\$3,000	\$3,055	\$55
Rental Payments to General Services Administration	\$2,100	\$1,941	\$613	(\$1,328)
Total - Non-Pay Cost Drivers	\$100,958	\$102,381	\$102,434	\$53

Explanation of Non-Pay Cost Drivers

Other Goods and Services from Federal Sources: These costs are driven by contractor services and interagency agreements for the purchase of goods and services for jointly funded projects. Examples include TSL's agreement with the FAA for the FAA to provide facility support services on a reimbursable basis for various activities, including utilities, building maintenance, emergency services, air shuttle services, and IT services. FPS provides security at PIADC. The funding for the labs is slightly different from year to year and shifts between the cost drives based on priority. The reduction in funding will have no significant impacts.

Laboratory Contract Support: This cost driver supports contractor staff required to assist in managing the execution of business operations including financial management, facility planning, engineering and technical services, and other administrative functions. The funding for the labs is slightly different from year to year and shifts between the cost drives based on priority. The reduction in funding will have no significant impacts.

Laboratory Supplies and Materials: These costs include business operations functions that pay for the purchase and maintenance of IT equipment, including hardware and software as well as upgrades of equipment. This cost driver also includes office supplies, materials, and vehicle maintenance.

Laboratory Facilities Operations and Maintenance: These costs cover the upkeep of facilities to meet mission requirements while maintaining safe, secure, compliant, and efficient operations. Laboratory facilities O&M includes labor, management, supervision, equipment, software, firmware, and materials for all services required for the safe, reliable, effective, efficient, and compliant operations and maintenance under normal, abnormal, and emergency conditions. Also included are service contracts, routine repair of facilities and upkeep of land. PIADC must be maintained on a 24/7 basis. The funding for the labs is slightly different from year to year and shifts between the cost drives based on priority. The reduction in funding will have no significant impacts.

Operations and Support**Laboratory Facilities - PPA**

Other Costs: These costs include operations and maintenance of the laboratories' IT systems, payments to vendors, utilities, fleet maintenance, travel, training, supplies, and other costs.

Rental Payments to GSA: This cost driver is associated with rental payment to GSA for NUSTL. The reduction in funding was moved to another rent cost driver.

*Acquisitions and Operations Analysis – PPA***Budget Comparison and Adjustments****Comparison of Budget Authority and Request***(Dollars in Thousands)*

	FY 2022 Enacted			FY 2023 Enacted			FY 2024 President's Budget			FY 2023 to FY 2024 Total Changes		
	Pos.	FTE	Amount	Pos.	FTE	Amount	Pos.	FTE	Amount	Pos.	FTE	Amount
Acquisition and Operations Analysis	-	-	\$72,933	-	-	\$92,375	-	-	\$77,720	-	-	(\$14,655)
Total	-	-	\$72,933	-	-	\$92,375	-	-	\$77,720	-	-	(\$14,655)
Subtotal Discretionary - Appropriation	-	-	\$72,933	-	-	\$92,375	-	-	\$77,720	-	-	(\$14,655)

PPA Level I Description

The AOA PPA provides funding to support expert assistance, including systems engineering, to entities across the HSE to ensure that the transition, acquisition, and deployment of technologies, information, and procedures improve the efficiency and effectiveness of the operational capabilities. This includes providing technological assessment of major acquisition programs in DHS to help ensure that technologies, Continuity of Operations (CONOPS), and procedures meet operational requirements, technology analysis and technology review of analysis of alternatives at the beginning and throughout an acquisition program's life; standards to support the homeland security mission; and administration of the SAFETY Act program.

FFRDC PMO: The FFRDC PMO increases the strategic value and utilization of the FFRDCs by advancing and sharing the work products, delivered by each FFRDC, that provide solutions to DHS's most complex R&D issues. The PMO provides centralized oversight and support to the two FFRDCs, the HSOAC and the HSSEDI. These FFRDCs work in the interest of the public to ensure the highest levels of excellence by bringing together the expertise and point-of-view of government, industry, and academia. The close, but independent relationship between DHS and the FFRDC allows the FFRDCs to provide objective, independent research, and analysis, free from conflicts of interest, that result in actionable recommendations and candid advice rooted in the context of a long-term trusted relationship. The HSOAC provides DHS with expertise, analytic rigor, and timely analysis to support operations, policy development, and decision-making for DHS and its partners across the HSE to transform mission-level goals into strategies, operational requirements, and performance metrics. The HSSEDI utilizes its independent and objective perspective, extensive knowledge of the DHS mission space, and deep technical and systems engineering expertise to identify and solve critical technical problems and accelerate to operational use, the technology, and systems necessary to secure the homeland.

International Cooperative Programs Office (ICPO): ICPO implements the Under Secretary's unique authorities within DHS to establish priorities for international cooperative RDT&E; to exchange personnel, classified information, and equipment in support of these cooperative RDT&E activities; and, to implement activities through mechanisms deemed appropriate under the legislative authority. International cooperation improves understanding between partners of shared security interests and leverages foreign direct investment in S&T RDT&E. ICPO establishes enduring relationships to provide access to innovative, international RDT&E knowledge across the innovation ecosystem (i.e., government, academia, laboratories, and industry), funding, and other unique capabilities and resources. Through bilateral and multilateral cooperation, including the Five Country Ministerial and North Atlantic Treaty Organization (NATO), ICPO coordinates across DHS operational Components, DHS Policy Office of International Affairs, and with the USG interagency, especially the Department of State, the development of strategic priorities for such activities. ICPO is responsible for the identification, selection, and oversight of S&T's international attachés who serve as regional RDT&E subject matter experts to DHS operational Component deployed staff. The United States and its allies mutually benefit from the sharing of information and technological expertise to combat domestic and international threats and other high consequence events.

Partnership Intermediary Agreements (PIA): The transfer and commercialization of federally funded technologies is frequently a time consuming and expensive undertaking, especially when resources are constrained at Government agencies, including DHS. S&T utilizes its network of qualified Partnership Intermediary organizations to increase the maturity and market readiness of DHS funded technologies to prepare them for transfer and commercialization to meet DHS's operational needs and the needs of the wider HSE. This program allows S&T's Technology Transfer and Commercialization (T2C) to expand its reach to promote and market DHS technologies; gain increased partnerships with a variety of businesses and educational institutions; gain insight on industry perspectives on DHS technologies; and increase the likelihood of impact from research outcomes. Multiple PIAs are required to capitalize on State and local relationships across the United States to identify subject matter experts and benefit from local economic development resources; tap regional angel and venture capital networks; and leverage existing contacts with State and local first responder/law enforcement/mass transit communities.

Office of the Chief Scientist: The Chief Scientist (CS) serves as a senior technology advisor and offers an analytic capability to the USST. The CS conducts technology reviews and delivers insights into the effectiveness of S&T's technology investments. These reviews present a picture of how well S&T's programs are filling capability identified and validated gaps. The office scans the technical horizon, and reviews and produces advanced scientifically sound analysis of emerging technologies focused on enhancing security and countering the constantly evolving threat environment.

Operations and Requirements Analysis (ORA): Through the S&T-managed DHS Integrated Product Team (IPT) process, and in coordination with the DHS JRC, S&T identifies common or similar operational R&D needs by DHS Components and delivers operational analyses that support technical solutions to increase DHS overall efficiency and effectiveness. ORA's management of the IPT process provides the mechanism to carry out these activities. The IPT process occurs annually, with ORA having responsibility to deliver the following: validated and coordinated list of DHS-wide R&D strategic priorities and capability gaps, and traceability of capability gaps to DHS missions and operations. ORA is also responsible for decomposing new capability gaps into actionable requirements. Collectively, these outputs inform S&T leadership decision-making on near and long-term R&D planning and resource allocation. The outputs also enable S&T to successfully deliver impactful solutions to DHS Components and first responders that meet their mission needs and make their operations safer and more efficient and effective. ORA also leads S&T activities required by the *Foundations for Evidence-Based Policymaking Act of 2018* (Evidence Act), which mandates DHS to develop a quadrennial learning agenda, annual evaluation plans, a quadrennial capacity assessment, and products used to assess, improve, and advise evidence building activities across DHS. S&T promotes the use of evidence to inform decision-making and developing the quadrennial DHS Learning Agenda to identify priority questions related to the programs, policies, regulations, and operations of the agency. ORA directly supports development of annual evaluation plans and the planning and execution of S&T program evaluations and other evidence building activities in line with the Evidence Act.

SAFETY Act: This program provides liability protections for Sellers of qualified anti-terrorism technologies (QATTs) that could save lives in the event of a terrorist attack. The program incentivizes the private sector to commit additional resources to significantly improve anti-terrorism preparedness and resilience. The program is intended to serve the American public and interests by improving the anti-terrorism capability of the Nation. The program thus has a public security mission. It is an outward-facing program that serves private and public-sector stakeholders as they seek to manage risk from deployments of anti-terrorism capabilities. This program also creates pathways for S&T to work with industry and small businesses in a synchronized, strategic fashion to improve the pace and quality of solution development for the critical needs of the HSE. In addition, the SAFETY Act Program actively supports DHS programs and initiatives (e.g., the National Infrastructure Protection Plan, TSA's Certified Cargo Screening Program, CBP's Customs-Trade Partnership Against Terrorism and other Federal anti-terrorism programs) by developing a streamlined procedure for providing SAFETY Act coverage known as Block Designations.

Standards: S&T performs the statutory functions of the Standards Executive for DHS and implements DHS's statutory responsibilities for the utilization of, and participation in, the development of consensus standards, facilitating the successful application of standards-enabled capabilities. This is conducted in six main functional areas executed across DHS by 1) providing advice, developing and overseeing standardization and conformity assessment policy; 2) coordinating standards and conformity assessment activities, ensuring DHS component standards activities are harmonized and compatible with the mission, authority, and priorities of DHS; 3) training and educating DHS personnel on standards and conformity assessment, enabling them to effectively engage in the standards process; 4) integrating standards into DHS programs and activities; 5) providing technical resources, subject matter expertise and strategic vision and direction on standardization; and 6) supporting and funding critical standardization projects or anticipatory standards development for rapidly emerging requirements when existing standards are insufficient for the missions. These responsibilities are executed through membership, participation, and leadership in, and coordination with multiple national and international standards development organizations and interagency groups. S&T provides technical standards, test methods, test kits and guidance to DHS Components and the HSE. DHS and HSE equities are represented in numerous new standards each year that deliver interoperable and counter-terrorism technologies and solutions to the DHS, other Federal agencies, the first responder community and the private sector.

Strategy and Policy Office: S&T's Strategy and Policy Office (SPO) oversees S&T-wide strategy development and sets strategic direction for the organization. SPO is responsible for developing and maintaining the S&T Strategy, leading interagency/international/industry strategies engagement, and leading S&T planning, policy, and program alignment. This includes administering the Homeland Security Science and Technology Advisory Committee (HSSTAC), by supporting the USST in nominating the 20-member HSSTAC that includes emergency first-responders or representatives of organizations or associations of emergency first-responders in addition to representatives of citizen groups, including economically disadvantaged communities. Knowledge Management is another capability under the realm of program alignment. This discipline enhances the ability to gather, curate, and manage accumulated mission-related knowledge and essential information for easy retrieval and use. SPO also manages S&T's Interagency Programs, which addresses high-priority homeland security needs through facilitation and collaboration with cooperative science, technology, and RDT&E endeavors with other Federal agencies, academia, and the private sector. This interagency function establishes trusted partnerships with government agencies to leverage their investments and other resources, acting as a force-multiplier for S&T programs and initiatives. It provides a key conduit for government agencies to capitalize on S&T innovation and leverages the capabilities and investments of external organizations to reduce duplication and identify unmet needs.

Systems Engineering: Systems Engineering enables DHS programs to improve the efficiency of identifying and transforming Component requirements into operational capabilities by applying a disciplined, consistent process for managing technical risk that facilitates achievement of cost, schedule, and performance objectives from concept definition to deployment. S&T conducts Technical Assessments of DHS Acquisition programs to identify major technical risks, provide recommendations to reduce those risks, support objective decision-making, and ensure that programs are technically sound. S&T assists DHS Acquisition and R&D programs in implementing systems engineering, leads the DHS Systems Engineering Center of Excellence, develops systems engineering guidance, and instructs the DHS Systems Engineering certification courses. S&T provides technical expertise to DHS Acquisition oversight offices including the Office of Program Accountability and Risk Management, Office of the Chief Information Officer, and the DHS JRC. S&T leads the development and implementation of the DHS Invention Secrecy Act compliance program to prevent the publication or disclosure of patent applications, or to withhold the granting of patents ("publication or grant of a patent") when deemed to be detrimental to national security.

System of Systems Operational Analytics (SoSOA): This effort supports transforming SoSOA to an enterprise-level capability to increase the effectiveness and efficiency of DHS data analytics as a whole and enables the analysis of highly complex systems of interdependent components (system of systems) for Components, Headquarter Offices, and the JRC. The demand for a fully mature, enterprise-wide SoSOA capability is strong amongst the HSE, based on what SoSOA has been able to provide to date through various proofs-of-concept. SoSOA provides Components an Enterprise-level capability with common analytic frameworks, tools, and training. Increasing analyses capability for DHS results in cost and time savings - freeing up operators and resources for mission-critical operations execution. Planned capabilities include:

- Assimilated visualization and analytic tools with fused data from disparate sources to improve reporting efficiency.
- Faster delivery of analyses to support decision making.
- Reduce costs for data-driven analysis by ensuring DHS Components leverage, share, reuse, and repurpose previously developed analyses.
- Enterprise analytic applications that include business analytics and visualization, statistical packages, modeling and simulation, decision analysis tools, and a library of online SoSOA analytics training manuals for 2500 users across DHS.

Test and Evaluation (T&E): T&E is the authoritative designee that provides a mechanism by which programs can better understand the capabilities and limitations of the system when operated and supported by trained users within the intended operational environment. S&T's T&E is also designated to support DHS by training the DHS Acquisition Workforce Test & Evaluation Career Field members. T&E performs these critical functions in support of delivering enhanced capabilities to DHS Operators to improve acquisition outcomes through comprehensive engagement in major acquisition programs and R&D efforts. T&E supports every major program on the Master Acquisition Oversight List; providing input at each Acquisition Review Board; reviewing and providing comments on each program Operational Requirements Document; reviewing and approving the selection of Independent Test Agents, T&E Master Plans, and Operational Test Plans. T&E prepares and issues Letters of Assessment, in support of initial and full production or deployment decisions that address operational effectiveness, operational suitability, and operational resilience. T&E provides support to development and certification for members of the T&E career field in the acquisition workforce. T&E, including utilization of our ONL capabilities at NUSTL, provides assistance and guidance to programs regarding Cyber Resilience T&E, First Responder Technology T&E, Scientific Test and Analysis Techniques, Reliability assessments, and effective mapping of government test facilities.

Technology Scouting and Transition (TST): TST supports S&T strategic and tactical R&D investment decision-making by providing a better understanding of the state of technology, including new and emerging technology and the private sector innovation landscape, providing innovative and cutting-edge technology discovery, end to end transition support, while maintaining a knowledge repository for sharing information. TST conducts activities that inform and support R&D decisions, and the transition and knowledge sharing of solutions to meet DHS's customer requirements through technology scouting, operational experiments, transition planning and the Technology Clearinghouse. Technology Scouting's program goals are to improve alternative options, increase speed of project execution, and reduce costs for projects. Technology Transition provides centralized support management in planning for and executing the transitioning of knowledge products, capabilities, and technologies to DHS Components. Transition collaborates across S&T to understand the factors that will shape the transition effort and delivery of new solutions to customers and identify opportunities to accelerate successful fielding of solutions or manage and mitigate risks to transition. TST tracks, assesses, and reports transitions to comply with DHS's 2017 National Defense Authorization Act reporting requirements to Congress. TST leads the development, operation and maintenance of the DHS Technology Clearinghouse that serves as the repository for S&T program and project reports and artifacts to aid in knowledge sharing to enhance the successful development and deployment of innovative homeland security technology solutions. TST also manages the OpEx program, which facilitates and conducts operational experimentations and rapid technology demonstrations with S&T program managers and DHS Component customers in order to evaluate the technical capabilities and operational use of new and emerging technologies and reduce the risk of procurements that fail to meet the required capabilities.

Acquisitions and Operations Analysis – PPA

Budget Authority and Obligations

(Dollars in Thousands)

	FY 2022	FY 2023	FY 2024
Enacted/Request	\$72,933	\$92,375	\$77,720
Carryover - Start of Year	\$10,577	\$8,742	\$9,236
Recoveries	\$2,536	-	-
Rescissions to Current Year/Budget Year	-	-	-
Net Sequestered Resources	-	-	-
Reprogramming/Transfers	\$252	-	-
Supplementals	-	-	-
Total Budget Authority	\$86,298	\$101,117	\$86,956
Collections - Reimbursable Resources	\$5,700	\$5,700	\$5,700
Collections - Other Sources	-	-	-
Total Budget Resources	\$91,998	\$106,817	\$92,656
Obligations (Actual/Estimates/Projections)	\$83,256	\$97,581	\$84,644
Personnel: Positions and FTE			
Enacted/Request Positions	-	-	-
Enacted/Request FTE	-	-	-
Onboard and Actual FTE			
Onboard (Actual/Estimates/Projections)	-	-	-
FTE (Actual/Estimates/Projections)	-	-	-

Acquisitions and Operations Analysis – PPA
Collections – Reimbursable Resources
(Dollars in Thousands)

	FY 2022 Enacted			FY 2023 Enacted			FY 2024 President's Budget		
	Pos.	FTE	Amount	Pos.	FTE	Amount	Pos.	FTE	Amount
Department of Energy	-	-	\$500	-	-	\$500	-	-	\$500
Department of Homeland Security - U.S. Citizenship and Immigration Services	-	-	\$50	-	-	\$50	-	-	\$50
Department of Homeland Security - Countering Weapons of Mass Destruction	-	-	\$900	-	-	\$900	-	-	\$900
Department of Homeland Security	-	-	\$500	-	-	\$500	-	-	\$500
Department of Homeland Security - Federal Emergency Management Agency	-	-	\$50	-	-	\$50	-	-	\$50
Department of Homeland Security - Transportation Security Administration	-	-	\$300	-	-	\$300	-	-	\$300
Department of Homeland Security - U.S. Customs and Border Protection	-	-	\$100	-	-	\$100	-	-	\$100
Department of Homeland Security - U.S. Immigration and Customs Enforcement	-	-	\$250	-	-	\$250	-	-	\$250
Department of Homeland Security - United States Coast Guard	-	-	\$100	-	-	\$100	-	-	\$100
Department of Homeland Security - United States Secret Service	-	-	\$1,500	-	-	\$1,500	-	-	\$1,500
Library of Congress	-	-	\$500	-	-	\$500	-	-	\$500
Department of Homeland Security - Cybersecurity and Infrastructure Security Agency	-	-	\$950	-	-	\$950	-	-	\$950
Total Collections	-	-	\$5,700	-	-	\$5,700	-	-	\$5,700

Acquisitions and Operations Analysis – PPA

Summary of Budget Changes

(Dollars in Thousands)

	Positions	FTE	Pay Amount	Non-Pay Amount	Amount
FY 2022 Enacted	-	-	-	\$72,933	\$72,933
FY 2023 Enacted	-	-	-	\$92,375	\$92,375
FY 2024 Base Budget	-	-	-	\$92,375	\$92,375
Total Technical Changes	-	-	-	-	-
Total Annualizations and Non-Recurs	-	-	-	-	-
Total Pricing Changes	-	-	-	-	-
Total Adjustments-to-Base	-	-	-	-	-
FY 2024 Current Services	-	-	-	\$92,375	\$92,375
Total Transfers	-	-	-	-	-
AOA-Acquisition Support	-	-	-	(\$9,806)	(\$9,806)
AOA-Federally Funded Research and Development Centers	-	-	-	(\$1,291)	(\$1,291)
AOA-SAFETY Act	-	-	-	(\$850)	(\$850)
AOA-Technology Transition Support	-	-	-	(\$2,708)	(\$2,708)
Total Program Changes	-	-	-	(\$14,655)	(\$14,655)
FY 2024 Request	-	-	-	\$77,720	\$77,720
FY 2023 TO FY 2024 Change	-	-	-	(\$14,655)	(\$14,655)

Acquisitions and Operations Analysis – PPA

Non Pay Budget Exhibits

Non Pay Summary

(Dollars in Thousands)

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget	FY 2023 to FY 2024 Change
Acquisition and Operations Analysis	\$72,933	\$92,375	\$77,720	(\$14,655)
Total	\$72,933	\$92,375	\$77,720	(\$14,655)
Subtotal Discretionary - Appropriation	\$72,933	\$92,375	\$77,720	(\$14,655)

Non Pay by Object Class

(Dollars in Thousands)

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget	FY 2023 to FY 2024 Change
21.0 Travel and Transportation of Persons	\$215	\$297	\$297	-
22.0 Transportation of Things	\$78	\$109	\$109	-
24.0 Printing and Reproduction	\$14	\$20	\$20	-
25.1 Advisory & Assistance Services	\$47,630	\$69,533	\$55,878	(\$13,655)
25.2 Other Services from Non-Federal Sources	\$1,161	\$2,357	\$2,357	-
25.3 Other Purchases of goods and services	\$22,979	\$18,789	\$17,789	(\$1,000)
25.4 Operations & Maintenance of Facilities	-	\$51	\$51	-
25.7 Operation & Maintenance of Equipment	\$50	\$68	\$68	-
25.8 Subsistence and Support of Persons	-	\$4	\$4	-
26.0 Supplies & Materials	\$51	\$67	\$67	-
31.0 Equipment	\$255	\$339	\$339	-
32.0 Land and Structures	-	\$20	\$20	-
41.0 Grants, Subsidies, and Contributions	\$500	\$682	\$682	-
42.0 Insurance Claims and Indemnities	-	\$39	\$39	-
Total - Non Pay Budget Object Class	\$72,933	\$92,375	\$77,720	(\$14,655)

Non Pay Cost Drivers

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget	FY 2023 to FY 2024 Total Changes
Contract Support Services	\$42,313	\$56,390	\$47,409	(\$8,981)
Other Goods and Services from Federal Sources	\$26,997	\$29,663	\$24,871	(\$4,792)
Other Costs	\$3,623	\$6,322	\$5,440	(\$882)
Total - Non-Pay Cost Drivers	\$72,933	\$92,375	\$77,720	(\$14,655)

Explanation of Non-Pay Cost Drivers

Contract Support Services: Costs include contract services for business operations including financial management, studies, analyses, and evaluations in support of IT and R&D activities, as well as other administrative functions. S&T's AOA programs rely on contracting services to provide analyses, engineering, test expertise, and products for operational end users within DHS and JRC. This overall decrease supports current service levels which support the implementation of the Evidence Act Officer and develop the capability to analyze and execute the results of formal S&T program evaluations; support the FFRDC PMO with contract support necessary to handle the increasing quantity of tasks related to the growing demand of FFRDC services; and provide OSAI with program, technical support and subject matter expertise to address the growing demands.

Other Goods and Services from Federal Sources: Funding supports Interagency agreements for contractual services for the purchase of goods and services for jointly funded projects. For example, OSAI relies heavily on the Institute of Defense Analyses and the RAND Corporation to provide studies, and analyses, in determining whether to designate a particular technology as a Qualified Anti-Terrorism Technology. This overall decrease maintains current service levels to support the program and analysis requirements for independent continuous evaluation of current policies, procedures, and process.

Other Costs: Costs include operations and maintenance of the SAFETY Act Management System, travel, conferences, and direct support of major acquisitions and systems essential to planning, R&D, or maintenance of the acquisition or system. There are no funding impacts to these services in 2024 for the Evidence Act Officer, the FFRDC PMO and the OSAI with their day-to-day operational requirements.

Department of Homeland Security

Science and Technology Directorate

Procurement, Construction, and Improvements



Fiscal Year 2024

Congressional Justification

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Procurement, Construction, and Improvements**Budget Comparison and Adjustments****Comparison of Budget Authority and Request***(Dollars in Thousands)*

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget	FY 2023 to FY 2024 Change
Construction and Facility Improvements	\$12,859	\$55,216	\$78,579	\$23,363
Total	\$12,859	\$55,216	\$78,579	\$23,363
Subtotal Discretionary - Appropriation	\$12,859	\$55,216	\$78,579	\$23,363

S&T's Procurement, Construction & Improvements (PC&I) appropriation provides resources to ensure the core capabilities of its laboratory infrastructures are operational in support DHS mission requirements. PC&I funding allows S&T to make essential investments in construction, maintenance, modernization, or removal as necessary to support requirements generated by DHS Components. In addition, PC&I funding allows S&T the ability to invest in equipment and information technology to ensure that S&T laboratories maintain accreditation.

S&T performs innovative Research, Development, Test and Evaluation (RDT&E) at its laboratories to support foundational science capabilities in direct support of identified DHS and Homeland Security Enterprise (HSE) capability gaps.

Construction and Facilities Improvement PPA: This PPA supports all major construction and improvements for S&T's laboratories above the real property threshold of \$2.0M set for minor construction in Operations and Support (O&S) appropriation.

Procurement, Construction, and Improvements Budget Authority and Obligations

(Dollars in Thousands)

	FY 2022	FY 2023	FY 2024
Enacted/Request	\$12,859	\$55,216	\$78,579
Carryover - Start of Year	\$8,359	\$16,861	\$45,824
Recoveries	-	-	-
Rescissions to Current Year/Budget Year	-	-	-
Net Sequestered Resources	-	-	-
Reprogramming/Transfers	-	-	-
Supplementals	-	-	-
Total Budget Authority	\$21,218	\$72,077	\$124,403
Collections - Reimbursable Resources	-	-	-
Collections - Other Sources	-	-	-
Total Budget Resources	\$21,218	\$72,077	\$124,403
Obligations (Actual/Estimates/Projections)	\$4,357	\$26,253	\$91,357
Personnel: Positions and FTE			
Enacted/Request Positions	-	-	-
Enacted/Request FTE	-	-	-
Onboard and Actual FTE			
Onboard (Actual/Estimates/Projections)	-	-	-
FTE (Actual/Estimates/Projections)	-	-	-

Procurement, Construction, and Improvements
Summary of Budget Changes
(Dollars in Thousands)

	Positions	FTE	Amount
FY 2022 Enacted	-	-	\$12,859
FY 2023 Enacted	-	-	\$55,216
FY 2024 Base Budget	-	-	-
Critical Repair/Replacement Requirement	-	-	\$10,000
Plum Island Closure and Support	-	-	\$33,579
Detection Sciences Testing and Applied Research Center	-	-	\$35,000
Total Investment Elements	-	-	\$78,579
FY 2024 Request	-	-	\$78,579
FY 2023 TO FY 2024 Change	-	-	\$23,363

Procurement, Construction, and Improvements**Non Pay Budget Exhibits****Non Pay by Object Class***(Dollars in Thousands)*

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget	FY 2023 to FY 2024 Change
21.0 Travel and Transportation of Persons	\$29	\$31	\$34	\$3
23.2 Rental Payments to Others	\$200	\$200	\$200	-
23.3 Communications, Utilities, & Miscellaneous	\$100	\$100	\$100	-
25.1 Advisory & Assistance Services	\$1,530	\$2,135	\$2,745	\$610
25.5 Research & Development Contracts	\$500	\$1,000	\$500	(\$500)
26.0 Supplies & Materials	\$500	\$1,000	\$3,000	\$2,000
31.0 Equipment	\$3,000	\$20,300	\$26,100	\$5,800
32.0 Land and Structures	\$7,000	\$30,450	\$45,900	\$15,450
Total - Non Pay Budget Object Class	\$12,859	\$55,216	\$78,579	\$23,363

Procurement, Construction, and Improvements
Capital Investment Exhibits

Capital Investments*(Dollars in Thousands)*

	Acquisition Level	IT/ Non-IT	MAOL	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget
N/A - Critical Repair/Replacement Requirement	Non-Major	Non-IT	No	-	\$35,750	\$10,000
N/A - Plum Island Closure and Support	Level 3	Non-IT	No	\$12,859	\$13,466	\$33,579
N/A - Detection Sciences Testing and Applied Research Center	Non-Major	Non-IT	No	-	\$6,000	\$35,000

Construction and Facility Improvements – PPA**Budget Comparison and Adjustments****Comparison of Budget Authority and Request***(Dollars in Thousands)*

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget	FY 2023 to FY 2024 Change
Critical Repair/Replacement Requirement	-	\$35,750	\$10,000	(\$25,750)
Plum Island Closure and Support	\$12,859	\$13,466	\$33,579	\$20,113
Detection Sciences Testing and Applied Research Center	-	\$6,000	\$35,000	\$29,000
Total	\$12,859	\$55,216	\$78,579	\$23,363
Subtotal Discretionary - Appropriation	\$12,859	\$55,216	\$78,579	\$23,363

PPA Level I Description

The Construction and Facility Improvements PPA supports all major construction and improvements for S&T's laboratories. S&T's laboratory facilities include the National Biodefense Analysis and Countermeasures Center (NBACC) at Fort Detrick in Frederick, Maryland, Plum Island Animal Disease Center (PIADC) on Plum Island, New York, Transportation Security Laboratory (TSL) in Atlantic City, New Jersey, National Urban Security Transportation Laboratory (NUSTL) in New York, New York, and Chemical Security Analysis Center (CSAC) at Aberdeen Proving Ground in Maryland. S&T's five laboratories are vital to the national homeland security mission, enabling America's brightest scientists and engineers to apply their expertise and develop solutions that address our most dangerous threats and homeland security vulnerabilities.

This PPA provides funding for, completing facility maintenance and repair, replacing outdated laboratory equipment, and investing in capital improvements – including IT modernization – to meet evolving mission requirements. All investments support critical scientific and technical capabilities necessary to conduct RDT&E for DHS and HSE. This PPA also includes funding required to close PIADC prior to the transfer of function to the National Bio and Agro-Defense Facility (NBAF).

This PPA is comprised of the following investments:

Critical Repair/Replacement Requirement: The FY 2024 President's Budget continues to support a capital investment program to enable S&T labs to meet regulatory requirements, maintain modern technological standards, and perform end-of-life replacements for mission-critical equipment.

Procurement, Construction, and Improvements

Construction and Facility Improvements – PPA

Plum Island Closure and Support: The FY 2024 President’s Budget continues to support the Plum Island Closure and Support (PICS) program and activities needed for the transition, closure, and conveyance of all Plum Island real property and all related personal property and transportation assets (including the Orient Point property) after the PIADC science mission is fully transferred to the NBAF. PICS activities include the following:

- Biological decontamination of the laboratory facilities
- Completion of environmental regulatory compliance activities (e.g., remediation of remaining waste management areas)
- Facility maintenance and closure activities
- Disposition of all records, personal property, real property, and IT assets; and
- Preservation/disposition of historic assets

S&T is managing the PICS program as a Level III non-acquisition program. The PICS current total estimate of \$150.0M will enable S&T to achieve closure of the island while enabling PIADC operations through mission transition to USDA. Once the PICS program is completed, Plum Island will be closed and available for release from DHS to another entity through the General Services Administration (GSA).

Detection Sciences Testing and Applied Research (DSTAR) Center: The FY 2024 President’s Budget supports construction of the DSTAR Center. The DSTAR Center facility will include partially automated, state-of-the-art laboratories to provide for the safe and effective validation of explosive screening devices. It also will include sterile areas for test and evaluation of trace detection devices and modern computational infrastructure for analyzing and archiving threat images from computed tomography and millimeter wave threat screening devices. This project is consistent with S&T’s congressionally mandated Infrastructure Master Plan for the TSL from 2010 through present day.

Construction and Facility Improvements – PPA

Budget Authority and Obligations

(Dollars in Thousands)

	FY 2022	FY 2023	FY 2024
Enacted/Request	\$12,859	\$55,216	\$78,579
Carryover - Start of Year	\$8,359	\$16,861	\$45,824
Recoveries	-	-	-
Rescissions to Current Year/Budget Year	-	-	-
Net Sequestered Resources	-	-	-
Reprogramming/Transfers	-	-	-
Supplementals	-	-	-
Total Budget Authority	\$21,218	\$72,077	\$124,403
Collections - Reimbursable Resources	-	-	-
Collections - Other Sources	-	-	-
Total Budget Resources	\$21,218	\$72,077	\$124,403
Obligations (Actual/Estimates/Projections)	\$4,357	\$26,253	\$91,357
Personnel: Positions and FTE			
Enacted/Request Positions	-	-	-
Enacted/Request FTE	-	-	-
Onboard and Actual FTE			
Onboard (Actual/Estimates/Projections)	-	-	-
FTE (Actual/Estimates/Projections)	-	-	-

Construction and Facility Improvements – PPA**Summary of Budget Changes***(Dollars in Thousands)*

	Positions	FTE	Amount
FY 2022 Enacted	-	-	\$12,859
FY 2023 Enacted	-	-	\$55,216
FY 2024 Base Budget	-	-	-
Critical Repair/Replacement Requirement	-	-	\$10,000
Plum Island Closure and Support	-	-	\$33,579
Detection Sciences Testing and Applied Research Center	-	-	\$35,000
Total Investment Elements	-	-	\$78,579
FY 2024 Request	-	-	\$78,579
FY 2023 TO FY 2024 Change	-	-	\$23,363

Construction and Facility Improvements – PPA**Non Pay Budget Exhibits****Non Pay by Object Class***(Dollars in Thousands)*

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget	FY 2023 to FY 2024 Change
21.0 Travel and Transportation of Persons	\$29	\$31	\$34	\$3
23.2 Rental Payments to Others	\$200	\$200	\$200	-
23.3 Communications, Utilities, & Miscellaneous	\$100	\$100	\$100	-
25.1 Advisory & Assistance Services	\$1,530	\$2,135	\$2,745	\$610
25.5 Research & Development Contracts	\$500	\$1,000	\$500	(\$500)
26.0 Supplies & Materials	\$500	\$1,000	\$3,000	\$2,000
31.0 Equipment	\$3,000	\$20,300	\$26,100	\$5,800
32.0 Land and Structures	\$7,000	\$30,450	\$45,900	\$15,450
Total - Non Pay Budget Object Class	\$12,859	\$55,216	\$78,579	\$23,363

Construction and Facility Improvements – PPA
Capital Investment Exhibits

Capital Investments*(Dollars in Thousands)*

	Acquisition Level	IT/ Non-IT	MAOL	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget
N/A - Critical Repair/Replacement Requirement	Non-Major	Non-IT	No	-	\$35,750	\$10,000
N/A - Plum Island Closure and Support	Level 3	Non-IT	No	\$12,859	\$13,466	\$33,579
N/A - Detection Sciences Testing and Applied Research Center	Non-Major	Non-IT	No	-	\$6,000	\$35,000

Critical Repair/Replacement Requirement– Investment Capital Investment Exhibits

Construction

(Dollars in Thousands)

	Acquisition Level	IT/ Non-IT	MAOL	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget
N/A - Critical Repair/Replacement Requirement	Non-Major	Non-IT	No	-	\$35,750	\$10,000

Description

This investment includes major PC&I facility infrastructure, replacement, and upgrade or improvement projects associated to S&T's laboratory facilities, which include NBACC, PIADC, TSL, NUSTL, and CSAC. Critical repairs and replacements are needed in S&T's laboratories to ensure the safety of its people, enduring science capability, and delivery of mission requirements. Additionally, these investments will allow S&T to meet regulatory requirements and support required for 24x7 operations and research capability in support of operators. Specifically, projects will be driven by the Facility Condition Assessment (FCA) program that identifies repairs and modifications necessary to support regulatory compliance and full facility functionality; as well as address safety issues that can no longer be deferred until a failure in infrastructure occurs.

This investment ensures each respective laboratories' ability to perform their duties in a safe and reliable manner. Investing in improvements to S&T laboratories, to include IT infrastructure, will maximize the use of shared resources and reduce the maintenance and troubleshooting burden on IT staff that results from managing diverse legacy equipment and software. Additionally, this investment will improve the availability and reliability of the IT infrastructure upon which the critical RDT&E work of the S&T laboratories depends. S&T labs will be able to share large data sets with both internal and external partners, including vendors and other government organizations, at both unclassified and classified levels.

Justification

The FY 2024 President's Budget includes \$10.0M for the Laboratory Capital Investment Program to support and address deficiencies at the following laboratory facilities to meet evolving mission requirements.

Project: Laboratory Capital Investment Program

Funding Requirement: The FY 2024 President's Budget includes \$10.0M to support S&T's capital investment program that enables the laboratories to continue to meet regulatory requirements, maintain modern technological standards, and perform end-of-life replacements for mission-critical equipment.

Description: To sustain S&T's labs, funding must cover depreciation of the laboratory buildings and assets to support functionality of facilities, systems, and equipment and prevent them from degrading to a state of dysfunction. Funding supports NBACC, TSL, CSAC and NUSTL to sustain existing laboratory capabilities by completing facility maintenance and repairs for real and personal property assets, to include replacing laboratory equipment, based on expected service lifecycles. The basis for prioritizing and addressing individual lab needs on a cyclical basis are FCA, environmental, safety, and health (ESH) inspections, as well as internal lab facilities and equipment inspections and audits.

Justification: S&T maintains laboratory assets (including facilities and equipment) in excess of \$270.0M. In FY 2021 S&T completed an analysis of the replacement lifecycles and depreciation costs of infrastructure across multiple labs and systems to determine the requirement for approximately \$10.0M to maintain the current functionality of facilities and systems to prevent them from degrading to a state of dysfunction and to fund equipment modernization that enables the labs to meet their respective mission requirements. S&T lab's physical infrastructure is depreciating at a rate of \$6.0M per year. Real property items at NBACC, NUSTL, CSAC, and TSL include all aspects of physical buildings including the physical structure, HVAC, waste disposal systems, and electrical systems. The S&T critical scientific and IT equipment is experiencing obsolescence at an annual rate of \$4.0M per year based on their expected service lives. S&T estimated the amount of funding necessary to sustain its physical laboratory-based assets by calculating their depreciation rates based Internal Revenue Service (IRS) Publication 946, which provides a basis for depreciation calculations and how assets degrade over time. The funding will enable the laboratories to support state-of-the-art facilities while allowing for flexibility in obtaining items that are expensive and difficult to repair or replace, as well as accommodating longer lead times in procurement timelines for more specialized laboratory equipment and improvements which are not as readily available.

- \$6.0M is included for NBACC to replace aging autoclave control systems built in 2007 and laboratory equipment approaching end of lifecycle including microscopes, biological safety cabinets, high-performance liquid chromatography equipment, Genomic Data, Network and Analysis (GDNA) Network Attached Storage, and computer and data storage servers.
- \$3.0M is included for TSL to replace laboratory equipment approaching end of lifecycle including: Direct Analysis in Real Time Mass Spectrometer, accelerated rate calorimeter, and Thermo-gravimetric Mass Spectrometer.
- \$1.0M is included for NUSTL scoping to upgrade existing laboratory infrastructure to create an in-house testbed for first responder technology evaluation, and to provide cybersecurity assessment capabilities to identify vulnerabilities in technologies used by first responders in the field

ONL maintains a schedule of assets, including real and personal property, which require replacement or improvement that exceed the threshold for operations and support funding. This schedule is evaluated quarterly to determine the highest priority projects that require funding for the following fiscal year. Specific equipment and capabilities repaired or replaced are subject to change based on a quarterly prioritization and as higher priority and unplanned items arise, such as equipment failures or unforeseen cost increases for higher priority projects.

Construction and Facility Improvements – PPA

Critical Repair/Replacement Requirement

Impact: This program will enable S&T laboratories to maintain compliance with regulatory requirements, modern technology standards, and perform end of life replacements for mission-critical equipment. S&T will be able to bring aging facilities up to current standards, thereby enabling core science work to occur in the laboratories. Facility maintenance and equipment replacements will be able to occur on schedule, generating less impact to mission execution, and more importantly, ensuring the safety of our laboratory employees. S&T will be able to continue to ensure regulatory compliance with applicable facility codes and standards including 7 and 9 CFR (Code of Federal Regulation) (Federal Select Agent Program), Biosafety in Microbiological and Biomedical Laboratories (BMBL, 6th Edition), 10 CFR (NRC radioactive materials standards), 29 CFR (OSHA general industry standards, e.g. electrical, fire protection, environmental controls; and laboratory standards, e.g. hazardous materials management, chemical hygiene, laboratory fume hoods and exhaust), and 40 CFR (Clean Air Act, Clean Water Act, hazardous waste requirements). FY 2024 funding is projected to provide for the replacement of trace laboratory mass spectrometers and accelerated rate calorimeter at TSL, replacement of aging autoclave control systems and aging laboratory equipment at NBACC and provide scoping funding for in-house testbed capabilities at NUSTL to evaluate first responder technologies and to assess cybersecurity vulnerabilities for equipment used by first responders.

Plum Island Closure and Support– Investment Capital Investment Exhibits

Construction

(Dollars in Thousands)

	Acquisition Level	IT/ Non-IT	MAOL	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget
N/A - Plum Island Closure and Support	Level 3	Non-IT	No	\$12,859	\$13,466	\$33,579

Description

The FY 2024 President's Budget includes \$33.6M to continue support for the PICS Program. The total cost for the PICS program is \$150.0M with a proposed six-year funding profile and eight-year multi-phased execution effort, in coordination with PIADC operations, to achieve closure of the island estimated in FY 2028.

The PICS program involves the transition, closure, and conveyance of the 'Plum Island Asset' (all real and personal Plum Island property and transportation assets (including the Orient Point Property)) after the PIADC mission is fully transferred to NBAF located in Manhattan, Kansas. The PICS program is a unique, multi-year effort which S&T is managing as a Level III non-acquisition program (ADE-2B milestone achieved in September 2021, enabling the transition to project execution). The first years of funding were primarily focused on planning and analysis activities (including regulatory requirements), equipment purchases, and targeted decontamination activities. The remainder of the project focuses on the complex physical decontamination of the BSL-3 containment facilities and other structures to meet regulatory health, safety, and environmental requirements prior to conveyance; and on the physical separation of usable assets (utilities for Building 100 Admin). This program is the largest closure and conveyance of a biocontainment facility ever in the United States.

PICS Program funding also supports the Program Management Office efforts in planning and development, implementation of the approach for surface and terminal decontamination and decommissioning of Building 101, and Building 111, continued reduction of the contaminated waste areas within Building 101, limited physical decontamination efforts in Building 101 (transition dependent), completion of execution of required decontamination efforts for Buildings 102 and, potentially, 257 as required by the New York State Department of Environmental Conservation (NYSDEC), monitoring of remaining Waste Management Areas remediation as required by the NYSDEC (fixed period after remediation efforts as per NYSDEC), initiation of physical utility service changes for remaining post-closure buildings, and continued records disposition activities as required by law for facility mission transfer, as well as a number of other minor related activities. This request also supports full implementation of the Scientific, Technical and Engineering Support (STENS) contract which provides senior technical level expertise to collaborate in planning/executing applied scientific activities for decontamination method assessment and development, develops decontamination and validation plans, delivers engineering and logistics to implement physical activities, and provides third-party verification testing.

Justification

The PICS program and activities are required for the transition, closure, and conveyance of the ‘Plum Island Asset’ after the PIADC science mission is fully transferred to the NBAF. The PICS Program funding enables S&T to achieve closure of the island while enabling PIADC operations through mission transition to USDA at NBAF. Once the PICS program is completed, Plum Island will be closed and available for release from DHS to another entity through conveyance by the GSA.

Once the PICS program is completed in FY 2028, Plum Island will be considered closed. This program is the largest closure and conveyance of a biocontainment facility ever in the United States.

The scope of activities, key performance objectives, needed to close the PIADC facility and prepare the island for conveyance include:

- biological decontamination of the laboratory facilities
- completion of environmental regulatory compliance activities (e.g., remediation of remaining waste management areas)
- facility maintenance and closure activities
- disposition of all records, personal property, real property, and IT assets
- preservation/disposition of historic assets

Continuation of the STENS contract implementation will provide five specific areas of support to address complexities associated with the work, including: Routine Operation of the Mobile Decontamination Laboratory; Matrixed Support of Subject Matter Experts with Experience in Biological Decontamination at Facility-Scale; Design and Execution of Applied Scientific Activities to Enable Biocontainment Facility Decontamination; Facility Modification Engineering, Planning, and Implementation; and Management of an Independent Third-Party Laboratory for Biological and Chemical Indicator Verification and Decontamination Sample Analysis.

- Facilities: The assessment, sampling, preparation, and ultimate decontamination of real property to regulatory standards that support the closure and conveyance of Plum Island; as well as the engineering and modification associated with maintaining valued assets to prepare for transfer. (\$30.4M)
- Program Management: The programmatic and administrative support to manage the PICS program; records management activities; and historic preservation/disposition of PIADC assets. (\$3.1M)
- Regulatory Compliance: Costs associated with maintaining current regulatory compliance and decommissioning/decontamination activity compliance with the State of New York, Environmental Protection Agency, and USDA’s Agriculture Select Agent Services (AgSAS). (\$0.1M)
- Mission Closeout: The drafting of plans to end the DHS science mission at PIADC and associated records management; and the transfer of assets to NBAF or other Federal entities, and transfer of records to National Archives & Records Administration. (\$0.1M)

FY 2021 and FY 2022 projects within the PICS Program provided baseline assessment and engineering direction for the rest of the program; FY 2023 and out-year projects through FY 2028 will mature those efforts through project plan execution. There are several long-lead, specialty devices included that will ensure S&T has the needed capabilities to start the physical decontamination of PIADC biocontainment facilities in FY 2024 when the science mission transfers. Funding also supports decontamination efforts in two older, smaller facilities, to ensure acceptance of the regulatory agreement with our chosen decontamination methodologies on PIADC's larger (and currently in-use) infrastructure moving forward. The overall value of this approach is cost avoidance for decontamination re-work in the larger facilities later in the project, while concurrently benefiting from regulatory buy-in of the chosen processes.

DHS has the responsibility to close and convey Plum Island through the FY 2012 DHS Appropriations Act (P.L. 112-74). Public Law 116-260 (Division FF, Title V, Section 501) repeals all previous 'direct sale' language and mandates the Administrator of GSA to dispose of all personal and real property and transportation assets, "as a single consolidated asset" under the Property Act. S&T has the responsibility to manage the closure of Plum Island to prepare all real and personal property assets for closure and conveyance by the GSA on behalf of DHS.

Impact:

The rate of completion for the various phases of the PICS program, as well as their congruity with the completion of the NBAF facility, is critical to the success of, and maintaining the cost estimate for this program. Delays in transition of the science mission will affect the ability to start physical activities in FY 2024. The current funding profile will allow S&T the ability to execute key activities critical to supporting the Program schedule for completion of PICS. In addition, PICS will prepare the island for closure and conveyance by mid-FY 2028, reducing future outlays of DHS funding to secure and maintain the PIADC facility after the science mission is complete. At present, S&T non-PICS funding related to Plum Island operations is upwards of \$50.0M annually. PICS is reliant on operations and maintenance (O&M) for key services such as transportation and utilities, among others. Once the PICS program is completed, the current operations funding estimate will decrease to \$10.0M annually, which is enough to sustain basic operations, maintenance, and security until Plum Island is conveyed.

The execution of the PICS program is reliant on the continued O&M funding for operations, contracted programmatic support and Federal staffing of PIADC beyond the transition of science programs to NBAF until the completion of the PICS program. The PICS program execution also requires PIADC operations and staff to provide island logistics, utilities, security, and regulatory compliance in accordance with environmental and USDA Select Agent requirements. S&T established a PICS Program Management Office (PMO) to coordinate PICS planning activities with PIADC operations, regulators, DHS Management, GSA, and other key stakeholders.

Project Schedule:

Activity	Estimated Schedule
Developed Science, Technical, Engineering and Support Package	FY 2022 Q1
Prepared Bio-Indicator Test Lab Planning Package	FY 2022 Q2
Provided procurement requisition (PR) package into system for Historical Records Management Activities	FY 2022 Q2
Provided PR Package into system for Science, Technical, Engineering and Support Package	FY 2022 Q3
Completed Building 102 Interior Surface Decontamination Planning	FY 2022 Q3
Started Validation Studies	FY 2022 Q4
Award Package for Science, Technical, Engineering, and Support Package	FY 2023 Q2
Delivered Bio-Indicator Test Lab	FY 2023 Q2
Deliver and Install Building 101 New Autoclaves	FY 2023 Q2
Start Building 101 New Autoclaves Installation	FY 2023 Q2
Start Utilities Planning Package	FY 2023 Q3
Start Building 101 Decontamination Planning Package	FY 2023 Q3
Autoclaves Acceptance Testing	FY 2023 Q3
Start Building 102 Interior Surface Decontamination (pending regulatory approval)	FY 2023 Q4
Complete Terminal Decontamination Validation Verification	FY 2023 Q4
Start Building 102 Final Fumigation (pending regulatory approvals)	FY 2023 Q4
Provide request for information (RFI) package into system for Building 257 Sampling and Decontamination (pending decision by regulatory agency)	FY 2023 Q4
Complete Building 102 Interior Surface Decontamination	FY 2024 Q2
Complete Building 102 Final Fumigation (pending regulatory approvals)	FY 2024 Q2
Complete Building 101 new autoclaves install and validation (pending regulatory approvals)	FY 2024 Q2
Implement Elements of Utilities Physical Work	FY 2024 Q3

Construction and Facility Improvements – PPA

Plum Island Closure and Support

Activity	Estimated Schedule
End Building 101 Decontamination Planning	FY 2024 Q4
Start Building 101 Limited Physical Decontamination	FY 2024 Q4
Continue Building 101 Decontamination based upon results	FY 2024 Q4

Detection Sciences Testing and Applied Research Center– Investment Capital Investment Exhibits

Construction

(Dollars in Thousands)

	Acquisition Level	IT/ Non-IT	MAOL	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget
N/A - Detection Sciences Testing and Applied Research Center	Non-Major	Non-IT	No	-	\$6,000	\$35,000

Construction Description

TSL is responsible for researching, developing, testing, and evaluating technologies to detect and mitigate the threat of explosives and other weapons that may be used against our Nation's transportation systems and infrastructure. Working closely with security equipment manufacturers and DHS Component Acquisition Managers, TSL ensures that operational components of the HSE acquire detection and mitigation solutions that meet their respective operational requirements, with a primary customer focus on TSA's explosives screening needs.

TSL's aging scientific equipment and outdated infrastructure limits the ability of the lab to fully meet its mission. The construction and facility improvement projects for TSL will allow S&T to better fulfill its mission and ensure its lasting impact in the future.

This investment is critical to ensure that the TSL maintains its ability to conduct RDT&E of explosive and threat screening devices.

Justification

The FY 2024 President's Budget includes \$35.0M to support the construction of the DSTAR Center.

Project: TSL Detection Sciences Testing and Applied Research (DSTAR) Center

Funding Requirement: The FY 2024 President's Budget includes \$35.0M to support the construction of the DSTAR Center.

Description: The DSTAR Center will be constructed in Atlantic City, NJ and is estimated at 54,000 sq. ft. and will include the Facility for Applied Research, the Facility for Energetic Materials Research (FEMR), removal of 2,000 sq. ft. existing temporary facility (B315 Annex trailers and connector, which are in poor condition as noted in recent FCAs) and reconfiguration of existing warehouse facilities back to their intended use, parking, and roadway improvements. The DSTAR Center will include an applied research laboratory, a dedicated homemade explosives synthesis/preparation facility, an explosives safety testing laboratory, flexible laboratory space for testing of explosive detection technologies, and new office space to replace temporary structures. This project is consistent with S&T's congressionally mandated Infrastructure Master Plan for the TSL from 2010 through present day. Initial documentation was completed in December 2017 and initial environmental planning was completed in March 2017.

Justification: The present suite of possible threats continues to expand beyond the current capabilities due to inadequate infrastructure and now includes marginally stable and highly sensitive homemade explosives with many variations. TSL constructed ad-hoc laboratories in warehouse spaces shortly after the emergence of homemade explosive threats starting with an attempt to destroy an aircraft with an improvised explosive placed in a shoe in 2001. As the homemade explosive threat grew and new counter measures emerged, these labs were expanded, but operations in these spaces remained inefficient and costly. These spaces were never intended for continuous occupancy and have remained sub-optimal since inception. TSL now has requirements to characterize and test homemade explosives that are more sensitive and less stable than the first set of homemade explosives. To handle these explosives safely TSL will need laboratories with more precisely controlled environmental conditions, built-in safety features (static mitigation), and automated synthesis capabilities to isolate personnel from hazardous operations (explosives synthesis). TSL has also begun testing systems capable of detecting opioids. These new threats create an additional testing burden on TSL and corresponding safety and disposal concerns. TSL is often asked to test technology solutions for an expanded network of transportation systems and potential targets such as government facilities, ports, and event venues (e.g., sports stadiums).

Shortly after 2001, much of TSL's work has been done in makeshift facilities, including warehouses and trailers that require increasing maintenance and repair, creating significant losses in work efficiency. Currently, many TSL staff work in office trailers and temporary buildings that have water penetration resulting in mold issues and are beyond their useful life. Substantial advances have been made in the development and application of explosives and weapons detection and mitigation technologies. In order to keep pace with new generations of detection equipment, TSL has developed rigorous processes, certifying to ISO 17025, 9000 and A2LA for testing and calibration laboratories. Without a purpose-built applied research space, and with the degraded facilities noted above, conditions are not conducive to maintaining these certifications. TSL was originally designed to conduct T&E on a small number of detection systems focused on conventional explosives. The initial T&E laboratories required T&E space and explosive storage bunkers. There are new and emerging threat types that must be synthesized and characterized in scientific laboratories. The return on investment of the facility is estimated to be \$13.0M each year, and this new, state-of-the-art facility will enable TSL to assist TSA and other customers with more efficiency and effectiveness in testing and evaluating threat screening devices.

Impact: The DSTAR Center project will allow S&T to resolve the issues identified above, better fulfill its mission, and ensure its lasting impact in the future. The return on investment of the facility is estimated to be \$13.0M each year, and this new, state-of-the-art facility will enable TSL to assist TSA and other customers with more efficiency and effectiveness in testing and evaluating threat screening devices. The DSTAR Center will feature automated, state-of-the-art laboratories to provide safe and effective validation of explosive screening devices. It also will include sterile areas for test and evaluation of trace detection devices and modern computational infrastructure for analyzing and archiving threat images from computed tomography and millimeter wave threat screening devices. The DSTAR Center will also have areas for Homemade Explosives (HME) assembly and will provide the means to synthesize hazardous and benign test articles. These areas are vital because of terrorists' increasing preference for HME, which has made the test and evaluation of explosive screening devices much more complex and time-consuming. These areas are vital because of terrorists' increasing preference for HME, which has made the test and evaluation of explosive screening devices much more complex and time-consuming.

This investment is critical to ensure that the TSL maintains the laboratory infrastructure conduct RDT&E of explosive and threat screening systems against rapidly evolving threats.

Activity	Estimated Schedule
Assisted Acquisition Award	FY 2024 Q2
Contract Solicitation	FY 2025 Q1
Design/Build Construction Award	FY 2025 Q3
Construction Start	FY 2026 Q1
Construction Complete	FY 2028 Q3

Department of Homeland Security

Science and Technology Directorate

Research and Development



Fiscal Year 2024

Congressional Justification

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Research and Development

Budget Comparison and Adjustments

Comparison of Budget Authority and Request

(Dollars in Thousands)

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget	FY 2023 to FY 2024 Change
Research, Development and Innovation	\$477,417	\$407,681	\$385,508	(\$22,173)
University Programs	\$65,537	\$53,537	\$51,037	(\$2,500)
Total	\$542,954	\$461,218	\$436,545	(\$24,673)
Subtotal Discretionary - Appropriation	\$542,954	\$461,218	\$436,545	(\$24,673)

The scope and diversity of the Department of Homeland Security's (DHS) missions require the Science and Technology Directorate (S&T) to address a wide range of programs supporting DHS Components' near-term needs for new operational capabilities, improved operational effectiveness, efficiency, and safety for the Homeland Security Enterprise (HSE). S&T has Research, Development, Test and Evaluation (RDT&E) responsibilities related to understanding and creating solutions for threats related to explosives, border security, cyber security, biological, chemical, and asymmetrical Threats. S&T's enduring research provides the essential building blocks for incremental scientific advances in collaboration with public and private sector research partners. S&T's analytics and knowledge products also are equally important to supporting analysis of alternatives for technology options; risk and threat assessments; operational testing and evaluation of technologies proposed for acquisition; and detailed technical characterization of potential biological threat organisms for both human and agricultural biodefense. S&T's RDT&E efforts are prioritized to the homeland's highest threats. In addition, S&T's capacity to engage R&D activities worldwide is augmented by S&T's university-based Centers of Excellence (COEs) and 14 bilateral international agreements.

S&T's Research and Development (R&D) appropriation provides resources necessary to identify, explore, and demonstrate new technologies and capabilities that enable DHS and its partners to prevent, protect against, respond to, and mitigate nuclear, chemical, radiological, and biological threats and incidents. Additionally, S&T's Small Business Innovation Research (SBIR) Program ensures U.S. small businesses participation in Federal research and development programs by offering competitive programs to bring innovative homeland security solutions to reality with the potential for commercialization. R&D funds support Technology Readiness Levels (TRLs) 1-7:

Basic Research		Applied Research		Technology Development	Technology Demonstration	System Development
TRL-1	TRL-2	TRL-3	TRL-4	TRL-5	TRL-6	TRL-7
Basic Principles Observed/Reported	Technology Concept/Application Formulated	Critical Function or Characteristic Proof of Concept	Validation in Lab Environment	Validation in Relevant Environment	System Prototypes in Relevant Environment	System Prototypes in Operational Environment

S&T has two programs, projects, and activities (PPAs) in its R&D appropriation:

Research, Development, and Innovation (RD&I): Provides state-of-the-art technology and/or solutions to meet the needs of DHS Components and the First Responder community. RD&I includes customer-focused, near-term, and output-oriented RDT&E programs that balance risk, cost, impact, and time to delivery. S&T's enduring research supports scientific advances in collaboration with public and private sector research partners. In addition, S&T explores emerging science and technology areas and their potential threat or application to future DHS missions. S&T's research and development activities also include technology demonstrations, university and industry partnerships, technology transfer and commercialization.

University Programs (UP): Supports critical homeland security related research and education at U.S. colleges and universities to address high-priority DHS-related issues and to enhance homeland security capabilities over the long term. UP includes COEs and Minority Serving Institutions (MSI), a consortium of universities generating groundbreaking ideas for new technologies and critical knowledge for the HSE.

Research and Development
Budget Authority and Obligations
(Dollars in Thousands)

	FY 2022	FY 2023	FY 2024
Enacted/Request	\$542,954	\$461,218	\$436,545
Carryover - Start of Year	\$174,333	\$258,434	\$147,982
Recoveries	\$18,842	-	-
Rescissions to Current Year/Budget Year	-	-	-
Net Sequestered Resources	-	-	-
Reprogramming/Transfers	(\$3,307)	-	-
Supplementals	-	-	-
Total Budget Authority	\$732,822	\$719,652	\$584,527
Collections - Reimbursable Resources	\$45,000	\$23,400	\$23,400
Collections - Other Sources	-	-	-
Total Budget Resources	\$777,822	\$743,052	\$607,927
Obligations (Actual/Estimates/Projections)	\$519,388	\$595,070	\$472,618
Personnel: Positions and FTE			
Enacted/Request Positions	-	-	-
Enacted/Request FTE	-	-	-
Onboard and Actual FTE			
Onboard (Actual/Estimates/Projections)	-	-	-
FTE (Actual/Estimates/Projections)	-	-	-

Research and Development Summary of Budget Changes

(Dollars in Thousands)

	Positions	FTE	Amount
FY 2022 Enacted	-	-	\$542,954
FY 2023 Enacted	-	-	\$461,218
FY 2024 Base Budget	-	-	-
Border Security Thrust Area	-	-	\$101,330
Chemical, Biological, and Explosive Defense Thrust Area	-	-	\$27,400
Counter Terrorist Thrust Area	-	-	\$60,894
Cyber Security / Information Analysis Thrust Area	-	-	\$37,500
First Responder / Disaster Resilience Thrust Area	-	-	\$28,750
Innovation Research and Foundational Tools Thrust Area	-	-	\$92,106
Physical Security and Critical Infrastructure Resilience Thrust Area	-	-	\$37,528
Centers of Excellence	-	-	\$45,880
Minority Serving Institutions (MSI)	-	-	\$5,157
Total Research and Development Projects	-	-	\$436,545
FY 2024 Request	-	-	\$436,545
FY 2023 TO FY 2024 Change	-	-	(\$24,673)

Research and Development Non Pay Budget Exhibits

Non-Pay by Object Class *(Dollars in Thousands)*

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget	FY 2023 to FY 2024 Change
21.0 Travel and Transportation of Persons	\$1,025	\$833	\$846	\$13
23.2 Rental Payments to Others	\$30	\$25	\$25	-
23.3 Communications, Utilities, & Miscellaneous	\$166	\$145	\$149	\$4
25.1 Advisory & Assistance Services	\$78,498	\$65,512	\$63,414	(\$2,098)
25.2 Other Services from Non-Federal Sources	\$1,798	\$1,546	\$1,604	\$58
25.3 Other Purchases of goods and services	\$4,680	\$5,717	\$5,298	(\$419)
25.5 Research & Development Contracts	\$400,502	\$337,511	\$314,356	(\$23,155)
25.7 Operation & Maintenance of Equipment	\$1,153	\$993	\$1,028	\$35
26.0 Supplies & Materials	\$473	\$406	\$421	\$15
31.0 Equipment	\$278	\$259	\$260	\$1
41.0 Grants, Subsidies, and Contributions	\$54,351	\$48,271	\$49,144	\$873
Total - Non Pay Budget Object Class	\$542,954	\$461,218	\$436,545	(\$24,673)

Research and Development
Research and Development Projects

Summary of Projects*(Dollars in Thousands)*

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget
Border Security Thrust Area	\$115,298	\$83,007	\$101,330
Chemical, Biological, and Explosive Defense Thrust Area	\$32,592	\$21,510	\$27,400
Counter Terrorist Thrust Area	\$69,361	\$60,983	\$60,894
Cyber Security / Information Analysis Thrust Area	\$60,600	\$48,567	\$37,500
First Responder / Disaster Resilience Thrust Area	\$77,715	\$55,950	\$28,750
Innovation Research and Foundational Tools Thrust Area	\$80,793	\$95,106	\$92,106
Physical Security and Critical Infrastructure Resilience Thrust Area	\$41,058	\$42,558	\$37,528
Centers of Excellence	\$57,880	\$45,880	\$45,880
Minority Serving Institutions (MSI)	\$7,657	\$7,657	\$5,157

*Research, Development, and Innovation – PPA***Budget Comparison and Adjustments****Comparison of Budget Authority and Request***(Dollars in Thousands)*

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget	FY 2023 to FY 2024 Change
Border Security Thrust Area	\$115,298	\$83,007	\$101,330	\$18,323
Chemical, Biological, and Explosive Defense Thrust Area	\$32,592	\$21,510	\$27,400	\$5,890
Counter Terrorist Thrust Area	\$69,361	\$60,983	\$60,894	(\$89)
Cyber Security / Information Analysis Thrust Area	\$60,600	\$48,567	\$37,500	(\$11,067)
First Responder / Disaster Resilience Thrust Area	\$77,715	\$55,950	\$28,750	(\$27,200)
Innovation Research and Foundational Tools Thrust Area	\$80,793	\$95,106	\$92,106	(\$3,000)
Physical Security and Critical Infrastructure Resilience Thrust Area	\$41,058	\$42,558	\$37,528	(\$5,030)
Total	\$477,417	\$407,681	\$385,508	(\$22,173)
Subtotal Discretionary - Appropriation	\$477,417	\$407,681	\$385,508	(\$22,173)

PPA Level I Description

The RD&I PPA provides state of the-art technology and/or solutions to meet the needs of DHS's Components and the First Responder community. This PPA supports customer-focused and output-oriented RDT&E programs that balance risk, cost, impact, and time to delivery resulting in technology demonstrations and transfer of new capabilities to DHS Components. It includes the following Thrust Areas:

Border Security: Invests in technologies and solutions to prevent the illicit movement and illegal entry or exit of people, weapons, dangerous goods, and contraband, and manage the risk posed by people and goods in transit.

Chemical, Biological, and Explosive (CBE) Defense: Funds R&D in technologies and solutions to support development of prevention and protective strategies and coordinated surveillance and detection to address CBE threats.

Counter Terrorist: Invests in technologies, methods, and procedures to counter terrorism.

Cyber Security / Information Analysis R&D: Conducts and supports RDT&E and the transition of advanced cybersecurity and information assurance technologies to secure the Nation’s current and future cyber and critical infrastructures.

First Responder / Disaster Resilience: Invests in technologies and solutions, which reduce vulnerability of key leadership, critical infrastructure, and events from terrorist attacks and other hazards. Also increases the level of preparedness of State, local, regional, tribal, territorial partners, non-governmental organizations, private sector, and public, while improving the capabilities of DHS to lead in emergency management.

Innovative Research and Foundational Tools: Identifies gaps through analysis and requirements prioritization and focuses on identifying and analyzing potential solutions while working with customers to select the best approach to delivering solutions, including knowledge and advice.

Physical Security and Critical Infrastructure Resilience: R&D technologies, methods, and procedures to enhance the physical security of the Nation’s critical infrastructure which includes the Nation’s air travel system, mass transportation systems, and schools as well as soft targets such as mass public gatherings.

Research, Development, and Innovation – PPA
Budget Authority and Obligations
(Dollars in Thousands)

	FY 2022	FY 2023	FY 2024
Enacted/Request	\$477,417	\$407,681	\$385,508
Carryover - Start of Year	\$144,119	\$215,649	\$123,580
Recoveries	\$18,842	-	-
Rescissions to Current Year/Budget Year	-	-	-
Net Sequestered Resources	-	-	-
Reprogramming/Transfers	(\$3,126)	-	-
Supplementals	-	-	-
Total Budget Authority	\$637,252	\$623,330	\$509,088
Collections - Reimbursable Resources	\$44,500	\$22,900	\$22,900
Collections - Other Sources	-	-	-
Total Budget Resources	\$681,752	\$646,230	\$531,988
Obligations (Actual/Estimates/Projections)	\$466,103	\$522,650	\$411,762
Personnel: Positions and FTE			
Enacted/Request Positions	-	-	-
Enacted/Request FTE	-	-	-
Onboard and Actual FTE			
Onboard (Actual/Estimates/Projections)	-	-	-
FTE (Actual/Estimates/Projections)	-	-	-

Research, Development, and Innovation – PPA
Summary of Budget Changes
(Dollars in Thousands)

	Positions	FTE	Amount
FY 2022 Enacted	-	-	\$477,417
FY 2023 Enacted	-	-	\$407,681
FY 2024 Base Budget	-	-	-
Border Security Thrust Area	-	-	\$101,330
Chemical, Biological, and Explosive Defense Thrust Area	-	-	\$27,400
Counter Terrorist Thrust Area	-	-	\$60,894
Cyber Security / Information Analysis Thrust Area	-	-	\$37,500
First Responder / Disaster Resilience Thrust Area	-	-	\$28,750
Innovation Research and Foundational Tools Thrust Area	-	-	\$92,106
Physical Security and Critical Infrastructure Resilience Thrust Area	-	-	\$37,528
Total Research and Development Projects	-	-	\$385,508
FY 2024 Request	-	-	\$385,508
FY 2023 TO FY 2024 Change	-	-	(\$22,173)

Research, Development, and Innovation – PPA

Non Pay Budget Exhibits

Non Pay by Object Class

(Dollars in Thousands)

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget	FY 2023 to FY 2024 Change
21.0 Travel and Transportation of Persons	\$935	\$809	\$839	\$30
23.2 Rental Payments to Others	\$30	\$25	\$25	-
23.3 Communications, Utilities, & Miscellaneous	\$166	\$145	\$149	\$4
25.1 Advisory & Assistance Services	\$76,103	\$64,810	\$63,218	(\$1,592)
25.2 Other Services from Non-Federal Sources	\$1,798	\$1,546	\$1,604	\$58
25.3 Other Purchases of goods and services	\$4,680	\$4,025	\$4,175	\$150
25.5 Research & Development Contracts	\$391,008	\$334,000	\$313,094	(\$20,906)
25.7 Operation & Maintenance of Equipment	\$1,153	\$993	\$1,028	\$35
26.0 Supplies & Materials	\$473	\$406	\$421	\$15
31.0 Equipment	\$278	\$239	\$247	\$8
41.0 Grants, Subsidies, and Contributions	\$793	\$683	\$708	\$25
Total - Non Pay Budget Object Class	\$477,417	\$407,681	\$385,508	(\$22,173)

Research and Development Research and Development Projects

Summary of Projects

(Dollars in Thousands)

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget
Border Security Thrust Area	\$115,298	\$83,007	\$101,330
Chemical, Biological, and Explosive Defense Thrust Area	\$32,592	\$21,510	\$27,400
Counter Terrorist Thrust Area	\$69,361	\$60,983	\$60,894
Cyber Security / Information Analysis Thrust Area	\$60,600	\$48,567	\$37,500
First Responder / Disaster Resilience Thrust Area	\$77,715	\$55,950	\$28,750
Innovation Research and Foundational Tools Thrust Area	\$80,793	\$95,106	\$92,106
Physical Security and Critical Infrastructure Resilience Thrust Area	\$41,058	\$42,558	\$37,528

Border Security Thrust Area
Research and Development
Technology Readiness Level Exhibit
(Dollars in Thousands)

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget
Border Security Thrust Area	\$115,298	\$83,007	\$101,330

R&D Thrust Area Description

BORDER SECURITY THRUST AREA: DHS secures the borders, territorial waters, ports, terminals, waterways, and air, land, and sea transportation systems of the United States. S&T invests in border security research and development for technologies and solutions to prevent illicit movement and illegal entry or exit of people, weapons, dangerous goods, and contraband, and manage risks posed by people and goods in transit. The table that follows shows initiatives and funding levels for FY 2024 in this area.

BORDER SECURITY THRUST AREA <i>(Dollars in Thousands)</i>				
Program	Project	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget
Total –Border Security Thrust		\$115,298	\$83,007	\$101,330
Air, Land and Port of Entry (POE) Security		\$41,048	\$28,592	\$33,834
	Air Security	\$20,300	\$14,000	\$18,434
	Enhanced Trade Technologies	\$655	\$1,100	\$1,500
	Ground Based Technologies	\$4,150	\$4,150	\$6,500
	POE Data Visualization and Emerging Analytics (formerly POE Forensics and Investigations)	\$4,100	\$2,500	-
	POE Mail	\$1,975	\$1,975	-
	POE Non-Intrusive Inspection (NII) and Alternate Technologies (formerly POE Scanning Technologies and Analytics)	\$8,118	\$3,367	-
	POE Security	-	-	\$7,400
	Tunnel Detection and Surveillance	\$1,750	\$1,500	-

BORDER SECURITY THRUST AREA <i>(Dollars in Thousands)</i>				
Program	Project	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget
Biometrics and Identity Management		\$5,950	\$3,250	\$3,750
	Biometrics Emerging Concepts	-	-	\$1,000
	Biometrics and Identity Screening	\$5,950	\$3,250	\$2,750
Counter Unmanned Aircraft Systems (CUAS)		\$29,165	\$26,165	\$24,996
	Counter UAS	\$29,165	\$26,165	\$24,996
Forensics and Criminal Investigations		\$12,350	\$9,800	\$9,500
	Digital Forensics	\$3,800	\$3,800	\$5,500
	Illegal Immigration Investigations	\$1,000	\$1,000	-
	Transnational Organized Crime and Counter Networks	\$7,550	\$5,000	\$4,000
Immigration Services		\$1,500	\$1,500	\$5,000
	Immigration-Based Technologies	\$1,500	\$1,500	\$5,000
Maritime Safety & Security		\$23,285	\$13,700	\$24,250
	Datahub Analytics	-	-	\$3,000
	Integrated Multi-Domain Enterprise (IMDE)	\$2,600	\$2,600	\$4,000
	Port and Coastal Surveillance	\$4,700	\$1,500	\$4,500
	Port and Waterway Resiliency	\$3,000	-	\$500
	Remote Maritime Technologies	\$14,985	\$9,600	\$12,250

Air, Land and Port of Entry (POE) Security – This program develops and transitions technical capabilities that strengthen the security of our national air, land, and space domains for border dominance by leveraging state of the art capabilities to detect and prevent illicit activities through the land and air domain while facilitating and safeguarding lawful trade and travel through the ports of entry.

Air Security

- **Problem:** DHS is experiencing an unprecedented surge in illicit transnational activity across the border where current operational capabilities are insufficient to properly detect, track, and interdict these activities. DHS needs Intelligence, Surveillance and Reconnaissance (ISR) capabilities that facilitate persistent domain awareness of the national border-space, and capabilities that facilitate the automation of missions, where possible, in an effort to safeguard agents from threats and hazards within the area of operations.

DHS lacks a sufficient capability to collect, organize, and analyze the vast amounts of data and information available, or that could be available if collection was enhanced, to provide strategic warning or forecast future resourcing of DHS assets, one such use case is migration when using advanced statistical modeling of migration in the western hemisphere. DHS needs the ability to collect and rapidly analyze—including through the application of artificial intelligence and machine learning—data related to drivers of migration (such as geopolitical and economic conditions, violent crime, other immigration policies, and perception of US immigration policy). In the absence of such capability, DHS is unable to provide quality and timely intelligence to enable effective operational and resource planning and provide decision-advantage for DHS and US Government leadership.

- **Solution:** The Air Security projects within this program advance critical technologies to close critical capability gaps within the air, land, and space domains. The following activities directly support the development, advancement, and deployment of critical capabilities to support border operations:
 - Large Unmanned Aerial Vehicle Improvements (Big Wing, VADAR Gen II, and SeaView): This effort is performing critical improvements and updates to transforms the aging, MQ-9 Reaper, fleet by dramatically increasing operational range, endurance, and sensor capabilities to provide persistent ISR coverage. These enhancements automate critical operational tasks and significantly reduce the risk of loss of the aircraft. ISR Sensors advance key sensor capabilities such as Advanced Maritime Radar and Vehicle and Dismount Exploitation Radar (VADER GEN II). Leveraging DoD baseline technology, this project will advance the sensor’s performance capability as well as develop the adaptations necessary for the DHS mission.
 - Enterprise Architecture and Tools: This effort focuses on the development of the ISR capabilities roadmap, processes, technologies, and tools required to support Enterprise Exploitation and Dissemination of ISR feeds. The goal of this effort is to support sharing and collaboration between Government wide agencies at the federal, state, local, and tribal level. The current tactical ISR feed architecture managed by DHS Components presents data exchange limitations.
 - Commercial High Speed Data Link Technologies: This effort leverages recent advances in commercial satellite-based data transfer services to facilitate communications between DHS manned and unmanned patrol aircrafts with command and control (C2) for maritime and ground based operations. Given the deployment of advanced sensor and mission systems aboard aircraft, current data link systems are insufficient in their ability to transmit required amounts of data within mission timeframes. This effort will focus on the evaluation of commercial off the

shelf (COTS) and government off the shelf (GOTS) data services for use in the HSE developing and evaluating system architecture technologies to transform DHS's capabilities to communicate C2 via a high-speed data link network. DHS will develop a series of technical baselines and integration kits which enable aircraft to communicate via a high-speed data network. This will enable real time support for tactical elements from manned aircraft surveillance as well as provide a force multiplier for U.S. Customs and Border Protection (CBP) fixed wing and rotary wing patrol aircraft. Also within this project area is the advancement of the tools and systems to enable persistent radar-based change detection capabilities of the entire border of the CONUS. Developments within this area will leverage collaborations with other government agencies and the commercial sector.

- Air Domain Awareness (ADA) – Is the effective understanding of information, threats, and anything associated with the air domain that could impact the security safety, or economy of the United States. ADA efforts are supporting the Counter Unmanned Airspace Program in order to detect, track, and identify small Unmanned Aircraft Systems (sUAS) operating in the National Air Space (NAS). S&T is collaborating with the National Aeronautics and Space Administration (NASA) and the Air Force Research Laboratory (AFRL) in coordination with its different contractors to understand how to integrate and effectively use air traffic data that will come from future sUAS ecospheres, and other ADA data sources. The ADA activity is working collaboratively with CBP Air and Marine Operations (AMO) to integrate sUAS software into the ADA picture and test sensors that can detect, track, and identify sUAS that are not complying with sUAS identification regulations. These efforts will enable DHS Components to separate compliant from non-complaint sUAS's. This effort will research, evaluate, and identify Remote Identification systems for use on DHS Unmanned Aircraft Systems (UAS). Remote Identification will be integrated into the DHS Component's air domain awareness system to provide a data feed of DHS sUAS operations.
- **Justification:** The FY 2024 President's Budget provides \$18.4M for this project, a \$4.4M increase from the FY 2023 enacted. Funding for this project advances the development of vital innovative and evolving aerospace technologies, such as UAS, ISR sensors, UAS Traffic Management (UTM) and sUAS technologies, and commercial satellite technology critical to support HSE border operations. Additionally, funds will support DHS Components with mission-critical air security tools needed for enhanced detection, classification, and tracking of illicit activities; augment emergency response capabilities; and improve resiliency and systems interoperability.
- **Impact:** The Air Security project directly supports the operations of ICE, USSS, CBP, I&A, and USCG and will continue: 1) the test and evaluation of capabilities to detect, track and classify manned and unmanned aircraft; 2) advance the development, integration and transition of ISR sensor technology with C2 and advance air mobility for applicable HSE operational scenarios; 3) advance current architecture to open tactical ISR feeds and allow DHS Components to share intelligence; 4) development and testing of sUAS platforms, sensors, and related technologies to close operational gaps limited by current technology, as sUAS technology continues to evolve; and 5) improve baseline operational asset technologies to enable a measurable increase in operational flight hours and area of operation while reducing life cycle costs. Air security threats are becoming increasingly sophisticated, to counter criminal organizations, DHS has a need to invest in air security technologies to remain paces ahead of drug cartels, human traffickers, unauthorized drone operators, border incursions and suspicious activities.

Type of Research

Developmental

Technical Readiness Level

TRL for project efforts range from TRL-5 to TRL-7. This project's R&D efforts typically start by performing a market survey of available COTS and GOTS technology that could be adapted for DHS Component use. Identified technology is then prototyped and evaluated first in a relevant environment (TRL-6) then in an operational environment (TRL-7) prior to transition. Examples from the R&D milestones detailed below:

- Currently initiating R&D efforts to prototype and evaluate ISR technologies such as VADER in a relevant environment (TRL-6).
- Individual air detection, track, and ID systems (TRL-7); integration of the disparate sensors and system (TRL-5 to start, then 6-7, and completion).

Transition Plans

- Provide resources to enable the development of ISR capability for use by CBP and USCG.
- Develop capability on second generation (GEN II) VADER technology for CBP AMO.
- Develop technologies to enable the transfer of mission data and live video from patrol assets to C2 elements within CBP, USCG and ICE.
- Develop high speed data infrastructure prototype to enable the transfer of large amounts of data from patrol assets to C2 elements within CBP, USCG and ICE.
- Develop technologies to advance the high endurance and all-weather capability of large UAS for CBP-AMO and sUAS for CBP United States Border Patrol (USBP).
- Design and develop the “Big Wing” modification kit with de-Ice capability for AMO's MQ-9.
- Develop next generation Maritime radar system.
- Develop Federal USS software based on NASA-proposed data standard and integrate into air domain awareness operations center.
- Develop DHS UAS UTM and Remote ID capabilities and policies that conform with FAA regulatory requirements.
- Deliver automated suspicious UAS detection and reporting to CBP AMO through advanced data analytics using data collected from multiple sources.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Provided test and evaluation results and enabled operational assessments for ICE and CBP U.S. Border Patrol (USBP) to determine best value of emerging sUAS capability.	FY 2022 Q1	FY 2022 Q4	6-7
Published JUSTICE demonstration, test and evaluation results, and associated analyses to DHS Components, first responder and emergency management service organizations.	FY 2022 Q1	FY 2022 Q4	6-7
Conducted demonstration and evaluation of Air Domain Awareness (ADA) systems and provided analyses results.	FY 2021 Q2	FY 2022 Q1	7

Research, Development, and Innovation – PPA
Border Security Thrust Area

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
Designed and developed the “Big Wing” modification kit with de-Ice capability for CBP Air and Marine Operation’s (AMO) MQ-9.	FY 2022 Q1	FY 2022 Q4	6-7
Developed a hyperspectral sensor capability for CBP AMO and USCG.	FY 2022 Q1	FY 2022 Q4	6-7
Developed capability on second generation (GEN II) VADER technology for CBP AMO.	FY 2022 Q1	FY 2022 Q4	6-7
Developed next generation Maritime radar system.	FY 2022 Q1	FY 2022 Q4	6-7
Developed technologies to advance the high endurance and all-weather capability of large UAS for CBP-AMO and sUAS USBP.	FY 2022 Q1	FY 2022 Q4	6-7
Provided resources to enable the development of Intelligence, Surveillance and Reconnaissance (ISR) capability for use by CBP and USCG.	FY 2022 Q1	FY 2022 Q4	6-7
Tested and evaluated increased endurance and weather capability.	FY 2021 Q1	FY 2022 Q4	6-7
	FY 2023		
Complete MQ-9 Big Wing modification kit and testing for AMO.	FY 2023 Q1	FY 2023 Q4	5-6
Conduct at least one cybersecurity vulnerability assessment that meets Chief Information Security Officer (CISO) requirements to procure and operate UAS.	FY 2023 Q1	FY 2023 Q4	-
Deliver UAS Service Supplier architecture to appropriate Air Domain Awareness Operations center.	FY 2023 Q1	FY 2023 Q4	6-7
Develop Federal UAS Service Supplier software based on NASA proposed data standard.	FY 2022 Q4	FY 2023 Q4	6
Execute joint test with CBP/AMO to demonstrate integration of below 500 ft (smaller radar cross section platforms) and above 500 ft (General Aviation aircraft) detection, tracking and ID in the Air Domain.	FY 2023 Q1	FY 2023 Q4	6-7
Initiate the design of a DHS owned multi-mission small, unmanned aircraft system.	FY 2023 Q1	FY 2023 Q4	5-6
Receive high endurance UAS prototypes and technical data packages from Department of Energy Savannah River National Laboratory (SRNL).	FY 2023 Q1	FY 2023 Q4	-
Transition SHAKE reporting application to I&A for implementation into the DHS ISR infrastructure.	FY 2023 Q1	FY 2023 Q4	6-7
	FY 2024		
Collaborate with CBP Air and Marine Operations (AMO) to integrate sUAS software into the ADA picture and test sensors that can detect, track, and identify sUAS that are not complying with sUAS identification regulations.	FY 2024 Q1	FY 2024 Q4	5-7
Complete operational evaluation of high-speed data airborne terminal.	FY 2024 Q1	FY 2024 Q4	5-6
Complete the first OCONUS deployment of Big Wing.	FY 2024 Q1	FY 2024 Q4	5-7
Develop Concept of Operations by NASA for CLUE Project.	FY 2024 Q1	FY 2024 Q4	5-6

Research, Development, and Innovation – PPA**Border Security Thrust Area**

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
Develop ISR capabilities roadmap to advance the current Enterprise architecture and tools to enable sharing of ISR data.	FY 2024 Q1	FY 2024 Q4	6-7
Identify and evaluate existing sensor technologies and data exchange architectures that can be leveraged to develop a remote identification capability that integrates into the DHS air domain awareness system.	FY 2024 Q1	FY 2024 Q4	6-7
Mapping of the intelligence handling processes required to make exploitation and dissemination of ISR data more effective and sustainable.	FY 2024 Q1	FY 2024 Q4	6-7
Perform integration and flight testing of SeaVue Multi-Role Radar for Big Wing.	FY 2024 Q1	FY 2024 Q4	5-7
Prototype, test, and evaluate a Remote Identification capability that integrates into the DHS air domain awareness system to provide data exchange between Federal and civil government agencies.	FY 2024 Q1	FY 2024 Q4	6-7

Enhanced Trade Technologies

- **Problem:** CBP's Office of Trade works to secure and facilitate imports arriving in the United States, collecting duties, taxes, and other fees; targeting illegal or fraudulent commerce; and enforcing U.S. trade law. CBP needs technology to safeguard the American public and promote legitimate international commerce, while considering the increasing volume and complexities of international trade. The capability for target agencies to enforce trade laws against counterfeit, unsafe, and fraudulent inbound goods, while facilitating lawful trade requires advanced analytics and machine learning analysis to enhance trade operations.
- **Solution:** This program identifies and develops technology to enhance the ability of CBP to facilitate and secure the import of trade goods. The program's goal is to identify, assess, and develop, new technology within the parameters of CBP's business needs, inform the acquisition of technology to proactively pursue improvements in the execution of their duties. Such technology will be oriented around collection of cargo data, performance of advanced data and risk analytics, and modeling to target illegal cargo while expediting the delivery of legitimate cargo.
- **Justification:** The FY 2024 President's Budget provides \$1.5M for this project, a \$0.4M increase from the FY 2023 enacted. Funding for this project will be used to target international trade violators, high risk shipments, counterfeit, unsafe, and fraudulent goods, which specifically tie to CBP's concern of long wait times for cargo processing and delivery to market.
- **Impact:** Impacts include: (1) Benefitting American markets by expedited processing of legitimate commerce, (2) enhancing ability to protect American consumers by targeting illegal or fraudulent cargo, (3) enhanced ability to efficiently collect duties, taxes, and tariffs, and (4) improved ability to enforce U.S. Trade law.

Type of Research

Applied and Developmental

Technical Readiness Level

The targeted initial TRL for projects ranges from TRL-1 to TRL-7. This project's R&D efforts will start by performing a market survey of available COTS and GOTS technology that could be adapted for CBP use. Identified technology is then adapted and validated in a laboratory or relevant environment (TRL-4/5). Following successful validation, the most promising solution(s) are then prototyped and evaluated first in a relevant environment (TRL-6) then in an operational environment (TRL-7) prior to transition. Using electronic systems to expedite the clearance of merchandise entries and to ensure effective customs controls (TRL-4).

Transition Plans

Transition analyses, knowledge products, technologies to CBP Office of Trade to support future request for proposals for enhancing targeting capabilities.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Generated a Comprehensive Solutions Approaches Report.	FY 2022 Q2	FY 2022 Q4	6-7
	FY 2023		
Develop a strategic capability roadmap that defines the prioritized operational challenges to the security of traded goods processing through the U.S. ports of entry. This roadmap shall identify time phased executable investments in technology advancements which address the gaps.	FY 2023 Q1	FY 2023 Q4	2
	FY 2024		
Begin executing against capabilities roadmap to include identifying project area, engaging customer needs via the S&T BPF matrix, identifying candidates to execute work, and awarding contract.	FY 2024 Q1	FY 2024 Q4	1

Ground Based Technologies

- **Problem:** CBP, USSS, and ICE lack reliable and accurate detection, identification, classification, tracking, and interdiction capability to locate illegal ground-based activity. CBP and ICE also have a limited capability to reliably detect cross-border tunnels, investigate discovered tunnels without putting an agent in the tunnel, and perform forensic analysis of the discovered tunnel to support investigations and prosecutions. Further, commercial telecommunications companies are deploying new networks across the country that pose challenges to law enforcement who use digital tools to legally find and investigate cross-border criminal and terrorist activity on telecommunications networks.
- **Solution:** The program is partnering with DHS Components to identify, develop, and transition innovative technologies that can be leveraged to enhance land border security between the POEs as well as improve agent safety and law enforcement investigative capabilities. This includes developing and deploying technology that provide law enforcement officers (LEOs) the ability to perform lawful telecommunications investigations. In response to the problem reliably detecting cross-border tunnels, this project is developing modeling and simulation capabilities to enhance USBP's knowledge of the state of technology modalities in detecting tunnels under diverse environmental conditions.
- **Justification:** The FY 2024 President's Budget provides \$6.5M for this project, a \$2.4M increase from the FY 2023 enacted. The work that was being done under the Tunnel Detection and Surveillance project will be re-aligned as an activity under Ground Based Technologies beginning in FY 2024. Funding for this project will be used to develop, test, and evaluate technologies designed to enhance the detection, identification, classification, and tracking of illicit activity in remote areas of the U.S. land border; assist USSS in evaluating changes in threats and potential countermeasures to current and emergent technologies, methods, and tactics, techniques and procedures (TTPs); enable improved asset use and informed resource requests to assist CBP in tactical deployment of existing assets; and test, validate and transition products to assist ICE in locating and investigating criminal suspects.
- **Impact:** Impacts include: (1) enhanced land domain awareness, (2) increased detection, tracking, and interdiction of illicit border activity, (3) enhanced data sharing and analytics to support CBP and ICE Homeland Security Investigations (HSI) intelligence and investigations, (4) enhanced effectiveness of field agents/officers while carrying out their duties, (5) new tools and methods to lawfully investigate and prosecute criminal and terrorist suspects, (6) technical risk reduction to future activities of USBP's Cross Border Tunnel Threat (CBTT) program of record, (7) increased ability to investigate/exploit discovered tunnels safely, (8) increased arrests and prosecution of individuals involved in the creation/use of tunnels, (9) reduction of hundreds of tons of drugs kept off U.S. streets, and (10) savings of thousands of CBP and ICE labor hours.

Type of Research

Developmental

Technical Readiness Level

TRL varies for specific portfolio projects between TRL-1 and TRL-7. This project's R&D efforts typically start by performing a R&D requirements analysis and market survey of available COTS and GOTS technology that could be adapted for DHS Component use. Identified technology is then adapted and validated in a relevant environment (TRL-5). Following successful validation, the most promising solution(s) are then prototyped and evaluated first in a relevant environment (TRL-6) then in an operational environment (TRL-7) prior to transition. Examples from the R&D milestones detailed below:

- Develop a collaborative platform for immersive visualization capabilities accessible to DHS Components.
- Development of new products and methods to lawfully investigate and prosecute criminal and terrorist suspects.

Transition Plans

- Transition enhanced cross-domain (Air, Land, Maritime, Space, Cyber) enterprise information sharing capabilities such as Tactical Chat, all-domain tracks, and sensor system information inform strategic planning.
- Transition products to aid ICE in locating and investigating criminal suspects.
- Transition products to USSS to provide immersive visualization capabilities.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Transitioned products to assist ICE in locating and investigating criminal suspects.	FY 2022 Q1	FY 2022 Q4	5-7
Communications Security: Delivered tools for use by investigators to apprehend nefarious actors.	FY 2022 Q1	FY 2022 Q4	5
Initiated integration of land and maritime information sharing services using IMDE.	FY 2021 Q4	FY 2022 Q3	6-7
Integrated tactical communications into the iOS Team Awareness Kit (iTAK) baseline and demonstrated use during an operational event. (ASAH)	FY 2022 Q1	FY 2022 Q4	7
Supported geoPDF integration and testing of iTAK platform for wildland fire response.	FY 2022 Q1	FY 2022 Q4	7
Transitioned sensor technology to CBP to improve the detection and tracking of illegal border activity.	FY 2022 Q1	FY 2022 Q4	5-7
Transitioned products to assist ICE in locating and investigating criminal suspects.	FY 2022 Q1	FY 2022 Q4	5-7
Communications Security: Delivered tools for use by investigators to apprehend nefarious actors.	FY 2022 Q1	FY 2022 Q4	5
Initiated integration of land and maritime information sharing services using IMDE.	FY 2021 Q4	FY 2022 Q3	6-7

Research, Development, and Innovation – PPA**Border Security Thrust Area**

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
Integrated tactical communications into the iTAK baseline and demonstrated use during an operational event. (ASAH)	FY 2022 Q1	FY 2022 Q4	7
	FY 2023		
Complete data ingestion system development to automate interactable object and material setup.	FY 2023 Q1	FY 2023 Q4	1-7
Develop electronic technologies for use by investigators to apprehend nefarious actors.	FY 2023 Q1	FY 2023 Q4	3-7
Import existing site models as part of baseline activities needed to transition current VBS3 training solution to a modern COTS gaming environment.	FY 2023 Q1	FY 2023 Q4	1-7
	FY 2024		
Demonstrate third party integration for Modeling Asset Past Performance for Border Planning (MAPP-BP).	FY 2024 Q1	FY 2024 Q4	6-7
Develop a collaborative platform for Unreal Engine accessible to DHS Components for immersive visualization capabilities.	FY 2024 Q1	FY 2024 Q4	6-7
Evaluate and modernize existing software capabilities, including enhancement of 4-screen simulation system and upgrade of Unreal Engine platform for immersive visualization capabilities.	FY 2023 Q1	FY 2024 Q2	6-7
Provide Operational Use Period testing support to USBP PMOD for the evaluation of detection systems acquired under the CBTT program.	FY 2024 Q1	FY 2024 Q4	-

POE Data Visualization and Emerging Analytics

- **Problem:** CBP Office of Field Operations (OFO) POE Security has a need to develop advanced technologies to address supply chain security and evaluate those technologies for functionality and ultimately for certification as acceptable security devices and/or methodologies.
- **Solution:** S&T is working with CBP OFO and a university partner to pursue R&D related to data visualization and emerging analytics that can enhance tracking for cargo and people from origin to destination with advanced interactive visual analytics to better identify transnational activity and provide additional insights into customs recovery, threat detection in the supply chain, while expediting trade.
- **Justification:** The FY 2024 President's Budget does not include funding for this project. The work that was being done in this project will align under POE Security project beginning in FY 2024, along with the work that had been done under POE Mail and POE Non-Intrusive Inspection (NII) and Alternate Technologies.
- **Impact:** Impacts include (1) enhanced ability to investigate illegal activity and detection of illegal goods and (2) potential to save thousands of CBP labor hours. This activity has the potential to replace the current manual inspection methods and streamline CBP inspection activities.

Type of Research

Developmental

Technical Readiness Level

TRL 5-7. This project's R&D efforts will leverage earlier work done with the university and Sandia National labs. The Technology Readiness Level of this effort between S&T with the university has not been determined yet. To date, the program has focused on developing methods to improve image quality of NII systems. Following successful validation, the solution(s) are then prototyped and evaluated first in a relevant environment (TRL-6) then in an operational environment (TRL-7) prior to transition.

Transition Plans

This project's R&D efforts are TRL 5-7. Software design requirements and deliverables will be developed in conjunction with customer and technical personnel. Transition will follow demonstration of these systems in a laboratory environment.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Communicated with stakeholders to establish requirements and a statement of work.	FY 2022 Q1	FY 2022 Q4	-
	FY 2023		
Evaluate algorithms on x-ray data for automated threat recognition of agricultural and biological threats.	FY 2023 Q1	FY 2023 Q4	4-5
	FY 2024		
N/A	-	-	-

POE Mail

- **Problem:** CBP has ineffective processes and technology to support international mail inspection. Despite legislative requirements to target and prevent illegal imports, CBP capabilities limit the number of inspections done on millions of pieces of incoming international mail each day. The limitations are largely due to inadequate guidance, equipment, and resources which hinders CBP's efforts to prevent prohibited items from entering the United States.
- **Solution:** The project will review operational capabilities to improve technology and address the large volume of international mail. The project will conduct analyses to determine what additional staff and technology solutions are needed to adequately address the large volume of international mail.
- **Justification:** The FY 2024 President's Budget does not include funding for this project. The work that was being done in this project will align under POE Security project beginning in FY 2024, along with the work that had been done under POE Data Visualization and Emerging Analytics and POE NII and Alternate Technologies.
- **Impact:** Impacts include: (1) expedited processing of mail; (2) enhanced ability to interdict illegal or fraudulent mail; and (3) enhanced ability to efficiently collect duties, taxes, and tariffs.

Type of Research

Applied and Developmental

Technical Readiness Level

S&T anticipates the TRL will vary between TRL-6 and TRL-7 depending on the activity. This project's R&D efforts will typically start by performing a market survey of available COTS and GOTS technology that could be adapted for DHS Component use. Identified technology will then be adapted and validated in a laboratory or relevant environment. Following successful validation, the most promising solution(s) will then be prototyped and evaluated first in a relevant environment (TRL-6-7) then in an operational environment (TRL-7) prior to transition.

Transition Plans

Transition technology to CBP conveyance and security division for improvements in CBP international mail inspection.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Modeled analysis and other knowledge products delivered to CBP's Office of Trade to support future mail equipment decisions.	FY 2022 Q1	FY 2022 Q4	4-7
	FY 2023		
Identify solution and execute request for proposal POE Mail technical solution.	FY 2023 Q1	FY 2023 Q4	-
Review qualified candidates and select performer for solution execution.	FY 2023 Q1	FY 2023 Q4	-
	FY 2024		
N/A	-	-	-

POE Non-Intrusive Inspection and Alternate Technologies

- **Problem:** CBP's NII systems technology requires R&D improvements to maintain parity with emerging threats. The volume of inbound goods and people projected to pass through the POEs is increasing from year to year, however, CBP manpower is not projected to increase proportionately. New, improved, or alternate technology can be a force multiplier to help address these challenges.
- **Solution:** This program develops alternate technology and future NII R&D technologies to enhance their detection performance and expand the range of detectable threats. These technologies will improve data integration and remote image analysis at common NII viewers. Other improvements include NII imaging for high-throughput package screening, automated anomaly detection, next-generation composite container and improvement in NII software algorithms, machine learning and threat detection and other advanced technologies.
- **Justification:** The FY 2024 President's Budget does not include funding for this project. The work that was being done in this project will be aligned to POE Security project beginning in FY 2024, along with the work that had been done under POE Data Visualization and Emerging Analytics and POE Mail.
- **Impact:** Impacts include: (1) dramatic increase in interdiction rates without additional staffing, (2) increase in the speed of commerce (greater/faster throughput), and (3) improved resource loading providing a significant increase in efficiency.

Type of Research

Developmental

Technical Readiness Level

TRL varies for specific project activities between TRL-6 and TRL-7. This project's R&D efforts typically start by performing a market survey of available COTS and GOTS technology that could be adapted for CBP use. Identified technology is then adapted and validated in a relevant environment. Following successful validation, the most promising solution(s) are then prototyped and evaluated first in a relevant environment then in an operational environment (TRL 6-7) prior to transition.

- Imaging systems technology to inspect and screen at CBP POE.

Transition Plans

Upon successful completion and operational assessment of the software/hardware upgrades, S&T will deliver prototype systems for laboratory testing, and if successful for operational demonstration. S&T will then deliver assessments of developed technologies and techniques to CBP to inform their acquisition process.

- Transition Technology integrating new imaging technology to CBP's Office Field Operations.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Awarded contracts and project initiation for alternate R&D technologies.	FY 2022 Q1	FY 2022 Q4	5-7
Awarded contracts and project initiation for NII project activities.	FY 2022 Q1	FY 2022 Q4	5-7
Performed initial assessment of technology/techniques to improve performance of NII detectors, algorithms, and data collection.	FY 2021 Q1	FY 2022 Q4	5
	FY 2023		
Active Neutron Detection: Execute a Preliminary Package and Presentation of trade space analysis.	FY 2023 Q1	FY 2023 Q4	3-4
Ag Threat Detection: Execute award in support of library and algorithm development.	FY 2023 Q1	FY 2023 Q4	-
Modeling & Simulation: Run predictive modeling in support of resource event response development.	FY 2023 Q1	FY 2023 Q4	-
Modify workflow to enable data exchange between one airline carrier and common viewer air system.	FY 2023 Q1	FY 2023 Q4	5-6
	FY 2024		
N/A	-	-	-

Port of Entry (POE) Security

- **Problem:** The volume of inbound goods and people projected to pass through POEs is increasing from year to year, however, CBP manpower is not projected to increase proportionately. CBP requires improved inspection infrastructure to enhance detection of threats allowing legal trade and public consumption with minimal economic disruption. CBP needs advanced scanning and non-intrusive inspection technologies at POEs (Seaports, Land Ports, Inland Ports, Airports, and International Mail Facilities) to rapidly screen cargo, people, and goods for contraband and from potential threats. To achieve this goal, development of innovative technologies and practices to enable ease of inspection, contraband detection and provide supply chain security at the port of entries into the United States are required.
- **Solution:** The project will review operational capabilities to improve technology and address the large volume of diverse types of trade, and conduct analyses to determine what, if any, additional staff, and technology solutions are needed to adequately address inspection challenges. This program develops alternate technology and future R&D technologies to enhance CBP's detection performance and expand the range of detectable threats. These technologies will improve data integration and image analysis. Other improvements include NII imaging for high-throughput package screening, automated anomaly detection, improvement in NII software algorithms, machine learning, modeling, and simulation (M&S), threat detection, and other advanced technologies.
- **Justification:** The FY 2024 President's Budget provides \$7.4M for this project, a \$7.4M increase from the FY 2023 enacted. This new project is an aggregation of the individual POE Projects that this program had previously executed: POE Mail, POE Data Visualizations & Emerging Analytics, and POE NII and Alternate Technologies. Funding for this new project will improve the current CBP inspection technologies of people and goods. Improved image quality, increased threat detection, greater predictive analytical capabilities, and higher efficiency practices will expedite contraband detection and ease processing times of legitimate trade and travel.
- **Impact:** Impacts include: (1) maximizing productivity and efficiency of public resources by increasing interdiction rates without additional staffing, (2) bolstering the American marketplace by increasing in the speed of commerce (greater/faster throughput of products to American markets) (3) increasing the percentage of vehicles crossing into the U.S. that undergo x-ray screening, and (4) safeguarding America by significantly reducing the flow of narcotics, contraband, and other illegal goods into the country.

Type of Research

Applied and Developmental

Technical Readiness Level

S&T anticipates the TRL will vary between TRL-2 and TRL-7 depending on the activity. This project's R&D efforts will typically start by performing a market survey of available COTS and GOTS technology that could be adapted for DHS Component use. Identified technology will then be adapted and validated in a laboratory or relevant environment. Following successful validation, the most promising solution(s) will then be prototyped and evaluated first in a relevant environment (TRL-6-7) then in an operational environment (TRL-7) prior to transition.

Transition Plans

- Transition technology to CBP Conveyance and Security Division for improvements in CBP international mail inspection.
- Transition technology integrating new imaging technology to the CBP OFO.
- Transition technology of open-sourced databases and algorithms to the CBP Office of Trade.
- Transition process improvement analysis of Office of Field Operations to CBP Office of Field Operations.
- Transition knowledge product on active neutron inspection application to CBP OFO.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
N/A	-	-	-
	FY 2023		
N/A	-	-	-
	FY 2024		
Active Neutron Detection: Identify criteria for testing of Active Neutron Detection prototype. Develop a test plan and execute testing of prototype.	FY 2024 Q2	FY 2024 Q4	4
Active Neutron: Transition knowledge products to end-user.	FY 2024 Q1	FY 2024 Q4	6
Develop an Automated Threat Recognition (ATR) algorithm plan for agricultural and biological threats.	FY 2024 Q1	FY 2024 Q4	5-7
Expand digital twin capabilities in coordination with customer-identified needs.	FY 2024 Q1	FY 2024 Q4	6
Modeling & Simulation: Transition existing M&S digital twin knowledge products to customer.	FY 2024 Q1	FY 2024 Q4	6
Track execution of funds and ensure contract execution meets predefined project milestones and timetables.	FY 2024 Q1	FY 2024 Q4	2
Work with customer, performer, and transition team to begin kickoff.	FY 2024 Q1	FY 2024 Q4	2

Tunnel Detection and Surveillance

- **Problem:** CBP and ICE have a limited capability to reliably detect cross-border tunnels, investigate discovered tunnels without putting an agent in the tunnel, and perform forensic analysis of the discovered tunnel to support investigations and prosecutions.
- **Solution:** This program is conducting market research, modeling and simulations, and operational experiments (OpEx) to enhance USBP's knowledge of the state of technology modalities to detect, exploit, and seal cross-border dug tunnels. The program will conduct technology assessments to investigate the ability to detect tunnels under varying environmental conditions and collect and analyze samples from discovered tunnels to enable investigations/prosecutions.
- **Justification:** The FY 2024 President's Budget does not include funding for this project. The work that was being done in this project aligns under Ground Based Technologies project beginning in FY 2024.
- **Impact:** Impacts include: (1) technical risk reduction to future activities of CBP's CBTT program of record, (2) increased ability to investigate/exploit discovered tunnels safely, (3) increased arrests and prosecution of individuals involved in the creation/use of tunnels, (4) reduction of hundreds of tons of drugs kept off U.S. streets, and (5) savings of thousands of CBP and ICE labor hours.

Type of Research

Developmental

Technical Readiness Level

TRL varies for portfolio projects between TRL-4 and TRL-7. This project's R&D efforts start by performing a market survey of available COTS and GOTS technology that could be adapted for DHS Component use. Identified technology is then further assessed and considered for evaluation in an OpEx in a relevant environment (TRL-6) or operational environment (TRL-7).

Transition Plans

Deliver to CBP a geophysical model that approximates seismic and acoustic wave attenuation for tunnel detection system performance analysis.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Analyzed and processed sensor response data collected at Joint Tunnel Test Range to support decision making on future system deployments and sensor suitability.	FY 2022 Q1	FY 2022 Q4	-
	FY 2023		
Conduct validation and verification activities to refine a mathematical model that approximates the physics of seismic and acoustic wave attenuation.	FY 2023 Q1	FY 2023 Q4	-
Finalize emulator calibration and deployment test procedures for use in operational test and evaluation of detection systems being evaluated by USBP.	FY 2023 Q1	FY 2023 Q3	-
	FY 2024		
N/A	-	-	-

Biometrics and Identity Management Program – The Biometrics and Identity Management Program adheres to the DHS Biometrics Strategic Framework 2015 – 2025 vision for biometric transformation and supports the specific goals and objectives for achieving the vision. This program develops and evaluates effective biometric and identity technologies to optimize identity validation and verification operations for people at POEs, transportation security checkpoints, secure facilities, online systems, or large-scale population migration/displacement events while also ensuring interoperability for information sharing across the HSE. The program employs a complimentary system engineering-based data-driven approach to identify and prioritize potential changes in existing operations based on anticipated improvements, consequences, and costs of new solutions. This will be accomplished as described below with the prioritization, initiation, and completion dependent on available funding and driven by Component inputs.

Biometric Emerging Concepts

- **Problem:** As organizations continue to leverage biometrics to an unprecedented level, the Office of Biometric Identity Management (OBIM) must remain in the forefront as the DHS biometric identity services provider. OBIM must implement and influence biometric identity service research and development projects that identify and evaluate new technologies and support the incorporation and adoption of those new technologies.
- **Solution:** Keeping OBIM at the forefront of this field requires that S&T collaborate closely on research and development projects to ensure DHS mission needs met with technically advanced solutions that keep pace with rapid advances in biometric technology and meet the mission needs of the DHS stakeholders. The project will bring expertise, technologies, tools, capabilities, and approaches from other government entities, as well as external scientific, technical, industrial, and academic sources to bear on the identity, cyber, and privacy problems of the HSE. Further, in cases where such capabilities do not exist, S&T in coordination with OBIM will build solutions, via investments in applied research, advanced development, test and evaluation, and technology transition to ensure their availability to the HSE.
 - Biometric Information Sharing Support for HSE: Apply RDT&E to determine how improved biometric data gathering can enhance information sharing capabilities. Inconsistent biometric data gathering impedes the rapid processing of biometrics during large-scale population migration and displacement events.

The U.S. Government's (USG) mission to protect the homeland and its citizens relies heavily on its ability to identify and guard against threats, whether posed by persons intending harm or natural disasters. OBIM provides biometric identity services – Match, Store, Share, and Analyze – to DHS and mission partners, enabling the operations across DHS missions, including:

- Prevent terrorism and enhance security: OBIM identifies dozens of known or suspected terrorists each day.

- Secure and manage borders: OBIM processes the biometrics of approximately 4,000 individuals trying to illegally enter the United States each day.
- Enforce and administer immigration laws: OBIM establishes and verifies the identities of 7,700 immigration benefit applicants each day.
- Ensure resilience to disasters: OBIM supports Federal Emergency Management Agency (FEMA) by screening and identifying disaster response officials receiving FEMA credentials.
- **Justification:** The FY 2024 President’s Budget provides \$1.0M for this project, a \$1.0M increase from the FY 2023 enacted. Funding for this project will be used by S&T to fulfill OBIM validated needs including research, development, planning, integration, execution, test & evaluation, and technical expertise for next generation identity technologies. Additionally, S&T will perform and support analyses, conduct experiments, demonstrations, challenge problems with industry and academia, proof of concepts, and prototypes in the exploration of future identity capabilities. This work will assist OBIM to evaluate and understand the feasibility of new and emerging operational capabilities that could support the DHS “Identity” enterprise and inform future acquisition.
- **Impact:** As the DHS Biometric Service provider, supporting 45+ DHS stakeholders, OBIM must evaluate a broad range of biometric and identity capabilities related to the match, store, share, and analyze continuum. The S&T research conducted under each activity enhance the efforts to inform the broader HSE about the possibilities for new or novel capabilities. OBIM will evaluate the S&T proof-of-concept solutions for potential prototypes that would be operationally relevant to ensure fulfillment of DHS mission needs with technically advanced solutions that keep pace with rapid advances in biometric technology and meet the mission needs of its DHS stakeholders.

Type of Research

Developmental

Technical Readiness Level

TRL varies for specific project activities between Not Applicable (N/A) for studies and TRL-7 for capabilities. This project’s R&D efforts typically start by performing a market survey of available COTS and GOTS technology that could be adapted for DHS Component use. Identified technology is then adapted and validated in a relevant environment (TRL-5). Following successful validation, the most promising solution(s) are then prototyped and evaluated first in a relevant environment (TRL-6) then in an operational environment (TRL-7) prior to transition.

Transition Plans

All analyses, models, data, technology prototypes, and knowledge products will be transitioned to OBIM Futures Identity to facilitate adoption and use by DHS Component operations. The products include all operational performance analyses, vulnerability and mitigation analyses, and engineering trade study documentation for follow-on acquisition and/or sustainment.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
N/A	-	-	-
	FY 2023		
N/A	-	-	-
	FY 2024		
Conduct a biometric workflow analysis study coupled with technology evaluations to indicate how improved biometric data gathering can enhance information sharing capabilities across the HSE. This knowledge will inform both OBIM data service offerings and Component Stakeholder acquisition plans to address large-scale population migration and displacement events.	FY 2024 Q1	FY 2024 Q3	4
Deliver one or more knowledge products to inform DHS OBIM on best practices or technology acquisitions to ensure data collected can be stored, matched, and shared by the Homeland Advanced Recognition Technology (HART) system.	FY 2024 Q1	FY 2024 Q4	6

Biometrics and Identity Screening

- **Problem:** Strategic plans from DHS Components include increasing the use of biometric screening of travelers. To accomplish this, DHS must address security and privacy concerns while handling increases in traveler volume and inspections to strengthen traveler vetting and adjust the scale of operations to facilitate lawful and legitimate travel. DHS requires effective biometric capabilities that improve identity validation and verification of people arriving or departing at US POEs, applying for benefits, and accessing secure Federal facilities or protection of designated sites. These capabilities must balance security, privacy and protection concerns with ongoing needs to facilitate lawful trade, travel, and assembly, by improving accuracy, flexibility, and scalability of solutions.
- **Solution:** Employ a comprehensive systems-engineering approach to find opportunities for changes that present operational improvements, consequences, processes, and technology improvements. This is done by conducting technology foraging, technology readiness evaluations, and operational readiness assessments to inform DHS acquisition planning for more advanced/lower cost technologies, including biometric recognition capabilities, to facilitate lawful and legitimate travel. For the activities listed below, S&T will apply a proven systems-engineering approach to identify opportunities for changes to existing operations and present improvements, consequences, costs of new solutions, processes, and impacts of technology improvements. The evaluation of the cost effectiveness of biometric capabilities and technologies is necessary to effectively adjust to evolving security and safety needs, appropriately scale operations, and optimally use available resources.
 - Incorporate Facial Recognition into Vetting Capabilities: Advise and supply technical assistance to measure and operationalize enhancements to CBP and TSA Face Recognition capabilities. Tasks for this project include automated face recognition performance monitoring based on National Institute of Standards and Technology (NIST) recommendation; informing incremental performance enhancements; comparative evaluations of human and system performance; enhancing overall performance through Officer and automated algorithm collaboration.
 - Biometrics for Vehicles at POEs: CBP needs the capability to capture high-quality facial images of the vehicle driver and all passengers prior to the vehicle arriving or at the POE inspection booths. Apply RDT&E to see how CBP can effectively use biometric technology to rapidly verify the identity of individuals in vehicles entering (and exiting) the United States at land POEs.
 - USSS Biometric Integration with OBIM: USSS requires a comprehensive analysis, free from commercial and organizational conflicts of interest, of both current and anticipated future biometrics capabilities related to the performance of its investigative and protective missions. Apply RDT&E capabilities to advise and provide technical assistance to conduct a study of the As-Is and To-Be Biometric Infrastructure of USSS to determine the actions and steps necessary for USSS to make the most efficient use of DHS enterprise biometric systems.

Objective 3.5 in the DHS Biometrics Strategic Framework requires DHS Components must “Implement Standard Solutions” as a mitigation for operational and programmatic gaps that pertain to undisciplined acquisition of biometric technology. As DHS considers enhancements to existing

inspection and screening operations for travelers at its POEs, it is important to employ a comprehensive systems-engineering approach to find opportunities for changes to existing operations and present predicted improvements, consequences, and costs of new solutions. Using a data-driven approach to assess identification and screening solutions will inform S&T in the prioritization of RDT&E activities. The solutions establish and leverage innovative and robust science-based capabilities to provide the DHS and Federal partners with data and knowledge products to inform requirements and acquisition decisions.

- **Justification:** The FY 2024 President’s Budget provides \$2.8M for this project, a \$0.5M decrease from the FY 2023 enacted. Funding for this project will support CBP OFO and USSS gaps, advise and supply technical assistance to measure and operationalize enhancements to the use of biometrics; and apply RDT&E to determine how Components can effectively use biometric technology to rapidly verify or identify the identity of individuals within their respective mission areas.
- **Impact:** Impacts include (1) enhanced lawful identification and validation for trade and travel; (2) improved ability to detect terrorists, criminals, and dangerous individuals; (3) improving and streamlining DHS biometric acquisitions by allowing Components’ to definitively determine best-value solutions for any mission by reducing technical risk during source selections; (4) enabling enhanced interoperability of secure, interoperable, enterprise solutions; (5) improved DHS staffing efficiency by enabling streamlined, scalable, and cost-effective security, screening and inspection operations; (6) improved traveler throughput and satisfaction; and (7) improving capability for retrieval of biometrics records to aid front line officers conducting investigations.

Type of Research

Developmental

Technical Readiness Level

TRL varies for specific project activities between Not Applicable (N/A) for studies and TRL-7 for capabilities. This project’s R&D efforts typically start by performing a market survey of available COTS and GOTS technology that could be adapted for DHS Component use. Identified technology is then adapted and validated in a relevant environment (TRL-5). Following successful validation, the most promising solution(s) are then prototyped and evaluated first in a relevant environment (TRL-6) then in an operational environment (TRL-7) prior to transition.

Transition Plans

All analyses, models, data, technology prototypes, and knowledge products will transition to DHS Components. Select work products may also be shared with industry stakeholders to facilitate adoption and integration into DHS Component operations in order to enable co-operative procurement through public-private partnerships. Component-specific products include all operational performance analyses, vulnerability and mitigation analyses, and engineering trade study documentation for follow-on acquisition and/or sustainment.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Developed technical requirements and specifications for various biometric modality collection systems and data quality to address the mission and assist acquisition needs of Components.	FY 2022 Q1	FY 2022 Q4	6
Established testing and qualification process to facilitate acquisition of interoperable and enhanced biometric collection capabilities to address DHS Component mission needs.	FY 2022 Q1	FY 2022 Q4	6
Facilitated development and operational deployment of biometric analysis workflows and technologies to support the incorporation and integration of Component biometric-enabled missions with the OBIM HART system.	FY 2022 Q1	FY 2022 Q3	7
	FY 2023		
Complete test and evaluation to recognize viable applications of biometric COTS/GOTS technologies that can be recommended to DHS Components.	FY 2023 Q1	FY 2023 Q4	-
Deliver assessment report of COTS/GOTS biometric modality collection systems technical specifications for use in Components' acquisition plans for meeting new Joint Requirements Council requirements and Biometric Enterprise Management Reform Act requirements.	FY 2023 Q1	FY 2023 Q4	-
Obtain current Component technical specifications for various biometric modality collection systems and data quality based on mission requirements.	FY 2023 Q1	FY 2023 Q3	-
Publish reports on biometric collection COTS/GOTS solutions that identify and assess further development, modification, integration requirements to support integration into DHS Components' operational mission spaces.	FY 2023 Q2	FY 2023 Q4	-
	FY 2024		
Conduct and deliver biometric T&E results of COTS technologies that evaluate the capture of high-quality facial images of the vehicle driver and all passengers prior to the vehicle arriving or at the land POE inspection booth. The results will inform CBP/OFO in planning future field evaluations and acquisition programs.	FY 2024 Q1	FY 2024 Q4	-
Conduct Rally to inform DHS on Identity and Biometric technologies that both meet current Component operational use cases and preserve privacy.	FY 2024 Q3	FY 2024 Q4	-
Deliver results of biometric workflow analysis and evaluation of technologies to support the incorporation and integration of USSS biometric-enabled missions with OBIM's HART system. The results will inform the USSS in planning current enterprise improvements and future acquisition programs.	FY 2024 Q1	FY 2024 Q4	-

Counter Unmanned Aircraft Systems Program – This program conducts research, tests, evaluates and transitions technical capabilities that strengthen the security of DHS covered assets and facilities by detecting, tracking, identifying, and mitigating threats posed by nefarious small Unmanned Aircraft Systems (sUAS).

Counter Unmanned Aircraft Systems (C-UAS)

- **Problem:** Recent technology advances have resulted in a flood of inexpensive and easily obtainable sUAS that are used for multiple legitimate and illegitimate uses. As a result of the Preventing Emerging Threats Act of 2018, DHS was charged with the responsibility for the safety, security, and/or protection of personnel, facilities, or assets, from unmanned aircraft systems (UAS) that pose a risk to a covered facility or asset. DHS Components have limited capabilities to detect, track, identify, and mitigate sUAS under Title VI, Section 124n when performing certain congressionally approved missions. Currently, DHS has four Components that are authorized by the Secretary of DHS to field capabilities that operationally mitigate the threat of nefarious sUAS use. Given the rapid proliferation of sUAS in the marketplace and their ever-increasing capabilities, S&T must work with industry, government, and our international partners to develop and test new and innovative C-UAS capabilities that detect, track, identify and mitigate these advanced threats.
- **Solution:** The program will accomplish the following objectives:
 - Identify or update and document initial DHS Component requirements based on specific mission sets and provide those initial requirements reports to DHS Components to be used in standing up their C-UAS acquisition and/or procurement programs.
 - Identify potential COTS or GOTS solutions that best meet requirements, document those findings, and provide the artifacts to DHS Components.
 - Modify/tailor/adapt COTS/GOTS and other mature technologies to address urgent needs.
 - Assist DHS Components in deployment of C-UAS technologies by adhering to all requirements, developing appropriate documentation, and coordinating with DoT/FAA to ensure there is minimal or no impact to the US National Airspace.
 - Determine the direction of sUAS technology advancement in the future to inform RD&I investments to counter these improvements.
 - Leverage industry and schools of higher education in the creation of novel technical methods to defeat sUAS using challenge events.
 - Pursue technologies that can improve the Unmanned Traffic Management system to help determine friend vs. foe UAS in the US National Air Space; and

- Perform research and development on capability gaps found in the 2019 DHS Capability Assessment Report (CAR) and prioritized DHS Component gaps identified and documented during the 2020 C-UAS DHS issue team.
- **Justification:** The FY 2024 President’s Budget provides \$25.0M for this project, a \$1.2M decrease from the FY 2023 enacted. Funding will address four R&D focus areas that encompass 24 different efforts in the C-UAS Capability Development Roadmap. The four R&D focus areas are: (1) Defense Chain Effectiveness, (2) Interoperability and Operational Coordination, (3) Deployment and Interagency Coordination, and (4) New and Emerging CUAS Technologies and Systems Engineering.

These activities will ensure safe integration and testing of C-UAS in national airspace in accordance with 6 U.S.C 124n, assist DHS Components (such as FPS, CBP Air and Marine Operations (AMO), CBP, USBP, USSS, and TSA) in defending the Nation from current UAS threats by providing RDT&E of available C-UAS technologies, and RDT&E of new and emerging technologies to address DHS Component requirements for countering sUAS threats. This request addresses approximately 50 percent of the Deputy's Management Action Group (DMAG) approved FY 2024 RDT&E capability development efforts aimed at addressing DHS Component capability gaps identified in the JRC-validated CAR.

- **Impact:** Impacts include 1) establishing an advanced drone forensics capability within DHS but in coordination with other departments including the Intelligence Community, 2) identifying and testing low collateral effect kinetic mitigation technologies applicable to DHS mission sets, 3) incorporating agent feedback from extended user evaluations into the multi-modal detection and personal portable C-UAS prototypes for CBP and FPS, 4) establishing recommended C-UAS data protocols to enable inter and intra-agency interoperability, 5) providing an opportunity to test and evaluate C-UAS technologies in an urban environment to optimize system performance and establish data sharing processes for Federal, State and local collaboration when addressing a drone threat and 6) furthering research, test and evaluation into emerging communication methods, like 5G.

Type of Research

Developmental

Technical Readiness Level

TRL varies for specific portfolio projects between TRL-5 and TRL-7. C-UAS solutions are tested and evaluated in the operational environment (TRL-7) prior to transition. Some milestones do not have TRL’s associated with them because they are knowledge products / artifacts.

Transition Plans

- Transition C-UAS systems from prototype pilots into operational systems to be used by DHS Components for protection of high priority facilities or assets as designated by the Secretary of DHS.
- Incremental C-UAS improvements based on the capability gaps identified by the 2019 validated C-UAS Capability Assessment Report (CAR) will be folded into C-UAS pilot systems in preparation for transition.
- Provide program knowledge product artifacts such as market research, test results, operational assessment reports, and draft operational requirements reports to DHS Components to assist with their C-UAS procurement or acquisition activities.

- Transition initial Cybertesting methodologies and processes developed to assess security posture of C-UAS systems.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Completed a performance assessment of at least one pilot C-UAS technology in or from a maritime environment applicable to USCG, FPS and/or CBP.	FY 2022 Q1	FY 2022 Q4	7
Completed a technical assessment of C-UAS technologies to detect, track and identify at TSA UAS testbed #1 located in MIA.	FY 2022 Q1	FY 2022 Q4	6-7
Completed transition of CBP pilot C-UAS kit.	FY 2022 Q1	FY 2022 Q4	7
Conducted flight tests to ensure transition readiness of Urban Prototype Fixed Site capability.	FY 2021 Q1	FY 2022 Q2	7
Demonstrated integration of at least 2 disparate C-UAS sensors in a common tactical display.	FY 2022 Q1	FY 2022 Q4	7
Developed and test portable capability for Component partner.	FY 2021 Q1	FY 2022 Q2	7
Integrated and tested new sensors into Urban C-UAS Operational Prototype system.	FY 2021 Q1	FY 2022 Q2	7
Integrated UCOP with existing user interface system for a common viewing platform.	FY 2022 Q1	FY 2022 Q2	7
Tested first implementation of intra-agency interoperability between two or more DHS operational C-UAS technologies.	FY 2022 Q2	FY 2022 Q4	6
Tested first version of departmental rapid response C-UAS capability with FPS.	FY 2022 Q2	FY 2022 Q4	6
	FY 2023		
Develop a market survey report for C-UAS technologies that can detect and possibly exploit advanced command and control links (e.g., 5G).	FY 2023 Q1	FY 2023 Q4	-
Develop a report on passive radar capability to detect, track and identify sUAS.	FY 2023 Q1	FY 2023 Q4	-
Develop and test modular, rapid roll-on roll-off detect, track, identify, and mitigate prototype capability for departmental response.	FY 2023 Q1	FY 2023 Q4	6
Develop and test prototype web-based tool for use by CISA to analyze the vulnerability of critical infrastructure to threats posed by sUAS.	FY 2022 Q1	FY 2023 Q4	6
Modify and test existing DHS prototype systems for DHS interoperability with another partner agency.	FY 2023 Q1	FY 2023 Q4	6-7
Test and assess C-UAS detect, track, ID and mitigate capability against multiple sUAS simultaneously.	FY 2023 Q1	FY 2023 Q4	6
Test detection and mitigation of non-emitting sUAS.	FY 2023 Q1	FY 2023 Q4	6

Research, Development, and Innovation – PPA**Border Security Thrust Area**

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2024		
Conduct Low Collateral Kinetic Mitigation Test Event Two.	FY 2024 Q1	FY 2024 Q4	-
Document test results from long-range passive radar testing and provide to DHS Components.	FY 2024 Q1	FY 2024 Q4	6
Initiate airborne C-UAS integration process for DHS Component specified aircraft or unmanned platform.	FY 2024 Q1	FY 2024 Q4	-
Integrate disparate person-portable technologies for enhanced DTI (Detect, Track, and Identify).	FY 2024 Q1	FY 2024 Q4	6
Test Automated threat chain execution with remote ID data.	FY 2024 Q1	FY 2024 Q4	6
Transition to use the Web-based Flight Restriction tool developed in coordination with CISA.	FY 2024 Q1	FY 2024 Q4	7

Forensic and Criminal Investigations Program – This program researches and develops technologies, procedures, detection, and intelligence capabilities to enable DHS Components to collect, analyze, share, and act on law enforcement data and information.

Digital Forensics

- **Problem:** Law enforcement officials require updated, current forensic tools to combat criminal activity. Due to technologies offering greater anonymity for both sellers and buyers, darknet criminal marketplaces have become increasingly more popular. In addition, evolving technology allows for evidence distribution among new devices and networks. Law enforcement must have the tools to respond to this evolving criminal activity.
- **Solution:** This project will design, develop, assess, and integrate new innovative technologies that will give law enforcement agents the ability to sift through massive amounts of digital data much quicker than their current manual process, and therefore, locate evidence, identify, and rescue victims, and identify the perpetrators much faster. This will be accomplished through the following activities with the prioritization, initiation, and completion dependent on available funding and Component input:
 - Language ID Tool: Develops, tests, and integrates language ID into current forensic tools. This new capability will allow forensic analysts to quickly determine what sections of video digital imagery contains voice and what language is spoken.
 - Livestream Project: Develop system architectures and prototypes that will find criminal behavior on livestream platforms and provide data exploitation. Iteratively transition tools to Component customers. Current efforts have focused on the Skype platform demonstrating success in FY 2022 and could be expanded to other social chat platforms.
 - Facilitation and Outcomes Analysis of the 5RD Workshop to Combat Child Exploitation: Convenes government agencies including law enforcement, policy personnel, and research scientists from Australia (AU), Canada, New Zealand, the United Kingdom, and the United States to exchange information, identify common strategic priorities, and coordinate R&D efforts in countering child exploitation.
 - Bulk Vetting to Identify Evasion of US Foreign Investment Screening and Export Controls: Develop a four-part, sequential “big data” research model will be matured/operationalized to regularly provide analytic and operational leads to DHS Components.
- **Justification:** The FY 2024 President’s Budget provides \$5.5M for this project, a \$1.7M increase from the FY 2023 enacted. Funding for this project will provide research & development of digital forensics tools to fill high priority gaps for DHS law enforcement operations. Specifically, S&T will focus research on digital analytic automation to provide tools that will drastically reduce the amount of time it takes and analyst to conclude a case. In addition, funds will further develop, assess, and integrate innovative digital forensics tools for forensic law enforcement applications.

- **Impact:** This project will provide agents with the ability to dramatically speed up the process of initial triage, and the subsequent necessary forensic deep dive, analysis of evidence, thereby increasing an investigators effectiveness. The tools developed within the project will also allow investigators to visualize new data to investigate and prosecute child exploitation, transnational crime, financial fraud, drug smuggling, and the entire spectrum of criminal activity investigated by DHS and other law enforcement partners. Additionally, this project will identify new techniques and entities involved in undermining US trade rules, which would inform the DHS's enforcement and intelligence missions.

Type of Research

Developmental

Technical Readiness Level

Varies per activities between TRL-4 and TRL-7. This project's R&D efforts typically start by performing a market survey of available COTS and GOTS technology that could be adapted for DHS Component use. Research is conducted when needed and then adapted and validated in a relevant environment (TRL-5). Following successful validation, the most promising solution(s) are then prototyped and evaluated first in a relevant environment (TRL-6). Examples from the R&D milestones detailed below:

- Test and update the Camera ID algorithms as a disruptive technology to match digital imagery (TRL-5).
- Transition language determination tools capable of determining where language is spoken in a video sequence, what language is spoken and transcribing common languages to English text (TRL-6).
- Develop LiveStream Platform capable of ingesting massive amounts of data from legal warrant returns, normalize data and give Agents the ability to visualize and process the data thus reducing their workload.

Transition Plans

- Language ID Project: Transition the Language ID Project technology to ICE HSI. FY 2023 will focus on R&D; transitions will begin in FY 2024.
- Livestream Project: Transition a livestream warrant data triage tool to ICE HSI and develop and transition an additional search and data analytics capability. FY 2023 will focus on R&D and transitions will begin in FY 2024.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Livestream Project: Transitioned a livestream warrant data triage tool to ICE HSI and developed and transitioned an additional search and data analytics capability.	FY 2022 Q1	FY 2022 Q4	4-6
Provided research in Natural Language Processing/semantic analysis for a Livestream data analytics capability.	FY 2022 Q1	FY 2022 Q4	5
Researched and integrated Camera ID capabilities into current user interface.	FY 2021 Q1	FY 2022 Q2	5

Research, Development, and Innovation – PPA
Border Security Thrust Area

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
Transitioned the Auto-Categorization Tool to ICE HSI.	FY 2022 Q1	FY 2022 Q4	4-6
Transitioned the Language ID Project technology to ICE HSI.	FY 2022 Q1	FY 2022 Q4	4-6
Transitioned the War Criminal Tool technology to ICE HSI Human Rights Violators & War Criminals Unit.	FY 2022 Q1	FY 2022 Q4	4-6
Transitioned Speech & Language determination tools capable of determining where language is spoken in a video sequence, what language is spoken, and transcribed common languages to English text.	FY 2022 Q1	FY 2022 Q3	5
	FY 2023		
Assess feasibility of expanding livestream capabilities to other social chat applications.	FY 2023 Q1	FY 2023 Q4	4-6
Develop livestream scraping capabilities in order to increase the automation of historically manual processes.	FY 2023 Q3	FY 2023 Q4	4-6
Research livestream scraping capabilities in order to develop these capabilities.	FY 2023 Q1	FY 2023 Q2	4-6
Research the use of computer vision (Language ID) for livestream capabilities.	FY 2023 Q1	FY 2023 Q4	4-6
	FY 2024		
Develop & integrate analytic framework/Applications Program Interface, including the Open Media Processing Framework to perform content detection and extraction on bulk multimedia for LiveStream Forensic Tools.	FY 2024 Q1	FY 2024 Q4	5-6
Develop bulk data evaluation capabilities to triage/assess/analyze massive datasets.	FY 2024 Q1	FY 2024 Q4	4-7
Develop use cases for advanced adaptive forensic tools.	FY 2024 Q1	FY 2024 Q2	4-7
Initiate advanced adaptive forensic capabilities to address use cases.	FY 2024 Q2	FY 2024 Q4	4-7
Integrate bulk data evaluation capabilities into operational environment.	FY 2024 Q3	FY 2024 Q4	4-7
Provide natural language processing (NLP) RDT&E to assess and implement enhanced text processing capabilities focused on (1) Optical Character Recognition and (2) Summarization for the Speech and Language Forensic Tools.	FY 2024 Q1	FY 2024 Q4	4-5
Simplify the process of adding additional language translation capabilities to support the Speech and Language Forensic Tools with back-end coding.	FY 2024 Q2	FY 2024 Q4	5-6

Illegal Immigration Investigations

Problem: The number of encounters at the southwest border has been steadily increasing and ICE-ERO is working around the clock to process the flow at the border. ICE-ERO, in collaboration with the Departments of Health and Human Services, Justice, and State in an all-of-government effort to, not only address the current situation at our southwest border, but also to institute longer-term solutions to irregular migration from countries in our hemisphere that are suffering worsening conditions. There are areas within ERO's mission space that require system modernization and implementation of new technologies and/or methods to provide efficiencies in the ERO processes.

- **Solution.** Continued enhancement of ERO's integration of the on-demand forecasting model that incorporates policy-driven and external data sets, to inform resource requirements and leadership decision making processes; additional R&D and development will be needed to further enhance ERO's capability, will be developed and integrated into ERO's operational environment. This request will support continuous development and implementation of technology that will support analyses and predictive models to answer operational questions at the Component.
- **Justification:** The FY 2024 President's Budget does not include funding for this project.
- **Impact:** ERO is helping to keep the U.S. borders secure, while humanely applying and enforcing immigration laws. Upon successful completion of this project, S&T will have identified systems and/or methods to aid ERO in its implementation of immigration processes, and technology solutions that can further aid in preventing detention.

Type of Research

Developmental

Technical Readiness Level

S&T anticipates the TRL will vary between TRL-5 and TRL-7. Following a FY 2022 market survey of available COTS and GOTS technology that could be adapted for ICE's use, identified technologies will be adapted and validated in a relevant environment (TRL-5). Upon successful validation, the most promising solution(s) will then be prototyped and evaluated first in a relevant environment (TRL-6) then in an operational environment (TRL-7) prior to transition. Examples that support the R&D milestones detailed below:

- Perform a market survey of technologies that could be adapted for ICE use to be validated in a relevant environment (TRL-5).
- Perform technology demonstrations & evaluations of system prototypes in a relevant environment (TRL-6).
- Apply R&D to bring identified solution paths in line with ICE's specific requirements.

Transition Plans

S&T plans to transition to ICE the resultant analyses, models, technology prototypes, and knowledge products in order to enhance the ability of ERO to perform their mission.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Initiated analysis of alternatives.	FY 2021 Q1	FY 2022 Q3	-
Provided technology recommendations and initiate associated R&D activities.	FY 2022 Q3	FY 2022 Q4	6-7
	FY 2023		
Conduct comprehensive analysis to determine scenarios and policies to inform mod/sim tool.	FY 2023 Q2	FY 2023 Q4	6-7
Initiate the development of the modeling and simulation tool for ICE-ERO mission space.	FY 2023 Q3	FY 2023 Q4	6-7
Validate toolset to be utilized to prototype in relevant environment with ICE-ERO.	FY 2023 Q2	FY 2023 Q4	5
	FY 2024		
Finalize the modeling and simulation tool for ICE-ERO mission space.	FY 2024 Q1	FY 2024 Q2	6-7
Integrate the modeling and simulation tool into ICE-ERO mission space.	FY 2024 Q2	FY 2024 Q4	6-7
Transition Modeling and Simulation Modules to ICE ERO.	FY 2024 Q3	FY 2024 Q4	6-7

Transnational Organized Crime and Counter Networks

- **Problem:** Transnational Organized Crime (TOC) networks and actors operate over wide geographic areas and are only effectively combated by a team approach that is equally diverse, agile, and generally not co-located. DHS Components (I&A, ICE/HSI, CBP, and USCG) require a fabric of connected purpose-built data systems and forensic tools that enable an enterprise-wide data sharing capability with a centralized data analytics platform to facilitate and encourage collaboration across DHS. Current forensic tools are standalone tools that do not contain the opportunity to benefit from artificial intelligence (AI) and machine learning (ML), which drastically increases the performance of these tools for law enforcement applications.
- **Solution:** The S&T Transnational Organized Crime and Counter Networks project partners with DHS operational stakeholders to develop forensic tools and a central unified framework that encourages collaboration and includes using Artificial Intelligence (AI) and Machine Learning (ML) technology, providing digital media exploitation capabilities designed to automate and augment current manual processes. The initial target of this work will be crimes involving human trafficking, forced labor, child sexual exploitation. The TOC work will leverage digital forensic tools and apply AI and ML, which will drastically increase the performance of those tools and move from manual to automated processes for operational end users. S&T will use R&D work from the intelligence agencies including Intelligence Advanced Research Projects Activity, Defense Advanced Research Projects Agency, and National Security Agency, and apply AI/ML, which will increase tool performance. TOC work will bring the current standalone digital forensics tools to an enterprise level on collaboration platforms including ICE HSI's Repository for Analytics in a Virtualized Environment (RAVEN). New capabilities will include computer vision for object and activity detection, voice semantic analytics, natural language processing of unstructured text documents, information fusion for entity resolution, automate data schema generation and tagging to move into the classified environment and place tools in a central platform for interagency tactical collaboration.
- **Justification:** The FY 2024 President's Budget provides \$4.0M for this project, a \$1.0M decrease from the FY 2023 enacted. Funding will provide subject matter expertise (SME) to further develop, test, and integrate investigative science technologies including digital forensics, identity resolution, behavioral science, and DOMEX (document and media exploitation); applying AI/ML to increase performance of these technologies for operational end users. This research work focuses on developing tools that use AI and ML to counter TOC, specifically targeting crimes of Human Trafficking, Forced Labor, Child Sexual Exploitation for the DHS enterprise. S&T SMEs will evaluate operational data and further develop forensics tools that will automate current manual processes, provide data link analysis, and apply analytics and media exploitation saving countless hours of time and provide agents with more leads for TOC investigations that are impossible to otherwise obtain.
- **Impact:** The S&T Transnational Organized Crime and Counter Networks project enables DHS to leverage new forensic tools that take advantage of data sharing capabilities that encourage a unified approach to combat global TOC. These new forensic tools and data sharing capabilities will close the operational gap using a central data hosting, analytics, and collaboration platform where agents can access new vital forensic that utilize AI/ML and share discoveries, theories, and analysis.

Type of Research

Developmental

Technical Readiness Level

This project's R&D efforts will start by performing a market survey of available COTS and GOTS technology that could be adapted for DHS Component use. Identified technology will then be adapted and validated in a relevant environment (TRL-5). Following successful validation, the most promising solution(s) will be prototyped and evaluated first in a relevant environment (TRL-6) then in an operational environment (TRL-7) prior to transition.

Transition Plans

- As a 5-year endeavor, this project focuses on R&D with spiral development (iterative phased development process designed to build upon lessons learned and enhancements gleaned from previous iterations) in unison with DHS Components that culminates in DHS Components piloting, testing, and integrating forensic tools and data sharing capabilities. All analyses and prototyped tools and capabilities will be transitioned to the DHS Component.
- FY 2023 will focus on R&D, while transitions will begin in FY 2024.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
FY 2022			
Conducted an operational gap analysis of the host data platform and associated analytic tools.	FY 2021 Q1	FY 2022 Q4	5-7
Developed a framework outlining technology gaps and a roadmap for research requirements.	FY 2021 Q1	FY 2022 Q4	5-7
Developed use cases and scenarios to understand the underlying system architecture and decision processes.	FY 2021 Q1	FY 2022 Q4	5-7
FY 2023			
Develop and apply AI/ML to new and novel investigative tools to automate current manual processes to counter transnational organized crime.	FY 2023 Q1	FY 2023 Q4	4-5
Develop automated tools to aide in ground truthing data sets.	FY 2023 Q1	FY 2023 Q4	4-5
Test forensic algorithms against operational data to determine delta in performance.	FY 2023 Q1	FY 2023 Q4	5-6
FY 2024			
Adjust and enhance software based on ICE HSI feedback, i.e., scalability, UI enhancements & search algorithm and analytics efficiencies.	FY 2024 Q2	FY 2024 Q4	4-6
Develop and apply AI/ML to new and novel investigative tools to automate current manual processes to counter transnational organized crime.	FY 2024 Q1	FY 2024 Q3	4-6
Test forensic algorithms against operational data to determine delta in performance.	FY 2024 Q1	FY 2024 Q4	4-6

Immigration Services Program – This program develops technologies for DHS Components to meet their goals of providing efficient adjudication of applications and petitions for immigration benefits, enhance the integrity of legal immigration IT systems, and provide trusted and timely immigration, employment, and identity information through a culture of efficiency and creativity. The products and capabilities delivered by the Program will enable leadership to make science driven decisions based on statistical information and analysis useful in evaluating social, economic, demographic, and other impacts of immigration laws, migration flows, and immigration enforcement.

Immigration-Based Technologies

- **Problem:** Immigration focused DHS Components (USCIS, DHS Policy and others) require technology improvements to ensure the accurate and timely distribution of immigration benefits; promote the lawful assimilation of immigrants into American society; and detect, deter, and mitigate human trafficking, smuggling, and threats to the immigration system; and address the root causes of migration. Without these capabilities, the increasing demand on the immigration system will require extensive efforts to properly adjudicate and thoroughly review applicants while leaving the system open to emerging threats.
- **Solution:** This project enhances the ability of DHS to efficiently resolve applications and petitions for immigration benefits, take timely action on related ancillary applications and other assigned product lines, provide direct customer service, maintain the accuracy and integrity of immigration information, ensure the integrity of the immigration system, and provide timely assistance to applicants, petitioners, and beneficiaries. The project will also assess data through the collection of information from encounters at U.S. borders related to motivators for unauthorized immigration. The program's goal is to provide technology and knowledge products to DHS that enhance the efficiency and integrity of their immigration services and activities.
- **Justification:** The FY 2024 President's Budget provides \$5.0M for this project, a \$3.5M increase from the FY 2023 enacted. Funding will support DHS strategic goals to secure U.S. borders and approaches through enforcement of immigration laws, policy, and analysis of the administration of the immigration benefits lifecycle to advance the security and prosperity of the Nation by enhancing analysis, available data sources, and tools.
- **Impact:** Automation of current immigration interview and documentation processes will: 1) enhance USCIS's ability to process immigration benefit applications/petitions, 2) enhance their ability to identify fraudulent immigration applications/petitions, 3) reduce applicant backlogs, 4) improve USCIS staffing efficiency, and 5) improve customer throughput and satisfaction. In addition, DHS Policy will have comprehensive datasets and analysis to identify factors related to population-level unauthorized migration and the individual-level immigration lifecycle processes. These newly developed capabilities will create quantitative information on the drivers of migration flow, support data integration, produce estimates of unauthorized populations, and support the analysis of enforcement.

Type of Research

Developmental

Technical Readiness Level

TRL varies for specific project activities between TRL-5 and TRL-7. This project's R&D efforts typically start by performing a market survey of available COTS and GOTS technology that could be adapted for DHS Component use. Identified technology is then adapted and validated in a relevant environment (TRL-5). Following successful validation, the most promising solution(s) are then prototyped and evaluated first in a relevant environment (TRL-6) then in an operational environment (TRL-7) prior to transition. Examples from the R&D milestones detailed below:

- Conducted market research to identify areas of R&D investment to enhance the efficiency and integrity of USCIS's execution of its statutory responsibilities (TRL-5).
- Perform system evaluations and test proposed solutions (TRL-6).

Transition Plans

S&T plans to transition to DHS Components analyses, models, technology prototypes, and knowledge products in order to:

- Enhance the integrity of the immigration system.
- Support efficient adjudication of all applications and petitions for immigration benefits.
- Provide the ability to maintain accuracy and integrity of immigration information; and,
- Ensure timely assistance to applicants, petitioners, and beneficiaries.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Performed an analysis of alternatives of identified potential R&D investments to enhance the efficiency and integrity of the immigration system and select area for R&D.	FY 2020 Q2	FY 2022 Q4	5
	FY 2023		
Define study objectives, document activities, and develop schedule.	FY 2023 Q1	FY 2023 Q1	7
Deliver a technology roadmap that identifies USCIS-S&T R&D multi-year engagement plan.	FY 2023 Q3	FY 2023 Q4	6-7
Develop Operational and System Architectures to identify and document Immigration Benefit processing workflow.	FY 2023 Q1	FY 2023 Q4	6-7
Evaluate technology and non-technology solutions to fill capability gaps.	FY 2023 Q2	FY 2023 Q4	6
	FY 2024		
Recommend activities that will address gaps identified by the R&D roadmap, both as short and long-term development projects.	FY 2024 Q1	FY 2024 Q4	6-7
Initiate high priority activities identified in R&D Roadmap.	FY 2024 Q2	FY 2024 Q4	6-7
Assess socio-economic factors of migration for DHS Policy.	FY 2024 Q1	FY 2024 Q4	5-6
Conduct technology scouting of available immigration dataset for DHS Policy.	FY 2024 Q2	FY 2024 Q4	5-6

Maritime Safety and Security Program – This program develops and transitions technical capabilities that enhance U.S. maritime border security by safeguarding lawful trade and travel, preventing illegal use of the maritime environment to transport illicit goods or people, and enhancing safety and resilience of the maritime transportation system.

DataHub Analytics

- **Problem:** DHS is experiencing an unprecedented surge in illicit transnational criminal activity across the border. DHS Components are unable to fully evaluate the massive data streams to identify suspect activities and direct resources to interdict these criminal activities. The issue is exacerbated with the ever-increasing volumes of commercial and government data from space, maritime, and terrestrial sensors systems. DHS requires automated, real-time analytics that leverage Artificial Intelligence/Machine Learning (AI/ML) to enable the evaluation of all available data to identify illicit activities obscured and undetected within these massive data streams.

Additionally, the convergence of DHS mission requirements, emerging asymmetric threats, evolving technologies, and critically strained resources make it imperative for S&T to advance technologies that produce efficient force-multiplying analytic capabilities for DHS, the Nation's law enforcement, and first responders.

- **Solution:** Leveraging the AI/ML platform developed by S&T, the DataHub Project will develop and deploy mission critical AI/ML analytics within the platform that run in real time on operational data feeds to detect and identify illicit activities and support border operations. These analytics will provide alerts for illicit behaviors or emergency situations and report into existing DHS system(s) of record for use by DHS analysts/operators.
- **Justification:** The FY 2024 President's Budget provides \$3.0M for this project, a \$3.0M increase from the FY 2023 enacted. Funding for this project will develop and deploy mission critical AI/ML analytics running in real time on DHS operational data streams.
- **Impact:** Direct impacts of this effort include: 1) the ability to evaluate all available operational data which currently exceeds human capacity, 2) the identification of behaviors and patterns previously obscured and undetected within these massive data streams, 3) increases the amount of time analysts and operators have to make a decision through earlier identification of behaviors by automated analytics, and 4) increases the detection of suspect activities and success rates for interdictions.

Type of Research

Applied and Developmental

Technical Readiness Level

TRL varies between TRL-4 and TRL-7 depending on the activity. This project's R&D efforts typically start by evaluating existing technologies and their suitability for a given analytic. Identified technology is then prototyped in a development environment (TRL-4/5). Following successful evaluation of a prototype, the analytic is engineered to run on streaming data in a test environment and improved through an iterative process of evaluation and refinement with Component domain experts (TRL-6). When the analytic achieves the desired level of performance, it is promoted into an operational environment (TRL-7). Examples that support the R&D milestones detailed below:

- Data Science assessment of data for spatial/temporal density, accuracy, etc.
- AI/ML technology survey(s).
- Development of analytic prototypes (TRL-4/5).
- Deployment of analytics in test environment (TRL-6).
- Deployment of analytics into production environment (TRL-7).

Transition Plans

Analytics will be deployed into existing Component(s) systems of record to support Component safety and security operations.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
N/A	-	-	-
	FY 2023		
N/A	-	-	-
	FY 2024		
Develop prototype analytics utilizing counter UAS data in support of CBP Air and Marine Operations (AMO).	FY 2023 Q2	FY 2024 Q4	6
Develop prototype maritime analytics utilizing Maritime Approaches Surveillance Tower (MAST) data in support of CBP Caribbean operations.	FY 2024 Q2	FY 2024 Q4	6
Mature and deploy analytics utilizing counter UAS data in support of CBP Air and Marine Operations (AMO).	FY 2023 Q4	FY 2024 Q4	7
Mature and deploy maritime analytics into the CBP Kestrel system leveraging Maritime Approaches Surveillance Tower (MAST) data in support of CBP Caribbean operations.	FY 2023 Q4	FY 2024 Q4	7

Integrated Multi-Domain Enterprise (IMDE)

- **Problem:** The *Joint Mission Need Statement (JMNS) for HSE Information Sharing*, Joint Requirements Council (JRC), sponsored by USCG and CBP, documented the need for an enhanced operational-level capability. This enhanced capability evolves the DHS enterprise from a stove-piped, Component-centric, operational environment into a maritime Information Sharing Environment (ISE) that integrates elements of the Maritime Domain Awareness (MDA) Network enabling increased information sharing and interoperability across DHS and authorized Federal, State, local, tribal, international, public, and private regional partners (FSLTIPP) to provide:
 - Broader access to common and federated data.
 - Synchronized domain and situational awareness for maritime and operational intersection with air and land.
 - Enhanced ability to share unclassified//For Official Use Only (FOUO)//Law Enforcement Sensitive (LES) data at a national/regional/tactical level and ensure the flow of information to the intelligence community to improve analysis and intelligence products; and
 - Improved ability to connect unclassified operational and intelligence systems, data sources and sensors, and applications-based functionality using common standards and repeatable integration patterns.
- **Solution:** S&T developed and demonstrated an enterprise information sharing architecture and reference implementation which led to the establishment of an IMDE HQ program under the Office of Homeland Security Situational Awareness (OSA), formerly the Office of Operations Coordination (OPS) in FY 2021 and realigned under the Office of Chief Information Officer (OCIO) Chief Data Officer (CDO) in FY 2022. S&T will support establishment and enhancements of core information sharing architecture to enable DHS to meet mission critical information sharing, domain awareness, and multi-agency operational coordination needs across the HSE.

IMDE supplies the following:

- The connection method and distribution point for Multi-Agency Information Sharing. It establishes an enterprise architecture to enable portability of data between various stakeholder information systems and allows users the ability to get information in their system of choice.
- Enables aggregation of data from HSE stakeholder sources, as well as supporting dissemination of this information within the owner's policy. In the long term, the creation of these data buckets enables the develop and delivery of analytics, visualization, and other decision aides to the enterprise.
- Shall leverage OCIO enterprise identity management, attribute management, and core information services such as the Geospatial Information Infrastructure (GII), DHS Common Operating Picture, and Homeland Security Information Network (HSIN). Once the core infrastructure is

established, Component and other stakeholder system owners can leverage enterprise user management and information sharing services within their own systems.

- **Justification:** The FY 2024 President’s Budget provides \$4.0M for this project, a \$1.4M increase from the FY 2023 enacted. Funding for this project will support the implementation of an integrated test environment for the IMDE Joint Program Office (JPO), enabling streamlined, repeatable, and high-quality service as well as connector development and implementation, supporting user and data attribute-based information sharing for the HSE; develop test fixtures and test data for services and interfaces as prioritized by the JPO; and implement continuous integration and automated test principles where possible.
- **Impact:** IMDE provides a true domain agnostic information sharing platform available to all within the HSE. With this investment, the HSE will have capabilities that directly: increase the sharing of targeting, intelligence, and scheduling information to improve situational awareness; uncover gaps in planned and ongoing operations and reduce duplication of effort between agencies; ensure the real-time awareness, evaluation of threats, and deployment of resources to the right places through active collection of port activity information; and minimize the economic impact from disruptions to commerce.

Type of Research

Applied and Developmental, Test and Evaluation

Technical Readiness Level

TRL varies between TRL-4 and TRL-7 depending on activity. This project’s R&D efforts typically start by performing a market survey of available COTS and GOTS technology that could be adapted for DHS use. Identified technology is then adapted and validated in a laboratory or relevant environment (TRL-4/5). Following successful validation, the most promising solution(s) are then prototyped and evaluated first in a relevant environment (TRL-6) then in an operational environment (TRL-7) prior to transition. Examples from the R&D milestones detailed below:

- Establish a test environment and conduct integration and test of authoritative data services and enterprise information sharing services. (TRL-5)
- Integrate, adapt, and/or mature candidate enterprise services as required by the IMDE program. (TRL 4-7).
- Support operational research as directed by the IMDE program.
- Transition enterprise services and authoritative data source interfaces to the IMDE program and/or OCIO (TRL-7).

Transition Plans

RDT&E in this program is aligned to the needs of the DHS IMDE program office, under the OCIO CDO and with CBP, USCG, and ICE as the program line of business owners.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Developed a Test and Evaluation Strategy for IMDE Program.	FY 2021 Q3	FY 2022 Q2	-
Transitioned IMDE to DHS Office of Operations Coordination and supported the establishment of a joint program office.	FY 2021 Q2	FY 2022 Q1	7
Updated IMDE accredited system and initiated preparations to formally establish a DHS Program of Record.	FY 2021 Q1	FY 2022 Q1	7
	FY 2023		
Conduct technology scouting for operational enterprise services, as prioritized.	FY 2023 Q2	FY 2023 Q4	4-6
Develop first set of IMDE service test fixtures and test data (service TBD as prioritized).	FY 2023 Q2	FY 2023 Q4	6-7
Develop test plan to support initial operational capability's	FY 2023 Q2	FY 2023 Q4	5-7
Implement Integrated Multi-Domain Enterprise (IMDE) Test Environment.	FY 2023 Q2	FY 2023 Q4	6-7
	FY 2024		
Deliver knowledge product report providing an Analysis of Alternatives (AOA) of operational data service candidate.	FY 2024 Q1	FY 2024 Q4	4-6
Initiate new operational information sharing service R&D activity.	FY 2024 Q1	FY 2024 Q4	4-6

Port and Coastal Surveillance

- **Problem:** USCG, ICE, and CBP require operational capabilities to improve MDA for compliant and non-compliant (dark or non-emitting) vessels; enhance their ability to detect, deter, interdict, and investigate illegal maritime activity; protect and monitor economic, environmental, and natural resources, and coordinate across the HSE.
- **Solution:** S&T is partnering with USCG, CBP, and ICE to identify, develop, and transition technologies that can be leveraged to improve MDA by improving, developing, or integrating sensors, algorithms, and platforms (including autonomous); information sharing technologies; mission support tools/techniques; and decision support capabilities to benefit FSLTIPP.
- **Justification:** The FY 2024 President's Budget provides \$4.5M for this project, a \$3.0M increase from the FY 2023 enacted. Funding for this project will support transition(s) resulting from FYs 2020 - 2022 MDA sensor technology integrations and assessments; identify and assess additional sensor technology candidates to contribute to a system-of-systems approach to MDA; and assess MDA gaps or shortcomings in stakeholder planned and resourced MDA sensor development roadmaps.
- **Impact:** Impacts include: 1) enhanced MDA, 2) increased detection, tracking, and interdiction of illicit activity, 3) increased efficiency/effectiveness/safety of personnel and equipment, 4) enhanced presence in the maritime domain, 5) enhanced information sharing to support DHS maritime safety and security missions, 6) improvements to environmental monitoring and response, and 7) improved ability to protect fisheries and legitimate economic activity.

Type of Research

Developmental

Technical Readiness Level

TRL varies between TRL-4 and TRL-7 depending on activity. This project's R&D efforts typically start by performing a market survey of available COTS and GOTS technology that could be adapted for DHS Component use. Identified technology is then adapted and validated in a relevant environment (TRL-4/5). Following successful validation, the most promising solution(s) are then prototyped and evaluated first in a relevant environment (TRL-6) then in an operational environment (TRL-7) prior to transition. Examples from the R&D milestones detailed below:

- Currently evaluating capabilities to detect vessels (compliant and non-compliant/dark) in a relevant environment (TRL-6).
- Promising maritime surveillance sensors will be tested and evaluated in an operational environment (TRL-7) prior to transition.
- Currently cooperating with USCG in evaluating and modifying Unmanned Systems for critical missions (TRL-6).

Transition Plans

- Deliver to Components dark vessel detection track information from commercial and/or Government owned sensor systems.
- Deliver to Components MDA Sensor systems.

Research, Development, and Innovation – PPA**Border Security Thrust Area**

- Inform CBP and USCG acquisition strategies for deployment of MDA capabilities.
- Inform USCG acquisition and operations strategy for the operation of Unmanned Systems.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Delivered assessments, and technical, test, and demonstration reports on selected technologies to USCG to benefit USCG operations.	FY 2022 Q1	FY 2022 Q4	6-7
Developed Plan of Action and Milestones (POA&M) - A written plan for a study, assessment, laboratory, or field tests of technologies to benefit USCG.	FY 2022 Q1	FY 2022 Q4	5-6
MDA Sensors: Assessed technology to support Maritime Domain Awareness in prioritized areas of interest.	FY 2021 Q1	FY 2022 Q4	5-7
MDA Sensors: Awarded contract for two technology sensor assessments in Southern California or Puget Sound areas.	FY 2021 Q4	FY 2022 Q2	-
Performed operationally relevant testing and assessment of select capabilities identified in the Maritime Domain Awareness analysis of alternatives against dark vessels in relevant areas of responsibilities.	FY 2020 Q1	FY 2022 Q3	6-7
	FY 2023		
Assess one or more MDA sensor technologies in the Puget Sound Region.	FY 2023 Q3	FY 2023 Q4	5-7
Assess one or more sensor technologies in the Southern California region.	FY 2023 Q2	FY 2023 Q4	4-6
Deliver assessments, and technical, test, and demonstration reports on selected technologies to US Coast Guard (USCG) to benefit USCG operations.	FY 2023 Q1	FY 2023 Q4	6-7
Demonstrate one unmanned maritime vehicle sensor system capabilities.	FY 2021 Q1	FY 2023 Q3	6
Develop Plan of Action and Milestones (POA&M) - A written plan for a study, assessment, laboratory, or field tests of technologies to benefit USCG.	FY 2023 Q1	FY 2023 Q4	5-6
Inform acquisition strategy for USCG Unmanned Systems.	FY 2022 Q3	FY 2023 Q4	3-6
MDA Sensors: Make available and/or dispose of MDA sensors, as appropriate.	FY 2023 Q3	FY 2023 Q4	6-7
Transition or dispose of unmanned maritime vessels and payloads.	FY 2023 Q3	FY 2023 Q4	6
	FY 2024		
Initiate wide area maritime surveillance R&D activities.	FY 2024 Q1	FY 2024 Q4	4-7
Initiate enhanced object detection and identification R&D activities.	FY 2024 Q1	FY 2024 Q4	4-7

Port and Waterway Resiliency

- **Problem:** The modern U.S. Maritime Transportation System (MTS) is rapidly evolving, driven by industry demand and technological innovation. However, the USCG relies on limited, legacy computer-based tools to monitor port and waterway health and aids to navigation (which support the safe navigation of government and commercial ships including autonomous vessels) efficiently and effectively. Due to the rapidly changing technological environment impacting the MTS and evolving commercial activity (the MTS role in the economy has grown to include renewably energy, commercial space launches, and autonomous vessel traffic for example). As the MTS evolves with the growing size and number of vessels, new challenges and threats have emerged requiring greater understanding and visibility of river conditions, aids to navigation, and the cyber infrastructure that supports it. To address the changes occurring in the MTS, the USCG must modernize its regulatory framework, update its CONOPS and technical capabilities to strengthen cyber security across the MTS which will mitigate risk and improve and improve the safety and security of commercial vessels, such as cruise liners, shipping and cargo vessels, and private and recreational craft. To help ensure safe travel in U.S. territorial waterways, the USCG is also in need of modern, versatile capabilities to aid in mass and ice rescue operations.
- **Solution:** S&T is developing and transitioning port and waterway resiliency analytical visualization tools, data, and technologies to provide USCG waterway managers with more effective and user-friendly capabilities to prepare for, mitigate, respond to, and recover from an incident or disaster affecting the Marine Transportation System (MTS); to investigate existing and emerging technologies to enable remote monitoring and inspection of waterway infrastructure; and to investigate and develop risk mitigation strategies and technical solutions for USCG to consider in ensuring safety and security of the public, commerce, and trade. Further, S&T will develop, test, and research new devices with the objective of amplifying USCG capabilities in the execution of search and rescue operations over extended periods and in extreme weather conditions.
- **Justification:** The FY 2024 President’s Budget provides \$0.5M for this project, a \$0.5M increase from the FY 2023 enacted. Funding for this project will address the maritime transportation system through enhancements in digital navigation, complex rescue scenarios, autonomous commercial vessel traffic, and law enforcement operations. These efforts will improve safety of vessels and individuals traversing inland waterways, ensuring continued free flow of commerce, and mitigation of risks to port and river operations.
- **Impact:** Impacts include: 1) enhanced safety and economic security of maritime ports and waterways, 2) improved situational awareness and understanding of waterway criticality, 3) enhance decision-making for more efficient/effective resource allocation to keep ports and waterways open, and 4) improved aids to navigation capabilities allowing for safer and more efficient waterway travel on commercial waterways.

Type of Research

Applied and Developmental

Technical Readiness Level

TRL varies between TRL-4 and TRL-7 depending on activity. This project's R&D efforts typically start by performing a market survey of available COTS and GOTS technology that could be adapted for DHS Component use. Identified technology is then adapted and validated in a laboratory or relevant environment (TRL-4/5). Following successful validation, the most promising solution(s) are then prototyped and evaluated first in a relevant environment (TRL-6) then in an operational environment (TRL-7) prior to transition. Examples from the R&D milestones detailed below:

- Developing Waterway Analysis and Management System (WAMS) software modules with sample datasets to demonstrate prototype capabilities to the customer (TRL-4).
- Delivering and integrating WAMS modules into a relevant software test environment (TRL-5).
- Successful modules will be tested and evaluated in the system of record relevant test environment (TRL-6).
- Modules will be deployed as beta versions in the system of record to assess in an operational environment (TRL-7).

Transition Plans

- Complete development of WAMS and integrate it into the USCG's system of record, United States Automated Information Management System (USAIMS) (TRL-7).
- Deliver search and rescue prototypes to USCG (TRL 5-6).
- Deliver port cyber security resiliency study to USCG and the public.
- Inform USCG port cyber security regulatory framework to assist in modernizing its regulatory authority.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
FY 2022			
Transitioned and integrated software and data upgrades into an existing program of record under the sponsorship of USCG Marine Transportation System.	FY 2022 Q1	FY 2022 Q4	4-7
FY 2023			
Design research plan to test commercial port cyber resiliency and USCG related regulatory authorities.	FY 2023 Q1	FY 2023 Q4	-
Design transition plan for new technology to enhance situational awareness of inland waterway aids to navigation and support USCG Marine Transportation Systems Directorate (CG-5PW) mission including support to safe navigation of autonomous vessels.	FY 2023 Q2	FY 2023 Q4	5-7
FY 2024			
Design, fabricate, and test search and rescue prototypes to address USCG gaps.	FY 2022 Q4	FY 2024 Q4	4-6
Transition waterway management software and data upgrades to USCG and integrate into USAIMS.	FY 2024 Q1	FY 2024 Q4	4-6

Remote Maritime Technologies

- **Problem:** DHS lacks technologies in the Arctic and other remote maritime regions to enable effective and timely execution of its law enforcement, regulatory, security and safety missions. The Arctic and other remote maritime regions pose unique challenges due to being difficult to access, their extreme environments, the need for communications and other infrastructure which limits maritime domain awareness and hampers communications to/from these areas. Both USCG and CBP require the ability to effectively detect, respond, and maintain command and control, for illicit maritime activities, hazards, or emergencies in the Arctic and other remote maritime regions.
- **Solution:** S&T is performing R&D on solutions to use in the Arctic and other remote maritime regions which improves detection and response to illicit maritime activities or emergency situations. Research includes technologies such as space systems to enhance Intelligence, Surveillance and Reconnaissance (ISR) and communications technologies to aid in effective prevention and response to hazards and prevent loss of life.
- **Justification:** The FY 2024 President's Budget provides \$12.3M for this project, a \$2.7M increase from the FY 2023 enacted. Funding for this project will develop solution approaches for distress alerting in remote maritime regions; develop capability and technology roadmaps; conduct in-depth requirements analysis to inform project plans; and assess prototype communications capabilities to address underway cutter connectivity needs.
- **Impact:** Impacts include: 1) real time detection, increased reliability, and geographic coverage for detecting distress alerts in the Alaska, the Arctic, and other remote maritime regions; and 2) improved ability to communicate and perform command and control for successful response to illicit maritime activities, hazards, or emergencies in remote environments.

Type of Research

Applied and Developmental

Technical Readiness Level

TRL varies between TRL-4 and TRL-7 depending on activity. This project's R&D efforts typically start by performing a market survey of available COTS and GOTS technology that could be adapted for DHS Component use. Identified technology is then adapted and validated in a laboratory or relevant environment (TRL-4/5). Following successful validation, the most promising solution(s) are then prototyped and evaluated first in a relevant environment (TRL-6) then in an operational environment (TRL-7) prior to transition. Examples that support the R&D milestones detailed below:

- Assess technologies against realistic use cases to address maritime safety concerns (TRL-5-7).
- Research and evaluate communications technologies to enhance underway cutter connectivity (TRL-4/5/6).
- Perform feasibility assessment of selected space system to prosecute maritime distress alerts.

Transition Plans

- Inform DHS acquisition and implementation of new Shipboard Interior Communications (SIC) systems.

Research, Development, and Innovation – PPA**Border Security Thrust Area**

- Inform DHS acquisition strategies for the deployment of remote maritime/Arctic MDA capabilities to support safety and/or security operations.
- Deliver distress alerting capabilities to USCG via service contract. (TRL-7)

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Assessed technologies for maritime search and rescue.	FY 2022 Q1	FY 2022 Q4	4-7
Delivered near real time analytic results from Datahub into DHS production environment.	FY 2022 Q1	FY 2022 Q1	7
Delivered to CBP and USCG recommendations to use COTS/GOTS capabilities in support of MDA.	FY 2022 Q1	FY 2022 Q4	4-7
Informed DHS acquisition strategies for the deployment of remote maritime/Arctic MDA capabilities to support safety and/or security operations.	FY 2022 Q1	FY 2022 Q4	4-7
Transitioned new data sources or analytic capabilities into existing Component(s) systems to support safety and security operations.	FY 2022 Q1	FY 2022 Q4	4-7
	FY 2023		
Develop R&D Requirements for Shipboard Interior Communications (SIC).	FY 2022 Q1	FY 2023 Q2	-
Identify appropriate space-based platform and payload opportunities capable of performing RF geolocation of distress signals supporting USCG District 17 operations.	FY 2022 Q4	FY 2023 Q4	-
	FY 2024		
Complete payload accommodation study for distress alerting capability (RASP: Rescue 21 Augmentation from Space).	FY 2024 Q1	FY 2024 Q2	4
Deliver sustainment cost estimate to USCG for RASP capabilities (RASP: Rescue 21 Augmentation from Space).	FY 2024 Q1	FY 2024 Q2	4
Develop baseline architecture to be validated through iterative T&E for USCG Shipboard Interior Communications (SIC).	FY 2024 Q1	FY 2024 Q4	2-4
Perform preliminary assessment of public communications infrastructure to inform development and evaluation of prototype capabilities.	FY 2024 Q2	FY 2024 Q4	5

Chemical, Biological, and Explosive (CBE) Defense Thrust Area

Research and Development

Technology Readiness Level Exhibit

(Dollars in Thousands)

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget
Chemical, Biological, and Explosive Defense Thrust Area	\$32,592	\$21,510	\$27,400

R&D Thrust Area Description

CBE DEFENSE THRUST AREA: R&D investments support prevention and protective strategies, as well as the coordinated surveillance and detection of CBE threats. S&T's R&D includes prevention of terrorism, reduction of vulnerability of critical infrastructure from terrorist attacks and other hazards, and prevention of the illicit movement and illegal entry or exit of people, weapons, dangerous goods, and contraband by providing technology, methods, and procedures to detect CBE threats.

CHEMICAL, BIOLOGICAL, AND EXPLOSIVE DEFENSE THRUST AREA				
<i>(Dollars in Thousands)</i>				
Program	Project	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget
Total – CBE Defense Thrust		\$32,952	\$21,510	\$27,400
Chem-Bio Detection and Defense		\$16,932	\$9,210	\$19,600
	Chem-Bio Threat Surveillance & Detection (formerly Bio surveillance Systems)	\$10,479	\$4,250	\$2,850
	Food, Agriculture and Veterinary Defense (FAV-D)	\$2,800	\$2,800	\$13,000
	Urban Security Initiative	\$3,653	\$2,160	\$3,750
Detection Canine		\$9,360	\$8,300	\$6,300
	Detection Canine Project	\$9,360	\$8,300	\$6,300
Opioid/Fentanyl Detection		\$6,300	\$4,000	\$1,500
	Opioid/Fentanyl Detection Project	\$6,300	\$4,000	\$1,500

Chem-Bio Detection and Defense Program – This program conducts research to assess, prevent, detect, prepare for, respond to, and recover from incidents involving chemical and biological (CB) threats and hazards. This program supports DHS, its Components, and the HSE with risk-awareness, knowledge products, and technical solutions needed to protect the Nation from incidents involving CB hazards by executing and enhancing a portfolio of capabilities and supporting activities to counter CB threats.

Chem-Bio Threat Surveillance and Detection

- **Problem:** Rapid response to CB events of national concern (e.g., a biological/chemical attack or disease outbreak) is critical to saving American lives, protecting critical infrastructure, and safeguarding the U.S. economy. In a CB event, there is a system of systems of required capabilities needed for prompt detection, defense, coordination, and rapid response actions that must occur amongst Federal, State, local governments, and the private sector. The timely detection of, defense against, and confident response to the release and/or exposure from CB events is a critical challenge to multiple DHS Components (CWMD and USSS) and other Federal, State, local, tribal, and territorial (FSLTT) customers, including the public health and first responder communities.
- **Solution:** S&T will develop cost-effective systems to rapidly detect, defend against, coordinate, and respond to CB events. This will tie first responders' needs to a broader system of systems, that work together and complement each other in a CB incident and will vastly increase operational effectiveness of CB technologies coupled with significant cost savings. Focusing on the implementation, coordination, and development of interoperable systems instead of independent solutions will enable decision makers to receive information more quickly, make actionable decisions in a timely manner, and improve coordinated actions. This program is pursuing a cost-effective approach to an indoor biothreat system of systems using existing COTS or GOTS solutions. Objectives of this system of systems include a) addressing timeliness to detect the release of a biological agent by developing novel sensor/trigger technologies, b) identifying data and data streams to provide early warning situational awareness, c) integrating analytical tools and applying advanced computational techniques to integrate and analyze real-time data, and d) enabling more real-time sharing of information across Federal agencies and SLTT officials.

Funding is paired with ongoing CWMD investments, including detection capabilities such as the Biological Detection for the 21st Century (BD21) program that can support rapid response to emerging biothreats, investments in the S&T Probabilistic Analysis of National Threats, Hazards and Risks (PANTHR) program for expanding and prioritizing the list of existing biothreats to augment existing capabilities, and additional investments by CWMD in information sharing and analytics that provide value to the broader stakeholder community. Efforts are aligned and synchronized to the greatest extent possible to ensure individual efforts result in enduring chemical & biological defensive capabilities across the HSE.

- **Justification:** The FY 2024 President's Budget provides \$2.9M for this project, a \$1.4M decrease from the FY 2023 enacted. Funding for this project will support:

- Evaluate COTS and GOTS for chemical, biological, and radiological (CBR) collective protection (COLPRO), and identify technologies that currently, or with refinement, can meet specific mission needs for temporary and permanent indoor spaces, as well as National Special Security Event (NSSE) sites.
- Continue testing and evaluating solutions for the indoor biothreat system, as well as continuing the development and delivery of supporting studies, and assessments based on real world threats and mission specific operational environments.
- Develop a single-particle mass spectrometer to make it smaller, able to detect a broader range of biothreats of interest such as viruses, and more affordable for planned use cases in customer venues of interest.
- **Impact:** Improved capabilities in indoor/outdoor biothreat technologies and systems, maximize fulfillment of end-users' needs (e.g., first responders, law enforcement, emergency management planners) by translating needs into functional capabilities, building critical capabilities into flexible integrated systems, reductions in redundancies of CB efforts across DHS by tracing end-user requirements through strategic level objectives, and improved effectiveness of DHS CB capabilities at a cost savings. Ultimately, this activity is anticipated to develop capabilities that will reduce the amount of time needed to detect a biological incident, limit the spread of contamination and exposure of the population, and enable more rapid responses that will reduce casualties, morbidity, and mortality resulting from a hazardous biological substance.

Type of Research

Applied and Developmental

Technical Readiness Level

The program began at TRL-3 and will end at TRL-7. Two types of projects are performed under this program: (1) development of knowledge products; and (2) technology development to improve chemical and biological threat preparedness and defense. For knowledge projects, first steps typically involve workshops or interviews with SMEs and applicable end users. Technology R&D projects typically start by performing a market survey of available COTS and GOTS technology that could be adapted for DHS Component use. Identified technology is then adapted and validated in a relevant environment (TRL-5). Following successful validation, the most promising solution(s) are prototyped and evaluated in a relevant environment (TRL-6), then in an operational environment (TRL-7) prior to transition. Examples:

- Develop and test a single-particle, time-of-flight mass spectrometer (TRL-5) as a presumptive identifier to detect bioaerosol threats; this instrument will be further developed to achieve a maturity of (TRL-7) so that it can be transitioned.

Transition Plans

With technology development, preference will be given to technologies that have commercial markets beyond Component needs to ensure the availability of an infrastructure to maintain and improve technologies as needed. To ensure successful development, integration, and ultimate transition of the deliverables under this program, individual system components and integrated system will work in coordination with all DHS Components including CWMD, to ensure synchronization & interoperability of efforts while creating an overall cost-savings to DHS.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Delivered indoor aerosolized biological particle detection design, including sensors and field-based detection technologies, to test bed for test and evaluation in an operationally relevant environment.	FY 2021 Q3	FY 2022 Q2	6
	FY 2023		
Complete requirements gathering in support of a test bed design that will assess vulnerabilities and mitigate chemical/biological risks in building air and water handling systems, and wastewater systems.	FY 2023 Q2	FY 2023 Q4	-
Complete technical assessment that evaluates and recommends CBR collective protection technologies for mobile spaces.	FY 2023 Q1	FY 2023 Q2	6
Deliver indoor aerosolized biological particle detection instrument with expanded operational capabilities to test bed for test and evaluation in an operationally relevant environment.	FY 2022 Q2	FY 2023 Q2	4-5
Deliver Transition Technology Readiness Assessment Report prepared by OSE/SES for the digital MALDI prototype as a Knowledge Product to Component stakeholders (e.g., CWMD).	FY 2023 Q1	FY 2023 Q1	-
	FY 2024		
Conduct a capability assessment and produce a plan for experimental design and development.	FY 2024 Q1	FY 2024 Q4	-
Deliver to an operational testbed a second-generation indoor aerosolized biological particle detection instrument with improved and validated operational capabilities to test bed for test and evaluation in an operationally relevant environment.	FY 2024 Q1	FY 2024 Q4	6-7
Develop and collect requirements in support of a national biological testing capability.	FY 2024 Q1	FY 2024 Q4	-

Food, Agriculture and Veterinary Defense (FAV-D)

- **Problem:** The United States' food and agriculture section is at significant risk for disruption due to various chemical and biological threats. An outbreak of high-consequence disease, whether caused by current, new, or emerging pathogens and pests could cost the U.S. economy thousands of jobs and billions of dollars - due to loss of ability to export products, decreased availability of food, and the high costs of responding to an outbreak. Some major concerns for disrupting the food and agriculture sector include infectious diseases affecting livestock, such as Foot-and-Mouth Disease (FMD) and African Swine Fever (ASF), pathogens or pests impacting crops/plants, and intentional adulteration of food.
- **Solution:** This project supports Office of Health Security (OHS) programs and missions to prevent, protect, mitigate, respond to, and recover from catastrophic events affecting the food and agriculture industry and the health and economic security of the United States. The S&T FAV-D Project leverages S&T in house capabilities such as the Plum Island Animal Disease Center (PIADC), the Chemical Security Analysis Center (CSAC), and Probabilistic Analysis for National Threats Hazards and Risks (PANTHR), as well as external partners to provide data and tools for DHS Components and stakeholders to inform decision making, and develop technologies to prevent, detect, and respond to chemical or biological disruptions to the food and agriculture sector. The technologies developed through the FAV-D project benefit DHS Components, interagency and industry stakeholders, and ensure that the Sector Responsible Agencies (United States Department of Agriculture (USDA) and Department of Health and Human Services (HHS) Food and Drug Administration (FDA)) State, local and tribal and other first responders in the food and agriculture sector, have the countermeasures needed to effectively identify, respond to, and recover from disruptions. In addition to investing in novel technologies for solution products to rapidly respond to and recover from these threats, this project works with commercial animal health industry partners to ensure completion of U.S. regulatory requirements for countermeasures (master-seed, pre-licensing serials, clinical trials) so that they are readily available in an outbreak situation. This project's funding is in addition to that requested by the DHS Chief Medical Officer in the OHS R&D appropriation.
- **Justification:** The FY 2024 President's Budget provides \$13.0M for this project, a \$10.2M increase from the FY 2023 enacted. Funding will address threats to the food and agriculture sector or DHS veterinary workforce, such as and is in the context of the current unprecedented outbreak of Highly Pathogenic Avian Influenza (HPAI), in commercial poultry and wildlife, where 58 million birds have been depopulated in the US, as well as an outbreak of ASF close to CONUS.
 - Accelerate the development of next-generation vaccines and other countermeasures to effectively identify, respond to, and recover from sector disruptions.
 - Continue transition that is currently underway for state-of-the-art countermeasures for the highest-priority transboundary animal diseases such as ASF, FMD, and Rift Valley Fever (RVF).
 - This will also include new reports to the National Pork Board (NPB) and Swine Health Information Center (SHIC) on the stability of ASF virus in different matrices.
 - Ensure the smooth transition of final PIADC R&D efforts that are expected to close out during FY 2024. After the transition effort, the FAV-D program will ensure the continuity of FAV-D-related efforts with other DHS Components.
 - Focus areas will specifically include foreign animal disease threats to livestock, and pathogens or pests that can impact food and feed crops.

- Development of new technologies will occur through collaboration with industry partners in conjunction with DHS, USDA, and other government and industry scientists.
 - Conduct a technical assessment of current plant pathogen detection capabilities.
 - Continue partnerships with the PIADC and DHS University COEs to develop and test vaccines to be transitioned for regulatory licensure and acquisition by the National Animal Vaccine and Veterinary Countermeasures Bank (NAVVCB) and National Animal Health Laboratory Network (NAHLN).
 - Identify depopulation, decontamination, and disposal methods that can be readily transitioned to farms and industries as part of countermeasure development.
 - Initiate research and development technical assessments on crop protection.
 - Identify solutions for diseases, such as Chagas disease, impacting working canines.
- **Impact:** This project strengthens the defense of the U.S. food and agriculture infrastructure, in support of the OHS's mission to prevent, protect, mitigate, respond to, and recover from catastrophic events affecting the Food and Agriculture industry, by ensuring that USDA, FDA, and SLTT first responders have effective countermeasures to respond to disruptions. The S&T FAV-D project's ongoing efforts to close knowledge gaps and develop multi-pathogen detection countermeasures will provide faster and more comprehensive protection to limit the spread and size of an outbreak. Data from this project will support DHS Components, interagency partners, and industry stakeholders. Technologies developed through this project will increase the availability of new countermeasures to the NAVVCB in the event of a high-consequence disease outbreak in the United States. Ultimately, this project will generate resources to defend the U.S. economy, and nation, from intentional or unintentional threats to the food, agriculture, and veterinary sector.

Type of Research

Applied and Developmental

Technical Readiness Level

This project funds the development of tools, techniques, and technologies applicable across defense of the food, agriculture and veterinary system including knowledge products, vaccines, laboratory and field deployable diagnostic assays, molecular detection tools, and disinfection and disposal solutions for disease/pest countermeasures, the vast majority of which start at TRL-3 and end at TRL-7.

Transition Plans

- Transition Foreign Animal Disease Countermeasures to the NAVVCB.
- Approved regulatory development package toward approval of a rapid, pen-side, nucleic acid-based diagnostic to prevent, protect, mitigate, respond, and recover from catastrophic events affecting the Food and Agriculture industry test for ASF virus.
- Approved regulatory development package toward approval of an ASF emergency use vaccine.
- Transition tools and techniques assessment results to Components for further action.
- Transition methodologies, countermeasures, and other knowledge products to other DHS Components as for application.
- Transition knowledge products to Components (CBP) for further planning and preparedness.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Approved regulatory development package toward approval of a prototype next generation messenger RNA-based subunit vaccine for livestock.	FY 2022 Q1	FY 2022 Q4	3-7
Completed Rapid Evaluation of Pathogens to prevent Epidemics in Livestock (REPEL) tool to predict incidences and spreads of wide range of high-priority animal diseases.	FY 2022 Q1	FY 2022 Q3	4
	FY 2023		
Complete validation studies of a rapid, pen-side nucleic acid-based ASF diagnostic test in direct support of USDA.	FY 2021 Q4	FY 2023 Q2	7
Submit interim reports to the National Pork Board (NPB) and Swine Health Information Center (SHIC) on the stability of ASF virus in (i) fecal slurry including time and temperature decay curves (NPB) and (ii) stored soybean oil cake and organic soybean meal.	FY 2023 Q1	FY 2023 Q3	5-6
	FY 2024		
Conduct landscape assessment of crops of U.S. economic significance associated pathogens, diseases and pests, environmental impact, and defense strategies.	FY 2024 Q1	FY 2024 Q4	3
Conduct landscape identification and assessment of diagnostic tools and techniques applicable to crops and animals in food and agriculture system.	FY 2024 Q1	FY 2024 Q4	3
Conduct R&D to assess strategies for Chagas diagnosis and countermeasures.	FY 2024 Q1	FY 2024 Q4	3

Urban Security Initiative

- **Problem:** The Urban Security Initiative (USI) supports CWMD, TSA's Intermodal testbed program, and multiple stakeholders across the HSE, including the New York Metropolitan Transportation Authority, New York Police Department, Port Authority of New York and New Jersey, New York City (NYC) Department of Health and Mental Hygiene, as well as urban centers with mass transit subway systems. Subway systems that serve large metropolitan areas are attractive targets for potential acts of bioterrorism, particularly with aerosolized biological threat agents. Real-time detection and identification of biological agents is currently not possible, and the underground environment of urban subway systems poses unique challenges for existing technologies. S&T's field test in the NYC subway simulated a biological agent release and confirmed dispersion model predictions that contamination from an aerosolized biological agent would be rapid, widespread, and lead to a major public health crisis, with indications contamination would not be confined to the underground. Utilization of computer and software tools support response and recovery actions based on plume tracking, optimized sensor placements in densely populated urban centers, and confirmatory identification of biohazards. Comparing field test data with data from various transport and dispersion models for urban environments helps to inform emergency management planners with preparedness for wide-area biological agent events and ensure confidence in model outputs. This all is critically important as access to scientific information and technology becomes more accessible in open sources and is readily exploited by an adversary.

Solution: S&T will partner with the Metropolitan Transportation Authority New York City Transit (MTA NYCT) to establish an enduring testbed, in the NYC subway system, to enable the evaluation of emerging chemical and bio-detection technologies, detection architectures, and mitigation strategies to limit agent transport and public exposure to an aerosolized threat. S&T will leverage a previous 2016 field test simulating a biological agent release in the NYC subway that indicated contamination of the above ground environment will also occur, complicating response and recovery actions and magnifying damage to the regional and the national economy. The outcomes of the FY 2022 field test provide a realistic test of sensors in the subway testbed, and more broadly inform emergency preparedness, response planning and optimized sensor positioning. The analysis of the FY 2022 experimental measurements validates and ultimately, transition to CWMD, integrated airflow and dispersion models and enable evaluation of their utility to estimate locations where the simulated attack had originated. The testbed and dispersion activities in NYC will be leveraged by the CWMD BD21 program through shared approved National Environmental Policy Act (NEPA) Environmental Assessments (EA), the testbed simulant for BD21 test events, and the test plans. Additionally, NYC BioWatch used the results from the dispersion tests to reposition units. In FY 2024, S&T will transition the testbed to NYC stakeholders and outcomes from the testbed operations have transferability to other urban centers with complex mass transit systems. Information sharing with other major urban transit systems is anticipated through briefings of the field tests findings and recommendations.

- **Justification:** The FY 2024 President's Budget provides \$3.8M for this project, a \$1.6M increase from the FY 2023 enacted. Funding for projects in the USI project will design, construct, install, and test other mitigation systems in an operational subway tunnel to minimize the movement of a bioaerosol through the transit system and decrease the scale of contamination. The Concept of Operations for this program is built on a system-of-systems approach, in an operational setting, that is fully representative of a functional bio surveillance system. The system-of-systems approach includes networked sensors and evidence-based mitigation measures to shrink the potential geographic footprint of

contamination and reduce the zone of the public health crisis. At the completion of the test period, a comprehensive technical report and data package on findings and recommendations to inform emergency preparedness will be delivered to stakeholders and other mass transit systems across the Nation.

- **Impact:** A test bed in the operational mass transit environment will enable assessment of the readiness of commercial and emerging chemical and bio detection technologies to reliably and continuously operate in the most challenging and critical infrastructure systems of a large metropolitan region, including effectiveness of mitigation strategies and countermeasures, with the goal to minimize the impact and consequences of a bioterrorism event in the subway. The test bed will enable subway system authorities to make informed decisions on technology acquisition and deployment to enhance public safety and rapid situational awareness. The outcomes will be transferrable to other subway systems.

Type of Research

Developmental

Technical Readiness Level

The USI builds upon previous R&D efforts and will focus on performing simulated bioagent releases in a complex urban environment, validate integrated urban dispersion models against environmental sampling data from the release; and evaluate handheld and stationary sensor technologies, networked sensor architectures; and the design and testing of plume mitigation measures in underground transit hubs in order to enable faster detection, response to and situational awareness of a CB event. Technology evaluations began at TRL-4 and will end at TRL-7.

Transition Plans

S&T will transition CB data and technical reports to users across the HSE, including CWMD, TSA, local and State, response organizations, and to appropriate commercial customers via the Hazard Knowledge Center (HKC). Integrated airflow and dispersion models will transition to CSAC. CB sensor architectures for mass transit applications will transition to local and State authorities that serve major urban centers (e.g., Chicago, Atlanta, Boston, Los Angeles, San Francisco Bay area, Washington, D.C.)

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Completed validation of integrated urban airflow and dispersion models.	FY 2022 Q2	FY 2022 Q4	7
Executed large-scale simulated bioagent release in New York City.	FY 2022 Q1	FY 2022 Q2	7
Installed, operated, and evaluated at least four chemical or biological sensors in NYC subway testbed.	FY 2021 Q1	FY 2022 Q2	7
	FY 2023		

Research, Development, and Innovation – PPA**Chemical, Biological, and Explosive (CBE) Defense Thrust Area**

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
Deliver technical report and complete data package on NYC simulated bio-aerosol attack to NYC stakeholders.	FY 2022 Q2	FY 2023 Q4	7
Deliver technical report and complete data package on NYC simulated viral phenomenology experiment to NYC stakeholders and other major urban centers having mass transit systems.	FY 2023 Q2	FY 2023 Q4	7
Expand CBR testbed in NYC subway to a fourth station.	FY 2023 Q1	FY 2023 Q4	7
Present results from the UTD final report to additional cities for examination of their respective urban transit systems and centers.	FY 2023 Q3	FY 2023 Q4	7
Transition a field-tested technology for mitigation of biological agent aerosols spread in the NYC and other underground subway systems to other major urban centers having mass transit systems.	FY 2023 Q1	FY 2023 Q4	7
Transition biological City Planner Resource (bioCPR) tool to FEMA.	FY 2023 Q2	FY 2023 Q4	7
Transition the integrated underground, outdoor and indoor airflow, and dispersion models to S&T CSAC. This includes the rapid plume viewer, source inversion and reach back tool to support estimate locations of a biological agent release, and modeling architecture to evaluate and optimize sensor placements in a bio surveillance architecture and integrated model.	FY 2023 Q1	FY 2023 Q4	7
	FY 2024		
Conduct a series of briefings with mass transit system stakeholders across the Nation, providing findings and recommendations from the 2021 Urban Threat Dispersion (UTD) test.	FY 2024 Q1	FY 2024 Q2	-
Deliver completed FOUO bioCPR tool and documents, to include a technical and user manual, to FEMA Chemical Biological Radiological and Nuclear (CBRN) Support Branch. The bioCPR tool will be used by FEMA Regional Planners to obtain quantitative effects information for a broad range of communities across the United States, to support response and preparedness planning.	FY 2024 Q1	FY 2024 Q3	7
Transition bio-CPR tool to host site on FEMA cloud platform.	FY 2024 Q2	FY 2024 Q3	7
Transition CBT testbed in NYC to Metropolitan Transportation Authority New York City Transit (MTA NYCT) to improve subway chemical and biodefense for both detection of and mitigative response for terrorist acts involving such materials.	FY 2024 Q2	FY 2024 Q4	7

Detection Canine Program – This program conducts research to provide the tools, techniques, and knowledge to inform and improve operational proficiency of the domestic detection canine. The Program’s scope spans the entirety of the HSE, including DHS Components, State, local, tribal, and territorial agencies that utilize detection canines across all threats.

Detection Canine Project

- **Problem:** Nationwide, DHS and the HSE have over 16,000 detection canine teams that lack the benefit of having a specific Federal program focused on providing critical tools, techniques, and knowledge to improve operational proficiency as well as better understand, train, and utilize these detection canine teams. Detection canines are called to respond to new and emerging threats, be it intelligence driven explosive materials or a global human pandemic, like COVID-19. The decentralized employment of this resource requires a Federal core capability to inform the community and decision makers on canine capabilities and concepts of operations for this biological detector. Over the last 20 years, the demand for elite detection canines has increased while domestic supply has not kept pace. This has resulted in an increased reliance on foreign sourcing of detection canines and subsequent reduction in the quality of the canines being offered for sale. This program provides a critical Federal focal point of knowledge and expertise to identify/address performance gaps in basic canine operations and emerging threat detection, effective/efficient canine training and supply, to improve DHS (TSA, CBP, USSS, FPS & USCG) and HSE (State, local, territorial and tribal) canine teams’ ability to better protect the Homeland.
- **Solution:** The Detection Canine program serves as a trusted Federal focal point for expertise and knowledge sharing, to address customer requirements by understanding emerging threat detection performance; analyzing how threat concealment effects detection; and providing scientifically rigorous/statistically significant R&D and test & evaluation (T&E). The COVID-19 pandemic forged new partnerships with CWMD to identify key markers that could lead to the use of canines (and other detectors, like Nano sensors) to identify asymptomatic individuals infected with COVID-19. Discovery made through this R&D investment will work to inform processes that will significantly shorten the timeline to solutions for future outbreaks. The program has partnered with DHS partners and industry stakeholders to bring focus to the domestic detection canine supply challenge through FY 2023. The program established a breeding roadmap, which was endorsed by DHS Components and validated by a Breeding Working Group to integrate the best scientific practices in genetics, genomics, breeding, olfaction, behavior, training, physiology, and metrology to improve the mobile canine sensing platform. In FY 2021, the program’s Breeding Consortium produced two litters of canines; with over 80 percent selected for advanced explosive detection training (over double the industry standard). In FY 2023, the output of this breeding consortium will be up to 100 candidate canines. The program has established core capabilities including odor chemistry expertise, breakthrough laboratory analysis capabilities, specialized T&E experts, and canine operations and training expertise to improve operational proficiency of DHS Component and State, local, tribal, territorial canine teams throughout the HSE.

- **Justification:** The FY 2024 President’s Budget provides \$6.3M for this project, a \$2.0M decrease from the FY 2023 enacted. Funding for this project will execute ongoing research efforts into development of training tools that will ensure effective and efficient training of detection canine teams. These tools include, but are not limited to, nonhazardous explosive training aids and training aids reflecting concealed devices. Ongoing research also includes conducting odor generalization studies to reduce training burdens, performing field assessments to validate operational strengths and limits of the mobile canine sensing platform, and continue a pilot breeding consortium effort to improve the supply of domestic working dogs. In addition, funds will expand efforts to continue scientifically validated canine mobile sensing technology for explosives detection, to be developed in collaboration with academia, which integrates best scientific practices in genetics, breeding, olfaction, behavior, training, physiology, and metrology. This includes independent testing and analysis of TSA and LEO teams both inside and outside of the checkpoint.
- **Impact:** The Nation relies on the performance of detection canine teams every day, and this program allows them to do their job more efficiently and effectively thereby improving mission performance. A dedicated R&D office supports the expansion of domestic detection canine supply, but also the improved efficiency of production, which substantially reduces dependence on foreign sources over time. The program establishes a domestic RDT&E focal point for detection canines which otherwise would not exist. This provides DHS and the HSE with a resource to fill critical gaps in canine training and mission performance, improve detection canine proficiency to more efficiently/effectively train and perform in operational environments, respond to emerging threats including infectious diseases, and address the growing threat and operational concerns of securing soft target venues and large public crowd events.

Type of Research

Applied and Developmental

Technical Readiness Level

The program began at TRL-4 and will end at TRL-7. This program’s R&D efforts span applied research to technology demonstration. The application of analytical chemistry research to develop novel non-hazardous explosive training aids begin with material development (TRL-4) through developmental test and evaluation (TRL-7) leading to technology transition and commercialization is one specific example. Understanding the need to tie phenotypical traits with genetic markers that improve detection canine breeding, early learning, and selection (TRL-4) are the building blocks of research that will form the base of an expansion of the domestic supply of high-quality detection canines. The program maintains enduring capabilities to respond to emerging threats and assess proficiency of the operationally fielded detection canine teams against these challenges (TRL 6-7).

Transition Plans

- **Training Aids and Tools:**
 - Complete transfer of non-hazardous, conventional, base odor canine training aids through rigorous quality assurance testing.
 - Complete transfer of electronic test tool to TSA, FPS and USSS.

- Operational Test and Evaluation (OT&E):
 - Inform TSA Passenger Screening Canine (PSC) Concept of Operations (CONOPS) with odor generalization studies.
 - Deliver PSC test results and recommendations for more efficient and effective operational testing practices in conjunction with the checkpoint system, including best practices in deployment configurations and basic training effectiveness and efficiency for the TSA PSC program.
 - Conduct Regional Explosives Detection Dog Initiative events to inform the HSE with validation of capabilities and areas for further focus for both R&D and operational training.
- Detection Canine Domestic Breeding Consortium Project:
 - Deliver analysis of phenotype and genotype study in support of Domestic Breeding Consortium Project.
 - Expand domestic detection canine supply infrastructure for the HSE.
 - Transition framework for increasing expanded domestic supply of detection canines.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Completed transfer of electronic test tool to TSA, FPS and USSS.	FY 2022 Q1	FY 2022 Q4	4-7
Conducted Regional Explosives Detection Dog Initiative events to inform the HSE with validation of capabilities and areas for further focus for both R&D and operational training.	FY 2022 Q1	FY 2022 Q4	4-7
Delivered study on anti-static training aid containers for USSS.	FY 2022 Q1	FY 2022 Q4	4-7
Delivered study that validates training aid signatures, evaluates surrogate training aids to address current/emerging threats, and uses explosives generalization research to reduce operational costs.	FY 2020 Q1	FY 2022 Q4	5
Informed TSA PSC CONOPS with odor generalization studies.	FY 2022 Q1	FY 2022 Q4	4-7
	FY 2023		
Complete study establishing best cognitive/behavioral predictors and traits for selection of successful detection canines.	FY 2020 Q1	FY 2023 Q4	4
Complete study that validates training aid signatures, evaluates surrogate training aids to address current/emerging threats, and uses explosives generalization research to reduce operational costs.	FY 2020 Q1	FY 2023 Q4	5
Conduct independent testing and analysis of a minimum 20 TSA-led Passenger Screening (PSC) teams inside the checkpoint.	FY 2023 Q1	FY 2023 Q4	6
Conduct independent testing and analysis of a minimum 50 TSA/NEDCTP LEO-led EDC (Aviation and Surface) teams.	FY 2023 Q1	FY 2023 Q4	6

Research, Development, and Innovation – PPA**Chemical, Biological, and Explosive (CBE) Defense Thrust Area**

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
Deliver Identification & Generalization in odor training within & across odor classes.	FY 2022 Q3	FY 2023 Q4	5
Expand the development and deployment of targeted automated tools to conduct randomized test events for detection canine performance during training and operational scenarios.	FY 2021 Q4	FY 2023 Q3	7
	FY 2024		
Conduct independent testing and analysis of a minimum 24 TSA-led Passenger Screening (PSC) teams both inside and outside the checkpoint.	FY 2024 Q1	FY 2024 Q4	6
Conduct independent testing and analysis of a minimum 64 LEO-led EDC (Aviation and Surface) teams.	FY 2024 Q1	FY 2024 Q4	6
Deliver knowledge product report on identification and generalization in odor training within & across odor classes to Federal, State, Local, Territorial, and Tribal law enforcement agencies.	FY 2022 Q3	FY 2024 Q3	1-5

Opioid/Fentanyl Detection Program – This program provides DHS Components and law enforcement partners with advanced, operationally effective detection and investigation capabilities to enable confident discovery and interdiction of opioids, and other narcotics, being trafficked across U.S. borders without disrupting the flow of legitimate commerce, as well as aid in the collection and analysis of complex evidence to be used for the prosecution and dismantling of the criminal networks responsible for distribution of illicit drugs.

Opioid/Fentanyl Detection Project

- **Problem:** The final report of the Commission on Combating Drug Addiction and the Opioid Crisis recognized challenges that limit DHS’s ability to disrupt the flow of synthetic opioids, like fentanyl, that cross U.S. land, sea, and air borders, including international mail. The top challenges faced by DHS Components supported by this work, include the physical detection and interdiction of opioids, which can be trafficked in very small or dilute quantities, and the discovery and disruption of Transnational Criminal Organizations (TCOs)/Drug Trafficking Organizations (DTOs), criminal networks, and individuals who support illicit manufacturing and trafficking. DHS Components, and law enforcement partners, have identified critical needs for advanced technologies to aid in their missions to target, investigate, and dismantle illicit opioid and other narcotic trafficking into the United States.
- **Solution:** In coordination with DHS Components, S&T is developing a layered set of solutions, including detection hardware, fusion of data, and advanced analytics, which can be deployed rapidly within existing operational environments. To enable agile and responsive support to DHS drug detection missions, S&T will pursue an iterative, integrated developmental approach and operational assessments. First, S&T will assess and develop cutting-edge rapid screening and chemical detection technologies enhancements that can support drug detection missions. Second, S&T will deliver capabilities to increase disruption of TCOs/DTOs through the development of analytics, such as deep learning algorithms for decision support, data visualization, and pattern recognition, to exploit available data (e.g., dark web commerce, cryptocurrency transactions) and fuse information with other investigative holdings to discover and disrupt criminal networks and the activities they conduct. Last, S&T will pursue a holistic analysis of counterdrug missions across DHS to identify additional where S&T can make investments to address anticipated future Component needs. Through this approach, the program will prioritize development of capabilities to support continuity of the entirety of DHS and HSE counterdrug missions, regardless of changes in trafficking behaviors.
- **Justification:** The FY 2024 President’s Budget provides \$1.5M for this project, a \$2.5M decrease from the FY 2023 enacted. Funding for this project will continue the development of analytic capabilities and software tools to aid investigators in collection and analysis of evidentiary data to identify, dismantle, and prosecute criminal drug distribution networks. This funding will support transition and implementation of developed capabilities into operational environments to support Component efforts to combat drug trafficking.

- **Impact:** The growing opioid problem in the United States is well documented and presents significant challenge to DHS and the HSE. With the capabilities provided by this project, DHS Components and law enforcement partners will be equipped with advanced, operationally effective detection and investigative capabilities to enable confident discovery and interdiction of opioids, and other narcotics, to maximize the impact on disrupting drug trafficking into the United States.

Type of Research

Basic, Applied and Developmental

Technical Readiness Level

TRL varies for specific project activities between TRL-2 and TRL-7. This project's R&D efforts typically start by performing a market survey of available COTS and GOTS technology that could be adapted for DHS Component use. Identified technology is then adapted and validated in a laboratory or relevant environment (TRL-4/5). Following successful validation, the most promising solution(s) are then prototyped and evaluated first in a relevant environment (TRL-6) then in an operational environment (TRL-7) prior to transition. Examples from the R&D milestones detailed below:

- Developed advanced analytical tools to increase probability of interdiction (TRL-4).
- Develop opioid-related investigative and training analytical capabilities (TRL-5/6).

Transition Plans

Within the next three years, S&T will:

- Complete and transition technical report on emerging forensics and investigative methods to DHS Components and law enforcement partners.
- Validate and transition capabilities to DHS Components for implementation in operational environments in accordance with roles and responsibilities documented in the transition plan agreement.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Completed data collection campaign for COTS instruments and assays to support upgraded fentanyl/fentanyl analogues reference libraries.	FY 2022 Q1	FY 2022 Q4	6-7
Delivered opioid-related investigative training for law enforcement professionals.	FY 2021 Q4	FY 2022 Q3	6-7
Developed data-handling methods (e.g., ingest, clean, scale, and normalize) to enable cross-cutting analysis of investigative holdings.	FY 2021 Q4	FY 2022 Q3	6-7
Developed Quality of Evidence prototype analytics application.	FY 2022 Q1	FY 2022 Q4	6-7
Transitioned one or more test, evaluation, and assessment report(s) on identified capabilities to support DHS counter-drug missions.	FY 2022 Q1	FY 2022 Q4	2-7
Validated and transitioned capabilities to DHS Components for implementation in operational environments.	FY 2022 Q1	FY 2022 Q4	2-7
	FY 2023		
Complete a report on the performance assessment of COTS instruments and assays equipped with upgraded fentanyl/Fentanyl analogue reference libraries.	FY 2023 Q4	FY 2023 Q4	7
Complete data engineering of investigative holdings to support forensic intelligence fusion proof of concept demonstration.	FY 2023 Q1	FY 2023 Q4	-
Deliver to CBP a report summarizing results characterizing border checkpoint environments to enable trace detection techniques.	FY 2022 Q4	FY 2023 Q1	-
Develop Value of Target (VoT) prototype analytics application.	FY 2022 Q4	FY 2023 Q3	5-6
	FY 2024		
Complete development of counterdrug capability roadmap to support DHS mission areas.	FY 2023 Q1	FY 2024 Q1	-
Transition Quality of Evidence (QE) analytics software application to ICE HSI.	FY 2023 Q1	FY 2024 Q2	7
Transition Value of Target (VoT) analytics software application to ICE HSI.	FY 2023 Q1	FY 2024 Q3	7

Counter Terrorist Thrust Area
Research and Development
Technology Readiness Level Exhibit
(Dollars in Thousands)

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget
Counter Terrorist Thrust Area	\$69,361	\$60,983	\$60,894

R&D Thrust Area Description

COUNTER TERRORIST THRUST AREA: S&T invests in the R&D technologies, methods, and procedures to counter terrorists. Efforts include R&D to identify individuals or groups that intend to conduct terrorist attacks and/or illicitly move weapons, dangerous goods, and contraband. It also includes providing threat assessments of high-consequence attack methods such as CBE that terrorists may use to attack the Nation.

COUNTER TERRORIST THRUST AREA <i>(Dollars in Thousands)</i>				
Program	Project	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget
Total – Counter Terrorist Thrust		\$69,361	\$60,983	\$60,894
Emerging Technologies		\$750	\$750	-
	Emerging Technologies	\$750	\$750	-
Explosives Threat Assessment		\$25,175	\$20,440	\$18,600
	Aircraft Vulnerability	\$3,000	\$3,000	-
	Explosives Risk Assessment	-	-	\$1,500
	Homemade Explosives Identification, Detection and Mitigation (HEID&M)	\$6,560	\$6,560	\$6,220
	Technology Explosives Assessment	\$15,615	\$10,880	\$10,880
Probabilistic Analysis of National Threats, Hazards and Risks (PANTHR)		\$43,436	\$39,793	\$42,294
	Agricultural Threat Characterization (AgTC)	-	\$500	\$2,934
	Biological Threat Characterization (BTC)	\$20,663	\$18,650	\$17,191
	Chemical Threat Characterization (CTC)	\$6,523	\$4,393	\$7,769
	Hazard Knowledge Center (HKC) (formerly Biodefense Knowledge Center)	\$400	\$400	\$400
	Tools for Integrated Evaluation of Risk (TIGER)	\$15,850	\$15,850	\$14,000

Emerging Technologies – This program represents a partnership led by S&T, Policy, and DHS Components to develop and sustain a risk assessment methodology that identifies emerging risks, including emerging technology, to homeland security missions in the next 3-5 years. The approach leverages internal subject matter assessments and engages interagency, academic, industry, and foreign partners to conduct assessments, studies, and analyses to identify and prioritize emerging risks and technologies relative to future mission, including determinations of adversarial use and representing opportunities to use and to mitigate the adverse impacts of emerging technologies to protect the Nation.

Emerging Technologies

- **Problem:** Staying ahead of emerging risks, including adversarial use of emerging technology, requires DHS have a process for identifying, contextualizing, and prioritizing emerging risks to help safeguard the homeland. The Secretary, Components, and S&T require a scientifically based process to identify these risks and recommend mitigation, exploitation, and response strategies. To position DHS to both, leverage emerging technologies and defend against emerging risks, the trends, risks, and opportunities must be identified as far in advance as possible through partnerships with government, private sector, and partners in the Defense and Intelligence communities. The HSE must proactively identify critical emerging risks and technologies in order to effectively leverage or defeat them in defense of the homeland.
- **Solution:** This program executes research to establish a comprehensive, repeatable process for identifying emerging risks (including emerging technologies), prioritizing which risks have the highest probability of impact to the Nation, and subsequently informing relevant strategies, policies, or investments in response. It will refine and deliver a process to identify emerging risks.
- **Justification:** The FY 2024 President’s Budget does not include funding for this project.
- **Impact:** DHS will use this research activity as a driver for conducting emerging risk assessments. Products from this R&D activity will be used by DHS PLCY and the Components to drive prioritization of risk and enhance investment and response planning across critical missions of the DHS. S&T will use the products of this activity, along with DHS and Component priorities, as a key demand signal for the development of focused research and development programs. Results from this activity will communicate the posture of homeland security emerging risks with the interagency, academic, industry, and international community to drive and focus key relationships that improve DHS leverage of external investments to mitigate risks and appropriately seize future mission opportunities to protect the homeland.

Type of Research

Developmental

Technical Readiness Level

The TRL Level is Not Applicable for this activity as it produces non-material knowledge products.

Transition Plans

Deliver up to 10 knowledge products to inform DHS policy development in emerging risks and technologies.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Created Emerging Risks and Technologies strategic program.	FY 2022 Q1	FY 2022 Q2	2-3
	FY 2023		
Deliver two or more risk assessments to inform DHS policy development in emerging technologies.	FY 2023 Q1	FY 2023 Q4	2-3
	FY 2024		
Deliver to DHS policy up to ten knowledge products which will inform them on emerging technologies which may present a risk to DHS.	FY 2022 Q4	FY 2024 Q4	-
Produce an analysis/framework of emerging technologies for DHS policy which may present a risk to DHS.	FY 2023 Q4	FY 2024 Q4	-

Explosives Threat Assessment Program – This program sponsors, coordinates, documents, and oversees collaboration between S&T labs and external research partners to enable intelligence-driven characterization of explosive properties, risk assessment, and vulnerability mitigation. The program provides a research path for explosive threat solutions, focusing on characterization, mission-tailored threat prioritization, detection, and response, ensuring that DHS Components have all the required data for their programs' success.

Aircraft Vulnerability

- **Problem:** When designing screening technologies for the detection of explosives, whether on passengers, in checked bags, or in air cargo, it is essential to first determine the effects that different explosive threats can cause to a variety of commercial aircraft. The vulnerability of commercial aircraft to the broad range of conventional and emerging improvised explosive device threat configurations is not thoroughly understood or characterized. This includes the blast effect vulnerability of relatively new composite aircraft structures currently entering the civil transport fleet. The vulnerability assessment data will support TSA in the development and update of explosive detection standards.
- **Solution:** S&T is working to identify the minimum size of the explosives threat that would result in catastrophic aircraft loss. S&T is also developing blast effects measurement testing capability to measure and characterize explosive performance and blast effects and derive explosive equivalence factors relative to standard explosive. S&T continues to work to develop commercial aircraft blast mitigation technology that will provide protection to commercial aircraft. In addition to live fire explosive testing capability S&T is developing commercial aircraft blast responses modeling, simulation and analysis tools, and capability. S&T is also developing emerging explosive threats rapid response and assessment capability for commercial aircraft. S&T is also designing a central archive to be populated with 35+ years of aircraft live fire explosive test data which is at risk of being lost due to aging of storage media.
- **Justification:** The FY 2024 President's Budget does not include funding for this project.
- **Impact:** Transportation Security Administration (TSA) capability gaps would be addressed that inform TSA operations, composite aircraft vulnerability research, modeling and simulation of blast effects and responses of commercial aircraft, support an explosives test database, and support newer explosive blast mitigation efforts. Decrease in funding will inhibit identification and remediation of current and evolving threats, on legacy and newer material (composite) US fleet aircraft, potentially to the detriment of passenger aircraft safety. Decrease of funding will risk irrecoverable loss of 35 years of explosive test data, which the currently being developed database will store after digitization of older media. Conversely, increase in funding will allow fabrication of composite material test fixtures, faster scale up times for modelling and simulation capabilities, digitization of legacy media, and development of composite material sub/full scale aircraft test items. The long-term benefit of these efforts are potential updates to TSA's explosive detection screening requirements (which will improve passenger safety to threats on newer composite constructed aircraft), continued evaluation of evolving/emerging threats, and retaining critical legacy test data.

Type of Research

Applied and Developmental

Technical Readiness Level

TRL varies for specific project activities. Project develops various knowledge and technology (software and hardware) products starting from TRL-3 – TRL-5 and ending in TRL-6 – TRL-7 before product transition.

Transition Plans

Primarily a knowledge-developing effort, the impact of the aircraft vulnerability project will be reliant on the capacity for transitioning knowledge products, analysis tools, models and database, technology products, and capabilities developed to primary customers, TSA RCA, S&T/OSE/TCD, stakeholders and end users.

- Completed sufficient conventional aluminum airframe vulnerability testing to update commercial aircraft vulnerability assessment and deliver updated vulnerability summary report to TSA by FY 2021 Q4.
- Delivered explosive vulnerability preliminary estimates for wide body composite commercial aircraft to TSA by FY 2021 Q3.
- Delivered recommendations on explosive equivalence (in reference to spherical C-4 baseline threat) approach for explosive damage and vulnerability of commercial aircraft to TSA by FY 2021 Q4.
- Completed the development and deliver to the TSA the pressure film sensors for blast overpressure measurement on aircraft fuselage structures by FY 2022 Q3.
- Develop modeling, simulation, and analysis capability of blast responses of commercial composite aircraft and develop the capability for the TSA by FY 2022 Q4.
- Further validate high fidelity modeling, simulation, and analysis capability of blast responses of commercial aluminum and composite aircraft by FY 2023 Q4.
- Develop and deliver prototype version of CAVM explosives test database by FY 2023 Q4.
- Develop and deliver beta version of fast running empirical engineering analysis tool for blast responses of commercial aluminum and composite aircraft by FY 2023 Q4.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Completed development of modeling and simulation capability of blast responses of composite aircraft panels and deliver to TSA.	FY 2019 Q4	FY 2022 Q4	6
Completed development of pressure film sensor for blast overpressure measurement and deliver to TSA.	FY 2019 Q1	FY 2022 Q3	6
	FY 2023		
Develop and deliver prototype version of CAVM explosives test database.	FY 2022 Q1	FY 2023 Q4	6
Further validate high fidelity modeling, simulation, and analysis capability of blast responses of commercial aluminum and composite aircraft.	FY 2023 Q1	FY 2023 Q4	7
	FY 2024		
N/A	-	-	-

Explosives Risk Assessment

- **Problem:** When considering explosives threats to their operation and infrastructure, detection programs and DHS Components need defensible means to determine threat prioritization, likelihood of a threat, and analysis of the consequence of that threat occurring. Without this data they cannot efficiently or effectively distribute resources, develop mitigation plans, employ detection technologies, or establish other preventative measures.
- **Solution:** This project develops and systematically update defensible risk assessment methodologies, including threat prioritization reports to support detection programs and DHS Components.
- **Justification:** The FY 2024 President's Budget provides \$1.5M for this project, a \$1.5M increase from the FY 2023 enacted. Funding will support the maintenance of the developed risk assessment methodology and further develop risk assessment models involving operational environments in addition to air transportation. The funding will also allow the project to gather forensic data from a broader scope to strengthen the threat prioritization reports.
- **Impact:** This project meets TSA and USSS operational space capability gaps for threat prioritization. In addition, other S&T Mission Capability Support (MCS) explosives detection related programs will have access to information that will allow their customers to make informed, data-based decisions on their security posture. A decrease in funding will put TSA and USSS at risk of not addressing the explosive threats for their operational space. Furthermore, the other projects within the Explosive Threat Assessment program rely on threat prioritization data to determine research focus areas.

Type of Research

Applied and Developmental

Technical Readiness Level

- Risk Methodologies are TRL 7-8 but require annual maintenance to maintain the TRL.
- Risk assessment decision trees are TRL 5-6 and will be TRL-7 by FY 2025.
- Threat Prioritization Reports start at TRL-6 and are TRL-7 by annual release.
- HexCAT FOUO start at TRL-5 and are completed at TRL-7.

Transition Plans

- Delivered DSARM CONUS in FY 2021 Q1.
- DSARM Soft Target US in FY 2022 Q4.
- Complete DSARM Global in FY 2023 Q2.
- DSARM CONUS biannual refresh in FY 2023 Q3 and FY 2025 Q3.

- Complete Risk assessment decision tree by FY 2024 Q4.
- Release annual Threat Prioritization Reports.
- Complete a FOUO version of the Homemade Explosives Consequence Analysis Tool to one DHS Component FY 2025 Q1.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
N/A	-	-	-
	FY 2023		
N/A	-	-	-
	FY 2024		
Complete initial FOUO version of HEXCat, perform a demonstration to stakeholders, and receive feedback.	FY 2022 Q4	FY 2024 Q3	5-7

Homemade Explosives Identification, Detection, and Mitigation (HEID&M)

- **Problem:** The explosives threat is persistent and continuously evolving for DHS Components. Detonation of an explosive device presents an ongoing threat to the public and the homeland, in transportation as well as public places. The results of the HEID&M program research will directly support DHS Components' ability to proactively address terrorist and criminal threats to the homeland involving the use of commercial, military, and homemade explosives.
- **Solution:** The HEID&M project's primary mission is to mitigate against the effects of explosive devices utilized in terrorist attacks. This project leverages capabilities to advance the mission throughout its lifecycle, including:
 - Coordinating technical input from across the domestic and international community to inform standards, rulemaking, and harmonization activities.
 - Coordinating and conducting applied research, development, integration, and certification testing for the detection and mitigation of commercial, military, and homemade explosives threats, including the management and utilization of laboratory capabilities.
 - Defining the needs and requirements for explosives characterization to inform risk response and posture.
 - Performing explosive vulnerability assessments and developing testing tools and methods to inform future needs.
 - Supporting training requirements.
- **Justification:** The FY 2024 President's Budget provides \$6.2M for this project, a \$0.3M decrease from the FY 2023 enacted. Funding for this project will continue conducting assessments of the HME threat including HME performance characterization, collecting explosives characterization data for input to detection technologies, and disseminating that information to other government partners. In addition, funds will complete the explosives, planning and reference tool (ExPRT) a database to include all S&T and government partner funded research reports of the related subjects.
- **Impact:** The HEID&M project results have allowed TSA to develop and field more effective transportation security equipment, provide better training to front line personnel, and validate and monitor continuing and emerging threats. Additionally, the project provides and transitions products that are essential to the mission of several other key DHS Components including CISA, USSS, and CBP. The tools, modeling, and risk mitigation projects undertaken by the project are technologies and knowledge products that protect national security and resiliency. A decrease in funding could limit the number of threat compounds able to be characterized, leading to gaps in the data TSA, USSS, and CBP require to combat their explosive threats, including rapid response testing to mitigate emergent explosive threats.

Type of Research

Developmental

Technical Readiness Level

TRL varies for specific project activities between TRL-6 and TRL-7. This project's R&D efforts include the collection of data on adapted commercial technology for developmental test and evaluation as well as intelligence-based assessments (TRL-6); piloting prototypical test articles, training, information databases, and procedures (starting at TRL-6 and ending at TRL-7); as well as the transitioning of the Explosives Planning and Reference Tool (ExPRT) (TRL-7).

Transition Plans

- Deliver two series of multi-day customized HME Training courses to the TSA end-user by FY 2023 Q3.
- Deliver a final report to TSA Special Operations Division's Red Team in support of TSA's access control testing detailing the results of the indexing study by FY 2023 Q3.
- Transition six characterization reports from US/Global DSARM prioritized list to the TSA to improve security effectiveness and operational efficiency via selection and implementation against highest risk threats by FY 2022 Q4.
- Deliver and maintain the Explosives Performance and Characterization Encyclopedia (EPCE).
- Deliver up to 5 Material Assessment Reports (MAR) on explosives and chemicals of interest by FY 2024 Q4.
- Deliver performance testing report for two explosives for use in risk assessment tools and consequence analysis tools by FY 2024 Q4.
- Complete method for quantitatively analyzing the amount of TATP in a canine standard by FY 2024 Q3.
- Provide characterization data reports to TSA on at least five explosives obtained from foreign countries by FY 2024 Q4.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Delivered a final report to TSA Special Operations Division's Red Team in support of TSA's access control testing detailing the results of the indexing study.	FY 2022 Q1	FY 2022 Q3	6-7
Delivered two series of multi-day customized HME Training courses to the TSA end-user.	FY 2022 Q1	FY 2022 Q3	6-7
Transitioned 6 characterization reports from CONUS/OCONUS DSARM prioritized list to the TSA to improve security effectiveness and operational efficiency via selection and implementation against highest risk threats.	FY 2022 Q1	FY 2022 Q4	6-7
	FY 2023		
Conduct two series of multi-day customized HME training courses to the TSA end user.	FY 2020 Q3	FY 2023 Q3	6
Deliver a final report to TSA Special Operations Division's Red Team in support of TSA's access control testing detailing the results of the indexing study.	FY 2022 Q2	FY 2023 Q3	7
Deliver a prioritized threat list based on the developed Global DSARM tool to TSA.	FY 2021 Q3	FY 2023 Q2	7
Deliver a prioritized threat list based on the refreshed US DSARM tool to TSA.	FY 2023 Q1	FY 2023 Q4	7
Deliver two characterization reports from the prioritized list and two additional reports to the TSA, USSS, and other Components to improve security effectiveness and operational efficiency.	FY 2020 Q1	FY 2023 Q4	7
	FY 2024		
Complete method for quantitatively analyzing the amount of TATP in a canine standard.	FY 2023 Q2	FY 2024 Q3	5-7
Deliver knowledge product report containing detection characterization data on 3 explosives in the form of Material Assessment Reports to TSA.	FY 2023 Q2	FY 2024 Q3	6
Deliver performance testing report for two explosives for use in risk assessment tools and consequence analysis tools.	FY 2023 Q3	FY 2024 Q4	6-7
Provide characterization data reports to TSA on at least five explosives obtained from foreign countries.	FY 2023 Q2	FY 2024 Q4	5-7
Provide up to 5 Material Assessment Reports (MARs) to TSA on explosives and chemicals of interest.	FY 2024 Q1	FY 2024 Q4	6-7

Technology Explosives Assessment

- **Problem:** The TSL conducts T&E of all explosives and threat detection equipment used by TSA and across the HSE, including systems installed at commercial airports. Explosive threats rapidly evolve, and emergent threats must be characterized quickly and accurately so that screening equipment can be upgraded to reliably detect these new threats. New and more cost-effective screening equipment must be validated against both conventional and emerging threats.
- **Solution:** A network of laboratory capabilities are required to quickly and accurately characterize existing and emerging threats and to develop cost-effective tools, simulants, and T&E methods, standards, quality control procedures, and conduct data collection activities appropriate to analyze and detect threats with modern screening technologies. TSL coordinates this capability through the management of its core laboratories:
 - The TSL at the William J. Hughes Technical Center (WJHTC), Atlantic City, NJ characterizes explosive threats and develops test articles, test methodologies, and quality control.
 - The Tyndall Reactive Management Group facility on Tyndall AFB, Florida houses a collection of specialized data for HME.
 - At the FBI TEDAC Improvised Explosives Detection and Synthesis (TIEDS) Center at Redstone Arsenal, Alabama (AL), S&T integrates the latest explosive characterization to evaluate new threats on transportation security equipment (TSE).
- **Justification:** The FY 2024 President’s Budget continues to provide \$10.9M for this project. Funding for this project will characterize existing and emerging threats and to develop cost-effective tools, simulants, T&E methods, standards, quality control procedures, and conduct data collection activities to analyze and detect threats with modern screening technologies.
- **Impact:** These capabilities enable quick, cost-effective, and accurate T&E of TSE to validate conformance with TSA requirements for existing and emerging threats. These capabilities also allow TSL to perform RDT&E that drives innovation and fosters the development of new technologies for the detection of emerging threats and other contraband (e.g., opioids).

Type of Research

Applied

Technical Readiness Level

The Technology Explosives Assessment provides tools, simulants, methods, standards, and quality control procedures for testing and evaluation and can be considered steady state TRL-3.

Transition Plans

The Technology Explosives Assessment capabilities enables and facilitates the production of products through applied research activities, but do not, in general, produce products for external customers. The applied research customers within TSA, Developmental T&E, and Independent T&E, work closely with staff to ensure the timely release of tools, simulants, testing methods, standards, and quality control procedures necessary to support T&E.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Completed data collection activities for threat materials in support of test and evaluation.	FY 2021 Q1	FY 2022 Q4	3
Developed drug detection methods and test articles for trace detection and quality control.	FY 2021 Q1	FY 2022 Q4	3
Developed testing methodologies and test articles for cargo skid screening systems.	FY 2021 Q1	FY 2022 Q4	3
Developed two new HME simulants for MMW and X-ray technologies.	FY 2022 Q1	FY 2022 Q4	3
Expanded scale up procedures for new HMEs for test and evaluation.	FY 2022 Q1	FY 2022 Q4	3
Performed Region of Responsibility (ROR) measurements for new HME threats.	FY 2021 Q1	FY 2022 Q4	3
	FY 2023		
Complete data collection activities for threat materials in support of test and evaluation.	FY 2023 Q1	FY 2023 Q4	4-6
Continue development of new HME simulants for MMW and X-ray technologies.	FY 2023 Q1	FY 2023 Q4	3-5
Continue development of texture measurement tools and simulants with appropriate texture properties for X-ray technologies.	FY 2023 Q1	FY 2023 Q4	3-5
Continue development of validation methods and test tools for machine learning algorithm used in MMW and X-ray technologies.	FY 2023 Q1	FY 2023 Q4	3-5
Expand scale up procedures for new HMEs for test and evaluation.	FY 2023 Q1	FY 2023 Q4	3-5
	FY 2024		
Complete data collection activities for threat materials in support of test and evaluation.	FY 2024 Q1	FY 2024 Q4	5
Continue development and timely release of testing methods, standards, and quality control procedures necessary to support T&E.	FY 2024 Q1	FY 2024 Q4	3
Continue development of new HME simulants for MMW and X-ray technologies.	FY 2024 Q1	FY 2024 Q4	4
Continue development of texture measurement tools and simulants with appropriate texture properties for X-ray technologies.	FY 2024 Q1	FY 2024 Q4	4

Research, Development, and Innovation – PPA**Counter Terrorist Thrust Area**

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
Continue development of validation methods and test tools for machine learning algorithm used in MMW and X-ray technologies.	FY 2024 Q1	FY 2024 Q4	4
Continue performing Region of Responsibility (ROR) measurements for new HME threats.	FY 2024 Q1	FY 2024 Q4	3
Expand scale up procedures for new HMEs for test and evaluation.	FY 2024 Q1	FY 2024 Q4	4

Probabilistic Analysis of National Threats, Hazards and Risks (PANTHR) Program – This program addresses biological, chemical, and hazard knowledge gaps to inform defensive strategies that provide accurate, useful, and defensible knowledge and tools to stakeholders in time to enable risk-informed decision-making pertinent for defense against Weapons of Mass Destruction (WMD) threats to the Homeland. PANTHR supports a full spectrum of knowledge products (e.g., risk platforms, scientific reports/studies, etc.) that are programmatically housed within the Hazard Knowledge Management System (HKMS), which functions as both the internal information archive and centralized source for disseminating chemical, biological, radiological, nuclear, and explosive (CBRNE) hazard information across the HSE. The program will execute CBRNE risk analysis capabilities to support national assessments, characterize biological and chemical hazards to support HSE biological and chemical defense, and coordinate hazard awareness and characterization activities across S&T, DHS Components, and the HSE. The PANTHR program is executed in close coordination with the Countering Weapons of Mass Destruction Office (CWMD) through a request memorandum for CBRNE hazard characterization and risk assessment, as well as Operating Principles to guide mission management. Such program capabilities are accomplished through executing PANTHR’s projects, containing HKC, BTC, CCTC, AgTC, and Tools for Integrated Evaluation of Risk (TIGER). These programmatic capabilities deliver operationally relevant impacts by increasing awareness, improving understanding, and enabling more effective decision-making regarding current and future chemical, biological, and agricultural hazards through tailored products, tools, technologies, and information.

Agricultural Threat Characterization (AgTC)

- **Problem:** DHS Components and the agricultural defense community require a capability to identify, evaluate, and characterize biological and chemical threats and vulnerabilities to the United States agricultural sector. Enhanced characterization data and analysis provide decision-makers with the knowledge products necessary to make data-informed assessments of potential risks to U.S. agriculture. Those defending agriculture lack critical data on certain characteristics of many threat agents. Scientific analysis is required to better inform investments that prevent, prepare for, respond to, and recover from potential threat events.
- **Solution:** AgTC activities conduct foundational research on traditional, new, and emerging biological and chemical threat agents that are of concern to the agricultural sector. The knowledge products (technical reports) will support the development and validation of required analytic methods on the fundamental properties of hazardous agents, materials, and related technologies to support hazard awareness and the development of strategies. This advanced laboratory and field research will provide critical empirical data and insight on the properties of the highest risk threats and the hazards they pose to the agricultural sector. Knowledge products will be made available to DHS Components and the U.S. Chem/Biodefense community and will support operational elements in planning for and responding to natural and/or intentional events or disease outbreaks to prevent, prepare for, respond to, and recover from incidents.
- **Justification:** The FY 2024 President’s Budget provides \$2.9M for this project, a \$2.4M increase from the FY 2023 enacted. Funding for this project will enable a critical capability by executing characterization research at PIADC, other National Laboratories, and with industry partners to fill critical knowledge gaps on agricultural hazards and support sector risk assessments. The scientific data generated from this program will be provided to various stakeholders across the HSE to inform an array of activities such as hazard modeling for operational planning, medical

countermeasure development, and policy development. AgTC will improve the preparedness of the USG for agricultural defense by supporting efforts to characterize traditional, emerging, and advanced chemical and biological hazards to the Nation.

- **Impact:** AgTC activities establish and leverage robust science-based capabilities to provide DHS with data and knowledge products which improve pre-event planning, event-specific operational response, and strategic Chem/Biodefense preparedness decisions. The data, analysis, and information generated will improve decisions, policies, and activities designed to prevent, protect, prepare, mitigate, respond, and recover from chemical or biological events. AgTC transitioned knowledge products and capabilities are important for effective preparedness and response to current and future agricultural threats will inform national homeland defense recovery activities to mitigate the impact of an event on U.S. agriculture.

Type of Research

Applied

Technical Readiness Level

AgTC provides tools for testing and evaluation that are TRL-3. The AgTC project executes laboratory or field research on agricultural hazards to address critical knowledge gaps and to inform requirements, mission assessments and operational plans. Activities are initiated based on stakeholder (e.g., DHS Components, HHS, DOD) needs. This research requires appropriately accredited facilities to support agricultural hazard research.

Transition Plans

AgTC will deliver/transition the knowledge and insight produced by laboratory studies through reports delivered to the S&T HKC regularly. These reports are shared with the HSE, including the Intelligence Community and the DOD, through the HKC's HKMS and other information portals. AgTC reports and knowledge products provide the essential technical foundation for confidence in both DHS and national consequence and risk assessments, enabling policymakers to establish technically informed and sound policy. The AgTC reports and knowledge products enable decision makers to appropriately prioritize agricultural defense spending on CONOPS, training, and research and development acquisition programs affecting billions of dollars of government spending.

Project Schedule

<u>Research & Development Description</u>	<u>Planned Start Date</u>	<u>Planned Completion</u>	<u>TRL Level(s)</u>
	FY 2022		
N/A	-	-	-
	FY 2023		
Conduct AgTC Projects execution, next year planning, and Year Project (portfolio) Review.	FY 2023 Q1	FY 2023 Q4	3
Develop/execute research studies to fill critical knowledge gaps on agricultural hazards based on priorities identified in risk assessments, collaboration with DHS Components, and PANTHR working group.	FY 2023 Q1	FY 2023 Q4	3
Transition at least one knowledge product resulting from agricultural threat studies to DHS Components and the agricultural defense community.	FY 2023 Q1	FY 2023 Q4	3
	FY 2024		
Conduct AgTC Projects execution, next year planning, and Year Project (portfolio) Review.	FY 2024 Q1	FY 2024 Q4	1-3
Develop/execute research studies to fill critical knowledge gaps on agricultural hazards based on priorities identified in risk assessments, collaboration with DHS Components, and PANTHR working group.	FY 2024 Q1	FY 2024 Q4	1-3
Transition at least one knowledge product resulting from agricultural threat studies to DHS Components and the agricultural defense community.	FY 2024 Q1	FY 2024 Q4	1-3

Biological Threat Characterization (BTC)

- **Problem:** DHS Components, and the biodefense community at large, lack critical data on certain characteristics of many biological threat agents, as well as the impact of technological advances on those characteristics. Improved data on these characteristics enables Components to confidently predict the consequences or risk of a biological attack involving a given agent on the United States. In turn, these analyses allow decision-makers to effectively prioritize biodefense investments to prevent, prepare for, respond to, and recover from such an event. Further, this data is needed to define performance requirements for defensive countermeasures (e.g., detectors, personal protective equipment, and operational protocols) to ensure that the developed solutions mitigate hazards posed by biological threat agents.
- **Solution:** BTC activities provide knowledge products (technical reports) that are generated through conducting foundational research on traditional, new, and emerging biological threat agents, including development and validation of required analytic methods on the fundamental properties of hazardous biological agents, materials, and related technologies in order to support hazard awareness and the development of strategies. These rigorous laboratory experimentations will provide critical empirical data and insight on the properties of highest risk biological threat agents and the hazards that they pose. Knowledge products are made available to DHS Components and the U.S. biodefense community to support operational elements for use in planning for, and responding to, natural and/or intentional disease outbreaks to prevent, prepare for, respond to, and recover from incidents involving their use. BTC activities are executed in coordination and collaboration with the Hazard Awareness and Characterization Technology Center (HAC-TC) and the National Biodefense Analysis and Countermeasure Center (NBACC).
- **Justification:** The FY 2024 President's Budget provides \$17.1M for this project, a \$1.4M decrease from the FY 2023 enacted. Funding for this project will enable a critical capability by executing characterization research at the NBACC, National Laboratories, and industry partners to fill critical knowledge gaps on biological hazards and support enduring biological risk assessments. This scientific data generated from this program is provided to various stakeholders across the HSE to inform an array of activities such as hazard modeling for operational planning, medical countermeasure development, and policy development. BTC will greatly improve the USG biodefense preparedness by supporting efforts to characterize traditional, emerging, enhanced, and advanced biological hazards to the Nation. The project also plans to transition at least four knowledge products resulting from biological threat agent studies to DHS Components and the biodefense community.
- **Impact:** BTC activities establish and leverage innovative science-based capabilities to provide DHS with data and knowledge products which improve pre-event planning, event-specific operational responses, and strategic biodefense preparedness decisions. The data, analysis, and information generated will improve decisions, policies, and activities designed to prevent, protect, prepare, mitigate, and respond, recover from biological events. BTC transitioned knowledge products and capabilities required for effective preparedness and response to current and future biological threats will inform national homeland defense recovery activities to mitigate the impact of a biological attack on the Homeland. In FY 2021, BTC executed high impact research to directly address critical knowledge gaps related to SARS-CoV-2 to support the Homeland, such as infectivity of novel SARS-CoV-2 variants, assessment of COVID-19 countermeasures, and environmental sampling to understand COVID-19 transmission and stability and to inform personal protective equipment requirements.

Type of Research

Applied

Technical Readiness Level

BTC provides tools for testing and evaluation that range from TRL-1 to TRL-3. The BTC project executes laboratory research on biological hazards to address critical knowledge gaps to inform requirements, mission assessments, and operational plans. Activities are started based on stakeholder (DHS Components, HHS, DOD, etc.) needs. This research requires appropriately accredited facilities to support biological hazard research.

Transition Plans

BTC delivers/transitions the knowledge and insight produced by laboratory studies through reports delivered to the S&T HKC regularly. These reports are shared with the HSE through the HKC's Biodefense Knowledge Management System and other information portals. BTC reports and knowledge products provide the essential technical foundation for confidence in both DHS and national consequence and risk assessments, enabling policymakers to establish technically informed and sound policy. The BTC reports and knowledge products enable decision makers to appropriately prioritize biodefense spending on medical and non-medical countermeasure acquisition programs affecting billions of dollars of Government spending.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Developed/executed research studies to fill critical knowledge gaps on biological threat agents based on priorities identified in collaboration with DHS Components and PANTHR working group.	FY 2022 Q1	FY 2022 Q4	3
Transitioned at least four (4) knowledge products resulting from biological threat agent studies to DHS Components and the biodefense community.	FY 2022 Q1	FY 2022 Q4	3
Conducted BTC Projects execution, next year planning, and Year Project (portfolio) Review.	FY 2022 Q1	FY 2022 Q4	3
Contributed priorities to the NBACC Annual Plan and execute approved plan (<i>aligned with NBACC's contract performance year</i>).	FY 2021 Q4	FY 2022 Q2	3
	FY 2023		
Contribute priorities to the NBACC Annual Plan and execute approved plan (aligned with NBACC's contract performance year).	FY 2023 Q1	FY 2023 Q2	3
Deliver the BTC Data for Risk Results to be incorporated into TIGER's annual risk assessment.	FY 2023 Q2	FY 2023 Q3	3
Develop/execute 5 laboratory studies to fill critical knowledge gaps on biological threat agents based on priorities identified in collaboration with DHS Components and performers.	FY 2023 Q1	FY 2023 Q4	3
Develop/execute 5 literature reviews to fill critical knowledge gaps on biological threats agents or emerging technologies identified in collaboration with DHS Components and performers.	FY 2023 Q1	FY 2023 Q4	3
Meet with internal BTC team, subject matter experts and external stakeholders to discuss priorities and conduct next year planning (for FY 2024).	FY 2023 Q3	FY 2023 Q4	3
Transition at least 6 knowledge products resulting from biological threat agent studies to DHS Components and the biodefense community.	FY 2023 Q1	FY 2023 Q4	3
Upload 10 biothreat reports to the Hazard Knowledge Center.	FY 2023 Q1	FY 2023 Q4	3
	FY 2024		
Conduct BTC Project execution, next year planning by meeting with internal BTC team, subject matter experts and external stakeholders to discuss priorities.	FY 2024 Q1	FY 2024 Q4	1-3
Contribute priorities to the NBACC Annual Plan and execute approved plan (aligned with NBACC's contract performance year).	FY 2024 Q1	FY 2024 Q2	1-3
Develop/execute 6 literature reviews to fill critical knowledge gaps on biological threats agents or emerging technologies identified in collaboration with DHS Components and performers.	FY 2024 Q1	FY 2024 Q4	3
Develop/execute 7 laboratory studies to fill critical knowledge gaps on biological threat agents based on priorities identified in collaboration with DHS Components and performers.	FY 2024 Q1	FY 2024 Q4	3
Transition at least seven (7) knowledge products resulting from biological threat agent studies to DHS Components and the biodefense community.	FY 2024 Q1	FY 2024 Q4	1-3

Chemical Threat Characterization (CTC)

- **Problem:** DHS Components and the chemical defense community have a need for a capability to identify, assess, and characterize chemical threats and vulnerabilities in the United States. Analyses allow decision-makers to effectively prioritize chemical-defense investments to prevent, prepare for, respond to, and recover from such an event. The community lacks critical data on certain characteristics of many chemical threat agents, as well as the impact of technological advances on those characteristics, and it requires analysis capabilities to be able to better inform decision makers and provide defensible recommendations on chemical defense investments to the HSE.
- **Solution:** CTC provides chemical hazard analysis and threat characterization as well as chemical surveillance, detection, modeling, and simulation. Through the CSAC, which by law conducts conduct studies and analyses for assessing the threat and hazards associated with an accidental or intentional large-scale chemical event or chemical terrorism event. CTC develops and maintains science-and technology-based quality assured information capabilities for acquiring, storing, indexing, evaluating, and making strategically available cheminformatic data, technical reports, and other knowledge products. CTC in coordination with the HAC-TC and collaboration with CSAC provides knowledge products (technical reports) that are generated through conducting foundational research on traditional, new, and emerging chemical threat agents. This includes development and validation of required analytic methods on the fundamental properties of hazardous chemical agents, materials, and related technologies to support hazard awareness and the development of chemical defense strategies. Knowledge products are made available to DHS Components and the U.S. chemical defense community and support operational elements nationwide. CTC provides the critical science and information that decision-makers rely upon to best prevent, prepare for, respond to, and recover from intentional or accidental chemical incidents.
- **Justification:** The FY 2024 President's Budget provides \$7.8M for this project, a \$3.3M increase from the FY 2023 enacted. Funding for this project will enable critical capabilities providing chemical hazard analysis and hazard characterization as well as chemical surveillance, detection, modeling, simulation, and chemical security laboratory experimental analysis. CSAC core funding enables 24/7 response and technical assistance to the HSE, including modeling and simulation, characterization of current and emerging chemical threats, bulletins, threat scenario planning support to Federal and State agencies, chemical threat knowledge tools that support Components as well as the HSE, and chemical security laboratory experimentation for DHS priorities. CSAC also provides a standing capability to rapidly execute high-priority and surge requirements to quickly respond to national emergencies and incidents involving chemical threats. The scientific data generated by CTC is provided to various stakeholders across the HSE to inform an array of activities such as hazard modeling for operational planning, medical countermeasure development, chemical threat detection and interdiction, safety and security of the Nation's food supply, and policy development that will greatly improve the USG's preparedness and chemical defense capabilities by researching and characterizing traditional, emerging, enhanced, and advanced chemical hazards to the Nation. This includes updating and maintaining a toxic chemical data repository to support strategic national risk assessments and other homeland security needs.

CSAC develops and maintains chemical hazard characterization analysis capabilities which provides the HSE with information needed to make science-based, defensible decisions regarding Homeland defense and recovery. CSAC updates toxic syndromes, ensuring knowledge products are based on the results of the most recent science and technology advancements.

- **Impact:** CTC activities provide DHS with data and knowledge products which improve pre-event planning, event-specific operational response, and strategic chemical defense preparedness decisions. The data, analysis, and information generated will improve decisions, policies, and activities designed to prevent, protect, prepare for, mitigate, respond to, and recover from chemical events. Careful analyses based on quality data and reasoned assumptions will more efficiently focus homeland security investments. CSAC is the Nation's only Federal studies, analysis, and knowledge management center for assessing the threat or hazard associated with an accidental or intentional large-scale chemical event or chemical terrorism event in the United States. CSAC serves key customers such as CISA, USSS, CWMD, TSA, and I&A within DHS, as well as several interagency partners. CTC coordinates and collaborates with other entities within the USG, industry, and academia to maximize its ability to generate and utilize fundamental studies and analyses. CTC transitions knowledge products and capabilities required for effective preparedness and response to current and future chemical threats that will inform national homeland defense recovery activities to mitigate the impact of a chemical attack on the Homeland.

Type of Research

Applied and Developmental

Technical Readiness Level

This project's activities span TRL-1 to TRL-7 and provide capabilities outside of technology development. The CTC project provides decision analytics support and executes laboratory research (TRL-3) on chemical hazards in order to address critical knowledge gaps to inform requirements, mission assessments and operational plans. Activities are initiated based on stakeholder (DHS Components, HHS, DOD, etc.) needs. CTC products and information tools (TRL-7) inform decision makers on chemical hazards.

Transition Plans

CTC knowledge products (e.g., chemical-related tailored assessments) and insights produced by laboratory studies will be delivered via reports, presentations, and tools that are directly transitioned to DHS Components, HSE stakeholders and international partners through the established CSAC processes as well as through the PANTHR Hazard Knowledge Center and other information portals such as HSIN. CSAC knowledge products (e.g., chemical-related tailored assessments) will be developed in accordance with the requirements (scope, content, timeline) of the stakeholder requesting the product.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Acute Exposure Chronic Effects (AECE) Research: Determined potential long-term effects from acute exposures to toxic chemicals of interest.	FY 2022 Q2	FY 2022 Q4	3
Added 10 technical or programmatic documents to the NTA Library to keep up to date with the latest published information.	FY 2022 Q1	FY 2022 Q4	-
Advanced the presumptive cyanide exposure detection innovation, to include determining stability of materials under simulated field conditions and developing a prototype instrument that could be used in field trail testing.	FY 2022 Q1	FY 2022 Q4	3
Completed and launched CARD v13.0. 1. Included, based on Open Source and classified reporting new high threat chemicals, their structures, synthesis, and existing chemical informatics data. Expand Taxonomy as necessary based on new classes of chemicals introduced or new projects areas to enhance search efficiency for project associated users.	FY 2022 Q1	FY 2022 Q2	7
Complete4d and launched CARD v14.0. 1. Enhanced search protocols to continue to increase efficiency of the user experience. Continue to Include, based on Open Source and classified reporting new high threat chemicals, their structures, synthesis, and existing chemical informatics data.	FY 2022 Q3	FY 2022 Q4	7
Completed follow-on Study on Acceptance, LD50 and Organoleptic Properties of Chemicals in Food Matrices.	FY 2022 Q2	FY 2022 Q4	3
Delivered final technical report on Dermal Toxicity of a Chemical in Saline and another carrier solvent and Toxidromic Progression.	FY 2022 Q1	FY 2022 Q2	3
Delivered final technical report on Solubility, Median Lethal Dose, and New Matrices.	FY 2022 Q2	FY 2022 Q4	3
Delivered follow-on study technical report on Acceptance, LD50 and Organoleptic Properties of Chemicals in Food Matrices.	FY 2022 Q2	FY 2022 Q4	3
Delivered technical report on Solubility, Acceptance, median LD50 and Organoleptic Properties of Chemicals in Beverages and Food Matrices.	FY 2022 Q1	FY 2022 Q2	3
Delivered technical report summarizing the validated chemical source term tool addressing the key hazard prediction modeling gaps, and introduction of the complementary computational modeling and conceptual design and evaluation of new vapor detection strategies of area surveillance.	FY 2022 Q1	FY 2022 Q2	3
Developed an architecture and graphic user interface of the chemical threat characterization database for the Chemical Threat Knowledge Management Platform V1.0.	FY 2022 Q1	FY 2022 Q2	7
Launched the Chemical Threat Knowledge Management Platform V1.0 by adding data from selected projects within S&T CSAC to allow for the coordinated search, recovery, and report formation.	FY 2022 Q1	FY 2022 Q2	7

Research, Development, and Innovation – PPA
Counter Terrorist Thrust Area

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
Provided a selection of three advanced concepts for advanced chemical detection as candidates for future investment.	FY 2022 Q1	FY 2022 Q3	3
	FY 2023		
Add a minimum of 5 technical or programmatic documents to the NTA Library to keep up to date with the latest published information.	FY 2023 Q1	FY 2023 Q4	-
Advance the presumptive cyanide exposure detection innovation, to include performing laboratory testing and planning field trial testing using a prototype instrument.	FY 2023 Q1	FY 2023 Q4	4
Carry out characterization studies for a minimum of 4 potential threat agents in two matrices to fill critical data gaps that will support and inform planning, preparedness, mitigation activities and the strategic risk assessment.	FY 2023 Q1	FY 2023 Q4	5
Complete CARD v15.0 that will include new high threat chemicals and expanded taxonomy.	FY 2023 Q1	FY 2023 Q4	7
Conduct laboratory experiments to define surface deposition source term to accurately predict hazards associated with anhydrous ammonia spill/leaks.	FY 2023 Q1	FY 2023 Q3	2
Launch the Chemical Threat Knowledge Management Platform V2.0 by adding data from selected projects within S&T CSAC to allow for the coordinated search, recovery, and report formation.	FY 2023 Q1	FY 2023 Q4	3
Update Non-Traditional Agent (NTA) Library by adding additional data points to advanced technical data matrices pertaining to all classes of NTAs, for the following research areas: toxicology, medical countermeasures, physical properties, detection, decontamination, and personal protective equipment.	FY 2023 Q1	FY 2023 Q4	3
Utilizing CSAC's chemical security laboratory core capability, evaluate emerging wearable sensors to detect chemical exposure for food protection and chemicals sensing in various settings.	FY 2023 Q1	FY 2023 Q4	5
	FY 2024		
Acute Exposure Chronic Effects (AECE) Research: Determine potential long-term effects from acute exposures to toxic chemicals of interest for additional toxidromes.	FY 2024 Q1	FY 2024 Q4	3
Add 5 technical or programmatic documents to the NTA Library to keep up to date with the latest published information.	FY 2024 Q1	FY 2024 Q4	-
Advance the presumptive cyanide exposure detection innovation to laboratory validation and initial field testing using a prototype instrument.	FY 2024 Q1	FY 2024 Q4	5-6
Complete and launch CARD V18.0 that will enhance search protocols to continue to increase efficiency of the user experience.	FY 2024 Q3	FY 2024 Q4	1-7
Complete CARD V17.0 that will include new high threat chemicals and expanded taxonomy.	FY 2024 Q1	FY 2024 Q2	7
Conduct the characterization studies on current and emerging hazards: enhance the understanding of three (3) potential threats to aid in planning, preparedness, and mitigation.	FY 2024 Q1	FY 2024 Q4	3
Deliver Master Questions List(s) for current and emerging threats: A reference guide to assist emergency responders and the research community that provides critical and scientific vetted information regarding the hazards they pose in operational settings.	FY 2024 Q1	FY 2024 Q4	3

Research, Development, and Innovation – PPA**Counter Terrorist Thrust Area**

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
Produce one informational bulletin for a transportable hazard chemical to provide technical awareness in the event of an intentional or accidental release.	FY 2024 Q1	FY 2024 Q4	6-7
Transfer Organ on a Chip technology capabilities from collaborators to the chemical security laboratory at CSAC and construct custom-based platforms to generate exposure information and compare with published animal testing data.	FY 2024 Q1	FY 2024 Q4	4-5
Update and maintain toxic chemical data repository to support strategic national risk assessments and other homeland security needs.	FY 2024 Q1	FY 2024 Q4	1-3
Update Non-Traditional Agent (NTA) Library by adding more data points to advanced technical data matrices pertaining to all classes of NTAs, for the following research areas: toxicology, medical countermeasures, physical properties, detection, decontamination, and personal protective equipment.	FY 2024 Q1	FY 2024 Q4	3

Hazard Knowledge Center (HKC)

- **Problem:** DHS Component and community partners require the ability to access relevant and trusted data to enable them to make risk-informed decisions, yet no single source exists with authoritative and trusted models, tools, and data. At the same time, customer's information and decision needs vary across DHS Components and multiple Federal, State, and local agencies. To help them make decisions to prevent and protect against threats and risks, and to mitigate, respond to, and recover from CBRNE, food and agricultural, as well as biotechnology and bioeconomy hazards and threats, customers from across the HSE and the interagency need a centralized repository to be able to access relevant technical results, information, analysis, and expertise.
- **Solution:** To host the large variety of classified and unclassified data and analyses, technical and analytical reports, and models and tools developed or written by the PANTHR projects, PANTHR has developed the HKMS. The HKMS will hosts hazard data, models, tools, and capabilities generated by the AgTC, BTC, and CTC projects, and incorporate models, tools and algorithms generated by the TIGER project so it can support risk assessments generated by the PANTHR program. Leveraging cloud capabilities provided by Intelligence and Analysis (I&A) for classified systems and S&T capabilities for its FOUO cloud system, the HKC is developing hosting solutions for safe and secure storage of PANTHR data, tools, products, and information. The system will incorporate advancements in AI/ML technology to enable faster and more efficient extraction from and access to the cloud-based database.
- **Justification:** The FY 2024 President's Budget provides \$0.4M for this project. Funding for this project will continue to build the HKMS cloud capability across FOUO and Top-Secret classification levels; host the first risk applications from existing PANTHR projects; transition both Chem and Bio data from multiple community sources and LLNL BKMS databases; and provide funding to maintain the administrative costs to build, host, and maintain the HKMS environments.
- **Impact:** The HKC provides a centralized repository of information that helps to increase the awareness and understanding of CBRNE, food and agricultural hazards, and risks across the HSE at multiple levels of classification, to inform policy, CONOPS, RDT&E, technology acquisitions, and development and acquisition of medical countermeasures. By developing and deploying the HKMS into a combined knowledge repository for CBRNE and Food and Agricultural hazards and threats by leveraging cloud services developed elsewhere within DHS, the the HKC will enable access to the technical information and analysis through a single, cost-effective, and secure portal for customers to make informed decisions to prevent, prepare for, respond to, and recover from incidents involving these hazards.

Type of Research

Applied and Developmental

Technical Readiness Level

This project's activities span TRL-4 to TRL-7 and provides capability outside of technology development. This project leverages technologies in the TRL-4 and above to develop a database structure that can be taken beyond TRL-7 into deployment for use and sharing of CBRN information within the HSE.

Transition Plans

HKC develops the HKMS as a cloud-based platform to host a series of databases and user interface tools. The HKC provides access to PANTHR-developed reports and tools to the HSE, including the Intelligence Community and the DoD. The HKC will transition PANTHR risk capabilities and related scientific and threat information to the HSE to enable better informed decisions related to CBRN topics. The HKC develops information sharing tools to allow for PANTHR developed knowledge products and tools, as well as other community assets, to be effectively shared promoting communication, scientific understanding and CBRN risk awareness.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
FY 2022			
Established unclassified//FOUO network hosting capability.	FY 2022 Q2	FY 2022 Q4	4-7
Uploaded and integrated PANTHR models, data, and tools across FOUO Cloud environment.	FY 2022 Q1	FY 2022 Q4	4-7
FY 2023			
Integrate PANTHR tools and capabilities across both FOUO and TS cloud environments.	FY 2023 Q1	FY 2023 Q4	7
Maintain and update TS secure cloud data, tools, and applications.	FY 2023 Q1	FY 2023 Q4	4-7
Maintain unclassified//FOUO cloud data, tools, and applications.	FY 2023 Q1	FY 2023 Q4	4-7
FY 2024			
Continue deployment of unclassified//FOUO cloud data, tools, and applications.	FY 2024 Q1	FY 2024 Q4	4-7
Continue development and deployment of TS secure cloud data, tools, and applications.	FY 2024 Q1	FY 2024 Q4	6
Continue development of the HKMS portal and applications for HSE access.	FY 2024 Q1	FY 2024 Q4	6
Locate DHS network to host Secret-level HKMS and plan hosting solution.	FY 2024 Q2	FY 2024 Q3	6

Tools for Integrated Evaluation of Risk (TIGER)

- **Problem:** DHS has the mission to prevent, protect, mitigate, respond, and recover from a range of intentional and unintentional events, including but not limited to CBRNE-based terrorist attacks, pursuant to the Homeland Security Act of 2002, Project Bio shield Act of 2004, Homeland Security Presidential Directive 9 and the Securing of Agriculture and Food Act of 2007. To meet these missions, Homeland Security Presidential Directives (18 and 22) and the National Biodefense Strategy outline the need for the comprehensive risk analysis capabilities of our Nation's defenses to help inform investments for national strategic defense planning, while identifying key knowledge and capability gaps and evaluating critical vulnerability mitigation strategies. To fulfill this mission, decision-makers require guidance from risk-relevant data that characterizes threats to the Homeland, to effectively manage resources and reduce likelihood and impacts of hazards such as CBRNE incidents. A critical part of providing timely relevant risk informed decisions, is having the ability to execute risk analysis.
- **Solution:** TIGER will leverage hazard data, threat information, and to develop and produce modeling and software tools that are required by HSE to conduct and improve these hazard/risk assessments. The PANTHR projects provide knowledge products (i.e., technical reports) generated through rigorous laboratory experimentation providing critical data and insight on the properties of threat agents and the hazards that they pose.

Knowledge products (i.e., risk assessments and tailored analyses) are made available to DHS Components and the United States CBRNE defense community to support strategic, operational, and tactical elements for use in planning for and responding to both natural and intentional CBRNE incidents. Various mathematical models will be improved and developed to provide more informed analysis and decision support.

- **Justification:** The FY 2024 President's Budget provides \$14.0M for this project, a \$1.8M decrease from the FY 2023 enacted. Funding for this project will continue to enable execution of CBRN risk analysis and expanding capabilities to address emerging and evolving threats, as well as expanding risk analysis approaches to other mission areas, such as the Food and Agricultural Sector, Biotechnological threats, the U.S. Bioeconomy, and Explosive threats. The risk and tailored assessment capabilities generated from TIGER are required by, and provided to, various stakeholders (e.g., DHS Components, HHS, DOD) to better enable and inform an array of activities such as operational and response planning, medical countermeasure development and acquisition, research and development, policy.
- **Impact:** TIGER's capabilities provide the HSE with tailored analyses that assess risks and enable strategic, operational, and tactical decisions to increase prevention, protection, preparation, mitigation, response, and recovery from hazard events including, intentional and unintentional CBRNE events, threats to the Food and Agricultural Sector and risks to the U.S. Bioeconomy. By improving the ability to assess threats and understand hazards, the data and models will inform the HSE on prioritization of resources based on the highest CBRN risks (National Security Strategy, priority action: "improve risk management") and allow improvement of risk management and an ability to understand and prepare for the greatest risks to Americans. In FY 2022, TIGER leveraged several computational models to provide rapid decision support to DHS Components on a range of topics (e.g., risk-based medical countermeasure investments, workforce health analyses, collective protection systems, and more).

Type of Research

Applied

Technical Readiness Level

The project is TRL-3 and provides capability outside of technology development. TIGER generates a National Level CBRN Risk Assessment and various tailored assessments based on Stakeholder requests as final knowledge products to support decision makers across the HSE, leveraging varying computational models and risk methodology approaches.

Transition Plans

TIGER will regularly transition knowledge products (risk and tailored assessments, computational models, etc.) to the S&T Hazard Knowledge Center. These reports will be shared with the HSE, including the Intelligence Community and the DOD, through the HKC's HKMS and other information portals. TIGER reports and knowledge products will provide the essential national consequence and risk assessments, enabling policymakers to establish risk informed and sound policy. The TIGER reports and knowledge products will enable decision makers to appropriately prioritize CBRN defense spending on medical and non-medical countermeasure acquisition programs affecting Government spending.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Executed development activities to improve and expand risk analysis capabilities.	FY 2022 Q1	FY 2022 Q4	-
Executed developments to support the agriculture risk assessment framework.	FY 2022 Q1	FY 2022 Q4	-
Executed developments to support the bioeconomy risk assessment framework.	FY 2022 Q1	FY 2022 Q4	-
Executed developments to support the biotechnology risk assessment framework.	FY 2022 Q1	FY 2022 Q4	-
Generated tailored assessments to address stakeholder needs.	FY 2022 Q1	FY 2022 Q4	-
Identified modeling and risk analysis capability developmental priorities.	FY 2022 Q3	FY 2022 Q4	-
Identified priority technical hazard data gaps for BTC and CTC.	FY 2022 Q3	FY 2022 Q4	-
Produced updated National CBRN Risk Data image for national assessments and risk tools.	FY 2022 Q1	FY 2022 Q4	-
	FY 2023		
Execute development activities to improve and expand risk analysis capabilities.	FY 2023 Q1	FY 2023 Q4	3

Research, Development, and Innovation – PPA
Counter Terrorist Thrust Area

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
Execute development activities to support the agriculture risk assessment framework.	FY 2023 Q1	FY 2023 Q4	3
Execute development activities to support the risk assessment framework for Bioeconomy.	FY 2023 Q1	FY 2023 Q4	3
Execute development activities to support the risk assessment framework to integrate biotechnological threats.	FY 2023 Q1	FY 2023 Q4	3
Generate tailored assessments to address stakeholder needs.	FY 2023 Q1	FY 2023 Q4	-
Identify development priorities for modeling and risk analysis capabilities.	FY 2023 Q3	FY 2023 Q4	-
Identify priority technical hazard data gaps for BTC, CTC, and AgTC.	FY 2023 Q3	FY 2023 Q4	-
Produce updated National CBRN Risk Data image for national assessments and risk tools.	FY 2023 Q1	FY 2023 Q4	3
	FY 2024		
Execute development activities to improve and expand capabilities to support the food and agriculture risk assessment framework.	FY 2024 Q1	FY 2024 Q4	3
Execute development activities to improve and expand capabilities to support the risk assessment framework to integrate biotechnological threats.	FY 2024 Q1	FY 2024 Q4	3
Execute development activities to improve and expand core computational risk analysis capabilities.	FY 2024 Q1	FY 2024 Q4	3
Generate tailored assessments 10 to address stakeholder needs.	FY 2024 Q1	FY 2024 Q4	3
Identify development priorities for modeling and risk analysis capabilities.	FY 2024 Q3	FY 2024 Q4	-
Identify priority technical hazard data gaps for BTC, CTC, and AgTC.	FY 2024 Q3	FY 2024 Q4	-
Produce updated National Risk Data image for CBRN, Food and Ag Sector, BioEconomy and Biotechnology analyses to leverage for national assessments, tailored assessments, and decisions support tools.	FY 2024 Q1	FY 2024 Q4	3

Cyber Security/Information Analysis R&D Thrust Area Research and Development

Technology Readiness Level Exhibit

(Dollars in Thousands)

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget
Cyber Security / Information Analysis Thrust Area	\$60,600	\$48,567	\$37,500

R&D Thrust Area Description

CYBER SECURITY / INFORMATION ANALYSIS R&D THRUST AREA: Conducts and supports RDT&E and transition of advanced cybersecurity and information assurance technologies which secure the Nation's current and future cyber and critical infrastructures. These solutions include user identity and data privacy technologies, end system security, law enforcement forensic capabilities, secure protocols, and software assurance.

CYBER SECURITY / INFORMATION ANALYSIS THRUST AREA <i>(Dollars in Thousands)</i>				
Program	Project	FY 2022 Enacted	FY 2023 Enacted	FY 2024 Enacted
Total – Cyber Security / Information Analysis Thrust		\$60,600	\$48,567	\$37,500
Cybersecurity Program (formerly Information Analytics)		\$60,600	\$48,567	\$37,500
	Cyber Data Analytics	\$59,600	\$47,067	\$37,000
	Cybersecurity for Law Enforcement	\$1,000	\$1,500	\$500

Cybersecurity Program— This program conducts research, analysis, and development of technologies to strengthen defensive cybersecurity capabilities in a spectrum of strategic technical areas to mitigate risk to the Nation's critical infrastructure, Federal departments and agencies, as well as state, local, tribal, and territorial organizations. The increasing reliance on complex data, technology, communication, and interconnectivity has changed and expanded vulnerabilities and increased the potential risk to governmental, citizen services, and critical infrastructure continuity.

Cyber Data Analytics

- **Problem:** Currently, there is no centralized source and capability for Cybersecurity and Infrastructure Security Agency (CISA) operational units to query and correlate information related to cyber risk analysis, physical and infrastructure risk, and blended cyber-physical risk/threat. To close

operational gaps, this research area will enhance the ability of operational units to correlate threat intelligence and risk data. This includes analysis of elements, increasing automated tools, and providing situational awareness of risk factors. This research area develops applied AIML infrastructure, algorithms, and tools to enable security orchestration, automation, and response (SOAR); behavioral anomaly detection; data reduction; tipping and queuing of analyst workflows; and other user driven mission needs. CISA's Threat Hunting leads the Federal response by serving as its primary operational arm in the execution of the asset response mission. To support the execution of the asset response mission, operators must be able to stream-line the advanced analytics through usage of AI/ML.

- **Solution:** This research area supports the improvement of computational analytics and information sharing to improve homeland security cyber-physical security risk analysis across government, the sixteen Critical Infrastructure Sectors, and fifty-five National Critical Functions. This ML work is strategic in nature, with tactical capability milestones. The work is driven by a vision for next generation CISA architectures, computation, and decision-making capabilities, and establishes the foundation for future AI solutions. Activities will focus on maturing CISA data analytics efforts through the development of representative data sets, stand up of joint computational sandbox capabilities, assessment of emerging analytics tools, experimentation with a variety of analytics use cases, and establishment of strategic research capabilities for the development of secure multi-party computational capabilities. This will be accomplished through the following:
 - Cybersecurity AI/ML and Cybersecurity Laboratory: Develop applied AI and ML infrastructure, algorithms, and tools to enable SOAR; behavioral anomaly detection; data reduction; tipping and queuing of analyst workflows; and other user driven mission needs. CISA's Threat Hunting leads the Federal response by serving as its primary operational arm in the execution of the asset response mission. To support execution of the asset response mission, operators must be able to stream-line advanced analytics through usage of AI/ML. Develop a secure data platform that correlates data collected from all CISA programs into a common information architecture available to all CISA critical mission activities. Development of hybrid cloud infrastructure to support the full breadth of cyber defense operations. Explore encryption techniques and commercial solutions to enable additional sensitive but unclassified data sharing with critical infrastructure owners and operators while protecting privacy. Develop algorithms, models, and data access mechanisms to ensure data is available within and across CISA and mission partners.
 - Cyber Analytics and Platform Capabilities (CAPC): Develops and advances cyber analytic capabilities in three major areas: 1) automate, to the extent possible, what is currently a largely manual process of malware analysis; 2) leverage expertise across multiple partners to accelerate cyber related R&D; 3) use data and analytics to gain information about adversaries to improve real-time network defense; and 4) address shortcomings in existing risk assessment methods that are needed to develop the National Critical Functions (NCF) risk architecture.
 - Software Assurance, Maturity, and Composition (SAMC): Develop and advance cybersecurity tools and analytic techniques around three major areas: 1) Software assurance of applications relating to security and safety within government environments; 2) Software lifecycle maturity studies and software to determine which aspects of an organization's code base are least mature and need attention; and 3) Software composition of codes at the source, byte, and binary levels to track usage, origination, and identify extra features that are not needed. These efforts will enhance CISA's ability to detect malicious and problematic software sooner in the lifecycle, potentially preventing our adversaries from gaining entry to critical systems.

- **Justification:** The FY 2024 President’s Budget provides \$37.0M for this project, a \$10.1M decrease from the FY 2023 enacted. Funding is needed to keep pace with the rapidly increasing sophistication of threat actors and attack vectors. Investment in these research areas positions technology innovations for operational use. This program enables exploration of new automation technologies that will accelerate effective integration of efficient data ML infrastructure to underpin the analytics architecture for CISA. This funding will develop and deliver data analytics and ML technologies to enhance CISA Threat Hunting and Vulnerability Management capabilities in defense of Federal networks and the Nation’s critical infrastructure. This program also plans to transition capabilities using emulation, active data collection, and analysis to gain information about adversaries, improve real-time network defense, and deliver capability advances in risk analysis for assessing and mitigating cybersecurity risks to critical infrastructure.
- **Impact:** The program and related projects will provide improved operational utilization of large and complex data with modern data analytics techniques and enhanced tools and procedures. Enhanced risk analysis, consequence analysis, and threat intelligence data capabilities will improve incident response times and threat and mitigation correlation across Federal, State, local governments, and the private sector.

Type of Research

Applied and Developmental

Technical Readiness Level

Project is identifying concepts currently at TRL-2+, and in partnership with the interagency, academia, industry and CISA, developing them into operational capability (TRL-7), to inform planning for full operational implementation.

Transition Plans

- Deliver targeted exploratory, developmental, and operational capabilities directly to CISA for operational use.
- Co-develop a technology platform to accelerate data characterizations, discovery, and innovation directly with CISA partners and to accelerate the assessments of technology and transition of S&T and CISA partner research innovations into operational use.
- Transition architectural concepts to CISA for use in future planning through workshops, white papers, technical assessments, technical reports, data inventories, and joint experiments.
- S&T, in conjunction with CISA, may publish items on open-source GitHub and other platforms for general use.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Completed development of railroad infrastructure testing skid and deliver to CISA Control Environment Laboratory Resource (CELR).	FY 2020 Q4	FY 2022 Q3	6
Completed initial build for multi-cloud environment for next generation CISA architecture.	FY 2022 Q1	FY 2022 Q4	5
Delivered initial supply chain approaches, novel mitigation techniques, addressing software assurance, maturity, and composition.	FY 2022 Q1	FY 2022 Q4	2
Delivered report on supporting human analysts in novel and increasingly automated ways to support operational goals of classifying, characterizing, and mitigating threats.	FY 2022 Q1	FY 2022 Q4	7
Delivered study results and recommendations to CISA's National Risk Management Center on software assurance lifecycle maturity and mitigation techniques.	FY 2022 Q1	FY 2022 Q4	3
Delivered updated transition and integration strategy to ensure handoff of tools, techniques, and methodologies to DHS/CISA for deployment, analyst feedback, and refinement.	FY 2022 Q1	FY 2022 Q4	7
Generated computational analytics and methodologies for CISA to accelerate and exploit the understanding of tools and techniques that can significantly enhance threat intelligence.	FY 2022 Q1	FY 2022 Q4	4-6
Completed development of railroad infrastructure testing skid and deliver to CISA Control Environment Laboratory Resource (CELR).	FY 2020 Q4	FY 2022 Q3	6
	FY 2023		
Achieve FISMA compliance (Authorization to Proceed) for multi-cloud sandbox environment.	FY 2023 Q1	FY 2023 Q4	-
Complete model integration of the Trustmark open-source tools (e.g., Trust Policy Authoring software, Trustmark Binding Registry software) into enterprise-level single sign-on (SSO) and multi-factor authentication (MFA) capabilities to achieve improved usability along with greater security and compliance.	FY 2023 Q1	FY 2023 Q3	7
Complete two technical evaluation reports that summarize seedling research and development efforts in areas aligned to CISA technology requirements.	FY 2022 Q4	FY 2023 Q4	2-4
Conduct a pilot site implementation of the CAD-to-CAD (computer-aided dispatch) interoperability specification to demonstrate how standards-based interoperability can be achieved between disparate systems.	FY 2022 Q3	FY 2023 Q2	5
Conduct a technical exchange session with CISA to inform best practices for analytic environments and applications of analytic methods and tools for mission problems.	FY 2023 Q1	FY 2023 Q4	-
Deliver a focused 5G security study to CISA which identifies gaps for 5G in the areas of network security, cybersecurity, and supply chain security.	FY 2023 Q1	FY 2023 Q4	-
Deliver a knowledge product that uses stateful communication protocols SS7, Diameter and GTP Firewall with security-focused advanced analytics algorithms and a global threat intelligence service to ensure network borders are continually secured.	FY 2023 Q1	FY 2023 Q4	-

Research, Development, and Innovation – PPA

Cyber Security/Information Analysis R&D Thrust Area

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
Deliver a study with recommendations for high-performance, distributed, large-scale analytics for application to CISA use cases.	FY 2022 Q4	FY 2023 Q4	4-7
Deliver analysis of software supply chain protection techniques, software bill of materials validation approaches, and operational software test and evaluation tools.	FY 2022 Q4	FY 2023 Q4	5
Deliver capability advances in risk analysis for assessing cyber risks to critical infrastructure.	FY 2023 Q1	FY 2023 Q4	4-6
Deliver capability advances to CISA on the use of emulation and active data collection/analysis to gain information about adversaries to improve real-time network defense.	FY 2022 Q1	FY 2023 Q4	4-6
Deliver cybersecurity techniques to CISA which advances automated cyber threat prediction, recognition, identification, and mitigation.	FY 2023 Q1	FY 2023 Q4	4-6
Deliver prototype plans for software assurance and integrity approaches utilizing machine learning capabilities and environments.	FY 2022 Q4	FY 2023 Q4	4
Develop a use case to inform the analytic methods and tools for cyber and/or infrastructure missions for the multi-cloud sandbox environment.	FY 2023 Q1	FY 2023 Q4	4
Expand CISA's advanced analytics environment to support an infrastructure security use case.	FY 2022 Q2	FY 2023 Q4	-
Provide a demo of a seamless, multi-cloud sandbox environment for developing rapid analytics for CISA missions.	FY 2023 Q1	FY 2023 Q4	5-6
Transition the Deception Orchestration Leveraging Open-Source-Intel effort to CISA.	FY 2023 Q1	FY 2023 Q4	4-6
	FY 2024		
Conduct advanced analytics and machine learning experimentation for two new CISA mission use cases in a multi-cloud environment.	FY 2024 Q1	FY 2024 Q4	6
Deliver capability advances in risk analysis for assessing and mitigating cybersecurity risks to critical infrastructure.	FY 2024 Q1	FY 2024 Q4	4-6
Deliver interim analyses of software supply chain protection techniques, software bill of materials validation approaches, and operational software test and evaluation tools.	FY 2024 Q1	FY 2024 Q4	5
Deliver interim studies and prototype plans for software assurance and integrity approaches utilizing machine learning capabilities and environments.	FY 2024 Q1	FY 2024 Q4	4
Demonstrate an application that enables CISA to conduct secure, privacy-protecting collaborative computations in a multi-cloud environment.	FY 2024 Q1	FY 2024 Q4	4-6
Demonstrate novel approaches to mitigate operational risks for collaborating on ML and data science with partners in DHS and external CISA stakeholders (e.g., federal, academia, industry, etc.).	FY 2024 Q1	FY 2024 Q4	4-6
Transition capabilities using emulation, active data collection, and analysis to gain information about adversaries and improve real-time network defense.	FY 2024 Q1	FY 2024 Q4	5-6
Transition cybersecurity capabilities to CISA to advance automated cyber threat prediction, recognition, identification, and mitigation.	FY 2024 Q1	FY 2024 Q4	4-6

Cybersecurity for Law Enforcement

- **Problem:** A significant barrier for DHS Components with a law enforcement mission is adapting to constantly evolving technologies used in criminal enterprise tactics, as well as technologies and tools used to counter or investigate those activities.

New technologies, modalities, and training are required to equip and enable law enforcement to counter these evolving threats. Some of the threats being encountered include exploitation of vulnerable populations in local communities through malicious cyber activities, anonymous networks and currencies, cyber-physical attacks of fleet vehicle vulnerabilities, Internet of Things (IoT) vulnerabilities, and cyber-attacks against critical infrastructure. In addition, malicious code and open-source software vulnerabilities pose risks to Component software supply chains.

- **Solution:** This project supports the research, analysis and development of new technologies, capabilities, and standards to assist law enforcement in training, prevention against cyber-attacks, cyber-crime investigations, and the forensic analysis of technologies used in criminal activity. These solutions will be delivered through the following:
 - Cybersecurity Training for Law Enforcement: Develops cybersecurity training addressing the technological, social, and economic impacts of malicious cyber activities on vulnerable populations and entities, such as the aging workforce, the elderly, and other vulnerable targets of online criminal schemes. Survey, implement, and evaluate the impact of cybersecurity training for local law enforcement for the protection of local communities and cyber systems. Develops technology solutions to strengthen the cybersecurity and resiliency of local communities.
 - Fleet Vehicle Cybersecurity Analysis and Mitigation: Develops a “defense-in-depth”, privacy-compliant strategy to enhance capabilities to mitigate current and expected cyber-physical threats against vehicles used in DHS Component law enforcement protective missions. Provides material and non-material solutions to diagnose and prevent cybersecurity vulnerabilities in Component vehicle fleets, specifically addressing vulnerabilities in vehicle attack surfaces, (i.e., electronic control units (ECUs) and Controller Area Network (CAN) buses.)
 - Forensic and Operational Applications of Software Assurance Tools: Explores models, procedures, and practices to prevent malicious actors from altering software used by law enforcement entities in a way that opens the door for vulnerabilities. Provides zero trust capabilities in software used by law enforcement entities through continuous validation of a Software Bill of Materials (SBOM) throughout the entire supply chain, ensuring compliance with Executive Order 14028.
- **Justification:** The FY 2024 President’s Budget provides \$0.5M for this project, a \$1.0M decrease from the FY 2023 enacted. Funding for this project will evaluate current technologies to be targeted for development, modification, and integration to fit within the law enforcement operational mission space and develop low to no cost exportable cyber forensics tools and process training. In FY 2024, procedural designs and practices will be developed and tested to provide options for secure open-source software supply chain validation and acquisition guidance.

- **Impact:** These technologies, capabilities, and standards will reduce the amount of time needed to analyze technology used in illicit activity, reduce the cost of acquisition for law enforcement agencies, and narrow the technology capability gap between criminals and law enforcement. Development and deployment of these capabilities is critical to supporting the security of enterprise networks with zero trust architectures, ensuring law enforcement operations and investigation may continue uninterrupted.

Type of Research

Applied and Developmental

Technical Readiness Level

TRL varies for specific project activities between TRL-3 and TRL-7. This project's R&D efforts typically start by performing a market survey of available COTS and GOTS technology that could be adapted for DHS Component use. Identified technology is then adapted and validated in a laboratory or relevant environment (TRL-4/5). Following successful validation, the most promising solution(s) are then prototyped and evaluated first in a relevant environment (TRL-6) then in an operational environment (TRL-7) prior to transition.

Transition Plans

End-users and customers, including DHS law enforcement Components, test developed tools and technologies, and at times, the project provides limited hardware/software licenses to support transition. Otherwise, tools and technologies are transitioned into commercially available tools or integrated into law enforcement field deployment.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Delivered final report on needs assessment and gap analysis on the status of cybersecurity education capabilities for law enforcement.	FY 2022 Q1	FY 2022 Q4	-
	FY 2023		
Deliver to the Federal Law Enforcement Training Center a landscape assessment of current and next-generation Internet of Things devices to support development of training for law enforcement entities.	FY 2023 Q2	FY 2023 Q4	3
	FY 2024		
Deliver low and no-cost exportable cyber forensics tools and processes for training of federal, state, local, tribal, and territorial law enforcement entities, especially those in remote or rural locations.	FY 2024 Q1	FY 2024 Q4	6
Develop/modify select technologies for testing and evaluation within Component operational mission spaces.	FY 2024 Q1	FY 2024 Q4	6
Provide tested procedural designs and practices for secure open-source software supply chain validation and acquisition guidance.	FY 2024 Q1	FY 2024 Q4	3

First Responder/Disaster Resilience Thrust Area Research and Development

Technology Readiness Level Exhibit

(Dollars in Thousands)

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget
First Responder / Disaster Resilience Thrust Area	\$77,715	\$55,950	\$28,750

R&D Thrust Area Description

FIRST RESPONDER / DISASTER RESILIENCE THRUST AREA: Work includes reducing vulnerability of critical infrastructure to terrorist attacks and other hazards; working with State, Local, Tribal, and Territorial (SLTT) governments to secure their information systems; working with local and regional partners to identify hazards, assess vulnerabilities, and develop strategies to manage risks associated with all hazards; increasing the level of preparedness of SLTT partners, as well as nongovernmental organizations, the private sector, and the general public; advancing and improving disaster emergency and interoperable communications capabilities; and improving capabilities of DHS and its Components to lead in emergency management.

FIRST RESPONDER / DISASTER RESILIENCE THRUST AREA <i>(Dollars in Thousands)</i>				
Program	Project	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget
Total –First Responder / Disaster Resiliency Thrust		\$77,715	\$55,590	\$28,750
Community and Infrastructure Resilience		\$51,978	\$40,550	\$10,000
	Climate Adaptation and Resilience	\$28,000	\$20,000	-
	Community Resilience Testbeds	\$3,650	\$3,200	\$2,500
	Critical Infrastructure Resilience	-	\$4,000	-
	Disaster Recovery	\$4,500	\$4,200	\$3,500
	Flood	\$11,928	\$6,000	\$3,000
	Next Generation Disaster Proofing	\$3,900	\$3,150	\$1,000
First Responder Capability		\$25,737	\$15,400	\$18,750

FIRST RESPONDER / DISASTER RESILIENCE THRUST AREA (Dollars in Thousands)				
Program	Project	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget
	Explosives & Radiological/Nuclear Resiliency	\$4,500	\$1,500	\$1,500
	First Responder Technologies	\$7,897	\$5,000	\$6,500
	Personal Protective Equipment (formerly Compact Personal Protective Equipment)	\$3,075	\$1,500	\$2,500
	Public Safety Communications	\$1,500	\$1,500	\$1,500
	Response and Defeat Operations Support (REDOPS)	\$3,515	\$3,000	\$3,000
	Stakeholder Engagement and Requirements (First Responder Requirements Group & International)	\$1,500	\$500	-
	Training and Optimization Performance	\$3,750	\$2,400	\$3,750

Community and Infrastructure Resilience Program – This program conducts research and develops innovative solutions and standards. It performs operational experimentation required to adapt and transition climate science and new technologies completed by S&T and other agencies on behalf of FEMA and CISA.

Climate Adaptation and Resilience

- Problem:** Climate change directly affects the Homeland Security missions of DHS. FEMA and CISA require access to the latest science and technology to address the risks and impacts of climate change. Climate change is driving sea level rise and changing weather patterns, resulting in increased droughts, floods, hurricanes, and wildfires. Changing weather patterns directly impact the nation's agricultural sector. The Nation faces increased loss of lives, infrastructure damages, and economic costs due to natural disasters driven by climate change. These increases affect the ability of the Federal government to financially support disaster recovery and maintain a sound financial framework for FEMA's Federal Insurance and Mitigation Program and its programs. The impact of climate change extends beyond the United States. Instability and displacement in one country have ripple effects which can be felt throughout regions across the world. Meeting this challenge requires mobilizing science at an unprecedented scale to address the long-term effects and the near-term impacts to Homeland Security and public safety. New technologies and sciences are needed to respond to climate change, and create opportunity for specialized jobs, strong economies, and a more secure world. Climate change directly affects the homeland security mission of DHS. FEMA and CISA need access to the latest science and technology to address the risks and impacts of climate change. Climate change is driving sea level rise and changing weather patterns resulting in increased droughts, floods, hurricanes, and wildfires. Changing weather patterns directly impact the nation's agricultural sector. The Nation faces increased loss of lives, infrastructure damages, and economic costs due to natural disasters driven by climate change. These increases affect the ability of the Federal government to financially support disaster recovery and develop and maintain a sound financial framework for FEMA's Federal Insurance and Mitigation Program and its programs. In addition, climate change is a global problem. Instability and displacement in one country

caused by catastrophic disasters and food insecurity have ripple effects which can be felt throughout regions and across the world. Meeting this challenge requires mobilizing science at an unprecedented scale to address the long-term effects and the near-term impacts to Homeland Security and public safety. New technologies and sciences are needed to respond to climate change, and these new technologies will create the opportunity for good jobs, strong economies, and a more secure world.

- **Solution:** DHS will support State and local governments to meet the Administration’s climate change and resiliency goals through Departmental programs. These programs aim to set policies, guidelines and standards, and administer grants. S&T performs the research, development, innovation, and operational experimentation needed to evolve climate science research. S&T is applying research addressing the long-term changes in risk from multiple compounding hazards, such as flooding and hurricanes. S&T will lead coordination of research needs and requirements for climate change to the HSE, in collaboration with DOE for new insurance and economic risk sharing solutions, and develop smart materials for more resilient buildings and infrastructure, use of alternative energy vehicles for disaster response, and carbon sequestration technologies for debris removal and risk reduction, such as forest undergrowth thinning, early warning sensors and disaster resilience, adaptation, and sustainability modeling. S&T will accomplish this by tapping into the imagination, talent, and grit of America’s innovators, scientists, and workers. S&T will fund this collaborative research in climate adaptation and resilience with the new ARPA-C that will be located within DOE. The ARPA model of high-risk, accelerated research is uniquely meant to conduct R&D that, if successful, results in transformational technology advancements.
- **Justification:** The FY 2024 President’s Budget does not include funding for this project.
- **Impact:** Components will be able to reduce disruptions and mitigate risks to critical infrastructure, improve social and environmental equity in climate resilience, improve the resilience of critical information and communication technology, and promote solutions for strengthening climate resilience and reducing carbon emissions.

Type of Research

Applied and Developmental

Technical Readiness Level

TRL varies for specific project activities between TRL-3 and TRL-7. This program’s R&D efforts will begin by conducting a requirements analysis and gap analysis including performing a market survey of available COTS and GOTS technology that could be adapted for DHS Component use. Active research and development will be initiated to prove feasibility (TRL-3). A system concept utilizing the identified technologies is then developed and validated in a relevant environment (TRL-5). Following successful validation, the most promising solution(s) are then prototyped and evaluated first in a relevant environment (TRL-6) then in an operational environment (TRL-7) prior to transition and end user adoption.

Transition Plans

The intended pathway for the transition of the Climate Adaptation and Resilience technologies, materials, and knowledge products are to submit the final prototypes and findings to FEMA and CISA at the end of the period of performance for each activity. Success will be determined by FEMA's and CISA's ability to implement climate change mitigation practices and work with SLTT governments to enforce these practices in an effort to better protect their communities. The intended end users are community officials and individuals that use novel materials to affordable and environmentally friendly solutions for strengthening climate resilience. A successful transition will be able to be implemented in communities that are the most impacted by climate change and will provide greater social and environmental equity and climate resilience.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
FY 2022			
Conducted Climate Resilience Innovation Prize Competition for Novel Cooling Solutions to reduce morbidity and mortality from extreme heat emergencies.	FY 2022 Q1	FY 2022 Q4	3-7
Conducted ideation sessions and solicit stakeholders' input to identify novel solutions, approaches, and technologies for addressing key DHS climate adaption and resilience goals.	FY 2022 Q1	FY 2022 Q4	-
Conducted research analysis on climate adaption and resilience efforts within local communities such as actions that integrate climate change and future risk into planning, zoning, and land use to identify best practices and success stories.	FY 2022 Q2	FY 2022 Q4	3-7
Delivered requirements analysis and plan for future R&D efforts.	FY 2022 Q1	FY 2022 Q4	5-7
Initiated requirements analysis.	FY 2021 Q3	FY 2022 Q2	-
Launched Climate Resilience Innovation Prize Competition for environmental and carbon-friendly debris remove and forest vegetation undergrowth thinning solutions.	FY 2022 Q3	FY 2022 Q4	3-7
FY 2023			
Conduct Climate Resilience Innovation prize competition for wildfires.	FY 2023 Q1	FY 2023 Q4	3-7
Conduct demonstration of hydrogen fuel powered vehicle for disaster response and recovery to foster the use of alternative energy equipment.	FY 2023 Q1	FY 2023 Q2	3-7
Identify scientifically sound sources of data on social equity related to disaster resilience and public action plans to improve disaster resilience outcomes.	FY 2023 Q3	FY 2023 Q4	3-5
Research and identify initial use cases for technologies to enable sensors with on-board analytics for automated alerting.	FY 2023 Q1	FY 2023 Q3	3-7
Research new insurance and economic sharing solutions to identify critical data and capability gaps to conduct policy incubation experiments to increase climate resilience.	FY 2023 Q1	FY 2023 Q3	3-5

Research, Development, and Innovation – PPA**First Responder/Disaster Resilience Thrust Area**

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2024		
Complete a parametric study on the effects of geometry and materials using ERDC's Centrifuge Research Complex.	FY 2024 Q2	FY 2024 Q4	4
Complete development of training to enhance climate literacy programs and develop the future homeland security climate resilience workforce.	FY 2024 Q1	FY 2024 Q4	4-7
Conduct demonstration of alternate fuel powered vehicle for disaster response and recovery to foster the use of alternative energy equipment.	FY 2024 Q1	FY 2024 Q3	3-7
Develop capability to model cascading dam failures to enhance the accuracy of dam and levee failure simulations.	FY 2024 Q2	FY 2024 Q4	4

Community Resilience Testbeds

- **Problem:** The consequences of manmade and natural disasters continue to rise on an annual basis. FEMA, State, and local communities need access to new and emerging innovative technologies to strengthen critical infrastructure lifelines, mitigate hazard vulnerabilities, and strengthen residential housing and commercial structures to reduce disaster risks and allow for a timelier recovery period.
- **Solution:** This R&D will pursue emerging technologies for streamlining/optimizing FEMA disaster resilience investments in insurance, mitigation, and recovery operations/assistance programs, and enable State, local, and private sectors. This will include setting up testbeds with local communities and the private sector to assess, evaluate, and innovate new approaches and technologies; and to serve as proving grounds for enhancing cooperation between Federal, State, local, and private sector to spur innovation and ensure new technologies and approaches work and are implementable.
- **Justification:** The FY 2024 President’s Budget provides \$2.5M for this project, a \$0.7M decrease from the FY 2023 enacted. Funding for this project will be used to experiment, evaluate, validate, and support the transition of future R&D outputs to FEMA and its external stakeholders including high risk areas and assisting FEMA with updating related policy, doctrine, operations, and training plans. In addition, funds will support ready to implement R&D projects for Civic Innovation that address the needs of DHS, FEMA, and its stakeholders in building community resilience. Further, funding will support community-level testing and evaluation of the Compound Flood modeling toolset.
- **Impact:** In support of FEMA, this program will evaluate and validate new solutions to reduce fatalities and property losses, keep pace with the Nation's evolving disaster risks, expand State and local capacities, and prioritize and optimize its pre- and post- disaster grants programs.

Type of Research

Developmental

Technical Readiness Level

The project efforts will range between TRL-5 and TRL-7. This project’s R&D efforts include Performing a market survey of available COTS and GOTS technology that could be adapted for FEMA use. A system concept utilizing the identified technologies is then developed and validated in a relevant environment (TRL-5). Following successful validation, the most promising solution(s) are then prototyped and evaluated first in a relevant environment (TRL-6) then in an operational environment (TRL-7) prior to transition.

Transition Plans

The intended transition pathway is to transfer operational tools and knowledge products to FEMA at the end of the period of performance for each activity. Success will be determined by FEMA’s ability to implement community resilient technologies and best practices in selected communities. The intended end users are state, local, and tribal governments in those communities heavily impacted by natural disasters. The desired end state is to

Research, Development, and Innovation – PPA**First Responder/Disaster Resilience Thrust Area**

implement new solutions, grant programs, and investments in technology and disaster planning. Transition measures of success for this effort will be demonstrated by a reduction in the number of fatalities and property losses following a natural disaster.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Established community resilience testbeds between local communities, research entities, and private sector partners that serve as proving grounds for assess, evaluate, and innovate new approaches and technologies for resilience and risk reduction.	FY 2022 Q1	FY 2022 Q4	6
	FY 2023		
Conduct field-level testing and evaluation of FY 2022 natural disaster innovations from the community and infrastructure resilience R&D investments within S&T community resilience testbeds.	FY 2023 Q1	FY 2023 Q4	3-7
Launch stage two of the national resilience Civic Innovation Challenge that connects researchers, community partners, and industry to solve key resilience challenges through new approaches, solutions, and technologies.	FY 2023 Q2	FY 2023 Q4	3-7
	FY 2024		
Conduct community-level testing and evaluation of the Compound Flood modeling toolset.	FY 2024 Q1	FY 2024 Q3	4-7

Critical Infrastructure Resilience

- **Problem:** Critical infrastructure resilience is vital to the national economic security, and national public health and safety. The Nation’s critical infrastructure is dependent on physical and electronic-based systems for many applications to maintain operations, which are at risk from man-made and natural events. In addition to the use of GPS for position and navigation, timing is an essential element for many critical infrastructures, such as the electric grid, telecommunications, transportation, and emergency services. Other electronic capabilities within critical infrastructure ecosystems are susceptible to intentional attack or natural occurrence of electromagnetic pulses (EMP) and geomagnetic disturbances (GMD). Currently, critical infrastructure owners and operators lack solid, data-driven information on the Positioning, Navigation, and Timing (PNT) and EMP threats, and the impacts to their sectors. This research fills that knowledge gap and provides CISA and infrastructure stakeholders with actionable information.
- **Solution:** The research from this effort will inform best practices and provide tools to critical infrastructure owner and operators on how best to prepare for and protect PNT capabilities and protect electronic systems against an EMP or GMD event. Activities focus on testing, evaluating, validating the impacts on select, prioritized critical infrastructure, including 5G infrastructure, to provide industry with actionable, timely information on how to protect their systems before widespread buildouts of new infrastructure occur. This research will enhance security and resilience of both government and private sector critical infrastructure from disruption, corruption, and dysfunction of infrastructure systems by addressing sector risks, mitigation options, and opportunities for industry to innovate novel solutions. This will be accomplished through the following:
 - Positioning, Navigation, and Timing (PNT): This research supports the CISA mission to enhance security and resilience of both government and private sector PNT disruption, corruption, and dysfunction of critical infrastructure by addressing sector risks, mitigation options, and opportunities for industry to innovate and participate with S&T.
 - Electromagnetic Pulse (EMP) Resiliency: This work builds knowledge and expands the understanding of the effects of EMP events on critical infrastructure. This work builds knowledge and expands our understanding of the impacts and effects of EMP events on critical infrastructure. The objective is focused on providing useful information and products to inform strategy, policy, and most importantly, critical infrastructure owners and operators (CI O&O). The research from this effort will inform best practices and provide tools to critical infrastructure owner and operators on how best to prepare for and protect against an EMP or GMD event.
- **Justification:** The FY 2024 President’s Budget does not provide funding for this project.
- **Impact:** This project will improve risk strategies and provide mitigation solutions to address new threats to PNT systems and the impacts of an EMP/GMD events through the enhancement of risk analysis and mitigation approaches to the first order effects on critical infrastructure and secondary economic and societal impacts.

Type of Research

Applied and Developmental

Technical Readiness Level

Project is identifying concepts currently at TRL-2+, and in partnership with the interagency, academia, industry and CISA, developing them into operational transition (TRL5+), to inform planning for full operational implementation.

Transition Plans

The intended transition pathway is to transfer operational tools and knowledge products to CISA at the end of the period of performance. Success will be determined by CISA's ability to implement critical infrastructure technologies and best practices in selected communities. The intended end users are critical infrastructure owners and operators, of which the new technology would provide solutions that address threats against PNT. The desired end state is to provide risk analysis and mitigation approaches that would lessen or eliminate the impact of an EMP/GMD event. Transition measures of success for this effort can be measured by its societal and economic impacts of persistent and reliable PNT.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Developed an "EMP Mitigation: Best Practices for Critical Infrastructure Operators and Owners" document that will be jointly published with CISA.	FY 2021 Q4	FY 2022 Q4	-
	FY 2023		
Deliver to CISA reports of assessments of tools, techniques and procedures addressing impacts to critical infrastructure systems from position, navigation, and timing (PNT) disruptions.	FY 2023 Q1	FY 2023 Q4	4
Develop framework to enhance modeling capabilities tailored to critical infrastructure owners and operator's business and technical roles, to enhance the ability to analyze the impact of employing electromagnetic pulses (EMP) mitigations on their infrastructure.	FY 2023 Q2	FY 2023 Q4	5
Develop planning and logistics for assessments, testing, and validation of electromagnetic pulses (EMP) vulnerabilities related to 5G infrastructure.	FY 2023 Q2	FY 2023 Q4	4
	FY 2024		
Conduct analysis on and test critical communications systems components to experimentally verify component vulnerability and upset thresholds.	FY 2023 Q4	FY 2024 Q4	4
Develop a report based on conducted power station vulnerability assessments coupled with assessments of commercially available electromagnetic pulses (EMP) mitigation technology.	FY 2023 Q4	FY 2024 Q3	4
Develop plan to conduct GPS Equipment Testing for Critical Infrastructure (GET-CI)-series test event in Fiscal Year 2025 for manufacturer real world equipment evaluation and to promote end-user vulnerability awareness.	FY 2024 Q1	FY 2024 Q4	5

Disaster Recovery

- **Problem:** Natural disasters are a leading cause of fatalities and economic loss in the United States. Recovery is the most expensive and time-consuming phase of disaster management. Local communities need access to new and emerging technologies to streamline and optimize FEMA’s disaster recovery operations and assistance programs. Communities need to speed up the process and reduce the time necessary to return to normal, restore critical functions and community lifelines, and help survivors get back to their daily lives.
- **Solution:** This project will develop new processes, products, and standards to improve operations and outcomes in FEMA, including promoting national preparedness and protective measures, preparing for catastrophic disasters, and reducing the complexity of FEMA. It will improve FEMA, State, local, and private sector abilities to recovery from disasters, return to normal, restore critical functions and community lifelines.
- **Justification:** The FY 2024 President’s Budget provides \$3.5M for this project, a \$0.7M decrease from the FY 2023 enacted. Funding for this project will support R&D needs aligned to FEMA strategic plan objectives, including providing support for FEMA operational functions such as housing inspections, National Flood Insurance Program (NFIP) claims processing, implementation of FEMA disaster programs, Disaster Recovery grant programs for Individual and Public assistance, and FEMA grant programs such as emergency management, firefighter assistance and safety, and hazard mitigation grants to reduce disaster recovery costs and losses. In FY 2024, funding will also support demonstrations of Mutual Aid tools for the advancement of tactical *National Urban Search & Rescue* Response System (US&R) management.
- **Impact:** In direct support to FEMA, this program will speed up recovery aid to affected communities; streamline individual and household assistance efforts using new technology; improve, rebuild, and restoration functions through improved damage assessments; reduce assistance complexities for communities and disaster survivors; and enable expedited government decision-making.

Type of Research

Applied and Developmental

Technical Readiness Level

The project efforts will range between TRL-3 and TRL-7. This project’s R&D efforts include:

- Develop new science, technology, and methods for improving accuracy and performance of hazard modeling and analytics that would support key decision points (TRL-3).
- Publish a Broad Agency Announcement to select technologies that have a likelihood of meeting published requirements and fund development (TRL-4).
- Validate the technologies in a relevant environment (TRL-5).
- Evaluate prototype technologies in a relevant environment (TRL-6).
- Transition to FEMA at (TRL-7).

Transition Plans

The intended pathway for transition of this knowledge product is to submit the results to FEMA at the end of the period of performance, and to share the outputs of this foundational research and analysis with SLTT governments in an effort to identify actionable items and strategies with the goal of helping to improve individual and community preparedness. The desired end-state is to fully understand when Federal assistance helps or hinders the recovery processes or outcomes. This will be accomplished by systemically examining disaster recovery efforts in context when Federal disaster assistance is not requested or is denied. Transition measures of success for this program will be determined by the handoff to FEMA and the dissemination of the final study results to SLTT governments.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Field tested and demonstrated wildfire sensor capabilities in live environment.	FY 2022 Q1	FY 2022 Q3	4
	FY 2023		
Conduct a capability demonstration focused on WUI-related (wildland urban interface) technology integrations with the FEMA IPAWS system; to include potential technologies such as in-vehicle alerting, mapping and navigation applications, alert originator systems, unattended sensor networks, or other relevant capabilities.	FY 2023 Q1	FY 2023 Q4	6
Enhance tools for incorporation into disaster recovery planning and community recovery efforts.	FY 2023 Q3	FY 2023 Q4	3-7
Enhance tools to provide access to information on useable, actionable guidance, helping communities and private institutions build resilience into disaster recovery.	FY 2023 Q3	FY 2023 Q4	3-7
	FY 2024		
Demonstrate Mutual Aid tools for the advancement of tactical National Urban Search & Rescue Response (US&R) System.	FY 2024 Q1	FY 2024 Q4	3-7

Flood

- **Problem:** Flooding is a leading cause of fatalities and economic losses in the United States from natural disasters. Communities need new and emerging technologies to increase their resilience to flood disasters and provide flood predictive analytic tools to the FEMA and to State and local governments to reduce future flood fatalities and economic damages.
- **Solution:** This program will develop new processes, products (sensors, data sets, analytic tools, imagery), and standards to improve operations and outcomes in FEMA (including the Flood Insurance and Mitigation Administration, flood assistance programs, and dam safety programs), other Federal agencies and the insurance industry. S&T is developing low-cost, network-connected flood sensors to improve regional and local flood prediction; new ML algorithms to detect buildings and other structures in hi-resolution satellite imagery, which will in turn create a national structures inventory to improve flood insurance risk evaluations and underwriting; and a variety of standards and specifications to support individual and community investments in flood-proofing products. These innovations will assist Federal, State, local, tribal, territorial, and other stakeholder groups in making planning, disaster response and recovery, and investment decisions related to floods. Specifically, S&T will develop the following:
 - New flood sensors and alerting: Develop and test an integrated flood warning system incorporating inexpensive, deployable flood sensors; information integration and modeling software; and an automated smartphone-based, geo-targeted alert system. Create flood alert models, tuned to local terrain that can provide longer lead-times and more accurate geo-targeting. Investigate the potential of adapting these technologies to dam/levee integrity monitoring.
 - Smarter remote sensing and situational awareness: Utilize a cross-section of imaging technologies (e.g., aerial Laser Imaging Detection and Ranging (LiDAR), high-resolution satellite based synthetic aperture radar) and emerging technologies (e.g., UAS) to improve the image base, exploit historical satellite imagery, and exploit emerging digital elevation modeling technologies to improve the definition and accuracy of flood hazard areas, including flood hazards in areas not included in FEMA Special Flood Hazard Areas (SFHAs).
 - New products from high performance computing and artificial intelligence: Apply computer learning technologies and facial recognition algorithms to the development of a national inventory of structures database for flood-prone areas, especially for identified FEMA SFHAs, including type of structure, elevation, tax assessment, ownership, and other relevant data. Work with private sector companies to investigate the feasibility of transitioning the national structures inventory to become a commercial product that supports flood and other disaster insurance underwriting.
 - Realigned economic incentives and risk analysis: Support more cost-effective investment decisions improving the resiliency of residential properties, business continuity, and public/private infrastructure resilience by improving the mitigation decision-making tools available, including integrated analytics such as Kentucky's Community Hazard Assessment and Mitigation Planning System tool, and the use of low cost historical satellite imagery to identify flood prone areas outside of those mapped to date by FEMA.

- Enhance community resilience: Promote faster and more complete recovery from flood disasters by identifying quantitative indicators of resilience that have practical use in guiding and mitigating investment decisions and by developing standard operating procedures, planning methodologies, and quantitative methods to integrate resilience analysis into local and State flood planning, response, and mitigation activities.
- Improve flood data quality and access: Provide decision-makers with access to the data they need and when they need it through developing a roadmap of the best available flood decision data for all data categories. As well as, developing new types of flood sensors that are cheap enough to be widely distributed and easily moved, developing technologies to create, maintain, and share elevation and structure footprint data, and developing new technical methods for filling decision data gaps.
- Improve predictive models and analytical services: Provide decision-makers with access to better models for all phases of flood management. Review all available flood models and forecasting tools with multiple uses and users in mind; create flood alert models, tuned to local terrain, which can provide longer lead-times and more accurate geo-targeting; provide better coverage of inland and flash flooding, accounting for increased impervious surfaces and the availability of fine-grained elevation data from new technology, and expand the coverage of models to better forecast the aftermath of floods.
- **Justification:** The FY 2024 President’s Budget provides \$3.0M for this project, a \$3.0M decrease from the FY 2023 enacted. Funding for this project will support the continued research and development for the needs of FEMA and the flood risk management community for the national flood insurance program. Funding will also support component-level testing and evaluation of the Community Lifeline System toolset.
- **Impact:** This program supports FEMA in the enhancement of whole community collaboration around disaster risk reduction, leveraging existing data sources to create multi-dimensional representations of community functions using an integrated system-of-systems approach, and empowering communities with decision support capabilities to enable both pre-event scenario-based risk planning and adaptive recovery in the post-event environment.

Type of Research

Applied and Developmental

Technical Readiness Level

The project efforts will range between TRL-4 and TRL-7. This project’s R&D efforts include:

- Perform market surveys and assessments of remote sensor technologies that could be suitable for use in multi-hazard, multi-environment operational missions. Initial studies also involve mission assessments, workshops, and interviews with end users and SMEs to determine system requirements. The outputs of these efforts will be used to define the system concept for subsequent development.
- Publish a Broad Agency Announcement to select technologies that have a likelihood of meeting published requirements and fund development (TRL-4).

- Validate technologies in a relevant environment (TRL-5).
- Evaluate prototype technologies in a relevant environment (TRL-6).
- Transition to FEMA at TRL-7.

Transition Plans

The intended transition pathway is to transfer operational tools and knowledge products to FEMA. Success will be determined by FEMA’s ability to implement flood hazard modeling and impact assessment tools in selected communities initially. The intended end users are first responders and the communities where flood hazard modeling and impact assessment support processes would benefit most. The desired end state is to build a culture of preparedness across the United States therefore reducing flood related fatalities and property losses. Transition success for this effort will be measured by emergency managers’ ability to leverage data sources and modeling programs to create pre- and post-event risk planning to enable faster decision making.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Provided decision support tools to FEMA for deployment to Federal, State, local users, and other stakeholders, including non-governmental agencies.	FY 2022 Q1	FY 2022 Q4	4-7
Developed DSS-Wise cascading impacts - tool enhancements.	FY 2022 Q1	FY 2022 Q4	4-7
Deployed enhancements to the Decision Support System for Water Infrastructure Security (DSS-WISE) web-enabled dam breach modeling and simulation service.	FY 2022 Q1	FY 2022 Q4	4-7
Transition reported on flood preparedness, response, tools, and best practices.	FY 2022 Q1	FY 2022 Q4	4-7
Launched Flood Detection and Modeling Prize Challenge.	FY 2022 Q2	FY 2022 Q4	4-7
Launched Insurtech innovation pilot for remote flood claims validation.	FY 2022 Q2	FY 2022 Q4	4-7
Provided new guidelines for a national standard for dam assessment monitoring and reporting.	FY 2022 Q1	FY 2022 Q4	4-7
Researched Compound Flood Events and Protective Action Guidance.	FY 2022 Q1	FY 2022 Q4	4-7
	FY 2023		
Complete community requirements documentation for the decision support tool for compound flooding.	FY 2023 Q1	FY 2023 Q2	4-7
Conduct research into new market innovations, incentives, and policy options related to parametric insurance services and micro-financing to improve risk reduction outcomes and advance social and environmental equity.	FY 2023 Q2	FY 2023 Q4	4-7

Research, Development, and Innovation – PPA**First Responder/Disaster Resilience Thrust Area**

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
Conduct research, testing, and evaluation of Fiber Reinforced Polymers for concrete dams and water infrastructure.	FY 2023 Q1	FY 2023 Q4	4-7
Develop DSS-Wise next generation enhancements in support of the National Levee and National Dam Safety Communities.	FY 2023 Q1	FY 2023 Q4	4-7
	FY 2024		
Conduct component-level testing and evaluation of the Community Lifeline System toolset.	FY 2024 Q2	FY 2024 Q4	4-7
Further advance DSS-Wise in support of FEMA and the National Levee and National Dam Safety Communities.	FY 2024 Q1	FY 2024 Q4	4-7

Next Generation Disaster Proofing

- **Problem:** The costs of manmade and natural disasters continue to rise on an annual basis in the United States. FEMA, State, and local communities need access to new and emerging technologies and innovations that reduce risk, improve protective measures, optimize mitigation investments, and decrease the damages, disruption, and ultimate costs of disasters.
- **Solution:** This research and development will pursue new/emerging technologies and standards for streamlining/optimizing FEMA disaster resilience investments in insurance, mitigation, and recovery operations/assistance programs and enable the States, local communities, and the private sector. Other examples of targeted research and development outcomes are developing new approaches to optimizing resilience investment to reduce disaster risk and losses, measure community resilience and monitor effectiveness over time, and new technologies to reduce damages to residential structures, public assets, and critical infrastructure.
- **Justification:** The FY 2024 President’s Budget provides \$1.0M for this project, a \$2.2M decrease from the FY 2023 enacted. Funding for this project will support R&D projects that pursue new/emerging technologies that reduce damages to structures, public assets, and infrastructure, and enhance FEMA mitigation program effectiveness. In FY 2024, the program plans to collaborate with FEMA to determine next-level Prize Competitions for natural disasters.
- **Impact:** This program supports FEMA’s pre- and post- disaster assistance programs, 20,000 communities participating in the NFIP and numerous State/local partners and critical infrastructure operators. These R&D investments allow FEMA to keep pace with the Nation's evolving flood risk, enable State and local capacity, and reduce fatalities and property losses.

Type of Research

Developmental

Technical Readiness Level

TRL varies for specific project activities between TRL-5 and TRL-7. This program’s R&D efforts will begin by performing a market survey of available COTS and GOTS technology that could be adapted for FEMA use. A system concept using the identified technologies is then developed and validated in a relevant environment (TRL-5). Following successful validation, the most promising solution(s) are then prototyped and evaluated first in a relevant environment (TRL-6) then in an operational environment (TRL-7) prior to transition.

Transition Plans

The intended transition pathway is to transfer disaster assistance programs to FEMA at the end of the period of performance for each activity. Success will be determined by FEMA’s ability to implement new standards and best practices in selected communities. The intended end users are SLTT government partners that manage community recovery operations following a natural disaster. The desired end state is to increase the number

Research, Development, and Innovation – PPA**First Responder/Disaster Resilience Thrust Area**

of people that benefit from disaster resilience research efforts in insurance and more rapid and efficient recovery operations. Successful transition for this effort will be measured by a reduction in lives lost following a natural disaster.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Initiated efforts to enhance Wildland Fire Alerts Warnings and Notifications.	FY 2022 Q3	FY 2022 Q4	5
	FY 2023		
Initiate the development of performance standards and best practices for disaster proofing Innovations.	FY 2023 Q3	FY 2023 Q4	5-7
Launch Disaster Proofing Innovations Prize Competitions for natural disasters.	FY 2023 Q3	FY 2023 Q4	5-7
	FY 2024		
Collaborate with FEMA to determine next-level Prize Competitions for natural disasters.	FY 2024 Q1	FY 2024 Q2	5-6

First Responder Capability Program – This program develops and transitions technologies, information, procedures, and CONOPS to aid FSLTT first responders, emergency managers, and incident commanders as they respond to hazardous situations. It assists emergency response communities through test and assessment of technologies for usability and seeks to transition viable solutions to the commercial marketplace to help make them available across all first responder communities.

Explosives & Radiological/Nuclear Resiliency

- **Problem:** A Radiological Dispersal Device Detonation or Nuclear Detonation are high consequence incidents and pose tremendous challenges to the first responder community and HSE in preparing for, responding to, and recovering from these events.
- **Solution:** S&T uses the National Urban Security Technology Laboratory (NUSTL) to improve responder preparedness for the complexity of a radiological/nuclear incident response and recovery operations. By working with partner agencies, Federal interagency working groups, and first responders, S&T will identify impactful opportunities that address technology and research needs in the areas of radiological/nuclear response management, incident characterization, initial response capabilities, medical care/triage, casualty/evacuee care, impacted area stabilization/control, and site cleanup/decontamination.
- **Justification:** The FY 2024 President’s Budget continues to provide \$1.5M for this project. Funding for this project will execute research and development activities in support of FEMA in their role in preparing first responders and SLTT communities for radiological/nuclear incidents. This R&D will include: a continued focus on preparing for longer-term recovery, including developing tools to support increased awareness and considerations for responders; studying new techniques for contamination containment, mitigation and decontamination, and researching other topics beyond immediate response that focus on incident stabilization to radiological clean-up; research and tool development on incident data management to support a common operating picture of all levels of government across the entirety of a response; development of tools that support radiological data standardization to support decision-making; and study of unmanned systems for remote operations that support responders in contaminated or unsafe environments.
- **Impact:** The project will result in improved radiological/nuclear response capabilities at the FSLTT levels through strategic investment in projects focused on increasing agency preparedness, improving government understanding of impacts and risks, and developing guidance, technology and other actionable solutions to radiological and nuclear capability gaps and mission needs.

Type of Research

Developmental

Technical Readiness Level

TRL varies for specific project activities between TRL-3/4 and TRL-7. This project’s R&D efforts typically start by performing market research of available COTS and GOTS technology as well as evaluation of existing research and interagency capabilities in modeling, analysis, and other

expertise that can be leveraged for first responder capability needs. Identified solutions are adapted, enhanced, tested, and piloted for planning, preparedness, and response operations to meet first responders and SLTT needs (TRL-6/7). Examples that support the R&D milestones are below:

- Enhancing modeling capabilities available through the FEMA-led IMAAC for radiological/nuclear incidents that support FSLTT decision-making on protective actions and response and recovery activities (TRL 5-7).
- Developing toolkits and guidance documents based on subject matter expertise, techniques and knowledge from the Department of Energy national laboratory network that can be implemented by SLTT responders, including for data quality assessment (DQA) techniques, and conducting wide around background survey (TRL 7).

Transition Plans

S&T will leverage existing radiological modeling, training, and preparedness organizations to include FEMA, DOE National Nuclear Security Administration (NNSA) and the Environmental Protection Agency (EPA) in transitioning and transferring for distribution and integration of the developed technology and knowledge products into SLTT radiological and nuclear preparedness and response activities. Typically, publications of knowledge products are shared through existing government websites or repositories of information. Technology investments are typically made into existing systems that are owned, operated, and maintained by the partners listed above.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Completed a simplified interface with streamlined input fields that allows FSLTT users to independently and accurately self-request radiological and nuclear modeling products for exercise use.	FY 2021 Q2	FY 2022 Q4	7
Completed development work for web-based and deployable application-based versions of the Nuclear Hazard Zone Tool, a tool that decision-makers can use to rapidly generate actionable protective action guidance and initial effects modeling following a suspected or confirmed nuclear detonation in the United States as part of the Interagency Modeling and Atmospheric Assessment Center (IMAAC) suite of tools.	FY 2017 Q1	FY 2022 Q1	7
Completed just-in-time training videos for radiological and nuclear briefings and modeling products in support of the IMAAC.	FY 2020 Q3	FY 2022 Q2	7
Completed technical support to the interagency, FEMA-led update to the 2010 Planning Guidance for Responding to Nuclear Detonation and supporting the interagency release of the updated Guidance for improved knowledge of the hazard and actions for planning by FSLTT emergency responders.	FY 2019 Q1	FY 2022 Q1	7
Demonstrated completed new request for information and assistance portal from the DOE Consequence Management Home Team in major interagency exercise with State and local partners for validation.	FY 2020 Q1	FY 2022 Q3	7

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Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
Developed actionable recovery planning guidance based on sound scientific principles and existing research for conducting public health decision making, gross-decontamination, clean-up, waste management, and repopulation following an RDD detonation.	FY 2020 Q2	FY 2022 Q4	7
Developed additional Turbo FRMAC features to improve FSLTT ability to assess and understand radiation impacts following a radiological and nuclear emergency.	FY 2021 Q1	FY 2022 Q4	7
Documented key findings and research in the form of actionable recommendations that can be integrated into first responder plans, procedures, and other materials that describe population screening and decontamination operations following a major radiological emergency.	FY 2020 Q4	FY 2022 Q1	7
Finalized the RRLT to support the efficient use of public works and municipal equipment in a radiological response and recovery.	FY 2018 Q4	FY 2022 Q4	7
Piloted a draft of the 72 Hour Planning Guidance for Response to a Nuclear Detonation with FSLTT jurisdictions to gain critical feedback before official publication.	FY 2020 Q1	FY 2022 Q1	7
	FY 2023		
Complete development of practical assessment course for the Radiological Operations Support Specialist (ROSS) position.	FY 2019 Q4	FY 2023 Q3	-
Complete report on the use of Virtual Reality (VR) for radiological field training for the public's consumption.	FY 2021 Q4	FY 2023 Q4	-
Complete research on resuspension in the urban environment to support SLTT radiological/nuclear response and recovery planning, readying for publication.	FY 2021 Q4	FY 2023 Q2	-
Complete updates on key radiological response guidance used by SLTT planners, readying for publication.	FY 2021 Q4	FY 2023 Q3	-
Create a toolkit for SLTT jurisdictions to conduct scientific wide area environmental radiation background surveys for response and recovery.	FY 2021 Q4	FY 2023 Q4	-
Deliver advanced fast running urban dispersion model to improve modeling capability available to FSLTT organizations.	FY 2021 Q4	FY 2023 Q4	7
Deliver decision-support guide and checklists for stormwater runoff and subsequent contaminant movement during radiological/nuclear response and recovery for FSLTT organizations.	FY 2021 Q4	FY 2023 Q3	-
Deliver instrumentation testing report to update FEMA's Radiological Emergency Preparedness Program guidance.	FY 2023 Q1	FY 2023 Q3	4
Deliver waste management case studies report for various radiological/nuclear scenarios to support emergency preparedness and planning.	FY 2021 Q4	FY 2023 Q4	-
Develop Data Quality Assessment (DQA) Toolkit for FSLTT organizations in conducting radiological data V&V following a radiological/nuclear incident.	FY 2021 Q4	FY 2023 Q2	-
Develop nuclear detonation visualizations on nuclear effects and response tactics to support planning, training, and exercises.	FY 2021 Q4	FY 2023 Q4	-
Study strategies for improving fast running urban dispersion modeling capabilities for larger geographic areas and more complex scenarios.	FY 2021 Q4	FY 2023 Q3	4
Write requirements document for interactive, automated DQA Tool.	FY 2023 Q1	FY 2023 Q4	6-7

Research, Development, and Innovation – PPA**First Responder/Disaster Resilience Thrust Area**

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2024		
Build dataset of nuclear test data to develop factors for ground truth inclusion in predictive modeling.	FY 2023 Q2	FY 2024 Q2	-
Build interactive and automated Data Quality Assessment tool and ready for test and evaluation.	FY 2024 Q1	FY 2024 Q4	7
Conduct literature review of scientific material and public guidance on building airflow recommendations following a radiological or nuclear release.	FY 2023 Q2	FY 2024 Q2	-
Conduct research and engagement on SLTT decision-makers information needs following a radiological or nuclear incident and what data products meet these needs, resulting in validated product list and initial steps for data automation processes.	FY 2023 Q3	FY 2024 Q4	-
Conduct scoping study on particle size distribution and activity size distribution factors for urban modeling.	FY 2023 Q2	FY 2024 Q3	-
Identify new requirements to advance radiological/nuclear capabilities for first responders and emergency managers with a specific focus on longer term recovery needs.	FY 2023 Q4	FY 2024 Q2	-
Initiate experimentation for understanding resuspension of radioactive materials in the urban environment following a radiological or nuclear incident using representative environments.	FY 2023 Q4	FY 2024 Q4	-

First Responder Technologies

- **Problem:** The response environment that our Nation’s first responders operate in on a day-to-day basis is constantly changing and requires an ongoing evaluation of needs, required capabilities, and potential investments and/or innovations to allow them to conduct their missions more safely, effectively, and efficiently. Commercializing technology that fully meet these challenges is typically a lengthy process. Developing near-term, innovative technologies that address high priority capability gaps identified by FSLTT first responders is critical to ensure their safety and ability to serve and protect their communities.
- **Solution:** S&T will identify high priority needs, develop prototype solutions, and conduct operational field assessments and experimentation of next generation technologies to address gaps identified by first responders with the goal of rapidly developing (12 to 18 months) and transitioning (an additional 12 months) technologies that meet 80 percent or more of the operational requirement. Individual R&D activities pursued will vary in response to current operational demands, new and emergent threats and hazards, new environmental conditions, and recent technology advancements. S&T is focusing on solutions/technologies including, but not limited to:
 - Data Collection, Management, and Analytics: Capabilities for rapid data capture, upload, management, and processing to enable data fusion, interpretation, and filtering to remove uninformative information and reduce data overload; improve timeliness to disseminate actionable intelligence; and increase situational awareness and capture, secure and process arrest reports in active operational environments.
 - Detection and Location of Responders and Resources: Capabilities to identify the location and position of First Responder personnel on the incident scene, including indoor and outdoor harsh environments, and resources, such as active emergency vehicles.
 - Detection and Location of Non-Responders: Capabilities to detect the presence of life within buildings and/or specific rooms that increases First Responders awareness and enables them to adjust their tactics to the situational at-hand and reduce the potential for injuries and/or fatalities to themselves and/or to other individuals within the area of operation.
 - Lithium-Ion Battery Storage Systems Fire Response and Handling: Capabilities that aid fire response teams to detect, protect against toxic out-gases, short- and long-term extinguishment of fire and handling of battery storage systems post fire.

Less Lethal Options: Capabilities that aid law enforcement and response communities in safely dispersing large crowds and deterring violence, such as less lethal dispersal tools, safe apprehension tools and vehicle incapacitation.

- **Justification:** The FY 2024 President’s Budget provides \$6.5M for this project, a \$1.5M increase from the FY 2023 enacted. Funding for this project will be used to identify high priority needs, develop prototype solutions, and conduct operational field assessments of next generation technologies to strengthen the response community’s ability to protect the homeland, respond to disasters, and save lives. Funding will support

completion of prototypes for two new first responder technology development activities that lead to commercialization efforts and two or more design reviews in collaboration with end-users.

- **Impact:** These technologies will strengthen the response community's ability to protect the homeland and critical infrastructure, respond to and minimize impact of disasters, and save lives through the increased availability and reliability of technology for first responders.

Type of Research

Applied and Developmental

Technical Readiness Level

Projects executed under the First Responder Technology Program begin at TRL-3, where a proof of concept has already been developed and demonstrated, and end when the technology is ready for transition and commercialization (TRL-7). R&D includes validating the technology in a laboratory environment (TRL-4), validating the technology in a relevant environment (TRL-5), producing prototypes that can be tested in a relevant environment (TRL-6), and developing harden prototypes that can be tested in an operational environment (TRL-7). Before contract award, a technology scouting initiative is executed to ensure the requirement driving the R&D is not readily available through an existing commercial offering. If it is, there is no R&D investment made, and responders are made aware of the existing commercial offerings.

Transition Plans

The primary stakeholders for First Responder technology are SLTT first responders who historically do not make bulk purchases or enter into transition agreements due to the limited funds first responders receive at the State level. To ensure a smooth and successful transition occurs, S&T works with the performer from the onset of a project to develop a transition and commercialization plan that identifies the performer's manufacturing capabilities, partners who will assist with manufacturing, and potential domestic and global reach. The plan also looks at market size, sales projections for years 1 through 3 and target costing for low and high-volume production runs. The plan is delivered to the S&T program manager and transition office liaison for review prior to the R&D effort coming to conclusion.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Began design for five new technology development efforts.	FY 2022 Q1	FY 2022 Q4	3
Transitioned two first responder technologies to the commercial marketplace.	FY 2022 Q1	FY 2022 Q4	7
	FY 2023		
Conduct Operational Field Assessment (OFA) for two new first responder technology development efforts.	FY 2023 Q1	FY 2023 Q4	6-7
Conduct two or more design reviews in collaboration with end-users.	FY 2023 Q1	FY 2023 Q4	3-6
Conduct two or more Market Landscape Studies for first responder technology development efforts.	FY 2023 Q1	FY 2023 Q4	3-6
Transition two or more first responder technologies to the commercial marketplace.	FY 2023 Q1	FY 2023 Q4	6-7
	FY 2024		
Conduct, assess and incorporate two or more design reviews across first responder technology development efforts in collaboration with end-users.	FY 2024 Q1	FY 2024 Q4	3-6
Conduct, assess and incorporate two or more Market Landscape Studies into first responder technology development efforts.	FY 2024 Q1	FY 2024 Q4	3-6
Conduct, assess and incorporate two or more Operational Field Assessments (OFA) into first responder technology development efforts.	FY 2024 Q1	FY 2024 Q4	6-7
Transition two or more first responder technologies to the commercial marketplace.	FY 2024 Q1	FY 2024 Q4	6-7

Personal Protective Equipment (formerly Compact Personal Protective Equipment)

- **Problem:** First responders require Personal Protective Equipment (PPE) to defend and mitigate the health risk associated with exposure to chemical, radiological, physical, electrical, or biological elements within their operational environment. Without sustained PPE availability, FSLTT first responders are left vulnerable to serious injuries which may lead to illness or even death. While no single combination of PPE offers protection against every hazard a first responder may face, the risk of potential harm to the first responder is significantly reduced when using specialized PPE.
- **Solution:** S&T engages with DHS Components, FSLTT and first responders to ensure understanding of the end-user needs, identify actionable requirements to address those needs, and effectively deliver solutions addressing identified PPE capability gaps. S&T will identify Project Performers to develop technology to strengthen the first responders' capabilities and enhance effective emergency responses in active threat incidents, contagious environments, unusual occurrences, and hazardous situations. S&T will engage with the respective Project Performer to develop prototypes at the Technology Readiness Level (TRL) 6/7 and pursue pathways to commercialization to make solutions widely available for procurement.
 - Responder PPE for Unusual Occurrences: FSLTT require PPE for use in crowd control or developing riotous situations. This includes all disciplines to ensure basic safety and protection during evolving incidents, to reduce injuries that may pose a direct threat to responders' lives.
 - Protection in Contagious Environments: FSLTT require PPE when responding to incidents where there is potential for exposure to an actively infected individual(s). This includes events occurring during an outbreak or active pandemic, and unintentional or deliberate chemical, radiological, or biological release.
 - PPE for Active Threats: FSLTT require PPE for in progress or on-going incidents which may include wildland fires, active shooter, natural disasters allowing for a continuation of assigned duties throughout the incident.
- **Justification:** The FY 2024 President's Budget provides \$2.5M for this project, a \$1.0M increase from the FY 2023 enacted. Funding for this project will develop critical PPE to address those capability gaps identified by first responders addressing the areas of: Responder PPE for Unusual Occurrences, Protection in Contagious Environments, and PPE for Active Threats. FSLTT will partake in an operational field assessment (OFA) to ensure the prototype meets the identified capabilities of the FSLTT.

- **Impact:** S&T will work with contracted Project Performers to ensure the supported customer base is provided a viable PPE solution that provides protection and mitigates the risk of serious injuries, illnesses, or even death, associated with the lack of collaboration and response incidence platforms, exposure to hazards, active threats, complex environments, or civil disturbances in the operational setting.

Type of Research

Applied and Developmental

Technical Readiness Level

TRL of delivered technology varies between an initial start of TRL-3 and a completion of TRL-7. OFAs (as applicable) will be conducted to assess the completion TRL.

Transition Plans

S&T develops a Transition Plan Agreement (TPA) in coordination with the Project Performer and S&T matrix partner to ensure a smooth transition of technology into the commercial marketplace. Additionally, the Project Performer is required to compose a Transition and Commercialization document which is incorporated into the TPA.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Coordinated the execution of either an OpEx or operational field assessment (OFA) for identified projects with a PoP ending within the current fiscal year.	FY 2022 Q2	FY 2022 Q4	3
Coordinated with OSE/TST to develop Transition Plan Agreements for identified new start projects.	FY 2022 Q2	FY 2022 Q4	3-7
Provided prototype technologies to first responder community, i.e. First Responders Resource Group.	FY 2022 Q3	FY 2022 Q4	6
	FY 2023		
Complete the development of Transition Plan Agreements for identified new start projects.	FY 2023 Q1	FY 2023 Q4	5-7
Conduct Operational Field Assessment for technology developed within the personal protective equipment portfolio.	FY 2023 Q1	FY 2023 Q3	6-7
Conduct technology assessment (i.e., preliminary design review, critical design review, voice of the customer, and/or technology readiness assessment) of personal protective equipment for first responders.	FY 2023 Q2	FY 2023 Q4	5-7
Deliver prototype technologies to first responder community, i.e. First Responders Resource Group.	FY 2023 Q2	FY 2023 Q4	6-7
	FY 2024		
Develop a Transition Plan Agreement for the Mission Adaptive Riot Protection Helmet Design.	FY 2024 Q1	FY 2024 Q2	6-7
Develop a Transition Plan Agreement for the Updated Law Enforcement Duty Uniform.	FY 2024 Q1	FY 2024 Q2	6-7
Facilitate Operational Field Assessment for Mission Adaptive Riot Protection Helmet Design.	FY 2024 Q1	FY 2024 Q2	6-7
Facilitate Operational Field Assessment for the Updated Law Enforcement Duty Uniform.	FY 2024 Q1	FY 2024 Q2	6-7

Public Safety Communications

- **Problem:** With the constant evolution of modern terrorism and other threats to the security of the homeland, it is critical that first responders have the technology to rapidly respond to emergent events. DHS Components need to have access to mission-critical communications solutions that are highly available and resilient, and innovative technology solutions capable of facilitating information sharing between public and private sector entities during emergency response operations. The introduction of broadband networks and new emerging standards has increased capability for the inclusion of voice, video, and data resulting in a more complex environment where responders need to be ensured of interoperability and compatibility across networks and ability to maintain interoperability with legacy solutions (Project 25). In the past, stove-piped, proprietary systems have resulted in fractured, non-interoperable, and expensive solutions. The evolution of new technologies and standards, such as the emergence of 5G/XG, Smart Cities, IoT, Next Generation 911 systems, AI, and advanced computing, has given rise to new opportunities for advanced capabilities that can be leveraged by DHS Components and first responders alike. However, these opportunities also result in numerous challenges for ensuring highly reliable, available, interoperable, and secure communications.
- **Solution:** Through the RDT&E of technologies, S&T will develop, tailor, and pilot applications and services that leverage emerging communications and networking technologies and standards to address technology gaps to meet mission needs and user requirements. Solutions will focus on achieving efficiencies, interoperability, compatibility, and effective use of applications and services while addressing threats and challenges (spectrum, utilization, network resiliency, cyber and physical attacks). Additionally, S&T will conduct detailed assessments of commercial technologies to ensure that end-solutions are interoperable, compatible, and standards-based ensuring the end solutions present best value and minimal risk to users. S&T will also conduct targeted exercises to improve the resilience and minimize impacts to systems.

Information Sharing: S&T RDT&E will secure public safety messaging and collaboration – facilitating interoperability across disciplines, geographies, and organizations. Act as a collaboration platform for public safety that will utilize information from disparate systems and provide expedient access to eligible users.

- **Justification:** The FY 2024 President’s Budget continues to provide \$1.5M for this project and will develop and deliver technology solutions, including knowledge products, to DHS Components as well as the broader first responder community to meet legislative requirements for interoperability and compatibility. In the area of 5G/XG and advanced communications, S&T will work to support the DHS mission needs for advanced computing and communications needs. This effort will closely align to National Strategy to Secure 5G Implementation Plan leveraging efforts across the Federal enterprise (e.g., NIST, National Telecommunications and Information Administration (NTIA), DOD, NSF, and Department of Commerce (FirstNet)).
- **Impact:** This project supports highly available and resilient critical communications and information sharing capabilities for DHS Components, including first responders using emerging technologies and communications networks. S&T will conduct testing and evaluation of solutions to improve the resilience and availability of public safety networks. in the presence of jamming (unintentional or intentional). This effort will also ensure that radio systems procured by federal, State, and local public safety users are interoperable and standards based.

Type of Research

Applied and Developmental

Technical Readiness Level

TRL varies for specific project efforts between TRL-3 and TRL-7. Project identifies and documents unique Federal, State, tribal, and local public safety requirements in voice, video, and data communications. First, technologies and capabilities are validated in a lab environment (TRL-4).

Following successful laboratory validation, technologies will be further tested in a relevant DHS Component customer environment (TRL-5). S&T will test COTS technologies in a technical demonstration environment (TRL-6). Subsequently, updates to the technology will be made, tested, and evaluated in an operational environment (TRL-7) prior to transition. Finally, the project will also include conducting interoperability and compatibility testing of products for compliance with P25 standards (TRL-7). Approved systems will be identified on P25 CAP website for transition and acquisition to DHS Components and responders nationwide.

Transition Plans

This effort will transition technology solutions to customers after rigorous laboratory, field, and operational testing. Solutions will be standards-based, non-proprietary in nature to allow plug-and-play adaptability for first responders. Forward-leaning first responder agencies will be identified to serve as early adopters and evangelists for the technology solutions. Knowledge product development (e.g., lessons learned, best practices, pilot reports, and test evaluations) will also be a key component of transition. Publicly available knowledge products can be disseminated more broadly and have great reach with end users. These knowledge products can also serve to promote best practices and help agencies learn from those who have come before them.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Conducted First Responder Jamming Exercise with Federal, State, and local public safety partners.	FY 2021 Q1	FY 2022 Q3	7
Developed use cases for evaluation and assessment of next generation (e.g., 5G, XG, IoT) communications technologies in a real-world component environment to examine how current and emerging communications and network technologies can increase component effectiveness.	FY 2021 Q3	FY 2022 Q3	7
Transitioned ISSI (Inter RF Subsystem Interface) / CSSI (Console Subsystem Interface) solutions to customers after rigorous standards-based laboratory testing.	FY 2020 Q1	FY 2022 Q1	7
	FY 2023		
Conduct performance, conformance and interoperability testing for P25 radios, consoles, and gateways systems as part of P25 CAP.	FY 2023 Q1	FY 2023 Q4	7
Develop testing scope to ensure interoperability between P25 and other communications networks (e.g., broadband, analog, and non-P25 systems).	FY 2023 Q1	FY 2023 Q4	5
	FY 2024		
Develop collaboration platform that remains network and device agnostic.	FY 2024 Q1	FY 2024 Q4	5
Provide seamless information sharing/interoperability across disparate systems.	FY 2024 Q1	FY 2024 Q4	5

Response and Defeat Operations Support (REDOPS)

- **Problem:** The response environment that our Nation's responders operate in on a day-to-day basis is constantly changing and requires an ongoing evaluation of needs, required capabilities, and potential investments and/or innovations, to allow them to conduct their missions more safely, effectively, and efficiently. Public Safety Bomb Squads and Special Weapons and Tactics (SWAT) Teams are on the forefront of addressing emerging threats such as active shooter, complex coordinated attacks, and improvised explosive devices (IEDs). While significant investments are made on explosive detection, there are limited investments being made across government to ensure bomb technicians have the capabilities to preserve life and/or property once an IED has been discovered. There is even less investments reflected towards the tactical community.
- **Solution:** S&T will support short, medium, and long-term focused efforts that ensure regular delivery of new capabilities to supported first responders. The Agency will identify user-developed innovations through direct and regular interaction with user community to identify user developed innovations that with additional development can be quickly transitioned. S&T will also identify high priority requirements and capability gaps, develop solutions, and conduct operational assessments of next generation technologies that address identified gaps, with a goal of rapidly developing and transitioning new capabilities. Furthermore, S&T will perform operational assessments of emerging technologies that assess new capabilities with immediate field applications and identify new research and development requirements. Finally, the Agency will develop IED disablement tools and/or techniques through a combination of rigorous scientific testing and cutting-edge engineering practices. Specifically, S&T is focusing on the following:
 - Micro Research and Development: Identify user developed innovations that can quickly transition to community-wide use. Validate performance of the innovation and develop required designs and specification for immediate operational use. Validate knowledge products with State and local agencies. Developed capabilities transition in less than 12 months.
 - Operational Assessments and Response Experimentation: Perform user-driven operational assessments of emerging technologies with immediate field applications to identify capabilities and limitations of equipment and systems, new technology development requirements, and lessons learned/best practices in high threat operational responses. Knowledge products transition within 12-18 months.
 - RAPID: Research and Prototyping for IED Defeat (RAPID) develops cutting edge counter-IED defeat capabilities with focused R&D on emerging threat devices. RAPID uses a hard science approach, both in the lab and in the field, to find the best possible methods for safely disabling bombs. Developed capabilities a transition to operational use within 12-24 months. RAPID performs in partnership with the FBI Critical Incident Response Group who transitions all REDOPS technologies to the State and local community.
 - RAPTOR: Research and Prototyping for Tactical Operations applies the REDOPS model to the tactical community with focused operational assessments, response experimentation, and micro-R&D in direct support the Federal, State, local, tribal, and territorial SWAT community.

- **Justification:** The FY 2024 President’s Budget continues to provide \$3.0M for this project and will assess C-IED technologies; develop new tools and/or tactics, techniques, and procedures to counter evolving threats; and transition work products to bomb technicians across the country. IEDs remain one of the most accessible weapons available to terrorists and criminals, and the tactics used in IED attacks continue to evolve as our adversaries seek to overcome countermeasures. This project closes associated capability gaps to preserve life and/or property. In FY 2024, REDOPS plans to publish two Special Technician Bulletin, conduct 4 testbed assessments, publish 4 micro-R&D tools, and develop and test two IED render safe technologies.
- **Impact:** Developed solutions will strengthen the front-line public safety response capabilities to the highest priority threats and increase our Nation’s ability to protect the homeland and respond to terrorist and criminal activities while saving lives and protecting property.

Type of Research

Applied and Developmental

Technical Readiness Level

TRL varies for specific project activities between TRL-4 and TRL-7. Some efforts begin as an idea identified by field users, which are then are designed and characterized in a lab environment prior to being published as a knowledge product (TRL-4). Some efforts assess existing technologies and tactics, techniques, and procedures which are validated and published as a knowledge product (TRL-6). The goal is to transition technology at TRL-7 or a knowledge product (TRL-6) within 12-24 months.

Transition Plans

The program partners with the National Bomb Squad Commanders Advisory Board, International Association of Bomb Technicians and Investigators, United States Bomb Technicians Association, National Tactical Officers Association, DOJ, and DOD, who are directly involved with the activities associated with this project from initiation to transition. In addition, the program partners with the FBI who serves as the National Program Manager for Counter IED activities and is responsible for the Hazardous Device School which trains all Public Safety Bomb Technicians within the United States. Products are evaluated and/or characterized before being transitioned directly into the Hazardous Device School and/or through the FBI’s Law Enforcement Enterprise Portal. This ensures that applicable work products reach the bomb technician community in its entirety.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Delivered four Advanced Disablement Engineering and Transition Seminars.	FY 2022 Q1	FY 2022 Q4	7
Developed and tested two REDOPS IED render safe technologies.	FY 2022 Q1	FY 2022 Q3	4-6
Executed four test bed assessments.	FY 2022 Q1	FY 2022 Q4	6
Validated and produced REDOPS knowledge products for four micro technologies.	FY 2022 Q1	FY 2022 Q4	6
	FY 2023		
Conduct four C-IED test events in support of the development of tools and/or tactics, techniques, and procedures.	FY 2023 Q1	FY 2023 Q4	4
Conduct four test events on C-IED technologies and/or tactics, techniques, and/or procedures.	FY 2023 Q1	FY 2023 Q4	4
Deliver four Advanced Disablement Engineering and Transition Seminars.	FY 2023 Q1	FY 2023 Q4	7
Develop two RAPID IED Technologies and/or knowledge products.	FY 2023 Q1	FY 2023 Q4	6
Execute five test bed assessments for both REDOPS and RAPTOR (tactical).	FY 2023 Q1	FY 2023 Q4	6
Perform four RAPID-X Operational Exercises leveraging RAPID developed technologies.	FY 2023 Q1	FY 2023 Q4	6
Perform four RAPID-X Operational Exercises for bomb squad community.	FY 2023 Q1	FY 2023 Q4	6
Validate and produce REDOPS knowledge products for four micro technologies.	FY 2023 Q1	FY 2023 Q4	6
	FY 2024		
Conduct four C-IED test events in support of the development of tools and/or tactics, techniques, and procedures.	FY 2024 Q1	FY 2024 Q4	4
Deliver four Advanced Disablement Engineering and Transition Seminars.	FY 2024 Q1	FY 2024 Q4	7
Develop two IED Technologies and/or knowledge products.	FY 2024 Q1	FY 2024 Q4	6
Execute five test bed assessments for both REDOPS and RAPTOR (tactical).	FY 2024 Q1	FY 2024 Q4	6
Validate and produce REDOPS knowledge products for four micro technologies.	FY 2024 Q1	FY 2024 Q4	6

Stakeholder Engagement and Requirements (First Responders Resource Group and International)

- **Problem:** First responders have no avenues to relay their highest priority requirements for R&D that can save their life and improve their safety, efficiency, and effectiveness.
- **Solution:** S&T will provide our Nation’s first responders and DHS Components, as well as international partners, with a forum to relay and pursue their highest priority capability needs and to provide critical input on the design and function of new technologies.
- **Justification:** The FY 2024 President’s Budget does not include funding for this project.
- **Impact:** The requirements identified, and end-user feedback provided by the stakeholder engagement led to the development of life saving technologies that make our Nation’s first responders safer, more efficient, and more effective. To date, the close coordination and execution of R&D projects through this stakeholder engagement has led to successful transition of more than 20 technologies to the commercial marketplace for first responders to purchase.

Type of Research

Applied and Developmental

Technical Readiness Level

The TRL values do not apply to stakeholder engagement activities (requirements gathering meetings). The operational field assessments are focused on TRL 5-6 technologies. The period of performance for activities varies from about 3-12 months.

Transition Plans

Identification of common global capability gaps informs transitions plans and encourages industry and other stakeholders to identify and develop solutions for first responders.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Completed two operational field assessments with First Responder participants.	FY 2022 Q1	FY 2022 Q4	5-6
	FY 2023		
Hold annual conference to identify 5 – 8 new technology requirements for DHS Components and our Nation’s law enforcement, fire, and emergency medical service first responders.	FY 2023 Q1	FY 2023 Q3	-
	FY 2024		
N/A	-	-	-

Training and Performance Optimization

- **Problem:** The efficiency, effectiveness, and resilience of DHS’s law enforcement, security officers, and emergency management officials supporting the front lines of national security is directly related to the preparedness and robustness, capacity for recovery, and adaptability achieved in training. DHS Components and first responders require modern training techniques and technologies, including secure IT network that delivers ubiquitous training wherever the consumer is located, that maximize proficiency, effectiveness, efficiency, safety, and build officer confidence and resilience. This capability and capacity are required to support the DHS’ missions and respond to local, national, or international disasters or emergencies.
- **Solution:** S&T works with DHS Components and the first responder community to identify common training mission and operational capability gaps that can be addressed through improved training methods and technology solutions that optimize training task transfer and retention. An informed strategy and capability that fully meets the current and anticipated future demand for remote learning, student throughput, scenarios repetition, replicable and simulated environments, and training space are required. Improved training in areas such as the underlying components of critical decision-making (e.g., perceptual skills, critical thinking, alternate option weighing) is imperative when operating in uncertain, stressful, time-constrained, or hazardous environments. Improving the delivery and retention of training and performance optimization tools includes maximizing human performance, effective human-machine integration, and enabling informed decision making. The collective synergy of a research-based approach to training and performance optimization will improve operational efficiency, effectiveness, and overall national security.
- **Justification:** The FY 2024 President’s Budget provides \$3.8M for this project, a \$1.4M increase from the FY 2023 enacted. Funding for this project will develop, assess, and transition immersive training and operations methods and tools for the Federal Law Enforcement Training Centers (FLETC), DHS Training Academies, and Component Training Offices in support of personnel on the front line of homeland security. DHS Components need modern training and immersive technologies that maximize skill sustainment and operational performance. A recent JRC Strategic Review Risk Areas report identified training for both proficiency and expertise as a need that may be accomplished in an online or distributed environment. The environment in which Components work, learner needs, professional development opportunities, and significant workplace training trends are advancing rapidly. Modern training approaches, such as immersive technologies and game-based learning, developed with this funding, when designed correctly and in a pedagogically consistent manner, have the potential to support and expand curriculum while enhancing learning outcomes in ways which have not been previously possible, affordable, or scalable. Funds will also support research and studies, in support of FLETC’s Training Environment of the Future, on emerging homeland security threats, methods, and tools for law enforcement.

- **Impact:** Mission success and resilience of our homeland security workforce is never assured. Providing DHS and broader homeland security enterprise end users with improved training methods, technologies, and tools will result in operational performance increases in those individuals and an increase in national security. More effective and efficient training measurably improves performance and is directly correlated to increased preparedness, safety, robustness, and capacity for rapid recovery and adaptability.

Type of Research

Applied and Developmental

Technical Readiness Level

This project's R&D efforts typically start by performing a market survey of available COTS and GOTS technology that could be adapted for DHS use. Identified technology is then adapted and validated in a laboratory or relevant environment (TRL-4/5). Following successful validation, the most promising solution(s) are then prototyped and evaluated first in a relevant environment (TRL-6) then in an operational environment (TRL-7). Project efforts will transition at TRL-6 or TRL-7. The period of performance for most activities is 12-18 months.

Transition Plans

- Provide recommendations for improved FLETC basic training course curriculum with enhanced training methods and technologies.
- Capability Roadmap for training technology development and assessment that will aid DHS Components in coordinating the acquisition of training technology, implement performance assessment processes, and identify training gaps and subsequent capability requirements.
- Study report of FLETC's Law Enforcement and Criminal Investigator training programs to understand and identify shortfalls in the Center's basic training programs while ensuring that they meet the entry-level job requirements and skills required of today's Federal law enforcement professionals.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Completed evaluation of an immersive analysis and training tool to assist law enforcement agencies with improving cognitive, visual, and manual officer skills required for emergency vehicle operations and help reduce accidents resulting from distractions commonly found in a patrol vehicle.	FY 2022 Q1	FY 2022 Q4	6
Initiated a job task analysis study of law enforcement and criminal investigator basic skills required to accurately determine if the training delivered in the Center Basic Training Programs fully meets the entry level job requirements and skills required of today's Federal law enforcement professional.	FY 2022 Q3	FY 2022 Q4	4-7
Initiated applied research assessment of immersive technologies for experimentation and validation that these tools improve the delivery of law enforcement training.	FY 2023 Q3	FY 2022 Q4	5-7
Transitioned a university program's infrastructure study with findings and recommendations to support and recommendations FLETC's Training Environment of the Future.	FY 2021 Q3	FY 2022 Q3	5
	FY 2023		
Deliver a report describing the Classroom of the Future to FLETC.	FY 2023 Q1	FY 2023 Q2	-
Initiate study to identify required skills, knowledge, and abilities for new law enforcement officers and gaps in current training.	FY 2023 Q2	FY 2023 Q4	5
Transition an immersive 4th amendment training simulation.	FY 2023 Q1	FY 2023 Q3	6
	FY 2024		
Complete the study to aid FLETC in better understanding the trainings needs of new law enforcement officers in the first 18 months of their jobs.	FY 2024 Q2	FY 2024 Q4	4-7
Develop curriculum, with FLETC, based on results of the study looking at the training needs of new law enforcement officers in the first 18 months of their jobs.	FY 2024 Q2	FY 2024 Q4	4-7
Develop study for FLETC aimed at better understanding the training needs of new law enforcement officers in the first 18 months of their jobs.	FY 2024 Q1	FY 2024 Q4	4-7

Innovative Research and Foundational Tools Thrust Area**Research and Development****Technology Readiness Level Exhibit***(Dollars in Thousands)*

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget
Innovation Research and Foundational Tools Thrust Area	\$80,793	\$95,106	\$92,106

R&D Thrust Area Description

INNOVATIVE RESEARCH AND FOUNDATIONAL TOOLS THRUST AREA: S&T aims to understand the high-priority, homeland security capability needs and gaps, and identify optimal approaches for providing solutions and knowledge that address those needs. R&D investments enable gathering gaps/needs through analysis and requirements prioritization with focus on identifying and analyzing potential solutions and working with customers to select the best approach to delivering solutions, including knowledge and advice.

INNOVATIVE RESEARCH AND FOUNDATIONAL TOOLS THRUST AREA <i>(Dollars in Thousands)</i>				
Program	Project	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget
Total –Innovative Research and Foundational Tools Thrust		\$80,793	\$95,106	\$92,106
Foundational Tools		\$16,006	\$15,006	\$15,006
	Aligning Departmental R&D with DHS Goals (Integrated Product Teams)	\$3,000	\$3,000	\$3,000
	First Responder Technologies-System Assessment and Validation for Emergency Responders (SAVER)	\$1,980	\$1,980	\$1,980
	Technology Clearinghouse	\$1,250	\$1,250	\$1,250
	Technology Scouting	\$4,796	\$4,796	\$4,796
	Technology Transition	\$4,980	\$3,980	\$3,980
Partnerships		\$24,796	\$18,675	\$15,675
	Bi-National Cooperative	\$2,000	-	-
	Commercialization Accelerator Program	\$5,185	\$3,000	-

INNOVATIVE RESEARCH AND FOUNDATIONAL TOOLS THRUST AREA (Dollars in Thousands)				
Program	Project	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget
	Coordination, Engagement, and Outreach	\$3,089	\$2,000	\$2,000
	Partnership Intermediary Agreements (PIA)	\$4,000	-	-
	SBIR Management (formerly Partnership Mechanisms and Technology Transition)	\$1,522	\$2,175	\$2,175
	Silicon Valley Innovation Program (SVIP)	\$9,000	\$9,000	\$9,000
	Technology Transfer and Commercialization	-	\$2,500	\$2,500
Technology Centers		\$39,991	\$61,425	\$61,425
	Advanced Computing Technology Centers	\$11,126	\$17,557	\$17,557
	Enduring Sciences Technology Centers	\$19,594	\$30,368	\$30,368
	Innovative Systems Technology Centers	\$9,271	\$13,500	\$13,500

Foundational Tools Program – A critical part of S&T’s mission as science advisor to the DHS Secretary is to ensure that R&D receives the proper requirements analysis and due diligence that will support homeland security operations. There are critical elements of the R&D lifecycle that are required for all programs and projects to undergo from the point of concept through the transition of a capability or knowledge product. S&T is responsible for collecting, identifying, and prioritizing DHS-wide R&D capability gaps/needs, minimizing or eliminating the duplication of efforts, as well as identifying cost effective solutions for Component operations and process inefficiencies. S&T also utilizes its scientific, technical, and mission expertise to conduct technology scouting analysis and transfer the information to Components and stakeholders in order to support the identification, development, and transition of solutions that address high priority capability needs and gaps. In support of these activities, S&T aims to expand the associated functions of OpEx events (to serve as centralized demonstrations of potential technology options) and the Technology Clearinghouse (to be a common knowledge management and communication portal for homeland security technology research and solutions).

Aligning Departmental R&D with DHS Goals

- **Problem:** S&T receives many requests each year from DHS customers for R&D work. Customers include DHS Operational and Support Components and state, local, tribal, territorial (SLTT) First Responder entities. With a limited budget, S&T needs to understand the relative priority of each of these requests and their significance to the customer’s mission and DHS strategic goals. S&T also needs to ensure all R&D programs, projects, and activities across DHS are coordinated to avoid duplication of efforts and to enable enterprise solutions.

- **Solution:** S&T implemented the Integrated Product Team (IPT) process as a mechanism to identify, collect, and prioritize customer’s R&D needs and coordinate R&D activities throughout the R&D lifecycle, from gap intake through development to solution delivery and transition. The IPT process will continue to serve as S&T’s primary mechanism for identifying and prioritizing customer R&D-related capability gaps as existing and emerging threats are identified, to support S&T decision-making on internal R&D activities and resource allocation. The IPTs also report on the status of all ongoing S&T R&D programs, projects, and activities to ensure customer alignment throughout the R&D lifecycle.

S&T also established the Department-wide Innovation, Research, and Development Coordination (IRDC) process as an enterprise-wide approach to achieving a more unified, coordinated approach for conducting innovation and R&D against DHS’s needs. IRDC will continue to deliver visibility, transparency, and traceability of the comprehensive set of DHS innovation and R&D investments, to inform resource decisions and ensure alignment to high priority mission needs. IRDC also reports on DHS’s overall innovation and R&D status. IRDC is aligned with S&T’s IPT process, ensuring that S&T’s IPT activities are recognized as contributing to Department-wide coordination, while allowing S&T the flexibility to manage them according to its own internal business process.

- **Justification:** The FY 2024 President’s Budget continues to provide \$3M for this project and will allow S&T to perform strategic planning and portfolio management to serve DHS customers. The combined implementation of the IPT and IRDC processes will provide transparency and traceability of S&T and DHS innovation and R&D activities, respectively, from capability gap/need identification to solution delivery. The improved processes ensure direct alignment of innovation and R&D resources to Component/HSE mission needs and DHS strategic priorities. S&T will also improve alignment of the IPT and IRDC processes with the DHS resource allocation planning cycle to improve prioritization and coordination of innovation and R&D with Component acquisitions.
- **Impact:** Through the IPT process, S&T ensures that R&D efforts will address validated and prioritized R&D needs of DHS operational and support Components and customers. This will in turn enable S&T to successfully deliver effective and impactful solutions that meet customer needs to help them fulfill their missions. Through the IRDC process, S&T ensures DHS innovation and R&D current activities, and long-term strategies are coordinated and aligned to optimize the use of limited innovation and R&D resources.

Type of Research

Applied and Developmental

Technical Readiness Level

This is the early part of the R&D lifecycle development and deployment for all programs and projects to ensure customer Component alignment, priority, and enterprise-wide collaboration. The majority of S&T R&D is between TRL-4 and TRL-7.

Transition Plans

The IPT and R&D Coordination processes facilitates, and track support provided to customers. Transition plans are unique to each R&D project and are addressed in each part of this document. Stakeholder participation in the IPT process informs transitions plans and encourages industry and other stakeholders to identify and develop solutions.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
FY 2022			
Conducted FY 2022 IPT process to identify and prioritize R&D capability gaps that will influence out year resourcing plans.	FY 2022 Q1	FY 2022 Q4	-
Integrated new standards and procedures to improve the quality, consistency, and efficiency of capturing and maintaining a comprehensive accounting of Department-wide R&D projects and activities. Improvements will be based on recommendations from the S&T Focus Group for R&D Standardized Reporting; S&T Leadership; and the R&D Coordination Steering Group.	FY 2022 Q1	FY 2022 Q3	-
FY 2023			
Charter the new R&D Coordination Council to govern the R&D Coordination process.	FY 2023 Q1	FY 2023 Q4	-
Conduct outreach to identify R&D capability gaps/needs for State, Local, Tribal and Territorial (SLTT) first responders.	FY 2023 Q1	FY 2023 Q4	-
Conduct the FY 2023 IPT process to identify and prioritize R&D capability gaps/needs.	FY 2023 Q1	FY 2023 Q4	-
Conduct the FY 2023-2024 R&D Coordination process to report on DHS's overall R&D status and strategic alignment.	FY 2023 Q1	FY 2023 Q4	-
Define DHS-wide strategic priority research areas that represent cross-cutting assemblies of enduring scientific efforts which provide a means for addressing priority needs across multiple homeland security enterprise mission areas.	FY 2023 Q1	FY 2023 Q4	-
Deliver R&D Coordination Implementation Guidance that defines alignment across DHS R&D, requirements, and acquisition processes, enabling an enterprise-wide approach for coordinated use of R&D and technology resources to address DHS's priority needs.	FY 2023 Q1	FY 2023 Q4	-

Research, Development, and Innovation – PPA**Innovative Research and Foundational Tools Thrust Area**

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2024		
Conduct FY 2024 IPT process to identify and prioritize R&D capability gaps/needs.	FY 2024 Q1	FY 2024 Q4	-
Conduct the FY 2024 Innovation, Research, and Development Coordination process to report on DHS overall innovation and R&D status and strategic alignment.	FY 2024 Q1	FY 2024 Q4	-
Enhance S&T prioritization and alignment of long-term innovation and R&D with the DHS Strategic Plan and the DHS Innovation, Research, and Development Strategic Plan.	FY 2024 Q1	FY 2024 Q4	-
Establish IPT Charters: review and update IPT Charters with existing customers as needed and establish IPT Charters or agreements with new customers as appropriate.	FY 2024 Q1	FY 2024 Q4	-
Hold annual conference to identify 5 – 8 new technology requirements for our Nation’s law enforcement, fire, and emergency medical service first responders.	FY 2024 Q1	FY 2024 Q4	-

First Responder Technologies-System Assessment and Validation for Emergency Responders (SAVER)

- **Problem:** Technology/equipment that first responder agencies need to purchase is increasingly complex and rapidly evolving. Additionally, these agencies frequently lack in-house specialized and technical expertise to make informed technology purchasing decisions.
- **Solution:** S&T utilizes the NUSTL SAVER knowledge products that serve as a valuable guide for informing first responder agencies' technology and equipment purchasing decisions by reporting what technologies are available in the marketplace, and how they perform in realistic conditions. This information can reduce agencies' risks of buying technology/equipment that does not meet their operational needs, enabling smart use of State and local, as well as DHS funds and grants. FEMA has provided billions of dollars in funding for emergency responder equipment through the Homeland Security Preparedness Grant Programs. Core FEMA Preparedness Grants totaled more than \$3.0B and its subset of security focused grants intended for First Responders totaled more than \$1.6B in FY 2022. The SAVER program was designed to make sure that this funding among First Responders is spent judiciously. The breadth of SAVER spans over 700 distinct types of technology and equipment that fall into the 21 FEMA Authorized Equipment List (AEL) categories associated with those preparedness grants. Without funding, NUSTL cannot conduct evaluations of commercially available first responder technologies nor provide knowledge products that support the responder equipment purchases across the Nation.
- **Justification:** The FY 2024 President's Budget continues to provide \$2.0M for this project and will be used to plan and execute SAVER activities that will help first responders of all disciplines (Fire, Emergency Medical Service, Law Enforcement) to better select, procure, use, and maintain emergency equipment. SAVER activities include the development of: Tech Notes, a two-page product summary that explains in basic terms what a technology does, what it is used for, and how it works; and market survey reports which provide a snapshot of the commercial market for a particular type of equipment. SAVER activities also include facilitating focus groups with first responders to gather and analyze technology requirements and evaluation criteria; and conducting comparative technology assessments with first responders using the equipment in real-world conditions. In addition, SAVER will document results from assessment events, conduct survey, analysis, and planning for FY 2025 and identify current market availability of technologies.
- **Impact:** First responder organizations rely on SAVER knowledge products to make sure their agencies have the right tools and technologies to effectively support their missions. If these tools do not perform as required, the lives of first responders and the people they protect are at risk. NUSTL's SAVER program recently looked at physiological monitoring systems for first responders, recognizing the distinct operational needs and austere environmental conditions that these devices need to function in, to provide real time information on health of first responders. SAVER assessments are driven by first responders, focusing on the responders' experience with the equipment – the operational features, and how it works for the end-user in realistic operational conditions. These considerations are not captured in product spec sheets, or even known by the technology vendor in many instances. NUSTL utilizes its own expertise and partners with external SMEs, for example other labs and organizations that have expertise in explosive detection, tactical equipment, chemical detection, to evaluate these tools with responders. For these reasons, responder agencies rely on SAVER as their first stop for researching technology and equipment solutions before making a purchase. Since 2004, SAVER has produced more than 1,000 knowledge products, addressing equipment in 18 of the 21 AEL categories, covering 194

Research, Development, and Innovation – PPA

Innovative Research and Foundational Tools Thrust Area

unique AEL numbers. Knowledge products are available to the national first responder community - the nearly 18,000 police agencies and 30,000 fire departments in the United States.

Type of Research

Applied

Technical Readiness Level

TRL N/A: All tools and technologies under evaluation are COTS products that are available for purchase by first responder agencies.

Transition Plans

The SAVER project transitions final knowledge products to the responder community by posting them on the S&T SAVER document library website, in accordance with the S&T COD publication review and approval process. Links to the final knowledge products are emailed to stakeholders. FOUO reports are provided directly to specific entities securely as needed. Transition success is tracked through website analytics and responder feedback.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Conducted survey, analysis, and planning for FY 2023 Assessments, Market Surveys and TechNotes.	FY 2022 Q3	FY 2022 Q4	-
Developed Partnerships for Patient Triage Using Artificial Intelligence.	FY 2021 Q3	FY 2022 Q4	-
Published Assessment Report for Radio Repeaters.	FY 2020 Q3	FY 2022 Q2	-
Published assessment reports and other knowledge products on S&T's public facing website. FOUO products are provided directly to specific entities securely as needed.	FY 2022 Q1	FY 2022 Q4	-
Published Market Survey Report for Blast Resistant Trash Receptacles.	FY 2021 Q4	FY 2022 Q2	-
	FY 2023		
Conduct survey, analysis, and planning for FY 2024 SAVER.	FY 2023 Q1	FY 2023 Q4	-
Develop document explaining call center triage systems using artificial intelligence to inform response agency procurement.	FY 2023 Q1	FY 2023 Q2	-
Document responder operational requirements and equipment evaluation criteria for usability, maintainability, capability, affordability and deployability resulting from focus groups to determine the assessment criteria weights for products for law enforcement and rescue personnel equipment.	FY 2023 Q4	FY 2023 Q4	-

Research, Development, and Innovation – PPA**Innovative Research and Foundational Tools Thrust Area**

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
Document results from assessment events comparing equipment and tools for law enforcement, fire, and emergency medical services.	FY 2023 Q2	FY 2023 Q3	-
Identify current market availability of technologies to help inform procurement agents of options for law enforcement, emergency medical services personnel, and radiation response personnel.	FY 2023 Q1	FY 2023 Q4	-
	FY 2024		
Deliver knowledge product report on a comparative assessment of equipment and tools for law enforcement, fire, and emergency medical services.	FY 2024 Q1	FY 2024 Q4	-
Document responder operational requirements and equipment evaluation criteria for usability, maintainability, capability, and affordability resulting from focus groups to determine the assessment criteria weights for products for law enforcement and rescue personnel equipment.	FY 2023 Q4	FY 2024 Q2	-
Identify current market availability of technologies to help inform procurement agents of options for law enforcement, emergency medical services personnel, and radiation response personnel.	FY 2024 Q1	FY 2024 Q4	-
Obtain responder operational requirements and equipment evaluation criteria for usability, maintainability, capability, affordability and deployability to determine the assessment criteria weights for products for law enforcement and rescue personnel equipment.	FY 2024 Q1	FY 2024 Q4	-
Plan and conduct assessment events comparing equipment and tools for law enforcement, fire, and emergency medical services.	FY 2024 Q2	FY 2024 Q4	-

Technology Clearinghouse

- **Problem:** DHS R&D solutions and other complementary investments in R&D to solve the broad range of homeland security requirements are not easily discoverable. Organizations who have similar mission needs are not discovering existing R&D efforts already funded by DHS resulting in unnecessary investments to replicate work already done. To solve this problem, S&T must maintain a collaborative information sharing capability for DHS Components, first responders, emergency preparedness, and response communities and the private sector. This information sharing platform enables the search, discovery, and access to information for its programs and to keep those communities informed about the technologies and knowledge products that could be applied to similar needs. Additionally, DHS needs a single, intuitive knowledge sharing resource to find, collect, curate, and disseminate relevant information to partners, stakeholders, academia, and the private sector (e.g., R&D and innovation communities), regarding homeland security technologies, innovative solutions, resources, and capabilities. Having a readily searchable inventory of DHS R&D products with the capability to access already funded research saves the government time and money and allows for re-use or adaptability of solutions. The Technology Clearinghouse will be designated as a DHS platform for ensuring that DHS is in compliance with the Office of the President Office of Science and Technology Policy (August 25, 2022) to ensure public access to DHS Federally funded research.
- **Solution:** S&T's Technology Clearinghouse provides the capability to streamline information sharing and support better decision making through a centralized search and discovery tool of final RDT&E results. This content is then widely discoverable, helping inform research, procurement, and implementation decisions. These collaboration opportunities among homeland security personnel, industry, academia, and other stakeholders' aids in the development of innovative technology solutions for homeland security. The S&T Technology Clearinghouse shares curated information and general resources that assist the R&D, industry, and manufacturing community in collaborating with DHS and the broader first responder community to protect the Homeland. This curated information defines authoritative homeland security requirements and gaps, research and development investment and business opportunities, licensing opportunities, operational testing and evaluation activities, standards development, and other partnership initiatives.
- **Justification:** The FY 2024 President's Budget continues to provide \$1.3M for this project and will be used to conduct a Technology Clearinghouse refresh to ensure that governance practices, ongoing technical development considerations, and content remain relevant while continuing to meet the requirements of the Homeland Security Act of 2002. Explore low-cost technical solutions for expanding login access to sensitive Technology Clearinghouse content to the broader homeland security community including State, local and tribal homeland security agencies, private sector, academia, and innovation communities in accordance with S&T policy for safeguarding sensitive information. Explore low-cost and repeatable technical solutions for creating interoperability between the Technology Clearinghouse and other authoritative repositories to allow for discovery of content across platforms from a single search query in the Clearinghouse. Expand stakeholder engagement with DHS Components to ensure the use of the Technology Clearinghouse as the go-to resource for innovative homeland security solutions. Provide technical input and recommendations for the DHS Public Access Plan.

- **Impact:** The Technology Clearinghouse facilitates better government decision making through the sharing of RDT&E activities to support the development, acquisition, and deployment of innovative solutions across the HSE.

Type of Research

Applied and Developmental

Technical Readiness Level

This is part of the R&D life cycle development and deployment for all programs and projects to ensure customer Component alignment, priority, and enterprise-wide collaboration. The majority of S&T R&D is between TRL-4 and TRL-7.

Transition Plans

N/A

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Prepared and completed quality control of 500 public and access-restricted knowledge products for removal from or migration to the Technology Clearinghouse on the DHS External Service Now portal.	FY 2022 Q1	FY 2022 Q4	-
Engineered the technical solution for the Technology Clearinghouse to authenticate and authorize users to allow access restricted Technology Clearinghouse content (e.g., FOUO, SBU, LES).	FY 2022 Q1	FY 2022 Q4	-
	FY 2023		
Gather, document, and prioritize new technical requirements to inform planning of capability upgrades in FY 2024.	FY 2023 Q1	FY 2023 Q4	-
Identify the technical requirements and potential solutions for integrating the Technology Clearinghouse with at least one knowledge repository that will result in an increased amount of discoverable content in the Clearinghouse for customers to access.	FY 2023 Q1	FY 2023 Q4	-
Maintain the capability for DHS Components to store and access S&T Transition knowledge products.	FY 2023 Q1	FY 2023 Q4	-
	FY 2024		
Identify low-cost methods for incorporating science and technology content from other authoritative sources to allow for discovery of content from outside S&T into a single search query in the Clearinghouse expanding discovery and reuse of R&D artifacts.	FY 2024 Q1	FY 2024 Q4	-
Identify options for low-cost technical solutions to expand login access to sensitive Technology Clearinghouse content to the increase R&D artifact access and reuse of science and technology solutions for the broader homeland security community in accordance with S&T policy for safeguarding sensitive information.	FY 2024 Q1	FY 2024 Q4	-

Technology Scouting

- **Problem:** DHS technology needs are increasingly complex and available solutions and markets are rapidly evolving. Identifying and determining, in a timely fashion, if relevant technology solutions are, or will soon be, available prior to making a decision to conduct R&D is needed. This is essential and is a part of program or project solution analyses. A centralized source using repeatable and transparent processes to provide information on existing commercial solution or relevant ongoing R&D work needs to be available to users or R&D funds could be used for inappropriate procurements or duplicative R&D efforts.
- **Solution:** By conducting research for existing technologies and solutions that are available commercially, through another Federal agency or supported research organization, technology scouting provides input to assist in the make versus buy decision. Technology scouting will provide detailed research and analysis of viable solutions and alternatives to improve program planning and R&D decision-making, as well as to inform a customer's decision on determining the most appropriate existing, adaptable, or new R&D solution(s). Technology scouting serves as a critical step in the S&T process to determine R&D solution approaches, can identify existing or adaptable solutions to save or eliminate the need to invest R&D dollars into solutions already available and is used directly by Components to quickly identify, down select, test, and move to acquisition in a much shorter timeframe.
- **Justification:** The FY 2024 President's Budget continues to provide \$4.8M for this project and will provide technology scouting services to inform the "R&D investment versus buy" decision for the S&T Business Process Flow, S&T Program Managers, and Component customers as well as to identify ways to improve the impact of the program.
- **Impact:** Leveraging these capabilities allows for faster solution development, increases partnership opportunities and resourcing to assist in the development of current or future homeland security systems and needs, and eliminates unnecessary R&D expenditures

Type of Research

Applied and Developmental

Technical Readiness Level

This is part of the R&D life cycle development and deployment for all programs and projects to gauge the state of the market and to ensure S&T leverages academia, industry, and other Federal entities before making R&D investments. The majority of S&T R&D is between TRL-4 and TRL-7.

Transition Plans

N/A

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Conducted two pilot tech scouting – rapid tech assessment activities and 50 tech scouting engagements to provide customers information on the viability of potential solutions.	FY 2021 Q3	FY 2022 Q4	-
Analyzed impacts of 6 tech scouting engagements to identify areas for improvement.	FY 2021 Q2	FY 2022 Q4	-
	FY 2023		
Conduct 47 tech scouting engagements to provide customers information on the viability of potential solutions.	FY 2023 Q1	FY 2023 Q4	-
Analyze impacts of four tech scouting engagements to determine areas for improving services to customers.	FY 2023 Q1	FY 2023 Q4	-
	FY 2024		
Conduct 10 rapid tech scouting engagements to provide customers information on readily available commercial or government off-the-shelf solutions to avoid needless expenditures on R&D.	FY 2024 Q1	FY 2024 Q4	-
Conduct 55 tech scouting engagements to provide customers information on relevant potential commercial, government, academia, or international technology solutions to inform R&D decision making and eliminate redundant expenditures.	FY 2024 Q1	FY 2024 Q4	-

Technology Transition

- **Problem:** The transition of new technologies and capabilities to DHS Components and other end users is a challenge for all USG agencies. The purpose of Technology Transition is to ensure, to the maximum extent practicable, that S&T transition management and execution is integrated into S&T's R&D program management lifecycle process, and then managed to ensure greater success in the adoption and tracking of solutions funded by DHS and developed for national homeland security purposes. Without centralized guidance, training, tools and metrics, the ability to manage transitions consistently, provide best practices and lessons learned and capture and report on overall performance is not possible. The transition office also coordinates with all other necessary partners to include transfer, commercialization, IP management and the end user to ensure at the beginning of solution agreement and development all parties understand their responsibility and commit to supporting the necessary actions to provide the best chance for the R&D investment to be put into practice and used in an operational environment. This can be a very complex process and requires continuous monitoring, risk management and support to project managers and end customers to coordinate and support all necessary preparations to maximize ROI and usefulness of R&D efforts.
- **Solution:** S&T will provide transition management services and tools that will assist Program Managers (PMs) and S&T decision-makers in project planning and execution. As part of the R&D lifecycle, all programs and projects will require transitioning planning. These services focus on critical transition areas identified by S&T including selection and implementation of transition tools and strategies; identification, measurement, and mitigation of transition issues and risks; engagement and communication between the PM and the customer; and assurance that the user is ready and resourced to employ S&T-developed products. Enhancements to transition management services will be based on a formal independent evaluation, analysis, and recommendations for the incremental build of a transition management service capability that can support the evolving needs of S&T and its customers.
- **Justification:** The FY 2024 President's Budget continues to provide \$4.0M for this project and will provide R&D transition planning and management service capability to DHS Program Managers; offer tools and services to track S&T's and DHS's project transitions; collect and analyze post-transition data for the purpose of reporting on the impact of DHS sponsored R&D; share guidance to standardize collection and reporting of R&D indicators of success by S&T and DHS in support of the FY 2017 National Defense Authorization Act (NDAA) R&D annual report; provide R&D program managers and staff technology transition education and coaching; and improve strategic communication channels to enhance transition coordination, management, and reporting.

- **Impact:** Providing S&T a transition management service capability for its R&D programs, projects, and activities will expedite the transition of technologies and knowledge to DHS customers and other government agencies; improve the probability of successful project outcomes; and provide a systematic approach to determine potential failure points associated with the transition of a solution so that resources can be quickly allocated to address issues or reallocated to priority projects. Separately, S&T will track and report on DHS R&D transitions and focus on post-transition evaluations of R&D activities for three years in accordance with the FY 2017 NDAA.

Type of Research

Applied and Developmental

Technical Readiness Level

This is part of the R&D life cycle development and deployment for all programs and projects to ensure successful transition of R&D capabilities to Component customers.

Transition Plans

N/A

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
FY 2022			
Developed a pilot program that uses customer feedback elicitation to collect information from customers to understand and quantify satisfaction levels with the R&D process and solution deployment on five (5) transitioned efforts.	FY 2022 Q1	FY 2022 Q4	-
Expanded planning, training, and education activities to promulgate transition management matrix services and enhance the development of measurable transition-specific metrics.	FY 2022 Q1	FY 2022 Q4	-
Provided transition planning and management capability services for S&T's R&D efforts while enhancing foundational governance and procedural guidance documents to further mature S&T's transition management services capability for R&D programs, projects, and activities.	FY 2022 Q1	FY 2022 Q4	-
FY 2023			
Develop initial Risk Framework to improve transition risk assessments.	FY 2023 Q1	FY 2023 Q4	-
Implement guidance to standardize the collection and reporting of R&D indicators of success by S&T and DHS Components in support of the 2017 NDAA and other data sharing requirements.	FY 2023 Q1	FY 2023 Q4	-
Provide transition planning and management capability services for up to 20 new S&T sponsored R&D efforts.	FY 2023 Q1	FY 2023 Q4	-
FY 2024			
Integrate new enhancements to guidance and procedures for the planning of R&D transitions and indicators of success by S&T and DHS Components in support of the 2017 NDAA and other data sharing requirements. Enhancements will be based on recommendations from a formal independent evaluation and analysis.	FY 2024 Q1	FY 2024 Q4	-
Provide technology transition job aids and guidance to promulgate and enhance transition planning and the development of transition-specific metrics reported.	FY 2024 Q1	FY 2024 Q4	-
Provide transition planning and management capability services for up to 20 new S&T sponsored R&D efforts with new early transition risk management and end user coordination engagement to improve transition outcomes.	FY 2024 Q1	FY 2024 Q4	-

Partnerships Program – S&T Partnerships build and sustain relationships with industry to advance the development and delivery of innovative technology solutions to homeland security operators. Funding supports two primary focus areas of innovative technology development and solution delivery.

Bi-National Cooperative

- **Problem:** DHS shares many of the same technology requirements as its international partners and without collaboration to address these requirements efforts could be duplicative.
- **Solution:** The Bi-National Industrial Research and Development Homeland Security (BIRD HLS) project promotes collaboration between U.S. and Israeli technology companies for joint product development for the HSE.
- **Justification:** The FY 2024 President’s Budget does not include funding for this project and activities will end in FY 2023.
- **Impact:** International research agreements leverage technical resources and expertise and share costs for technology research, development and assessment and contributes to building a global homeland security industrial base, and, most importantly, help generate cutting-edge technologies in support of first responders and the larger homeland security mission. This effort raises awareness of capability gaps within the global innovation ecosystem. Specifically, BIRD helps build relationships between industry and homeland security organizations, both in Israel and the U.S.

Type of Research

Developmental

Technical Readiness Level

The project identifies R&D efforts from TRL-5 to TRL-7 and facilitates the sharing or transition of the technologies between international partners.

Transition Plans

S&T will identify activities associated with these efforts based on input from U.S. and Israeli end-users. In addition, the vendors supporting the activities will be domestic and international partners and will leverage a broader customer base which results in manufacturers being able to produce the products more efficiently thus reducing the cost for the end user.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Transitioned or commercialized outcomes of previous BIRD HLS cohorts.	FY 2022 Q1	FY 2022 Q4	5-7
Released a new call for proposals addressing homeland security priority areas for technical development.	FY 2022 Q1	FY 2022 Q4	-
Completed commercialization planning with active BIRD performers to encourage homeland security market relevance.	FY 2022 Q1	FY 2022 Q4	-
	FY 2023		
N/A	-	-	-
	FY 2024		
N/A	-	-	-

Commercialization Accelerator Program (CAP)

- **Problem:** Only a small fraction of the research performed using Federal funding reaches the marketplace where it can have an impact and ensure the most meaningful return on investment. This is due to limited resources to identify the right technology, mature it for transfer, ensure it meets operational needs, and create partnerships with communities in the private sector that can facilitate commercialization.
- **Solution:** CAP will support S&T in delivering innovative technology solutions to DHS Customers by focusing on accelerating the commercialization process and addressing roadblocks to transfer federally funded R&D. The program will increase market readiness of technologies and collaborate with operational users, start-up companies, small businesses, the R&D community, manufacturing and supply chain partners, and development partners to accelerate commercialization and HSE adoption of innovations through partnerships.
- **Justification:** The FY 2024 President’s Budget does not include funding for this project.
- **Impact:** Completion of existing CAP projects will provide the transfer of technology and knowledge to DHS and other government agencies and continuously improve future CAP project outcomes, reduce inefficiencies, and provide commercially available products and services to enhance public safety and improve homeland security. The program will enable S&T to leverage relevant existing technologies, including those funded and developed by others, to ensure a pipeline of ready to transition solutions for DHS Components at a fraction of the time and cost.

Type of Research

Applied and Developmental

Technical Readiness Level

Advancing low level TRL technologies to a higher TRL to make the technology more commercially viable.

Transition Plans

The program will leverage Technology Transfer and Commercialization (T2C) mechanisms to identify potential market segments and partners to transfer the technology. This information is shared with the CAP performer, who handles executing the transfer to achieve the wider utilization of R&D investments.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Awarded one to three Interagency Agreements to domestic laboratories including the DOE national labs, DOD labs, FFRDCs & UARCs to leverage federally funded innovations that will develop and strengthen homeland security enterprise technology capabilities and enable commercialization to the marketplace.	FY 2022 Q3	FY 2022 Q4	-
Conducted technology and innovation analysis for DHS's broad mission priority technological/capability requirements to inform commercial viability.	FY 2022 Q2	FY 2022 Q4	4-7
Executed the development of 4-6 DHS research projects in partnership with the CAP cohort of performing laboratories and focus on developing partnerships for commercialization.	FY 2022 Q1	FY 2022 Q4	4-7
Organized kickoff for the six FY 2022 DHS CAP projects with laboratory scientists, engineers, academia, and private sector cohort members.	FY 2022 Q1	FY 2022 Q2	-
Released a new call for proposals for late stage federally funded applied research addressing homeland security priority areas for technical development.	FY 2022 Q1	FY 2022 Q2	-
Transitioned or commercialize outcomes of CAP cohorts by collaborating with non-profit and private sector partners to execute a robust commercialization assistance process in cooperation with federally funded laboratory scientist and engineers interested in performing impactful research projects that will advance homeland security related innovations into the marketplace for utilization across the government.	FY 2022 Q1	FY 2022 Q4	-
	FY 2023		
Execute the development of DHS research projects in partnership with the CAP cohort of performing laboratories by collaborating with non-profit and private sector partners focused on transfer of technologies to the HSE.	FY 2023 Q1	FY 2023 Q4	3-7
Release call for proposals covering broad DHS needs to leverage federally funded innovations that will develop and strengthen homeland security enterprise technology capabilities and enable commercialization to the marketplace.	FY 2023 Q1	FY 2023 Q4	-
Transfer outcomes of CAP cohorts by collaborating with non-profit and private sector partners to execute a robust commercialization assistance process in cooperation with federally funded lab performers interested in performing impactful research projects that will advance homeland security related innovations into the marketplace for utilization across the government.	FY 2023 Q1	FY 2023 Q4	-
	FY 2024		
N/A	-	-	-

Coordination, Engagement and Outreach

- **Problem:** Traditional methods of engaging and contracting require innovation to ensure that S&T is reaching the broader groups of industry who are poised to deliver significant solutions to DHS Components in an appropriate, condensed timeline. Focused engagement to new potential partners is necessary to develop and maintain mechanisms for engaging industry to meet Components' technology needs.
- **Solution:** S&T will utilize a series of expanded innovation programs and platforms designed to engage a range of community stakeholders on homeland security missions, technology, and innovative solutions.
- **Justification:** The FY 2024 President's Budget continues to provide \$2.0M for this project and will be used to reach an ever-broader industry audience with DHS mission-relevant capabilities by facilitating additional events to educate stakeholders on the activities and technology needs of DHS Components. In addition, funds will be used to coordinate engagement efforts with the private sector which will allow S&T to forge connections with technology developers and operational end users, enabling joint R&D and energizing a diverse group of research communities to address Homeland Security challenges.
- **Impact:** The program will ensure S&T is able to deliver the best technology solutions to DHS's end-users and operators building and sustaining relationships with industry and innovation communities.

Type of Research

Applied and Developmental

Technical Readiness Level

This is part of the R&D life cycle development and deployment for all programs and projects to gauge the state of the market and to ensure S&T leverages academia, industry, and other Federal entities before making R&D investments. The majority of S&T R&D is between TRL-6 and TRL-7.

Transition Plans

This will be determined at later date and developed based on event observations and feedback.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Facilitated 8 events to educate stakeholders on the activities of DHS Components, current technology capabilities, and technology needs.	FY 2022 Q1	FY 2022 Q2	6-7
Facilitated 8 events to educate stakeholders on the activities of DHS Components, current technology capabilities, and technology needs.	FY 2022 Q2	FY 2022 Q3	6-7
Facilitated 8 events to educate stakeholders on the activities of DHS Components, current technology capabilities, and technology needs.	FY 2022 Q3	FY 2022 Q4	6-7
	FY 2023		
Facilitate 10 events to educate stakeholders on the activities of DHS Components, current technology capabilities, and technology needs.	FY 2023 Q1	FY 2023 Q2	6-7
Facilitate 10 events to educate stakeholders on the activities of DHS Components, current technology capabilities, and technology needs.	FY 2023 Q2	FY 2023 Q3	6-7
Facilitate 10 events to educate stakeholders on the activities of DHS Components, current technology capabilities, and technology needs.	FY 2023 Q3	FY 2023 Q4	6-7
	FY 2024		
Facilitate 15 events to educate stakeholders on the activities of DHS Components, current technology capabilities, and technology needs.	FY 2024 Q1	FY 2024 Q2	6-7
Facilitate 15 events to educate stakeholders on the activities of DHS Components, current technology capabilities, and technology needs.	FY 2024 Q2	FY 2024 Q3	6-7
Facilitate 15 events to educate stakeholders on the activities of DHS Components, current technology capabilities, and technology needs.	FY 2024 Q3	FY 2024 Q4	6-7

Partnership Intermediary Agreements (PIA)

- **Problem:** The transfer and commercialization of federally funded technologies is frequently a time consuming and expensive undertaking especially when resources are constrained at Government agencies, including DHS.
- **Solution:** S&T will utilize its network of qualified Partnership Intermediary organizations to increase the maturity and market readiness of DHS funded technologies to prepare them for transfer and commercialization to meet DHS' operational needs and the needs of the wider HSE.
- **Justification:** The FY 2024 President's Budget does not include funding for this project. Funding for this project moved to O&S as of FY 2023.
- **Impact:** This program allows S&T Technology Transfer and Commercialization (T2C) to expand its reach to promote and market DHS technologies; gain increased partnerships with a variety of businesses and educational institutions; gain insight on industry perspectives on DHS technologies; and increase the likelihood of impact from research outcomes. Multiple PIAs are required to capitalize on State and local relationships across the United States to identify SMEs and benefit from local economic development resources; tap regional angel and venture capital networks; and leverage existing contacts with State and local first responder/law enforcement/mass transit communities.

Type of Research

Does not apply.

Technical Readiness Level

This is part of the R&D life cycle development and deployment for all programs and projects to gauge the state of the market and to ensure S&T leverages academia, industry, and other Federal entities. Project focuses on the transfer or commercialization of technologies at TRL-6 and TRL-7.

Transition Plans

The program will plan the transfer of all relevant DHS funded technologies to other government agencies, State, local, tribal, and territorial governments, and the open market via commercialization.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Maintained and expanded network of DHS PIAs to meet S&T technology transfer needs and leverage the S&T innovation ecosystem to drive the development and commercialization of DHS relevant technologies.	FY 2022 Q1	FY 2022 Q4	6-7
	FY 2023		
N/A	-	-	-
	FY 2024		
N/A	-	-	-

SBIR Management (formerly Partnership Mechanisms and Technology Transition)

- **Problem:** There are administrative costs to running the SBIR Program, most notably the program requires a portal for industry to understand and submit proposals for solicitations. The current portal, which was developed using technology from a previous SBIR, is now outdated technology. A new portal needs to be developed that can better produce required information for the congressionally mandated annual report submission to Small Business Administration (SBA) and to comply with current security standards.

Additionally, the SBIR Policy Directive requires agencies to conduct targeted outreach to specific disadvantaged small business concerns. Conducting outreach that engages disadvantaged small business concerns and provides a beneficial impact to participation in the SBIR program requires research and addressing of knowledge gaps in the DHS processes and missions.

- **Solution:** Funding is utilized to develop and maintain easy to navigate tools (portal) which, along with additional outreach, will improve industry response to solicitations. The tool also facilitates tracking, tasker response, and mandated SBIR reporting.

Develop a strategic plan to ensure that outreach efforts are accessible and engaging for disadvantage small business concerns. The plan will incorporate existing programs and resources as well as developing elements to address additional knowledge gaps.

- **Justification:** The FY 2024 President’s Budget continues to provide \$2.2M for this project and will fund the maintenance and advancement of the portal to facilitate congressionally mandated data reporting for the SBIR program and facilitate proposal submission to reduce submission errors which lead to unresponsive proposals. This portal will support multiple programs including: SBIR, SVIP, and Broad Agency Announcements (including the Long-Range Broad Agency Announcement). In addition, funds will be used to ensure the outreach efforts are being done most effectively and can ultimately have a beneficial impact on the disadvantaged small business community.
- **Impact:** This funding will administer the IT, management, and overhead costs of the SBIR program to successfully interface with Small Businesses so that they can efficiently respond to solicitations. The IT will also be able to be leveraged for other S&T programs to facilitate their pursuit of technology innovation. The funding will also decrease the knowledge gap for disadvantaged Small Business concerns to increase successful participation in the SBIR program.

Type of Research

Applied and Developmental

Technical Readiness Level

This is part of the R&D life cycle to ensure S&T leverages academia, industry, and other Federal entities. Project focuses on the development and commercialization of technologies between TRL-4 and TRL-7.

Transition Plans

In FY 2023 Q1, the new portal will fully support SVIP and continue to support the SBIR program and BAAs.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Deployed S&T's new SBIR program portal.	FY 2021 Q2	FY 2022 Q4	-
Conducted five engagement events to support SBIR program execution.	FY 2022 Q1	FY 2022 Q4	-
	FY 2023		
Continue refinement and security updates for SBIR Portal.	FY 2023 Q1	FY 2023 Q4	-
Deploy expanded OIP portal capability to include support for Silicon Valley Innovation Program leveraging existing functionality.	FY 2021 Q4	FY 2023 Q1	-
Conduct five engagement events to support SBIR program execution with emphasis on underserved communities.	FY 2023 Q1	FY 2023 Q4	-
	FY 2024		
Identify and develop improvements to the portal for refinement of the proposal submission and security updates to support the SBIR, SVIP, and BAA (LRBAA) programs.	FY 2022 Q1	FY 2024 Q4	-
Conduct five engagement events to support SBIR program execution with emphasis on underserved communities.	FY 2023 Q1	FY 2024 Q4	-

Silicon Valley Innovation Program (SVIP)

- **Problem:** As the needs and technology gaps of DHS operational agencies and critical infrastructure partners continue to evolve, DHS needs to pursue multiple paths to innovative solutions for these needs. Lengthy procurement processes have created barriers for entry for innovative, high-tech, commercial, non-traditional, small businesses thus limiting the Government's access to relevant and timely solutions to meet these evolving needs.
- **Solution:** The SVIP reaches out to innovation communities across the Nation and around the world to harness the commercial R&D ecosystem for government applications, co-invest in ideas, and accelerate transition-to-market. The SVIP also involves DHS Components, end users and HSE stakeholders throughout each project, thereby increasing the likelihood of successful transitions that meet operational needs. SVIP solutions allow DHS Components to directly acquire and deploy innovative commercial technologies and gain visibility across the Federal government enabling broader adoption of security-driven capabilities.
- **Justification:** The FY 2024 President's Budget continues to provide \$9.0M for this project and will complete phased funding of existing projects, including transitioning capabilities to DHS Components, such as maritime object tracking technologies, digital immigration credentials, and offline language translation. In addition, funds will also enable SVIP to generate one to two new topics to address Component innovation requirements. New topics supporting Component innovation interests include cybersecurity and privacy enabling technologies.
- **Impact:** The SVIP provides accelerated and novel solutions for Component and HSE requirements that can be used in operations in as little as 12-24 months. The program attracts new companies that may not have previously engaged with the Government. These new companies address long-standing issues, as well as emerging needs, such as the COVID-19 pandemic, in a rapid fashion, increasing avenues by which DHS and its partners can obtain and leverage innovative technology and solutions. For a more detailed look at SVIP's inventive selection process, a list of current SVIP-funded startups, and video demonstrations of technologies aimed at solving complex DHS problem sets through the power of the innovation community, please visit our website at <https://www.dhs.gov/science-and-technology/svip>. Highlights include innovations in offline language translation for USCG boarding teams where cellular and internet connections are not available, as well as K9 wearables to monitor and detect heat stress in canine agents in the field.

Type of Research

Applied and Developmental

Technical Readiness Level

Specific company solutions are expected to begin Phase I at a minimum TRL-6, and solutions that successfully progress through Phase IV should finish at a TRL-7.

Transition Plans

The SVIP coordinates directly with DHS Components to enable the transition of SVIP-funded startup solutions by ensuring those technologies meet the requirements to address DHS operational mission needs, are ready for deployment, and are commercialized and thus available for direct acquisition.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Generated new solicitation calls in one to three specific areas covering broad DHS and critical infrastructure needs and requirements as identified through S&T requirement sourcing activities.	FY 2022 Q1	FY 2022 Q4	-
Transitioned completed projects into Component operational acquisition cycles or commercial products (project/solution dependent).	FY 2022 Q1	FY 2022 Q4	6-7
	FY 2023		
Conduct end-to-end technical demonstration of supply chain digitization with paperless transactions and digital certificates into CBP Dev IT environment to streamline the entry of imports into the U.S. working with CBP Office of Trade and Trade Partners.	FY 2023 Q1	FY 2023 Q3	6-7
Conduct technical demonstration of the issuance of secure and privacy respecting digital immigration credentials with U.S. Citizenship and Immigration Services.	FY 2023 Q1	FY 2023 Q4	6-7
Perform test and evaluation including operational and airborne drop tests for the Silicon Valley Innovation Program's Maritime Object Tracking Technology buoys at a U.S. Coast Guard Facility.	FY 2023 Q1	FY 2023 Q3	6-7
Release new solicitation calls in one to three specific areas covering broad DHS and critical infrastructure needs and requirements as identified through S&T requirement sourcing activities.	FY 2023 Q1	FY 2023 Q4	-
Transition completed projects into Component operational acquisition cycles or commercial products (project/solution dependent).	FY 2023 Q1	FY 2023 Q4	6-7
	FY 2024		
Deliver knowledge product consisting of a data set of 500 synthetic images for use in training millimeter wave-based detection algorithms related to on-person screening at TSA checkpoints.	FY 2024 Q1	FY 2024 Q4	6-7
Release new solicitation calls in one to two specific areas covering broad DHS and critical infrastructure needs and requirements as identified through S&T requirement sourcing activities.	FY 2024 Q1	FY 2024 Q4	-
Transition project technology product outputs to DHS Component for submission into their acquisition cycles or into the licensing process for commercial products.	FY 2024 Q1	FY 2024 Q4	6-7
Transition technologies that provide CBP Office of Trade with supply chain traceability across natural gas imports, cross-border oil imports, steel imports, direct-to-consumer e-commerce shipments.	FY 2024 Q1	FY 2024 Q4	6-7

Technology Transfer and Commercialization (T2C)

- **Problem:** The transfer and commercialization of federally funded technologies is frequently a time consuming and expensive undertaking especially when resources are constrained at Government agencies, including DHS.
- **Solution:** S&T will support required staff needs and will allow the office to procure and maintain a technology transfer knowledge management system, support the continuation and expansion of the Homeland Security Startup Studio program, actively manage a DHS PIA network and associated PIA projects, and develop new programs to track intramural and extramural invention disclosures, monitor S&T program activities and engage with PMs throughout the Business Process Flow (BPF) process, fund our Federal Laboratory Consortium dues and meaningfully participate in interagency Federal technology transfer programs and activities.
- **Justification:** The FY 2024 President’s Budget continues to provide \$2.5M for this project and will maintain a technology transfer knowledge management system to support the continuation and expansion of the Homeland Security Startup Studio program, actively manage the DHS PIA network and associated PIA projects and develop new programs to track intramural and extramural invention disclosures. Additionally, it will allow for the monitoring of S&T program activities and enable engagement with PMs throughout the BPF process, fund our Federal Laboratory Consortium dues and meaningfully participate in interagency Federal technology transfer programs and activities. Transfer and commercialization activities of DHS program offices develop program level strategic plans, execute, and respond to unexpected needs.
- **Impact:** Technology transfer is a key metric for Federal research agencies as it documents the impact of the agency’s research investments and ensures that the public benefits from new products and services. DHS has an interest in ensuring that its technologies are commercialized and made available to its Components and the HSE. Long term, this translates into local economic impact as measured by venture capital/angel investment, the creation of jobs, and increased tax revenue. DHS needs to adequately resource technology transfer and commercialize to realize its broader goals and support the DHS mission.

Type of Research

Developmental

Technical Readiness Level

This is part of the R&D life cycle development and deployment for all programs and projects to gauge the state of the market and to ensure S&T leverages academia, industry, and other Federal entities. Project focuses on the transfer or commercialization of technologies at TRL-6 and TRL-7.

Transition Plans

The program will plan the transfer of all relevant DHS funded technologies to other government agencies, State, local, tribal, and territorial governments, and the open market via commercialization.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
N/A	-	-	-
	FY 2023		
Acquire and customize intellectual property, technology transfer, and commercialization system to manage all Technology Transfer and Commercialization (T2C) Branch workflows including intellectual property (IP) docketing and licensing, Cooperative Research and Development Agreements (CRADAs), Partnership Intermediary Agreements (PIAs), (Memoranda of Understanding) MOU/ Memoranda of Agreement (MOA) and royalty disbursement.	FY 2023 Q3	FY 2023 Q4	-
Develop a DHS web-based technology/SME locator which will incorporate all relevant (Office of National Labs) ONL information and Office of General Counsel IP/patent information for DHS inventions.	FY 2023 Q1	FY 2023 Q4	-
Expand the Homeland Security Startup Studio program to include a phase 0 module which will be codeveloped with ONL to provide entrepreneurship training and skills development for DHS researchers.	FY 2023 Q1	FY 2023 Q4	-
	FY 2024		
Award at least 2 agreements to support the further development of DHS-relevant federally funded innovations with a CAP performer. Monitor CAP funded research projects to accelerate the transfer and commercialization of the CAP supported technologies to homeland security end users in partnership with the CAP performer.	FY 2024 Q1	FY 2024 Q4	3-7
Implement the intellectual property, technology transfer, and commercialization system to manage all Technology Transfer and Commercialization (T2C) Branch workflows including intellectual property (IP) docketing and licensing, Cooperative Research and Development Agreements (CRADAs), Partnership Intermediary Agreements (PIAs), Interagency Agreements (IAAs), (Memoranda of Understanding) MOU/ Memoranda of Agreement (MOA) and royalty disbursement.	FY 2024 Q1	FY 2024 Q4	-

Technology Centers Program – The Technology Centers conduct enduring, foundational, basic, and applied research activities into cross-cutting scientific, engineering, and technological areas. This will ensure emerging technologies and advancements in science and technology are harnessed for cutting edge solutions to operational challenges and ensure technical SME capabilities are available to S&T and DHS for decision making. The Technology Centers are the source within S&T for scientific, engineering, and technology expertise and solutions to widespread challenges across DHS mission spaces. The funding for Technology Centers is applied towards broad outcomes that fundamentally change or provide a unique capability to address DHS’s recognized gaps, needs, and emerging threats, to include:

- Maintaining S&T’s technical baseline competency and awareness of the state-of-the-art/art-of-the-possible in key science, engineering, and technology areas.
- Advancing the state of science and technology where needed to address operational gap areas common to multiple missions/multiple portfolios.
- Exploring emerging technology areas and their potential threat and/or application to current and future DHS missions.
- Providing cross cutting solutions against challenging and persistent DHS mission needs and Component requirements.
- Delivering rapid-response expertise to urgent needs.

The Technology Centers have identified several key research areas by analyzing several strategic drivers, including administration priorities, global and industry trends, emerging technologies, and academic developments. These key research areas provide a science and technology focused lens on where S&T is headed and what aspects are, or will be, relative to DHS, both from the perspective of beneficial developments to help advance our missions as well as keeping ahead of potential dual-use issues that could cause additional risk or harm to DHS, its missions, and the Nation. In addition to conducting research along these topic areas, the Technology Centers provide critical subject matter expertise across multiple disciplines to serve as advisors to programs within S&T and to DHS at large. S&T’s Technology Centers serve to educate the broader DHS community through their technical communities of interest, while also collaborating with interagency and international partners to strengthen the DHS’s network of scientists and engineers who are focused on addressing Homeland Security challenges.

Advanced Computing Technology Centers

- **Problem:** We, as a Nation and a member of the global community, face a rapidly evolving digital environment, one in which rapid advancements in distributed computing architectures, information storage, quantum computing, immersive and augmented reality, and AI/ML are pushing the edge of innovation. These advancements enable us to explore new ways of training and protecting officers, detecting threats, and analyzing systems that were previously too complex or too dangerous to examine in the real world. However, this speed of innovation also makes it difficult to track and assess needed solution options for critical homeland security missions. In addition, our adversaries are exploiting these systems via weaknesses in our cybersecurity defenses in an attempt to thwart, deter, and/or slow down our progress and ability to execute our mission. DHS

Components are generating and have access to more relevant data for decision-making than can be processed, assimilated, and used. The Components continue to face challenges with leveraging additional data sources to compute threats, impacts, risks, and to maintain situational awareness due to the exponential growth of data, particularly data associated with IoT, commercial, non-profit, open source, and publicly available information. Not only is research into these spaces necessary but the subject matter expertise to ensure proper adaption of these new

technologies and capabilities into the DHS mission spaces is critical for being able to successfully leverage the promise of these new technologies, as well as inform the risks and potential unintended consequences.

- **Solution:** The Advanced Computing Technology Centers bring together a full complement of capabilities and subject matter expertise as S&T's key resource in the fields of data sciences & analytics, cybersecurity, AI/ML, computational methods, modeling and simulation techniques, and Quantum Information Science (QIS). Research investments in emerging innovations enable our subject matter experts to experiment, learn, inform, and apply the strengths of these various advanced computing developments to homeland security systems and operations. Working across multiple disciplines, our SMEs illuminate next-generation problem sets, tools, techniques, technologies, and simulation environments to increase mission effectiveness. Research investments provide access to the ecosystem of experts, tools, and applications that can be leveraged for new applications, such as training applications that augment human perception and comprehension and conducting computationally and data-intensive research in support of DHS missions. Finally, the Advanced Computing Technology Centers serve to educate the broader DHS community by hosting communities of interest in the areas of Big Data, AI/ML, Modeling & Simulation, and QIS, while collaborating with interagency and international partners, to ensure S&T can fulfill its responsibility to inform and advise DHS on the proper use and implementation of advanced computing capabilities, especially at scale. The Advanced Computing Technology Centers conduct research in the following focus areas:
 - Data Science & Analytics (formerly under Data Analytics Technology Center and Modeling and Simulation Technology Center): Keeps pace with the rapidly evolving and emerging digital environments by experimenting with growing data sets and next generation technologies at scale, including publicly available information, real-time analytics, secure multi-party computation, high performance computing, edge computing, blockchain, modeling & simulation tools, immersive simulations, and cloud environments to inform program planning, avoid technical obsolescence, accelerate transition, and prevent mission surprise. This provides DHS and S&T programs with coordinated research and subject matter expertise to improve program efficiency, share best practices, and improve security and privacy protection across DHS system investments, with additional reach back capability provided by our collaboration with interagency partners and our hosted communities of interest for Big Data and Modeling & Simulation.
 - Quantum Information Science (QIS) (formerly named Quantum Information Science Research Activity): QIS advancements offer promise and as well as risks. S&T has established a QIS community of interest within DHS that engages Components to promote a better understanding of QIS technologies (including quantum computing & networking, quantum sensing and quantum communications) and identify potential mission areas where QIS technologies will provide significant impact. Informed by these engagements, as well as SME engagements with industry, academia, and international partners, we will pursue research to advance the state of the art of select promising quantum sensing applications for DHS use, as well as use our SME to advise on DHS's preparation and implementation of post-quantum encryption and conduct additional research into cryptographically agile solutions.
 - Artificial Intelligence and Machine Learning (AI/ML) (formerly under Artificial Intelligence & Machine Learning Technology Center): DHS's initial examination of emerging technology threats to homeland security has identified that AI/ML pose significant opportunities and threats to homeland security. This research activity will examine and characterize the state of AI research relative to future homeland security mission applications. Research activities will focus on the development of core capabilities that enable trustworthy AI to improve core

automation capabilities that are secure, private, and trusted for critical homeland security applications. S&T also established an AI/ML community of interest that promotes the understanding of AI/ML fundamentals and shared practices for foundational data and infrastructure needs of AI/ML capabilities.

- Cybersecurity (formerly under Cybersecurity Threats Technology Center): Cybersecurity is a very fast-moving technical challenge for government agencies and critical infrastructure partners. The Cybersecurity Division of CISA partners with us to research and develop new cyber-threat hunting, information security, and software assurance capabilities for CISA and others as part of a technology pipeline for rapid deployment of effective cybersecurity against an ever-changing threat landscape. Work in this research activity will mature the methodology for operationalizing emerging research for use across the U.S. government and critical infrastructure partners.
- **Justification:** The FY 2024 President’s Budget continues to provide \$17.6M for this project and will continue research of analytics infrastructures to characterize multi-cloud and hybrid environments that will enable data sharing and collaboration across system owners, authorities, and policies, as well as continue predictive threat modeling of DHS operational domains and continue to support CISA with cybersecurity subject matter expertise. Further research will be conducted within advanced analytics, quantum information, trustworthiness and explain ability of artificial intelligence solutions, and enhancements of cyber threat mitigation approaches. Additionally, as privacy, data and digital trust concerns continue to grow, we will explore the use of privacy enhancing technologies for data handling (such as secure multi-party computation). Specific work will continue to focus on:
 - Data Science & Analytics: Continued investments to grow data sets and examine next generation advanced analytics technologies at scale, including publicly available information, real-time analytics, secure multi-party computation, high performance computing, edge computing, blockchain, modeling & simulation tools, immersive simulations, and cloud environments to inform program planning, avoid technical obsolescence, accelerate transition, and prevent mission surprise.
 - Advanced Data Analytics Capabilities –Improving existing data analytics capabilities and invent/adapt new and emerging capabilities for DHS use.
 - Advanced Modeling and Simulation Capabilities – Improving existing modeling and simulation capabilities and adapt new and emerging capabilities for DHS use.
 - Data Ecosystem – Increasing knowledge and informing best practices for data ecosystems that serve all DHS modeling communities and enable data analytics, simulation, and AI applications.
 - Quantum Information Science (QIS): Continued investments to advancing the state of the art of promising quantum sensing applications for DHS use, preparing and implementing post-quantum encryption, and identifying cryptographically agile solutions.
 - Artificial Intelligence and Machine Learning (AI/ML): Continued investments to advance trustworthy AI and improving core automation capabilities that are secure, private, and trusted for critical homeland security applications. FY 2024 will also focus on Adversarial AI.

- Trustworthy AI/AS - Assessing the performance of AI/AS for potential operational use in order to maintain the integrity of DHS missions and ensure the appropriate systems are employed.
- Adversarial AI - Across all the layers in the communications and tech stacks (data, software, hardware, networks, and communications), guarding against sophisticated adversaries employing AI attacks.
- Advanced Applications of AI/AS for Unique DHS Missions – Advancing AI/AS capabilities in various subfields (such as computer visioning, natural language processing, predictive modeling, etc.) to drive application of AI/AS across specific DHS missions and needs (e.g., biometric capabilities, media and analytics for mis/dis/mal information, digital forensics, etc.).
- Cybersecurity: Research to identify and assess new cyber-threat hunting, information security, and software assurance capabilities.
 - Data-Centric Security – Increasing the reliability and employability of data for homeland security missions.
 - Software and Hardware Assurance – Ensuring the resilience of the data, software, and hardware used to execute homeland security mission functions.
- Advanced Computing Experimentation Lab: S&T needs to be able to experiment with new and emerging technologies in laboratory environments, as well as test and evaluate them in realistic operational settings to fulfill its role as science and engineering advisors to DHS Components. Funds will be used to continue to stand up the computing laboratory environment that enables emerging and advanced computational, analytics, AI, cybersecurity, virtual reality, and quantum information capabilities experimentation. These capabilities will enable S&T to 1) understand emerging and prototype technologies in light of DHS operational missions; 2) characterize and document technical requirements for DHS acquisitions; and 3) formulate strategies for R&D and Next-Gen mission capabilities.
- **Impact:** The Advanced Computing Technology Centers enable DHS to push beyond the state-of-the-art and harness new technologies that both increase the productivity and effectiveness of the homeland security workforce and solve hard problems in more efficient ways. By investing in capabilities that empower data discovery, data curation, advanced cognition, and increased perception, homeland security end users and operators can spend more time looking at the right data and understanding the situation, rather than looking for data and missing opportunities. In addition, these centers bring together communities of interest in relevant disciplines, which focus a broad set of collaborative experts towards researching opportunities and solutions to homeland security challenges. This research ensures DHS stays ahead of emerging technology, is informed of the impacts of such technology, and avoids technology surprise. Research investments in advance computing will inform how to implement large-scale AI that engenders trust with the public, address vulnerabilities in protecting DHS assets given advances in quantum computing, builds next generation cybersecurity capabilities for protecting networks and cyber-physical systems, and enable large-scale M&S to provide critical insights for addressing critical mission problems.

Type of Research

Basic, Applied and Developmental

Technical Readiness Level

Projects range from TRL-2 to TRL-7. The Technology Centers focus on basic & applied research to address critical knowledge gaps that inform policy, strategy, requirements, mission assessments and operational plans. Therefore, we do not transition technologies directly to Components as we do not directly develop technology. Activities are initiated based on stakeholder (e.g., DHS Components, HHS, DOD, State and local practitioners, DOJ, etc.) strategic needs. Most deliverables are knowledge products and tools to inform decision makers. For this reason, the TRL level on many of its projects tend to be lower.

Transition Plans

The Technology Centers work directly with DHS Components and critical infrastructure communities of interest to share knowledge and understanding of state-of-the-art, in addition to providing experimental results through technical reports and briefings that are relevant to homeland security missions. This transition of knowledge products provides inputs to S&T program planning as well as Component acquisition planning and ongoing operations. Reports of research results are provided to the broader DHS and Interagency communities through S&T's Tech Clearinghouse.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
AI/ML: Leveraged the National Institutes of AI with Academic and Industry Partners to develop new AI concepts and evaluate their potential to enhance homeland security missions.	FY 2022 Q1	FY 2022 Q4	4
Cybersecurity: Developed research partnerships to leverage interagency R&D to improve vulnerability analysis and threat hunting to meet next generation cybersecurity needs.	FY 2022 Q1	FY 2022 Q4	4
DA-TC: Conducted two advanced data analytics demonstrations to inform Component mission operations and expand DHS operational capabilities.	FY 2022 Q1	FY 2022 Q4	3-6
DA-TC: Developed two knowledge products based on emerging technology evaluations that guide acquisitions across DHS Components and the broader Government.	FY 2021 Q4	FY 2022 Q4	3-6
MS-TC continued to host DHS M&S community of interest to share relevant best practices and impactful emerging M&S capabilities and tools.	FY 2022 Q1	FY 2022 Q4	2-7
MS-TC: Developed Augmented Reality and Virtual Reality (AR/VR) modeling capabilities in collaboration with the FLETC: virtualize a training site utilizing AR/VR technology.	FY 2022 Q1	FY 2022 Q4	2-7
QIS activities built and shared knowledge among a DHS Community of interest that promotes an understanding of QIS technologies and identifies potential mission areas where QIS technologies will provide significant impact.	FY 2022 Q1	FY 2022 Q4	2-7
QIS: Developed a Landscape Assessment for QIS relative to DHS specific strategic and operational goals and update at least yearly.	FY 2022 Q1	FY 2022 Q4	-
QIS: Developed a roadmap of QIS R&D activities that communicates DHS QIS technology needs to Federal/industry/academic research communities.	FY 2022 Q1	FY 2022 Q4	5

Research, Development, and Innovation – PPA

Innovative Research and Foundational Tools Thrust Area

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
QIS: Developed working partnerships to leverage other work within the Federal Government applicable to DHS QIS needs.	FY 2022 Q1	FY 2022 Q4	6
QIS: Hosted monthly meetings of the DHS QIS COI and brought in at least 6 guest speakers on relevant specialized topics to promote learning, capacity building, and info-sharing in support of DHS.	FY 2022 Q1	FY 2022 Q4	-
QIS: Identified DHS Critical and essential investment needs in QIS.	FY 2022 Q1	FY 2022 Q4	5
QIS: Developed at least two DHS specific QIS use cases. QIS technology will be investigated to align with solutions for these two use cases.	FY 2022 Q1	FY 2022 Q4	-
The community of interest developed a roadmap of QIS R&D activities that will be shared with the NSTC Subcommittee on QIS, EUWG.	FY 2022 Q1	FY 2022 Q4	2-7
	FY 2023		
AI/ML: Deliver two technical reports summarizing model performance and metrics for enabling and protecting next generation AI mission systems.	FY 2022 Q2	FY 2023 Q2	3
AI: Initiate execution of the AI/ML strategy, establishing and resourcing subject matter experts for the AI/ML Center and working with DHS Components and Offices to communicate research activities for next generation AI/ML capabilities to ensure alignment with mission needs.	FY 2022 Q1	FY 2023 Q3	-
Cybersecurity, Communications & Digital Trust: Host seminars and deliver research papers identifying specific advances in artificial intelligence as applied to cybersecurity for further development.	FY 2022 Q2	FY 2023 Q3	-
Cybersecurity, Communications & Digital Trust: Develop roadmaps for cybersecurity R&D activities to include Zero-trust, as well as cybersecurity law-enforcement tool and critical infrastructure cybersecurity R&D activities that communicates DHS needs for designated audiences.	FY 2023 Q1	FY 2023 Q4	-
Cybersecurity, Communications & Digital Trust: Identify and prioritize cyber threats to civil space systems to inform future strategy, policy, R&D needs, and decision-making for resilient space systems.	FY 2022 Q4	FY 2023 Q4	4
Data Science & Analytics: Deliver two technical research reports summarizing evaluation results of emerging computational technologies to guide acquisitions across DHS Components and the broader Government.	FY 2022 Q4	FY 2023 Q4	3
Data Science & Analytics: Develop two knowledge products based on emerging technology evaluations that guide acquisitions across DHS Components and the broader Government. Conduct two advanced data analytics demonstrations to inform Component mission operations and expand DHS operational capabilities.	FY 2023 Q1	FY 2023 Q4	3-7
Data Science & Analytics: Develop two knowledge products based on emerging technology evaluations that guide acquisitions across DHS Components and the broader Government. Conduct two advanced data analytics demonstrations to inform Component mission operations and expand DHS operational capabilities.	FY 2022 Q4	FY 2023 Q4	5

Research, Development, and Innovation – PPA

Innovative Research and Foundational Tools Thrust Area

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
Evidence Building: Continue to host the DHS ModSim COI and increase community's membership to enhance the sharing of best practices and emerging M&S capabilities with interagency and DHS Component partners. Reports and knowledge products are shared via quarterly forum in a government accessible knowledge repository.	FY 2023 Q1	FY 2023 Q4	3-7
Evidence Building: Develop a knowledge product that assesses the landscape of Modeling and Simulation (M&S) technologies, allowing S&T MS-TC to improve understanding of the technology horizon, direction of technological developments in the M&S domain, and its implications to the HSE.	FY 2023 Q1	FY 2023 Q1	3-7
Quantum Information Science: Complete analysis of two use cases for DHS QIS applications.	FY 2023 Q1	FY 2023 Q4	3
Quantum Information Science: Engage the international community in assessing practical applications of quantum sensing.	FY 2021 Q4	FY 2023 Q4	-
	FY 2024		
Deliver knowledge product report characterizing multi-cloud and hybrid environments that will enable data sharing and collaboration across system owners, authorities, and policies.	FY 2024 Q1	FY 2024 Q4	5
Deliver knowledge product report identifying and assessing cryptographically agile quantum capabilities.	FY 2024 Q1	FY 2024 Q4	3
Deliver knowledge product report of updated landscape analysis of emerging developments and timelines in quantum information and quantum sensing and those that may impact DHS missions.	FY 2024 Q1	FY 2024 Q4	3
Deliver knowledge product report on an assessment of new cyber-threat hunting, information security, and software assurance capabilities.	FY 2024 Q1	FY 2024 Q4	3
Deliver knowledge product report on improvements in core automation capabilities that are secure, private, and trusted for critical homeland security applications.	FY 2024 Q1	FY 2024 Q4	5
Deliver knowledge product report on status of at least one promising quantum sensing applications for DHS use.	FY 2024 Q1	FY 2024 Q4	3
Deliver knowledge product report on the results of initial experiments with advanced AI/ML applications to inform operational implementation opportunities and challenges.	FY 2024 Q1	FY 2024 Q4	4
Deliver knowledge product reports summarizing model performance and metrics for enabling and protecting next generation AI mission systems.	FY 2024 Q1	FY 2024 Q4	3

Enduring Sciences Technology Centers

- **Problem:** DHS continues to observe that the threat (hazards and risks) landscape to the homeland is evolving and becoming more volatile, uncertain, complex, and ambiguous. Challenges and threats range from terrorism and emergency incidents such as chemical and biological attacks, global pandemics, active shooter, and violent extremism, technological and cyber on networks and critical infrastructure, natural hazards such as fires, earthquakes, superstorms, and floods to potential impacts from climate change. These evolving threat vectors stretch our operational and technical capabilities and result in immense economic and human costs. Challenges persist in our ability to prevent, prepare for, respond to, and recover from the effects of such actions and events. The HSE focused on these risks and threat vectors, often lack critical data and expertise necessary to formulate appropriate policy, operational, and system-level requirements and knowledge of current and emerging science and technologies related to interventions, counter measures and training. This capability provides DHS the ability to understand the drivers behind the various threat vectors to mitigate these risks, while identifying new technologies that impact its ability to address such risks (threats and hazards), when integrating solutions into operational use. It also enables the Department to collect, analyze, publish, and disseminate information on topics critical to the homeland security mission space – including data on acts of terrorism, targeted violence, violent extremist movements, and more.
- **Solution:** The Enduring Sciences Technology Centers are S&T's resource for supporting awareness of; mapping the causes and consequences of; and understanding the characteristics of current, emerging, and potential future threats. The Enduring Sciences Technology Centers provide DHS with expertise in decision and risk science, biotechnology, and social sciences through a centralized function within S&T to coordinate that critical expertise; provide access to knowledge products (i.e., technical reports) generated through rigorous technical analysis or laboratory experimentation; and identify and fill critical data gaps and insight on the properties of chemical, biological, and explosive threat agents as well as the hazards that they pose; and strategic insights into the motivations and actions behind human trafficking, violent extremism, insider threats and terrorism to meet the policy, operational, and public needs to improve the effectiveness of interventions, counter and protective measures, and violence prevention efforts implemented by FSLTT and non-governmental stakeholders to inform DHS activities and operations. The ongoing research will continue as threats and our need to understand them evolve. The Enduring Sciences Technology Centers conduct research in the following focus areas:
 - Risk Science (formerly under Hazard Awareness and Characterization Technology Center and Earth Systems Science Technology Center): This focus area identifies and assesses the homeland security implications of emerging technologies and scientific developments, particularly those that may become future threats and hazards to the homeland. Evidence-based research also identifies developed or emerging solutions that can be leveraged to mitigate current or emerging hazards, to include chemical, biological, and explosives hazards. This focus area also supports an integrated response to threats from climate change, environmental pollution, global disease, and other interactions between human and earth systems that impact DHS's missions. S&T directly coordinates with a variety of S&T programs and projects including PANTHR, BTC, CTC, TIGER, HKC, HEID&M, NBACC, PIADC, and the CSAC.
 - Social and Behavioral Science (formerly under Social Science Technology Center): Evaluation research, capability enhancement, and data development focusing on social and behavioral science support countering human trafficking, countering foreign influence, and targeted

violence and terrorism prevention to ensure that stakeholders who perform, oversee, select and direct prevention and protection activities can understand and predict their effects and success in a variety of settings based on evidence. Through this research, stakeholders gain the ability to select prevention and protection activities with known effects, outcomes, and impacts. This project develops new, scientific data on the nature of threats, crimes, organizations, and individuals to better understand where, when, and how to best intervene and prevent future public safety threats. Social and Behavioral Science also applies best practices in social science research to new and emergent DHS priorities, including countering online disinformation, where foundational research will improve our understanding and decision making.

- Biotechnology (formerly under Hazard Awareness and Characterization Technology Center): Advances in cross-disciplinary life, physical, and social sciences and convergence of material, medical, computing, and artificial intelligence technologies that leverage breakthroughs such as CRISPR (clustered regularly interspaced short palindromic repeats) pose significant risks through expanding threats and increasingly broad and complex impacts. Synthetic biology and bio-chemical technologies are evolving rapidly and is a multi-trillion-dollar market driven by billions in venture capital and national investments. With the rapid pace of innovation in biotechnology and the threats emerging from this domain, it is critical that S&T understand the landscape, the evolution of the various aspects of the technology, the complexities, the supporting science, and the needs of Department to shape investment decisions. It is also critical for S&T to look ahead in this domain and anticipate future trends and Departmental needs relative to biotechnology.

Novel Materials and Manufacturing: The future impacts of novel materials and manufacturing are quickly gaining interest in the U.S. and abroad due to the projected impact of these areas on innovation and the ability to adapt technologies at an accelerated pace. Novel materials and their availability could be incorporated into multiple DHS systems with the promise of reducing cost and providing enhanced benefits. Advanced manufacturing is comprised of techniques that can produce highly customized products at lower cost, greater efficiency, and less waste which holds the promise to have broad-reaching impacts to lowering cost and availability of technologies for DHS use. As these technical advances mature, so does the ability of “bad actors” to devise new threats using this technology. Challenges arise where research and development and products in this area are dual use with implications for DHS operations to screen, interdict and protect against items that could also be common commodity items. Microelectronics or the semiconductor-based integrated circuit safety and supply chain has garnered significant national attention in the last decade. This is due to the migration of the manufacturing base from the US to other countries along with the uptick in malicious actors threatening to cause havoc on U.S. infrastructure. Executive Order 14017: America’s Supply Chains assigns DHS the responsibility of building resilient supply chains and securing microelectronics. To assist in addressing this responsibility, the Innovative Systems Technology Centers are advancing research into combatting trafficking in counterfeit, fake, and maliciously affected chips from entering U.S. borders.

- Statistical Collection and Reporting: Through Statistical Collection and Reporting research, the Enduring Sciences Technology Centers will begin to collect, store, maintain, analyze, and disseminate key terrorisms statistics that DHS operations can act on and can be messaged to the public, and will look to a scalable solution that will enable DHS to systematically make evidence-based decisions on domestic violent extremism and terrorism prevention using objective, independent, quality-controlled data. This work will be closely coordinated with the Office of Immigration Statistics and the Office of the Chief Data Officer, for ensuring similar data standards are maintained, as appropriate, and for long-term benefits of this data and other Department-wide programs.

- **Justification:** The FY 2024 President’s Budget continues to provide \$30.4M for this project and will both maintain subject matter expertise and conduct long-term biodefense, chem-defense, explosives, and terrorism threat research that directly informs DHS Component risk assessment efforts. S&T will acquire additional subject matter experts through a variety of mechanisms, engage technical communities of interest, and exchange technical information with strategic interagency partners. The Enduring Sciences Research Centers will conduct the following ongoing research and development as threats and our need to understand them evolve:
 - Risk Science: Continued exploration of new and advanced methods to inform threat characterization. In addition, S&T will analyze the structure and functioning of the Earth as an adaptive, integrated system to better understand the impacts of threats (climate, pandemic, man-made) and opportunities for increased resiliency, as well as mature subject matter expertise in these key areas for immediate reach back capabilities for the Department.
 - Worldwide Developments in Earth System Science and Climate Innovations – Continuously monitor worldwide developments in earth system science—and climate technologies and innovations more broadly—to fully understand new opportunities for U.S. adversaries to misappropriate those developments for offensive use and to enable the United States to harvest them for strategic use.
 - Earth System Monitoring and Detection Capabilities - Identify, leverage, and develop capabilities that can quickly detect and identify any potential 1st, 2nd, and 3rd order effects of climate change and extreme weather risks.
 - Disaster Adaptation and Resilience Capabilities - Support Homeland resiliency by identifying, leveraging, and developing capabilities for enhanced adaptation to and resilience from disasters.
 - Social and Behavioral Science: Continued assessment and evaluation of terrorism trends, terrorism prevention strategies, and technology adoption to inform policy makers.
 - Motivations and Drivers – Increase our understanding of the underlying motivations and drivers of specific human-centric DHS missions and produce the knowledge, fundamental understanding, and tools necessary to manage risk, find remedies for ills, and prepare for change in the future of DHS missions.
 - Changing Behavioral and Social Implications – Improve our awareness and understanding of how changes in the technology landscape (particularly as science and technology continues to evolve) impact social interactions, behaviors, and threat vectors.
 - Technology Acceptance & Limitations – Advance the acceptance of new technologies into DHS missions.
 - Biotechnology: Continued investments in Science Watch, which monitors current and emerging trends in Genetic engineering, DNA sequencing and exploitation, bio-manufacturing, modified microbiome, and living sensors and validates the efficacy of these new science and emerging technologies to better enabled DHS to effectively characterize and assess the risk from the synthetic biology domain. S&T will also continue researching the use of new analytical methods and biosensors to detect new biomarkers and diagnostics to build trust in the general

public toward DHS capacity to address this evolving threat domain. Finally, S&T will advance its understanding of the ethical, legal, and policy implications, as well as the effectiveness of, biotechnology countermeasures and interventions.

- Novel Materials and Manufacturing: Continued research to identify and assess new advances in geophysical, materials, and regenerative sciences to include novel materials with attributes such as self-healing, light weight, or have tailored thermal, electrical, or optical properties that can be applied to DHS needs. S&T will also explore the security impacts of evolving manufacturing technologies to both supply chains and the goods that are used by the American people, as well as the potential ways these processes can be misused.
- Statistical Collection and Reporting: Continue efforts to collect information on key terrorisms statistics based on the study results of S&T's FY 2023 National Academy of Sciences study to develop and understand the terrorism data needs of DHS stakeholders.
- **Impact:** Enduring Sciences Technology Centers establish and leverage innovative science-based capabilities to provide DHS and our partners with the expertise, research, data, and knowledge necessary to implement best-practices and appropriate understanding of functional requirements for solutions to current and emerging chemical, biological, and explosive, as well as climate change, and natural, and technological hazards. Science-informed and evidence-based policy and practice also support more efficient and accurate analysis of the threats posed by violent extremists and evidence-based terrorism prevention policies, programs, and interventions. The application of expertise, enduring research, and knowledge coordinated through the centers increases the efficiency of DHS by enabling development of more effective solutions based on consistent and defensible recommendations, such as developing and fielding more effective transportation security equipment, providing better training to front line personnel, and validating and monitoring continuing and emerging threats.

Type of Research

Basic, Applied and Developmental

Technical Readiness Level

Projects range from TRL-2 to TRL-7. The Enduring Sciences Technology Centers focus on basic & applied research to address critical knowledge gaps that inform policy, strategy, requirements, mission assessments and operational plans. Therefore, we do not transition technologies directly to Components as we do not directly develop technology. Activities are initiated based on stakeholder strategic needs. At times, this research requires appropriately accredited facilities to support our research. The majority of deliverables are knowledge products and tools to inform decision makers, which we share with our partners and stakeholders through a variety of mechanisms. For this reason, the TRL level on many of its projects tend to be lower.

Transition Plans

The Technology Centers work directly with DHS Leadership, DHS Components, and interagency partners to deliver/transition knowledge and insight produced through various products and research results regularly. Recipients of the knowledge products and research results include internal S&T programs, all DHS Components, DHS Headquarters elements – to include the Office of Terrorism Prevention Partnerships, Offices of the Principal Deputy Counterterrorism Coordinator, Policy, DHS I&A, DHS Office for Partnerships and Engagement, Fusion Center, Civil Rights and

Research, Development, and Innovation – PPA**Innovative Research and Foundational Tools Thrust Area**

Civil Liberties, Center for Countering Human Trafficking, State and local governments, and local terrorism prevention practitioners, as well as DOD, and the Intelligence Community. This transition of knowledge products provides input to S&T program planning as well as Component acquisition planning and ongoing operations. Reports of research results are provided to the broader DHS and Interagency communities through S&T's Tech Clearinghouse or publication on S&T's public website.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Generated prioritization for basic research for the Chemical Threat Characterization Project's FY 2023 Activities.	FY 2022 Q2	FY 2022 Q4	-
HAC-TC: Identified and validated method for populating explosive equivalency based on significant factor.	FY 2022 Q3	FY 2022 Q4	3
HAC-TC: Completed characterization research on one large scale explosive test that will inform DHS's risk profile.	FY 2020 Q4	FY 2022 Q1	3
HAC-TC: Delivered one technical report on an agent or technology that may impact future biological threats.	FY 2022 Q1	FY 2022 Q4	-
HAC-TC: Delivered one technical report on an agent or technology that may impact future chemical threats.	FY 2022 Q1	FY 2022 Q4	-
HAC-TC: Facilitated international collaboration on current and emerging biological threats, hazards, and risks through establishment and participation in an international forum for exchanging information.	FY 2022 Q1	FY 2022 Q4	-
HAC-TC: Generated prioritization for basic research for the Biological Threat Characterization Project's FY 2023 Activities.	FY 2022 Q2	FY 2022 Q4	-
Resilience: Resilience Research regularly delivered/transitioned the knowledge and insight produced through various technical reports that are shared with DHS Components and HSE partners.	FY 2022 Q1	FY 2022 Q4	5
SS-TC: Delivered COVID-19 related research outputs targeted to first responder communities and other government relevant government agencies.	FY 2021 Q1	FY 2022 Q2	-
SS-TC: Delivered terrorism prevention and intervention Evaluation Plans for use across USG funded violence intervention programs.	FY 2021 Q1	FY 2022 Q3	5
SS-TC: Established formal, international information sharing for R&D supporting the prevention of Targeted Violence or Terrorism.	FY 2021 Q1	FY 2022 Q2	-
	FY 2023		
Decision & Risk Science: Identify hazard targets for risk modeling likely to be impacted by climate change, the associated climate conditions that could impact their spread, and likely impacted regions encountering these conditions.	FY 2023 Q1	FY 2023 Q4	3-7

Research, Development, and Innovation – PPA**Innovative Research and Foundational Tools Thrust Area**

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
Decision & Risk Science: Pilot one technology foresight and assessment capability for evaluation of applicability to DHS risk assessment.	FY 2023 Q1	FY 2023 Q4	3
Evidence Building: Characterize an improvised explosive in joint effort with US and international partner.	FY 2023 Q1	FY 2023 Q4	3
Evidence Building: Deliver a report on risk mitigating strategies to prevent terrorism and targeted violence.	FY 2023 Q1	FY 2023 Q4	3-7
Evidence Building: Deliver report identifying more efficient techniques to characterize the acute toxicity of existing and emerging chemical hazards.	FY 2022 Q1	FY 2023 Q3	3
Evidence Building: Deliver report on public perceptions of one emerging technology to inform acquisition, fielding development and deployment.	FY 2023 Q1	FY 2023 Q4	-
Evidence Building: Deliver report on the impact of mental health/wellness for DHS law enforcement and first responders.	FY 2022 Q4	FY 2023 Q4	4
Evidence Building: Deliver reports to DHS Components and the HSE based via appropriate portals on the analyses of risks, hazards, vulnerabilities, characterizations, and other assessments conducted.	FY 2023 Q1	FY 2023 Q4	-
Evidence Building: Develop characterization approach for explosive hazards that will inform DHS's risk profile.	FY 2023 Q1	FY 2023 Q4	3-7
Evidence Building: HAC-TC: Generate prioritization for basic research for the Chemical Threat Characterization Project's FY 2024 Activities.	FY 2023 Q1	FY 2023 Q4	-
Evidence Building: Map the Information Threat Landscape for DHS that informs DHS Component partners of state of disinformation.	FY 2023 Q1	FY 2023 Q4	-
HAC-TC: Facilitate international collaboration on current and emerging biological threats, hazards, and risks through establishment and participation in an international forum for exchanging information.	FY 2023 Q1	FY 2023 Q4	-
Risk Science: Coordinate/facilitate a community of interest exchange of information event on explosives threats, research, or operations.	FY 2023 Q1	FY 2023 Q2	-
SS-TC: Complete scientific assessment of insider threats facing domestic law enforcement agencies, with specific focus on identification and analysis of research, prevention efforts, and internal policies.	FY 2023 Q1	FY 2023 Q4	3-7
SS-TC: Conduct an outcome evaluation of the Digital Forums on Terrorism prevention in support of DHS CP3 initiative.	FY 2023 Q1	FY 2023 Q4	3-7
SS-TC: Develop a briefing guide with practical steps for both understanding and responding to threats posed by the Incel movement.	FY 2023 Q1	FY 2023 Q4	3-7
SS-TC: Develop the framework for the Blue Campaign evaluation and validate the Blue Campaign human trafficking indicators.	FY 2023 Q1	FY 2023 Q4	3-7
SS-TC: Disseminate a dataset and corresponding codebook examining acts of terrorism or extremist violence in the United States for use by research, DHS I&A fusion centers, DHS's Center for Prevention Programs and Partnerships, and other HSE partners.	FY 2023 Q1	FY 2023 Q4	3-7

Research, Development, and Innovation – PPA
Innovative Research and Foundational Tools Thrust Area

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
SS-TC: Establish the collection and sharing of independent, objective data related to individuals, events, and organizations participating in targeted violence in the United States.	FY 2023 Q1	FY 2023 Q4	3-7
Statistical Collection and Reporting: Collect recommendations from known experts on lessons learned for statistical offices and provide report to DHS PLCY.	FY 2023 Q1	FY 2023 Q2	-
Statistical Collection and Reporting: Deliver recommendations for the collection, reporting and dissemination of data in support of establishing a department level capability to DHS PLCY.	FY 2023 Q1	FY 2023 Q4	4
Statistical Collection and Reporting: Identify data dissemination methods.	FY 2023 Q2	FY 2023 Q4	-
Statistical Collection and Reporting: Identify standards for the collection of terrorism data.	FY 2023 Q1	FY 2023 Q3	3
Statistical Collection and Reporting: Identify terrorism data needs of key DHS, Interagency, Legislative, OMB, and State, local, tribal, and territorial partners.	FY 2023 Q1	FY 2023 Q2	-
Statistical Collection and Reporting: Receive legal and privacy analysis from DHS Headquarters on measures necessary to ensure all statistical data is collected in a way that protects individual privacy, civil rights, and civil liberties.	FY 2023 Q1	FY 2023 Q2	-
Synthetic Biology: Deliver one technical report on an agent or technology that may impact future biological threats.	FY 2023 Q1	FY 2023 Q4	-
Synthetic Biology: Deliver one technical report on an agent or technology that may impact future chemical threats.	FY 2022 Q1	FY 2023 Q1	-
Synthetic Biology: Identify methods that inform how deep learning approaches can be used to identify synthetic biology threats.	FY 2023 Q1	FY 2023 Q4	3-7
	FY 2024		
Deliver knowledge product report of an agent or technology that may impact future biological threats.	FY 2024 Q1	FY 2024 Q4	3
Deliver knowledge product report of an assessment of the ethical, legal, and policy implications, as well as the effectiveness of, biotechnology countermeasures and interventions.	FY 2024 Q1	FY 2024 Q4	-
Deliver knowledge product report on the use of new analytical methods and biosensors to detect new biomarkers and diagnostics.	FY 2023 Q3	FY 2024 Q1	3
Risk Science: Coordinate/facilitate an exchange of information event on explosives threats, research, or operations for the community of interest.	FY 2024 Q1	FY 2024 Q2	-
Risk Science: Deliver report describing one new advanced method to characterize explosives to US interagency stakeholders.	FY 2024 Q1	FY 2024 Q4	3
Social and Behavioral Science: Deliver knowledge product report of assessment and evaluation of terrorism trends and terrorism prevention strategies to policy makers.	FY 2024 Q1	FY 2024 Q4	-
Statistical Collection and Reporting: Deliver report and data set of data collected according to standards for the collection of terrorism data identified in previous fiscal year.	FY 2024 Q1	FY 2024 Q4	4

Innovative Systems Technology Centers

- **Problem:** Technology can be a tool for increasing the efficiency and effectiveness of homeland security operations; it can enhance capabilities and collaboration, provide better awareness and information, speed decision making, and deliver the ability to do things that were once not possible. Emerging technology and private sector innovations in the areas of communication, sensors, and identity technologies are playing an increasingly significant role in securing the Homeland against dynamic threats. However, S&T lacks a coordinated approach to research and analyze these next generation technologies through the lens of DHS and its unique mission needs and requirements and inform DHS on technical maturity and potential risks of new technology. This includes potential vulnerabilities and/or malicious dual use of emerging technology.
- **Solution:** The Innovative Systems Technology Centers are S&T's resource for understanding and harnessing next-generation systems and emerging innovations for cross-cutting mission capabilities. Along with providing deep subject matter expertise in telecommunications, sensors, and identity technologies, these centers focus on understanding, exploring, researching, and analyzing these next generation technologies and capabilities to inform DHS on how to leverage these advancements to better meet mission needs and evolving requirements, while identifying and preventing potential vulnerabilities and/or malicious dual use. This is done, in part, by experimenting with and field-testing innovations to identify technological maturity, operational uses, and vulnerabilities of these systems. The Innovative Systems Technology Centers conduct research in the following focus areas:
 - Advanced Communications (formerly under Office for Interoperability and Compatibility Technology Center): Advanced communication networks are a key element of tomorrow's digital infrastructure and a technology enabler. The promises of advances in technologies such as 5G are expected to be revolutionary. Much more than traditional cellular communications, 5G enables high speed machine-to-machine communication and is expected to facilitate fundamentally new classes of applications, from real-time remote operations and enhanced situational awareness, to self-driving cars, smart buildings, augmented reality and more. 5G is the platform and infrastructure these capabilities will leverage. The ability to communicate is vital to DHS front line workers and public safety, harnessing the advances of new technologies while ensuring their security and resiliency for DHS missions is paramount. The Innovative Systems Technology Centers' research will enhance the communications and network capabilities of DHS, while maintaining security and resiliency, using advanced communications.
 - Advanced Sensing (formerly under Sensors and Platforms Technology Center): Many DHS operations involve detecting, tracking, monitoring, and identification of activities, goods, or people across different environments – including borders, maritime, wildlands, urban, transportation, space, etc. – and in different event situations and venues ranging from daily operations to disaster response. These operations also occur across multiple jurisdictions involving Federal, State and local law enforcement, adding complexity to efficient and effective operations. Research into next generation intelligent sensors, including innovative sensors that detect a broad spectrum of threats, and advanced emergency and security alert technologies ensures operators have access to, and can take advantage of, emerging sensor capabilities.

- Digital Trust & Privacy (formerly under Biometrics and Identity Technology Center): Digital trust is critical to verifying the validity of data, maintaining privacy, and ensuring integrity across multiple platforms and applications. With the supply chain challenges surrounding 5G creating vulnerabilities in our infrastructure, to emerging new use of digital capabilities such as mobile driver's licenses, digital trust and its enabling technologies will be a prevalent issue in the coming years, with widespread impact to many Department missions. The White House Office of Science and Technology Policy FY 2022 priorities state that "Departments and agencies should also prioritize R&D aimed at improving data accessibility and security, including fundamental research into efficient privacy and security preserving techniques and building and/or strengthening infrastructure, platforms, and tools that facilitate responsible data use." The Innovative Systems Technology Centers' research into digital trust and privacy focuses on enabling digital trust across platforms, technologies, and applications of importance to DHS. DHS continues to need an enhanced set of identity technologies, and capabilities that Component customers and S&T program managers can incorporate into their R&D projects. Additionally, they provide a sustainable, common platform for driving biometric and identity technology standards, best practices, and innovation across DHS. This enables DHS Components to quickly establish technical competence using more capable and cost effective biometric and identity technologies that facilitate operational excellence.
- Autonomy (formerly under Sensors and Platforms Technology Center): As the availability of autonomous systems grows and human input into business operations decreases, we must keep abreast of how autonomous technologies are advancing, their vulnerabilities to cyber intrusion, and their availability for misuse in ways that may harm the American people. The Innovative Systems Technology Centers are examining topics of true-full autonomy, secure autonomy, and verifiable autonomy. True-full autonomy identifies systems that can provide truly autonomous unmanned air, ground, and sea systems for use in DHS operations. Secure autonomy identifies approaches to security and safety of autonomous system operations. Verifiable autonomy assesses autonomous systems in lab environments to verify the integrity of the systems.
- **Justification:** The FY 2024 President's Budget continues to provide \$13.5M for this project and will acquire additional subject matter experts through a variety of mechanisms, engage technical communities of interest, and exchange technical information with strategic interagency partners to access supplementary expertise and leverage ongoing research for homeland security applications. S&T will also address the following research:
 - Advanced Communications: Conclude initial research of 5G/XG advanced communication concerns—including identification of DHS use-cases to drive and inform requirements for secure advancements and implementations of 5G networks and identification of increased methods for resilience of communication networks against cyberattacks. S&T will also Continue efforts to renew its partnerships with CISA, DOT, NIST, and SLTT to secure public safety communication, ensure interoperability, and to securely move capabilities into the next generation of telecom equipment. (FSLTT) Additional research activities will focus on communications and Network resiliency to protect the transportation of voice and data between devices/humans and the interconnected software and hardware systems (e.g., V2X).
 - Advanced Sensing: Explore the next generation of intelligent sensors and systems for use across the HSE.
 - Signature Exploitation and Detection – Understand how emerging sensor technologies and existing detection capabilities can be applied in new ways to detect, track, and identify objects, threats, hazards, physical, and cyber conditions.

- Sensor Integration – Develop appropriate sensor system architectures for novel sensors, integrate multiple sensors, and evaluate novel sensor effectiveness.
- Emerging Sensing Technologies – Collaborate with leading researchers and innovators in quantum sensing and nanotechnology to support initial transitions of early development into successful prototypes of novel tools for DHS missions and use cases.
- Digital Trust & Privacy: Directly address the emerging opportunities and risks in biometrics and digital identity as well as explore the validity and applicability of emerging privacy enhancing technologies.
 - Digital Identity – Assess and manage risks associated with new, emerging, and disruptive technologies that may affect DHS ability to establish and verify identity of entities (natural person, non-person) to strengthen and manage risks across a diverse range of DHS missions.
 - Privacy Enhancing Technologies - Understand effective and performant ways to meaningfully exchange data while respecting the confidentiality and use of entities information
 - Trust and Safety – Understand how trust can be gained, lost, and enhanced between entities on digital platforms.
- Innovative Systems Operational Testbeds: S&T requires realistic operational testbed environments to understand the technical capabilities that next-generation systems offer that may increase mission success. FY 2024 will continue an Operational Checkpoint Testbed that expands upon S&T's Maryland Test Facility to assess the application and performance of commercial technologies such as advanced biometrics and identity capabilities on DHS checkpoint operations; 2) an Advanced Communication Technology Testbed Network that develops partnerships with key agencies (DoD, NIST, NTIA, and NSF) to establish a network of telecommunication testbeds that will enable S&T to assess the risks, security vulnerabilities, and interoperability issues of next-generation and advanced communication capabilities (e.g., 5G, 6G, and XG).
- **Impact:** The Innovative Systems Technology Centers enable DHS Components, as well as State, tribal, local governments, and industry partners, public safety to better take advantage of next generation and emerging innovations in communication, sensor, and identity technologies. These centers and testbeds ensure that operators can effectively identify, evaluate, and integrate technologies into use and that potential vulnerabilities are mitigated.

Type of Research

Basic, Applied and Developmental

Technical Readiness Level

Projects range from TRL-2 to TRL-7. The Innovative Systems Technology Centers focus on basic & applied research to address critical knowledge gaps that inform policy, strategy, requirements, mission assessments and operational plans. Within the Innovative Systems Technology Centers, TRL levels tend to be generally higher (TRL 5-7) than other technology centers as they often conduct experiments with existing capabilities to understand how they can be adapted into applications to meet the needs of DHS end users. Activities are initiated based on stakeholder strategic needs. At times, this research requires appropriately accredited facilities to support our research. The majority of deliverables are knowledge products and tools to inform decision makers.

Transition Plans

The Innovative Systems Technology Centers work directly with DHS Leadership, DHS Components, and interagency partners to deliver/transition knowledge and insight produced through various products and research results regularly. Recipients of the knowledge products and research results include internal S&T programs, all DHS Components, DHS Headquarters elements, and State and local governments. This transition of knowledge products provides inputs to S&T program planning as well as Component acquisition planning and ongoing operations. Reports of research results are provided to the broader DHS and Interagency communities through S&T's Tech Clearinghouse or publication on S&T's public website.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
BI-TC: Assessed innovative multi-biometric recognition-on-the-move technologies.	FY 2022 Q1	FY 2022 Q3	5
BI-TC: Contributed to digital identity and biometric technology standards and best practices in coordination with relevant entities (e.g., NIST) on topics including Quantifying biometric system performance variation across demographic groups and Mobile Driver's Licenses.	FY 2022 Q2	FY 2022 Q4	5
BI-TC: Facilitated collaboration among DHS Offices and Components in the review and potential adoption of novel digital identity capabilities within select DHS operations.	FY 2022 Q1	FY 2022 Q3	7
BI-TC: Identified and develop research initiatives to address technological or process weaknesses in DHS Biometric or Identity based operations.	FY 2022 Q1	FY 2022 Q4	4
OIC-TC: Developed use cases for DHS Components and First Responder applications of beyond-5G broadband capabilities for homeland security missions. These use cases will be the basis for future system prototype validation in relevant environments (TRL-7).	FY 2021 Q1	FY 2022 Q4	5-7
	FY 2023		
Autonomy: Identify enduring research questions in autonomous systems in maritime environments by collaborating with DHS Components through targeted workshops.	FY 2023 Q1	FY 2023 Q2	-
Cybersecurity, Communications & Digital Trust: Conduct technology experiment for 5G/XG in support of operational DHS Components and first responder missions.	FY 2023 Q1	FY 2023 Q4	4
Cybersecurity, Communications & Digital Trust: Contribute to digital identity and biometric technology standards and best practices in coordination with relevant entities (e.g., NIST) on topics including Quantifying biometric system performance variation across demographic groups.	FY 2023 Q1	FY 2023 Q4	-
Cybersecurity, Communications & Digital Trust: Develop results, analysis, and recommendations for 5G Domain Awareness and Remote Operations.	FY 2023 Q2	FY 2023 Q4	-
Cybersecurity, Communications & Digital Trust: Select 5G/5G Advanced/6G capabilities and standards of impact to DHS missions, define requirements or gaps associated, and the risk or opportunity posed by these forthcoming capabilities and standards, e.g., messaging prioritization standards over wireless networks, and their impact to DHS mission critical communications.	FY 2023 Q1	FY 2023 Q4	3-7

Research, Development, and Innovation – PPA

Innovative Research and Foundational Tools Thrust Area

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
Cybersecurity, Communications & Digital Trust: Update risk and vulnerability assessments of mDL Digital Identity Documents and support DHS Component technology evaluations.	FY 2023 Q1	FY 2023 Q4	-
Evidence Building: Collaborate with industry solution developers to address challenging DHS biometric and identity border and aviation use cases through cooperative evaluations.	FY 2023 Q1	FY 2023 Q4	6-7
Evidence Building: Develop draft biometric equipment acquisition framework to differentiate between biometric capabilities based and perform limited evaluations.	FY 2023 Q1	FY 2023 Q4	3-7
Evidence Building: Develop test methods to assess the integrity and vulnerabilities of biometric capabilities relevant to DHS missions.	FY 2023 Q1	FY 2023 Q4	3-7
Novel Materials and Manufacturing: Deliver landscape assessment of the risks to the microelectronic supply chain and our ability to secure the Nation's critical infrastructure.	FY 2022 Q4	FY 2023 Q4	4
	FY 2024		
Accuracy, Equitability and Fairness: Develop transparent and defensible test methods to assess the accuracy, equitability, and performance of DHS biometric systems through more challenging and advanced evaluations.	FY 2024 Q1	FY 2024 Q4	-
Advanced Communications: Deliver report of results of demonstrations of 5G DHS Component Use Cases to inform DHS Components of potential 5G solutions to address existing problems/gaps.	FY 2023 Q2	FY 2024 Q4	6-7
Advanced Sensing: Deliver knowledge product report of the assessment of the next generation of intelligent sensors and systems for use across the Homeland Security Enterprise.	FY 2024 Q1	FY 2024 Q4	3-4
Advanced Sensing: Deliver knowledge product report of the assessment of the security and resiliency of commercial space-based systems.	FY 2024 Q1	FY 2024 Q4	5
Biometric Collection Technology Characterization: Design and conduct evaluations of state-of-the-art face, iris, fingerprint, and other biometric capabilities to meet common needs across operational missions.	FY 2024 Q1	FY 2024 Q4	-
Biometric Technology Rallies: Collaborate with industry solution developers to address challenging DHS biometric and identity use cases through cooperative evaluations.	FY 2024 Q1	FY 2024 Q4	-
Digital Trust & Privacy: Contribute to digital identity and biometric technology standards and best practices in coordination with relevant entities (e.g., NIST) on topics including Quantifying biometric system performance variation across demographic groups and Mobile Driver's Licenses.	FY 2024 Q1	FY 2024 Q4	-
Human Algorithm Teaming: Develop/Define new datasets and methodologies for more comprehensive assessments of how humans and biometric AI algorithms can most effectively collaborate to identify individuals in DHS use cases (e.g., counter terrorism, immigration, law enforcement, border security, critical infrastructure, and transportation security missions).	FY 2024 Q1	FY 2024 Q4	-
Morph and Presentation Attack Detection: Engage partners to develop evaluation methods to assess risks, prepare standards, best practices, and guidance.	FY 2024 Q1	FY 2024 Q4	-

Physical Security and Critical Infrastructure Resilience Thrust Area

Research and Development

Technology Readiness Level Exhibit

(Dollars in Thousands)

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget
Physical Security and Critical Infrastructure Resilience Thrust Area	\$41,058	\$42,558	\$37,528

R&D Thrust Area Description

PHYSICAL SECURITY AND CRITICAL INFRASTRUCTURE RESILIENCE THRUST AREA: S&T invests in the R&D technologies, methods, and procedures to enhance the physical security of the Nation's critical infrastructure which includes the Nation's air travel system, mass transportation systems, and schools as well as soft targets such as mass public gatherings. S&T also conducts RDT&E to analyze the foreign influence spectrum; how it can impact critical functions such as the media and elections, and what can be done to prevent them. This research will enable policy makers and operational end-users to make informed decision to mitigate vulnerabilities and enhance community resilience in the face of various physical, social, and behavioral threats.

PHYSICAL SECURITY AND CRITICAL INFRASTRUCTURE RESILIENCE THRUST AREA <i>(Dollars in Thousands)</i>				
Program	Project	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget
Total –Physical Security and Critical Infrastructure Resilience Thrust		\$41,058	\$42,558	\$37,528
Baggage / Cargo / People Screening		\$34,080	\$34,080	\$29,250
	Air Cargo Screening	\$3,250	\$3,250	\$3,250
	Checked Baggage Technology Development	\$7,750	\$7,750	\$5,000
	Next Generation Explosives Trace Detection	\$6,080	\$6,080	\$5,250
	Primary Screening for Carry-On Bags	\$5,500	\$5,500	\$5,000
	Primary Screening for Passengers	\$4,000	\$4,000	\$3,250
	Screening at Speed	\$7,500	\$7,500	\$7,500
Countering Violent Extremism		\$5,478	\$6,478	\$7,278

PHYSICAL SECURITY AND CRITICAL INFRASTRUCTURE RESILIENCE THRUST AREA (Dollars in Thousands)				
Program	Project	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget
	Public Safety and Violence Prevention	\$5,478	\$6,478	\$7,278
Physical Security		\$1,500	\$2,000	\$1,000
	Soft Target Security (formerly Soft Targets, Vehicular, School Safety, Protective Sites)	\$1,500	\$2,000	\$1,000

Baggage / Cargo / People Screening Program – This program develops prototype solutions for high priority technology capability gaps within the security screening processes for the Nation's air travel and other mass transportation systems.

Air Cargo Screening

- Problem:** Air Cargo is one of three critical components of Aviation Security, along with Checked Baggage and Checkpoint Baggage. Public Law 110-53, mandates 100 percent screening of air cargo on passenger aircraft, to the same standards as checked baggage. Almost 50 percent of the contents in a passenger aircraft are cargo and almost all U.S. commercial carrier passenger flights carry air cargo. Per the July 2021 International Civil Aviation Organization (ICAO) requirement, all outgoing U.S. cargo must be screened to the same level as cargo on passenger planes. The range of air cargo commodity types is extraordinarily wide, and this poses challenges to developing screening systems for cargo. The current state of Air Cargo Screening deployment is critically behind that of checked baggage screening. Evolving threats pose a significant and continual threat to passenger safety through the Air Cargo conduit. Additionally, the increasing volume of air cargo (currently totaling over six trillion dollars of goods a year) makes it impossible to screen securely with current screening technologies. These three issues necessitate the need to develop next generation cargo screening systems.
- Solution:** To handle the extremely high volume of cargo shipped by hundreds of shippers, TSA has decentralized the security screening of cargo to private cargo screening companies. The implementation of this decentralization is via the mechanism of the Certified Cargo Screening Facility (CCSF) program. In this program, TSA provides certification to private screening companies, that meet specific TSA standards, so that they can screen cargo using equipment that TSA lists on its ACSTL (Air Cargo Screening Technologies List). Since private screening companies are low-margin facilities, screening equipment must be affordable as well as effective. TSA and S&T work with private screening companies through the Aviation Security Advisory Council to determine appropriate solutions. The Air Cargo program supports TSA's CCSF program through a combination of short term, mid-term, and long-term strategies. These include (a) augmenting existing screening systems via advanced hardware and software to support increased security in the short term, (b) developing low cost Computed Tomography (CT) systems for 3D imaging of skids and automated threat detection algorithms and developing technologies to screen dense cargo in the midterm, and (c) in the long term, developing high speed screening technologies to support exponential growth of cargo. The program seeks to achieve these goals to meet TSA capability gaps identified by close collaboration between TSA, S&T, original equipment manufacturers (OEMs) and Screening Companies. The Air Cargo Screening program will continue to fund efforts to develop and update test and evaluation capability for air cargo screening equipment

at Transportation Security Laboratory (TSL) and to continue development of cargo scanners and associated software and tools to meet ongoing and updated TSA capability gaps.

- **Justification:** The FY 2024 President’s Budget continues to provide \$3.3M for this project, and will be used to support the research and development for solutions in the areas of both cargo and passenger safety. The focus of the Air Cargo program is to identify technology for screening complex and dense cargo, advance high-speed screening to support exponential growth of cargo and continue development of test and evaluation capability for cargo screening equipment at TSL. The technologies developed for screening air cargo for explosives can also be adapted and applied to other operational scenarios and Component requirements, including the use of hardware for the screening of opioids and other contraband for CBP, as well as the use in high security areas and sites for USSS. In June 2021, new mandates were released requiring the screening of all air cargo in an effort to reduce significantly and address ongoing threats and the risk of catastrophic events occurring aboard commercial aircraft. Funds will also be used to accelerate development of new technology for effective screening of high-density air cargo pallets for threat items.
- **Impact:** This developmental work is critical to TSA meeting its Congressionally mandated requirements for Air Cargo Screening, and for U.S. freight carriers to meet their ICAO obligations. This will ensure passenger and cargo safety challenges that occur due to continued exponential growth, both in the volume and variety, of e-commerce are addressed. Air Cargo security has a vital impact on both passenger safety and economic interests. Funding this research is critical to ensuring air cargo and passenger safety and will contribute to the strengthening of the Nation’s air cargo security and aviation security infrastructure. In FY 2024, high density cargo imaging will be completed, a low-cost CT system will be ready for TSA qualification testing, and progress will be made in the ongoing development of a high-density cargo penetration CT system and complete third-party vendor independent ATR development.

Type of Research

Applied and Developmental

Technical Readiness Level

- The TRL levels associated with Air Cargo screening projects typically start at a level of 3 or 4 and end at 7. The projects cover a spectrum of topics that include developing cargo scanners and their associated software as well as augmenting existing scanners using the latest software and hardware technology.

Transition Plans

- When the air cargo skid scanners development reaches a TRL-7, the products will be available for TSA qualification tests. Successful completion of TSA qualification tests will lead to marketplace deployment.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Completed data collection at a shipping facility and provide a final technical report discussing the performance of the RV during stream of commerce data collection at the test site.	FY 2022 Q1	FY 2022 Q2	7
Completed pre-production software and evaluate it at multiple TSA approved sites.	FY 2022 Q1	FY 2022 Q4	3-7
Completed ruggedization of Skid Screening System Air Cargo Using CT.	FY 2017 Q4	FY 2022 Q1	7
Completed ruggedization of Raytheon Nuclear Quadrupole Resonance Cargo Skid Screening.	FY 2019 Q4	FY 2022 Q1	6
Completed stream of commerce data collection at TSA approved cargo screening facilities. These will be the first low-cost CT scanners capable of scanning skids measuring 48~ W x 65~ H x 48~ L (or longer).	FY 2020 Q4	FY 2022 Q3	7
Conducted Field Evaluation Test of ruggedized Nuclear Quadrupole Resonance (NQR) scanner for air cargo skids measuring 48" x 48" x 65" NQR, in which specific chemicals may be detected by the interactions of their nuclei with an electric field, may provide an alternate means of scanning high density cargo and determining if there are explosive threats.	FY 2020 Q4	FY 2022 Q3	6
Received a system design package for integration of single and dual view X-ray scanners with a neutron scanner for improved explosives and contraband detection.	FY 2021 Q3	FY 2022 Q4	6
Tested ATR algorithms on a simulator using images obtained from CT scans of typical cargo at TSL. The ultimate goal is to integrate that into scanner hardware and no funding is currently available for this.	FY 2018 Q3	FY 2022 Q4	6
	FY 2023		
Complete build and submit test plan to government for approval of laboratory prototype neutron skid scanner being developed by Bubble Technology Industries.	FY 2021 Q4	FY 2023 Q1	5
Complete design review of high-density penetration CT system being developed at Lawrence Livermore National Laboratory.	FY 2022 Q1	FY 2023 Q1	5
Complete laboratory prototype neutron skid scanner (Bubble Technology Industries).	FY 2021 Q4	FY 2023 Q3	1-5
Demonstrate an x-ray simulation tool at the Transportation Security Laboratory.	FY 2022 Q2	FY 2023 Q2	7
Perform formal test and evaluation of cargo CT scanner (Astrophysics) at TSL and generate a final technical report detailing performance and issues.	FY 2022 Q2	FY 2023 Q1	7
Provide final Convolutional Neural Network (CNN) ATR Report.	FY 2020 Q3	FY 2023 Q1	7

Research, Development, and Innovation – PPA**Physical Security and Critical Infrastructure Resilience Thrust Area**

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2024		
Complete development of CTCSS cargo scanners and perform ACSTL qualification tests covering image quality, penetration & FDRS (Field Data recording systems), on candidate cargo scanners at their factory site.	FY 2024 Q1	FY 2024 Q4	7
Complete high-energy tomographic air cargo scanner build.	FY 2023 Q2	FY 2024 Q3	5
Host Automatic Threat Recognition algorithm for Air Cargo, using data from a CT X-ray Cargo Scanner on a computer simulator at TSL.	FY 2023 Q1	FY 2024 Q3	7
Implement software to automatically switch into and out of the high penetration/reduced pitch CT mode based on an automatic assessment of contents (IDSS).	FY 2023 Q1	FY 2024 Q3	7

Checked Baggage Technology Development

- **Problem:** Explosive threats continue to expand due to improvised explosives. Detection of the full array of existing and emerging threats in checked baggage is limited due to the finite capabilities of currently deployed technologies. In addition, the current operational false alarm conditions are stressing the resources of TSA Electronic Baggage Screening Personnel, in term of number of secondary inspections which must be undertaken to clear baggage for safe flight.
- **Solution:** S&T and TSA are working jointly with industry and academia to research and develop interim technologies that enhance capabilities until the next generation explosive detection systems are developed and deployed. Acquired technologies will incorporate novel detection algorithms, enhanced software, more robust components, and new innovative, scalable systems. The Checked Baggage Program has five specific focus areas:
 - Advanced X-ray Systems Development: Development and testing of systems of full up design models, including orthogonal screening technologies, such as x-ray diffraction, which provide additional material discrimination and information distinct to that available from traditional x-ray transmission screening.
 - Algorithms: Development and maturation of threat detection and, false alarm reduction, and alarm resolution algorithms, integration into operational/prototype systems, and demonstration.
 - Component Technology Development: Development and maturation of system components and subsystems (such as X-ray Sources and Detectors) necessary to evolve laboratory and experimental prototypes into full up X-ray system designs able to meet the Advanced X-ray Systems requirements.
 - Baggage Movement Technology: Development of information-based methods to include new methods of baggage classification, screening, and transport in the checked baggage domain to enable multiple parallel screening tiers to adjudicate bag safety outside of X-ray technologies.
 - Screening Performance and Training Applications: Development of software integrated with currently deployed systems to facilitate data collection in support of performance management.
- **Justification:** The FY 2024 President's Budget provides \$5.0M for this project, a \$2.8M decrease from the FY 2023 enacted. Funding for this project will be used to continue funding ongoing and new research and development activities through test and evaluation and ultimately through transition to TSA operations. Such activities would focus on the following three solution areas: Advanced X-Ray Systems Development, Algorithms, and Component Technology Development. Additionally, in 2024, funding will support the demonstration and evaluation of officer training and evaluation improvements.

- **Impact:** These next generation explosive detection systems and subsystems will provide TSA with enhanced threat detection capabilities, lower false alarm rates, improved alarm resolution, and reduced lifecycle costs. This will allow TSA to be more efficient and effective in keeping pace with new threats as well as with the evolution of the traveling public. Future program goals include the following:
 - Expanded library of explosives and explosives signatures that can be effectively detected.
 - Improved automated explosives detection.
 - Improved false alarm resolution and performance.
 - Enhanced ability to detect priority non-explosive components of explosive devices.
 - Improved system reliability, screening speed (throughput) and reduced cost of ownership.
 - Improved baggage movement technologies that support changes to security parameters which will improve operations and allow for innovative infrastructure solutions.

Type of Research

Applied and Developmental

Technical Readiness Level

The Checked Baggage Technology Program will continue to initiate R&D through targeted TRL 2-6 projects that develop novel approaches and re-envision existing technologies to resolve current TSA capability gaps.

Transition Plans

- Perform independent testing to determine detection, identification, and false alarm performance characteristics of all prototype systems to assess transition worthiness and present data analysis and results to relevant stakeholders.
- Initiate transition of prototypes through knowledge products and acquisition alignment with TSA.
- Transition developed Components to original equipment manufacturers for both system retrofit and future system production.
- Coordinate development with TSA's recapitalization plans ensuring coordinated, timely technology insertion.
- Develop technology transition plans for qualifying software and data packages, ensuring these tools are provided to TSA with the data rights necessary for capability integration. Complete transition through coordination sessions supported by interagency agreements and Technology Transfer Agreements.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Commissioned prototype hybrid CT-X-ray-diffraction baggage screening system.	FY 2022 Q1	FY 2022 Q3	5
Transitioned knowledge products and software solutions for Automatic Threat Recognition algorithms.	FY 2021 Q1	FY 2022 Q1	4-6
	FY 2023		
Award technology development contract(s) in accordance with TSA Electronic Baggage Screening Technology Roadmap Strategy.	FY 2023 Q1	FY 2023 Q3	4-6
Conduct preliminary design review for cost-effective multi-energy CT detector components.	FY 2021 Q3	FY 2023 Q2	5-7
Conduct preliminary design review for detection algorithm which identifies threat device components.	FY 2021 Q3	FY 2023 Q1	5-7
Demonstrate a backwards compatible CT detector using the 4-side butt-able CT Module components in an existing system.	FY 2022 Q1	FY 2023 Q4	5-7
Demonstrate and test an algorithm that assists an operator with alarm resolution by identifying threat device components in addition to the explosives alarm.	FY 2022 Q1	FY 2023 Q3	5-7
Demonstrate novel system and subsystem development for Hybrid XRD system for Checked Baggage detection.	FY 2023 Q1	FY 2023 Q2	5-7
Perform testing of prototype hybrid CT-X-ray-diffraction baggage screening system.	FY 2022 Q1	FY 2023 Q1	6
	FY 2024		
Conduct CDR for an orthogonal screening system and provide estimates of impact on false alarm rates.	FY 2023 Q4	FY 2024 Q4	4-6
Demonstrate and evaluate officer training and evaluation improvements.	FY 2023 Q4	FY 2024 Q4	4-6
Perform 8.0 detection standard characterization studies of existing Checked Bagged screening systems.	FY 2023 Q1	FY 2024 Q1	6-7

Next Generation Explosives Trace Detection (NGETD)

- **Problem:** As terrorists continue to evolve their tactics and threats, the variety of Homemade Explosives (HMEs) used in explosive devices has simultaneously increased. This leads to an enduring need for enhanced explosives screening and novel R&D solutions for employment at aviation checkpoints, border crossings, and large events. As part of understanding the nature of emerging threats and associated scope of R&D, S&T must continue to assess the effectiveness of deployed technologies against emerging threats; identify capability gaps; develop novel capabilities to address these gaps; and test, evaluate, mature, and transition these capabilities to end-users. In addition to identifying and defeating emerging threats, the Program also explores and experiments with pathways to integrate Small-bulk Confirmatory Capabilities through Barriers with NextGen trace and vapor detection for checkpoint applications. Looking beyond current needs, the Program spearheaded a ML effort to explore whether ML modules can learn features of new threats, shorten the development of detection algorithms, and, ultimately, increase accuracy of threat detection.
- **Solution:** As a result of collaborations with DHS Components, industry, academia, and FFRDC partners, S&T gained a comprehensive understanding of the nature of threats and operational requirements. This understanding provides the framework for the development of a three-pronged R&D plan:
 - Short Term Solution: enhancing detection capabilities of currently deployed systems. This includes retrofitting currently deployed Explosives Trace Detectors, training end-user on sampling efficiency, and expanding detection library to include emerging threats.
 - Mid-Term Solution: conducting R&D of Small-bulk Confirmatory Capabilities through Barriers and maturing Next Gen Mass Spectrometry ETDs.
 - Long Term Solution: further developing novel detection capabilities (ex: Small-bulk Confirmatory Capabilities through Barriers, Vapor Detection, and Machine Learning) to revolutionize Alarm Resolution (AR) capabilities.
 - With the expanded scope of AR, the Program has the knowledge, know-hows, and experiences needed to execute R&D and deliver solutions to the Components effectively.
- **Justification:** The FY 2024 President’s Budget provides \$5.3M for this project, a \$0.8M decrease from the FY 2023 enacted. Funding will develop innovative solutions for Components while putting in place developmental milestones and framework needed for technical and capability breakthroughs in the future. There are multiple Component requests, collaborations, and joint R&D efforts spanning four different AR thrust areas (i.e., enhanced capabilities of deployed systems, Next Gen Mass Spectrometry ETDs, Small-bulk Confirmatory Capabilities through Barriers, and Vapor Detection). Additionally, in 2024, funding will also support an airport demonstration of machine learning algorithms running on a chemical analysis device (CAD) used by Transportation Security Specialists-Explosives for high-threat analysis.
- **Impact:** Working in collaboration with TSA Acquisition Program Management and Requirements Capabilities Analysis, the program

demonstrated an excellent record of transitioning R&D solutions to Transportation Security Officers, CBP laboratories, Federal agents, and police officers. These solutions increased probability of detection of deployed systems, kept false alarm rates low, increased security effectiveness to meet evolving threats, and enhanced end-user satisfaction. In addition to TSA, capabilities developed under this program also contributed to detection enhancements for officers in the Secret Service and CBP. Active collaborations with both agencies are ongoing.

- **Mission Impact:** The Next Gen ETD Program works to advance DHS’s mission to counter terrorism and homeland security threats, particularly those in operational environments such as airports and airways. NGETD prioritizes developing new and improved trace explosives detection capabilities to satisfy the wide variety of operational environments and DHS Components/ customers. NGETD works closely with Federal laboratories, academic institutions, and private sector companies to conduct RDT&E of trace explosive-related technologies, in order to better detect, identify, and mitigate potential threats. Emerging detection technologies will address previous capability gaps encountered by the Homeland while simultaneously improving the end-user experience.
- **Public and End-User Benefit**

Short-Term Solutions	
Retrofitting Currently Deployed ETDs	<ul style="list-style-type: none">• Fewer alarm rates• Faster throughput• Enhance collection efficiencies
Training End-Users on Sampling Efficiency	<ul style="list-style-type: none">• Easier to use processes and technologies• Enhance operational capabilities of TSOs
Expanding Detection Library to include Emerging Threats	<ul style="list-style-type: none">• More threats being caught• Confidence that every threat is accounted for
Mid-Term Solutions	
R&D of Small-bulk Confirmatory Capabilities through Barriers	<ul style="list-style-type: none">• Identify hazardous materials quickly• No sample preparation so faster throughput• More accurate and efficient instrumentation• Expand what passengers can bring with them• Advanced access control point credential authentication systems
Maturing Next Gen Mass Spectrometry ETDs	
Long-Term Solutions	
Further Developing Novel Detection Capabilities	<ul style="list-style-type: none">• More streamlined process for the end-user• Increasing security effectiveness while dramatically reducing wait times• Reliably detecting a wider range of prohibited items regardless of concealment• Minimize pat down procedures and enable touchless screening
Revolutionize Alarm Resolution (AR) Capabilities	

Type of Research

Applied and Developmental

Technical Readiness Level

Grounded in operational needs, the Program invests in selected technologies spanning all four thrust areas. As such, R&D efforts span a wide range of TRLs, from 4 – 7 for emerging capabilities to 7 – 8 for mature technologies. Whereas emerging capabilities are developed at the requests of DHS Components, matured technologies are developed with active participation and joint funding from DHS Components. In particular, the development and maturation of Next Gen Mass Spectrometry ETDs has been singled out for joint funding. This is a testament to S&T's R&D excellence and laser focus on turning requirements into capabilities.

Transition Plans

The Program embraced and embodied S&T Matrix Team to develop and deliver innovative R&D solutions to DHS Components. Transition plans are developed jointly at the beginning of projects and include R&D roadmaps and transition milestones. The Program then leverages all resources available within S&T and in some instances selected resources from the Components to achieve those transition milestones. To date, two transition plans have been jointly developed, one with TSA and the other with the Secret Service. On a smaller scale, another transition plan is being developed with CBP Laboratories and Scientific Services. The Matrix Team represents the best of DHS collaborative spirit, and the Program embraces this concept for years to come.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Assessed Small Bulk Confirmatory Capabilities.	FY 2021 Q4	FY 2022 Q2	-
Completed a limited ML assessment of optical technologies.	FY 2021 Q3	FY 2022 Q2	-
Matured Mass Spec ETD to meet requirements for emerging threats.	FY 2021 Q4	FY 2022 Q4	7
Validated Explosives Vapor Testbed using real-life scenarios.	FY 2021 Q4	FY 2022 Q2	7
	FY 2023		
Assess detection algorithms based on Machine Learning and compare their performance to conventional detection algorithms.	FY 2023 Q1	FY 2023 Q2	6
Complete a design review for a small-bulk confirmatory prototype capable of screening through barriers.	FY 2023 Q1	FY 2023 Q4	6
Develop, test, and evaluate an Ambient Desorption Ionization (ADI) module retrofitted into a mass spectrometer trace explosives detection system.	FY 2022 Q1	FY 2023 Q3	5

Research, Development, and Innovation – PPA**Physical Security and Critical Infrastructure Resilience Thrust Area**

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2024		
Demonstrate at an airport, machine learning algorithms running on a chemical analysis device (CAD) used by Transportation Security Specialists-Explosives for high-threat analysis.	FY 2023 Q3	FY 2024 Q4	6
Test and evaluate a Small-bulk Confirmatory prototype capable of screening through barriers.	FY 2023 Q4	FY 2024 Q3	5

Primary Screening for Carry-On Baggage

- **Problem:** TSA’s primary screening of carry-on bags and other personal items is slow, labor-intensive, and subject to significant operator performance variability. Furthermore, space constraints limit the types of solutions that can be deployed to smaller airports. As the number of travelers increases every year and, as new threats emerge, TSA’s capabilities must meet the increased demand. The high false alarm rate during carry-on screening requires Transportation Security Officers (TSOs) to scrutinize on-screen images with even greater vigilance, resulting in lower passenger throughput and greater TSO fatigue.
- **Solution:** This project develops modular, dynamically upgradable carry-on baggage screening technologies to improve detection capability and increase passenger throughput, while maintaining or improving life cycle costs. Specifically, this project will deliver carry-on baggage screening systems, in full-size and reduced form factors, with ATR for explosives and other prohibited items. Technologies under development include CT-based X-ray systems augmented with enhanced material discrimination capabilities, to screen more effectively while reducing the need for divestiture. New systems will be compatible with TSA standards and systems.
- **Justification:** The FY 2024 President’s Budget provides \$5.0M for this project, a \$0.5M decrease from the FY 2023 enacted. Funding for this project will develop primary and secondary X-ray screening systems and algorithms to meet TSA’s most challenging detection requirements, reduce operator cognitive load, and improve passenger throughput. Funds will also be used to adapt current computed tomography, or other primary aviation screening systems, to meet requirements from other DHS Components to create dual use technologies. Additionally, in 2024, this project plans to submit for certification a combined Computed Tomography (CT) X-ray system with an augmenting X-ray technology (e.g., X-ray diffraction or Phase Contrast Imaging) to improve detection capabilities while reducing false alarms.
- **Impact:** TSA will be provided with technology that allows for greater throughput and higher security measures, while reducing operator burden. Improved technologies and algorithms would provide TSA the capability to detect prohibited items in over 600 bags per hour, without divestiture of electronics, liquids, aerosols, powders, or gels.

Type of Research

Applied and Developmental

Technical Readiness Level

TRL varies for specific project efforts between TRL-3 and TRL-7. TRL-3 and TRL-4 projects are evaluated through technology demonstrations using simulated or representative data and processes to validate viability against TSA requirements. Projects that are TRL-5 or higher are evaluated at S&T’s TSL (TRL-5/6), TSA’s TSA System Integration Facility (TRL-6), and/or operational airport demonstrations (TRL-7) in coordination with TSA’s Innovation Task Force.

Transition Plans

The Primary Screening for Carry-On Baggage project regularly transitions technology and knowledge products to TSA. The project's R&D plan follows the Joint Consolidated Technology Roadmap, developed in partnership with TSA Requirements and Capability Analysis (RCA) and the TSA Capability Manager for Accessible Property Screening (APS). Aligning development to the roadmap ensures transitioned knowledge and capabilities meet TSA's technology development priorities. After the completion of DT&E at the TSL and R&D efforts conclude, critical knowledge products that define technology potential and capabilities, data collection and demonstration results about operational performance, and systems and algorithms for acquisition certification testing are delivered to TSA. Development spirals will be coordinated with TSA's recapitalization plans to ensure both a smooth and timely technology insertion. The Primary Screening for Carry-On Baggage project matures technologies to TRL 6, or as need per TSA guidance, and then transfers ownership of products to TSA for engineering development to move into their acquisition lifecycle. Not only do the transitioned products enable S&T and TSA to develop and refine acquisition requirements and continue to develop state-of-the-art capabilities to improve aviation security that meet TSA's priorities, but also offer other Government customers the opportunity to leverage the DT&E towards applications beyond the aviation environment.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
FY 2022			
Conducted a technical design review of an orthogonal X-ray augmentation technology to improve detection and reduce secondary screenings.	FY 2022 Q1	FY 2022 Q4	5
Demonstrated a CT X-ray system operating in a remote screening configuration using high speed network interconnects to demonstrate the efficacy and security of remote screening stations in an airport security checkpoint environment.	FY 2022 Q1	FY 2022 Q3	5
Demonstrated an X-ray diffraction-based system and deliver a test report showing the ability of the system to resolve alarms from an upstream X-ray transmission system, reducing accessible property false alarms at an airport checkpoint.	FY 2021 Q1	FY 2022 Q3	5
FY 2023			
Complete Transportation Security Laboratory data collection and receive report for an augmenting X-ray detection system (e.g., phase contrast imaging or X-ray diffraction) more capable of distinguishing explosive, chemical, and 3-D printed threat items from benign passenger belongings than current primary screening systems.	FY 2022 Q4	FY 2023 Q1	5
Demonstrate a complete video analytics solution that associates passengers and their belongings throughout the checkpoint, detects anomalies, and enables next-generation concepts of operations like self-screening.	FY 2023 Q1	FY 2023 Q4	6
Demonstrate a small-form factor computed tomography (CT) X-ray system capable of meeting TSA's most challenging detection requirements while also meeting size, weight, and power requirements necessary to deploy CT systems at smaller airports.	FY 2021 Q2	FY 2023 Q3	5

Research, Development, and Innovation – PPA**Physical Security and Critical Infrastructure Resilience Thrust Area**

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2024		
Integrate an automated data labeling tool into the TSA-approved Common Graphical User Interface to demonstrate real-time tagging of stream of commerce X-ray images at a checkpoint to support Artificial Intelligence/Machine Learning algorithm development.	FY 2023 Q1	FY 2024 Q2	7
Perform data collection for a prototype small form factor Computed Tomography X-ray System that can be shared with third parties for algorithm development and/or a prize competition.	FY 2023 Q4	FY 2024 Q4	5
Submit for certification a combined Computed Tomography (CT) X-ray system with an augmenting X-ray technology (e.g., X-ray diffraction or Phase Contrast Imaging) to improve detection capabilities while reducing false alarms.	FY 2023 Q4	FY 2024 Q4	7

Primary Screening for Passengers

- **Problem:** High false alarm rates and extensive divestiture requirements associated with passenger screening create significant bottlenecks at aviation checkpoints. Whenever passenger screening systems predict a potential threat, TSA staff engages in a secondary, manual screening process that increases operational costs and negatively impacts the experience of the traveling public. As the number of travelers increases every year and as new threats emerge, TSA's capabilities must meet the increased demand. Additionally, currently qualified systems use proprietary architectures, which limits TSA's ability to engage a broader HSE to deploy improved capabilities.
- **Solution:** This program develops people screening technologies that are safe, provide higher-resolution scans, and have better automated detection algorithms. These systems will substantially reduce the need for divestiture of shoes, headwear, outerwear, and small personal items. Novel approaches to solving these problems include improving competition winning algorithms for next-generation Advanced Imaging Technology (AIT) systems. New capabilities are under development for AIT systems include the ability to screen passengers with improved imaging resolution to more efficiently detect challenging and emerging threats. New systems may also include the ability to screen passengers while they walk or while wearing bulky outerwear and shoes.
- **Justification:** The FY 2024 President's Budget provides \$3.3M for this project, a \$0.7M decrease from the FY 2023 enacted. Funding for this project will be used to develop on-person screening systems, primarily millimeter-wave systems, and automated detection algorithms to meet TSA's most challenging detection standards and throughput requirements to improve the passenger experience, mitigate insider threat risks, and reduce pat-down rates. Additionally, in 2024, this project also plans to complete a technical design review for screening passengers with limited mobility (e.g., passengers with disabilities or elderly passengers) that is capable of meeting TSA's most challenging detection standards.
- **Impact:** When integrated with other advanced checkpoint technologies, these systems will provide faster, less invasive, and less costly screening of passengers. Limited divestiture will decrease passenger inconvenience and increase checkpoint throughput. Systems with material discrimination will confirm whether suspect items are potentially harmful or benign, reducing the rate of pat-downs and other intrusive security measures.

Type of Research

Applied and Developmental

Technical Readiness Level

TRL varies for specific project efforts between TRL-3 and TRL-7. TRL-3 and TRL-4 projects are evaluated through technology demonstrations using simulated or representative data and processes to validate viability against TSA requirements. Projects that are TRL-5 or higher are evaluated at S&T's TSL (TRL-5/6), TSA's TSA System Integration Facility (TRL-6), and/or operational airport demonstrations (TRL-7) in coordination with TSA's Innovation Task Force.

Transition Plans

The Primary Screening for Passengers project regularly transitions technology and knowledge products to TSA. The project's R&D plan follows the Joint Consolidated Technology Roadmap, developed in partnership with TSA Requirements and Capability Analysis (RCA) and the TSA Capability Manager for On-Person Screening (OPS). Aligning development to the roadmap ensures transitioned knowledge and capabilities meet TSA's technology development priorities. After the completion of DT&E at the TSL and R&D efforts conclude, critical knowledge products that define technology potential and capabilities, data collection and demonstration results about operational performance, and systems and algorithms for acquisition certification testing are delivered to TSA. Development spirals will be coordinated with TSA's recapitalization plans to ensure both a smooth and timely technology insertion. The Primary Screening for Passengers project matures technologies to TRL 6, or as needed per TSA guidance, and then transfers ownership of products to TSA for engineering development to move into their acquisition lifecycle. Not only do the transitioned products enable S&T and TSA to develop and refine acquisition requirements and continue to develop state-of-the-art capabilities to improve aviation security that meet TSA's priorities, but they also offer other Government customers the opportunity to leverage the DT&E towards applications beyond the aviation environment.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
FY 2022			
Conducted a critical design review of prototype, handheld MMW screening devices in a wand form factor that will be used to resolve on-person screening alarms or as a primary on-person screening device in space constrained environments.	FY 2020 Q3	FY 2022 Q4	4
Conducted a technical design review for an advanced real-time passenger imaging system.	FY 2020 Q4	FY 2022 Q3	5
Demonstrated a video analytics capability to enable and support passenger screening automation.	FY 2022 Q1	FY 2022 Q4	4
FY 2023			
Deliver three High-Definition Advanced Imaging Technology (AIT) Retrofit Kits to TSA capable of improving the detection performance of existing AIT systems through improved image quality.	FY 2022 Q1	FY 2023 Q3	5
Demonstrate a prototype, handheld MMW screening device in a wand form factor that will be used to resolve on-person screening alarms or as a primary on-person screening device in space constrained environments.	FY 2022 Q2	FY 2023 Q3	5
Demonstrate an in-motion advanced imaging technology prototype that enables next-generation concepts of operations such as passenger self-screening or high-throughput screening.	FY 2022 Q3	FY 2023 Q4	6
Submit for certification readiness testing a shoe scanner with an automatic threat recognition algorithm capable of detecting weapons or organic threat items concealed in footwear without requiring passengers to remove their shoes.	FY 2021 Q3	FY 2023 Q4	6

Research, Development, and Innovation – PPA**Physical Security and Critical Infrastructure Resilience Thrust Area**

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2024		
Complete a technical design review for screening passengers with limited mobility (e.g., passengers with disabilities or elderly passengers) that is capable of meeting TSA's most challenging detection standards.	FY 2022 Q3	FY 2024 Q3	5
Submit for certification readiness testing a real-time Advanced Imaging Technology system capable of meeting TSA's most challenging detection standards while enabling passenger throughputs similar to a metal detection.	FY 2023 Q4	FY 2024 Q4	7

Screening at Speed (SaS)

- **Problem:** Current DHS checkpoints use standalone sensors that do not speak to each other and are costly and time-consuming to upgrade in response to evolving threats. Current sensors are also prone to false alarms that require intrusive pat downs and manual searches to resolve and require that individuals being screened divest personal belongings to screen effectively. All these factors increase the per-person screening cost, operator fatigue, probability of missed threats, and the frustration of individuals being screened. The current screening process will become untenable as the number of people needing to be screened at TSA, USSS, and CBP permanent and temporary checkpoints continues to rise, and new threats continue to emerge. DHS Components require detection technologies that effectively and efficiently screen for concealed threats using an integrated system-of-system that uses layered screening technologies.
- **Solution:** SaS is developing independent sensors that will be integrated to enable a seamless curb-to-gate security solution. It will reliably detect a wider range of prohibited items regardless of concealment, using technologies for passenger screening, property screening, video analytics, and infrastructure supporting technologies. Future systems that record and analyze a richer array of data will provide greater security while limiting the number of invasive, time-consuming false alarms. This could eliminate the need for today's cumbersome requirement to remove outwear, footwear, and personal belongings; reduce TSO manual searches and pat downs; and enable future checkpoint automation.
- **Justification:** The FY 2024 President's Budget continues to provide \$7.5M for this project, and will be used to develop an integrated system of sensors from curb-to-gate, which may include stand-off millimeter wave, trace explosives detection, and video analytics. Integrating these and other sensors into the same system will reduce technology stovepipes and enable rapid deployment of new capabilities and upgrades to the field at reduced acquisition costs. Funding to integrate sensors will also enable TSA's next generation concept of operations to dramatically increase passenger throughput while enhancing TSA security capabilities by increasing the amount of unstructured screening performed before the checkpoint, reducing the amount of screening necessary at the checkpoint, and meeting TSA's high detection standards. In 2024, the project also plans to demonstrate a fully integrated self-screening solution that allows for both property screening and on-person screening to occur with limited Transportation Security Officer (TSO) engagement.
- **Impact:** The SaS Program will integrate screening tools with real-time and walk-by sensing, wide-area surveillance, credential authentication, risk-based screening, and other technologies to further reduce overall risk throughout airports and in other operational areas including soft targets and national special security events. Improved detection probabilities and reduced false alarms will translate into fewer secondary inspections, lowering per-passenger costs for TSA, and reducing passenger inconvenience. A system-of-systems approach integrated using open architectures and capable of deploying a layered aviation security posture from curb-to-gate will reduce security risks and costs, and facilitate rapid, cost-effective system upgrades to continue countering evolving adversaries.

Type of Research

Applied and Developmental

Technical Readiness Level

TRL varies for specific project efforts between TRL-3 and TRL-7. The SaS program uses spiral development techniques to deliver intermediate capabilities that contribute to the system-of-systems approach. TRL-3 and TRL-4 projects are evaluated through technology demonstrations using simulated or representative data and processes to validate viability against TSA requirements. Projects that are TRL-5 or higher are evaluated at S&T's TSL (TRL-5/6), TSA's TSA System Integration Facility (TRL-6), and/or operational airport demonstrations (TRL-7) in coordination with TSA's Innovation Task Force.

Transition Plans

The Screening at Speed project regularly transitions technology and knowledge products to TSA. The project's R&D plan follows the Joint Consolidated Technology Roadmap for Architecture, developed in partnership with TSA Requirements and Capability Analysis (RCA) and the TSA Capability Managers for Accessible Property Screening (APS) and On-Person Screening (OPS). Aligning development to the roadmap ensures transitioned knowledge and capabilities meet TSA's technology development priorities. After the completion of DT&E at the TSL and R&D efforts conclude, critical knowledge products that define technology potential and capabilities, data collection and demonstration results about operational performance, and systems and algorithms for acquisition certification testing are delivered to TSA. Development spirals will be coordinated with TSA's recapitalization plans to ensure both a smooth and timely technology insertion. The Screening at Speed project matures technologies to TRL 6, or as need per TSA guidance, and then transfers ownership of products to TSA for engineering development to move into their acquisition lifecycle. Not only do the transitioned products enable S&T and TSA to develop and refine acquisition requirements and continue to develop state-of-the-art capabilities to meet TSA's priorities, but they also offer other Government customers the opportunity to leverage the DT&E towards applications beyond the aviation environment.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Conducted a design review for a small form-factor computed tomography (CT) X-ray system to enable a more compact, integrated screening solution.	FY 2022 Q1	FY 2022 Q4	4
Conducted a design review for next generation millimeter wave panel sensors to enable an automated passenger screening solution.	FY 2022 Q1	FY 2022 Q4	4
Conducted a technical design review for an automated passenger screening solution concept to improve throughput and reduce secondary screening requirements.	FY 2021 Q3	FY 2022 Q3	4
Conducted kick-off for three new contracts for automated passenger screening solution concepts to improve throughput and reduce secondary screening requirements.	FY 2022 Q1	FY 2022 Q1	4
Demonstrated an automatic threat recognition (ATR) algorithm on a high-definition advanced imaging technology (HD-AIT) system that integrates test & evaluation best practices, using artificial intelligence (AI), to improve the robustness of deployed detection systems.	FY 2021 Q3	FY 2022 Q4	5

Research, Development, and Innovation – PPA**Physical Security and Critical Infrastructure Resilience Thrust Area**

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2023		
Demonstrate a secure, integrated checkpoint computing environment that enables the use of more advanced algorithms and improves passenger throughput while reducing overall system costs.	FY 2022 Q1	FY 2023 Q4	5
Demonstrate an integrated self-screening automated checkpoint system which can enable flexible TSO assignment and resource optimization and provide an enhanced passenger experience.	FY 2022 Q1	FY 2023 Q2	6
Kickoff two contracts designed to produce highly accurate synthetic computed tomography images necessary for deep learning-based algorithms for explosives and prohibited item detection.	FY 2022 Q4	FY 2023 Q1	-
	FY 2024		
Demonstrate a fully integrated self-screening solution that allows for both property screening and on-person screening to occur with limited Transportation Security Officer (TSO) engagement.	FY 2022 Q1	FY 2024 Q2	6
Demonstrate interconnected sensor systems that automatically fuse data from both sensors in order to improve overall detection performance while reducing false alarm rates.	FY 2023 Q2	FY 2024 Q4	6
Publish a fully synthetic, non-sensitive dataset to support third-party development of on-person screening and property screening algorithms.	FY 2023 Q1	FY 2024 Q2	-

Countering Violent Extremism Program – Acts of violence can pose a significant impact to American lives and Federal, State, local, and tribal governments. This Program aims to conduct evidence-based research to meet the policy, operational, and public needs to improve effectiveness of public safety and violence prevention efforts implemented by FSLTT and non-governmental stakeholders. This research will enable policy makers and operational end-users to make informed decision to divert vulnerable individuals, prevent potential offenders, mitigate vulnerabilities, and enhance community resilience in the face of various social and behavioral threats.

Public Safety and Violence Prevention

- **Problem:** With a growing and evolving threat landscape, with changing motivations and actors, effective response requires a proactive, analytical, and qualitative approach to the prevention of, protection from, mitigation of, response to, and recovery from acts of violence that impact public safety. One of DHS’s top priorities is to protect citizens from terrorism and other homeland security threats; however, the drivers behind these acts that impact public safety are not fully understood. Targeted violence and terrorism are not a single issue, but a complex host of problems, crimes and activities that are related to a number of threats. This program supports the *National Strategy for Countering Domestic Terrorism*, which highlights the need to better understand the full range of domestic terrorism threats in our country.
- **Solution:** S&T will conduct evidence-based research to identify high quality data to better understand the nature and threats in the United States while providing independent, objective assessment of activities to ensure that State and local stakeholders can continually improve and integrate new evidence and basic research in pursuit of the general welfare of our citizens. This program will utilize the application of fundamental research within social science disciplines to assist in the development of knowledge, tools, and techniques to support SLTT efforts as we aim to mitigate and prevent acts that put an individual(s) or group(s) safety into question, with a specific focus on targeted violence and terrorism prevention, information integrity, and community resilience. Findings from this research aims to build evidence, data and knowledge products that shall strengthen public safety and violence prevention programming domestically.
- **Justification:** The FY 2024 President’s Budget provides \$7.3M for this project, a \$0.8M increase from the FY 2023 enacted. Funding for this project will be used to develop knowledge products (e.g., best practices, evaluations) and capabilities that aim to improve our understanding of how and why individuals radicalize to violence, mobilize to violence, and disengage from violence. Additionally, in 2024, funding will support the publications of at least four Systematic Reviews and other evaluation products that aim to improve prevention approaches in order to build a global evidence base for terrorism prevention policy, strategy, and activity.
- **Impact:** Provides the HSE with knowledge and findings to enable education and awareness to reinforce a whole-of-society prevention architecture. These efforts will equip and empower local efforts including peers, teachers, community leaders, and law enforcement – to minimize a threat as it evolves while enhancing emergency preparedness and response by better understanding how current prevention programming can improve while highlighting opportunities to improve and strengthen local prevention initiatives. Data and knowledge derived from the program shall increase understanding about what works, what doesn’t, and what’s promising in enhancing public safety and violence prevention efforts, while informing strategy, policy and operations for DHS Components and other key stakeholders.

Type of Research

Varies (basic and applied)

Technical Readiness Level

TRL varies for specific project activities between TRL-5 and TRL-7. This project's R&D efforts will start by performing a survey of tools and techniques that could be adapted for the purposes of this effort. Identified tools and techniques are then adapted or prototyped and then validated in a relevant environment (TRL-5/6). Following successful validation, the most promising solution(s) are evaluated in an operational environment (TRL-7) prior to transition.

Transition Plans

- Knowledge products in the form of best practices, protocols, and educational materials shall be developed for use by DHS and shared publicly. Evidence developed shall be shared within the HSE to help inform future policy and practice in terrorism prevention programming.
- Recommendations, best practices and techniques that are developed for local use are adopted, piloted, evaluated for impact and consequences, are transferred and applied to sector-specific training, guidance, and exercise services within the HSE.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
FY 2022			
Assessed the validity of current threat assessment and threat management approaches to inform DHS as to the needs, use, and efficacy of threat assessment tools and models.	FY 2021 Q4	FY 2022 Q4	-
Conducted and published systematic reviews of prior research and evaluation to build a global evidence base for terrorism prevention policy, strategy, and activity.	FY 2020 Q4	FY 2022 Q4	-
Conducted evaluation of locally based prevention programs in support of the Center for Prevention Programs and Partnerships (CP3) Grants Program.	FY 2021 Q1	FY 2022 Q4	-
Developed protocols for a text-enabled call center to handle potential cases of violent extremism in a local environment that will be shared for their operational use.	FY 2020 Q4	FY 2022 Q3	5
FY 2023			
Deliver an assessment on the utilization of threat assessment tools and techniques that have been implemented by State and local security stakeholders.	FY 2021 Q1	FY 2023 Q3	-
Deliver an impact and/or outcome evaluation of locally based prevention programs in support of the Center for Prevention Programs and Partnerships (CP3) Grants Program.	FY 2023 Q1	FY 2023 Q4	-
Implement social-behavioral modeling to examine human factor influence and countermeasures for IED response operations.	FY 2021 Q4	FY 2023 Q4	-

Research, Development, and Innovation – PPA**Physical Security and Critical Infrastructure Resilience Thrust Area**

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
Publish at least two Systematic Reviews of prior research and evaluation to build a global evidence base for terrorism prevention policy, strategy, and activity.	FY 2022 Q1	FY 2023 Q4	-
Publish best practices on rehabilitation and reintegration programming that includes and expands on how the approach can be applied to different settings (i.e., school health and safety management teams).	FY 2021 Q4	FY 2023 Q4	
	FY 2024		
Analyze online harms to better understand how foreign influence operations impact the radicalization, particularly among domestic violent extremists.	FY 2023 Q2	FY 2024 Q4	-
Conduct impact/outcome evaluations of Federal, State, or locally based prevention programs.	FY 2023 Q2	FY 2024 Q4	-
Develop an analytical system that better understands threat, risk, and vulnerabilities across the country on a range of threats to include domestic violent extremism and terrorism, online harms, and other domestic threats.	FY 2023 Q4	FY 2024 Q4	6
Develop outcome measures for domestic violent extremism which can be used to help develop practice and programs.	FY 2023 Q2	FY 2024 Q4	-
Field a nationally representative survey to better understand the impact of online harms on an individuals' attitudes and actions.	FY 2021 Q4	FY 2024 Q4	-
Measure the effectiveness of threat assessment tools and models while identifying pathways to successful implementation.	FY 2023 Q2	FY 2024 Q4	-
Publish at least four (4) Systematic Reviews of prior research and evaluation to build a global evidence based for terrorism prevention policy, strategy, and activity.	FY 2023 Q2	FY 2024 Q2	-

Physical Security – Provides a layered and integrated capability to safely screen for potential threat items in unstructured crowds within soft-target venues and crowded spaces without impact to the speed of travel while maintaining individual privacy.

Soft Targets Security (formerly Soft Targets, Vehicular, School Safety, Protective Sites)

- **Problem:** Current security capabilities for screening people and their belongings in soft targets and crowded places (such as surface transportation environments) are extremely limited. The unique requirements of soft targets and crowded places (an open system with no fixed checkpoints, extremely high throughput, and an unalterable existing infrastructure within which technologies for various threats or anomalous behavior detection must fit) dictate the need for a dedicated program to address vulnerabilities.
- **Solution:** S&T will provide an orthogonal, layered, and integrated capability to safely screen for potential threat items in unstructured crowds within soft-target venues and crowded spaces without impact to the speed of travel while maintaining individual privacy.
- **Justification:** The FY 2024 President’s Budget provides \$1M for this project, a \$1M decrease from the FY 2023 enacted. Funding for this project will be used to complete a simplified assessment tool to consider attacks using firearms in occupied spaces which will result in a prototype Active Shooter Application. The application will be developed by the Army Engineer Research and Development Center (ERDC) for CISA and USSS CONOPS with the final version being installed in the Special Events Protection Tools portal on the CISA Gateway. Continue a survey of available commercial off-the shelf active vehicle barriers will be conducted to determine those capable of being assembled and deployed using minimal personnel, capable of stopping a vehicle of specified weight, and at a designated impact speed. Develop real-time video analytics to alert on leave behind events or other anomalous behaviors through the Silicon Valley Innovation Program (SVIP).
- **Impact:** Leave-Behind detection with surrounding circumstance assessment will allow security personnel to clear 30-50 percent of suspicious packages without necessitating an emergency response (\$.600M/year manpower savings per Washington Metro Area Transit Authority (WMATA) and increase screening from three percent (current bag searches) to a goal of 95 percent of all passengers.

Type of Research

Developmental

Technical Readiness Level

TRL varies for specific project activities between TRL-5 and TRL-7. This project’s R&D efforts typically start by performing a market survey of available COTS and GOTS technology that could be adapted for DHS Component use. Identified technology is then adapted and validated in a relevant environment (TRL-5). Following successful validation, the most promising solution(s) are then prototyped and evaluated first in a relevant environment (TRL-6) then in an operational environment (TRL-7) prior to transition.

Transition Plans

- DT&E and OT&E will be conducted with surface transportation end-users within TSA Mass Transit Test Beds (MTTBs). When technologies reach appropriate maturity, they will be transitioned to an industry partner for commercialization. Once in the marketplace, the technology can be added to the approved equipment list (AEL) for purchase by surface transportation authorities.
- Massachusetts Institute of Technology Lincoln Laboratory (MIT/LL) has entered into a technology transition agreement with Liberty Defense Technologies (LDT). LDT has obtained the license to an MIT/LL patent (based on the mmW Flat Panel Imaging Array technology under development for S&T) to develop a portal-based millimeter wave system for detecting potential threat items entering large venues (i.e., stadiums) and schools.
- U.S. Army Engineer Research and Development Center (ERDC) has developed a Special Events Protection portal containing Event Security Decision Support Tools for use by CISA and DHS Regional Protective Security Advisors (PSAs). Tools will be used to assist event coordinators with planning, assessing, and implementing effective physical security measures at events held at the State or local level which may receive limited Federal support. Newly developed tools/applications will be transitioned to the portal and hosted on the CISA Gateway.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
FY 2022			
As part of the Event Security Decision Support Tools Project, developed the Blast Stand-off App, the Serpentine App, and Vehicle Barrier Selection App.	FY 2022 Q1	FY 2022 Q4	5-7
As part of the Event Security Decision Support Tools Project, developed the Protection Planning, Visualization, and Assessment Tool (PPVAT).	FY 2021 Q4	FY 2022 Q4	5-7
In coordination with TSA MPAC, conducted OT&E of FOVEA tool suite within TSA mass transit test bed in preparation for transition to industry partner for commercialization.	FY 2022 Q1	FY 2022 Q4	5-7
FY 2023			
Conduct DT&E of stand-off chemical detector for vehicle borne IED detection in lab environment.	FY 2023 Q1	FY 2023 Q3	5-7
Deliver OT&E final report of FOVEA tool suite to TSA Multimodal and Public Area Capabilities (MPAC) Division.	FY 2023 Q1	FY 2023 Q2	5-7
Integrate component technologies into layered system with automated threat detection for proof of principle.	FY 2022 Q4	FY 2023 Q4	5-7
Procure third party stand-off sensor (ThruVison TAC, SPO-NX, etc.) for inclusion in Layered Architecture and conduct in lab testing.	FY 2022 Q2	FY 2023 Q4	5-7
FY 2024			
Deliver Active Shooter Application to CISA, integrate within the Special Event Planning Tool (SEPT) Portal on the CISA Gateway.	FY 2023 Q4	FY 2024 Q1	7

*University Programs – PPA***Budget Comparison and Adjustments****Comparison of Budget Authority and Request***(Dollars in Thousands)*

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget	FY 2023 to FY 2024 Change
Centers of Excellence	\$57,880	\$45,880	\$45,880	-
Minority Serving Institutions (MSI)	\$7,657	\$7,657	\$5,157	(\$2,500)
Total	\$65,537	\$53,537	\$51,037	(\$2,500)
Subtotal Discretionary - Appropriation	\$65,537	\$53,537	\$51,037	(\$2,500)

PPA Level I Description

University Programs (UP) supports homeland security-related research and education at U.S. colleges and universities to address high-priority DHS-related issues and to enhance homeland security capabilities over the long term. This PPA includes programs that bring together scientists, mathematicians, and engineers from many academic disciplines and institutions. These researchers are investigating research questions important to DHS, as well as developing new technologies and approaches to solve complex and challenging homeland security problems.

UP includes the following programs:

Centers of Excellence (COE): The COE program focuses on building homeland security expertise in the academic community, creating strategic partnerships among universities, commercial interests, and public agencies, and developing a new science and engineering workforce dedicated to homeland security. COE program priorities are developed by DHS Components, based on their long-term mission needs.

MSI: This program enhances the capabilities of MSIs to develop homeland security-related science, technology, engineering, and mathematics research and curricula, and prepare MSI students for successful homeland security careers.

University Programs – PPA
Budget Authority and Obligations
(Dollars in Thousands)

	FY 2022	FY 2023	FY 2024
Enacted/Request	\$65,537	\$53,537	\$51,037
Carryover - Start of Year	\$30,214	\$42,785	\$24,402
Recoveries	-	-	-
Rescissions to Current Year/Budget Year	-	-	-
Net Sequestered Resources	-	-	-
Reprogramming/Transfers	(\$181)	-	-
Supplementals	-	-	-
Total Budget Authority	\$95,570	\$96,322	\$75,439
Collections - Reimbursable Resources	\$500	\$500	\$500
Collections - Other Sources	-	-	-
Total Budget Resources	\$96,070	\$96,822	\$75,939
Obligations (Actual/Estimates/Projections)	\$53,285	\$72,420	\$60,856
Personnel: Positions and FTE			
Enacted/Request Positions	-	-	-
Enacted/Request FTE	-	-	-
Onboard and Actual FTE			
Onboard (Actual/Estimates/Projections)	-	-	-
FTE (Actual/Estimates/Projections)	-	-	-

University Programs – PPA
Summary of Budget Changes
(Dollars in Thousands)

	Positions	FTE	Amount
FY 2022 Enacted	-	-	\$65,537
FY 2023 Enacted	-	-	\$53,537
FY 2024 Base Budget	-	-	-
Centers of Excellence	-	-	\$45,880
Minority Serving Institutions (MSI)	-	-	\$5,157
Total Research and Development Projects	-	-	\$51,037
FY 2024 Request	-	-	\$51,037
FY 2023 TO FY 2024 Change	-	-	(\$2,500)

University Programs – PPA

Non Pay Budget Exhibits

Non Pay by Object Class

(Dollars in Thousands)

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget	FY 2023 to FY 2024 Change
21.0 Travel and Transportation of Persons	\$90	\$24	\$7	(\$17)
25.1 Advisory & Assistance Services	\$2,395	\$702	\$196	(\$506)
25.3 Other Purchases of goods and services	-	\$1,692	\$1,123	(\$569)
25.5 Research & Development Contracts	\$9,494	\$3,511	\$1,262	(\$2,249)
31.0 Equipment	-	\$20	\$13	(\$7)
41.0 Grants, Subsidies, and Contributions	\$53,558	\$47,588	\$48,436	\$848
Total - Non Pay Budget Object Class	\$65,537	\$53,537	\$51,037	(\$2,500)

Research and Development
Research and Development Projects

Summary of Projects
(Dollars in Thousands)

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget
Centers of Excellence	\$57,880	\$45,880	\$45,880
Minority Serving Institutions (MSI)	\$7,657	\$7,657	\$5,157

Centers of Excellence
Research and Development
Technology Readiness Level Exhibit
(Dollars in Thousands)

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget
Centers of Excellence	\$57,880	\$45,880	\$45,880

R&D Project Description

CENTERS OF EXCELLENCE: S&T's COEs develop multidisciplinary, customer-driven, homeland security science and technology solutions and help train the next generation of homeland security experts. The COE network is an extended consortium of hundreds of universities conducting groundbreaking research to address homeland security challenges. COEs work closely with the homeland security community to develop customer-driven, innovative tools and technologies to solve real-world challenges. COE partners include academic institutions; industry; national laboratories; DHS Components; S&T divisions; other Federal agencies; State, local, tribal, and territorial homeland security agencies; and first responders. These partners work in concert to develop critical technologies and analyses to secure the Nation. In support of Administration priorities, this request maintains additional funding across the COEs to strengthen the Nation's investments in foundational, early-stage R&D at universities, to further secure our future.

CENTERS OF EXCELLENCE <i>(Dollars in Thousands)</i>			
Project	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget
Center for Accelerating Operational Efficiency (CAOE)	\$4,875	\$4,875	\$4,875
Coastal Resilience Center of Excellence (CRC) ¹	\$4,875	\$4,875	-
Criminal Investigations and Network Analysis (CINA)	\$4,876	\$4,876	\$4,876
Critical Infrastructure Resilience Institute (CIRI) ²	\$4,876	\$4,876	-
Cross Border Threat Screening and Supply Chain Defense (CBTS)	\$4,876	\$4,876	\$4,876
Current State of Border Security	\$12,000	-	-
Soft-target Engineering to Neutralize the Threat RealitY (SENTRY) ³	\$4,876	\$4,876	\$4,876
Master of Business Administration/Security Technology Transition (MBA/STT)	\$2,000	\$2,000	\$2,000

CENTERS OF EXCELLENCE (Dollars in Thousands)			
Project	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget
National Counterterrorism Innovation, Technology and Education Center of Excellence (NCITE)	\$4,875	\$4,875	\$4,875
Procurement Sensitive New COE Topic #1 ⁴	\$4,875	\$4,875	\$4,875
Procurement Sensitive New COE Topic #2 ⁵	\$4,876	\$4,876	\$4,876
Procurement Sensitive New COE Topic #3 ⁶	-	-	\$4,875
Procurement Sensitive New COE Topic #4 ⁷	-	-	\$4,876
Total – Centers of Excellence Thrust Area	\$57,880	\$45,880	\$45,880

¹ CRC will be reaching the end of its period of performance and a new COE Topic (Procurement Sensitive) will be in the planning stages. FY 2024 funding for CRC would be for this new COE Topic.

² CIRI will be reaching the end of its period of performance and a new COE Topic (Procurement Sensitive) will be in the planning stages. FY 2024 funding for CIRI would be for this new COE Topic.

³ This new SENTRY COE was awarded in FY 2022 Q1. Previously known as Engineering Secure Environments from Targeted Attacks COE.

⁴ FY 2022 funding for ADAC is being applied to this new COE topic (Procurement Sensitive pending posting of the Notice of Funding Opportunity). FY 2023 and FY 2024 funding for ADAC would be applied as well.

⁵ FY 2022 funding for BTI is being applied to this new COE topic (Procurement Sensitive pending posting of the Notice of Funding Opportunity). FY 2023 and FY 2024 funding for BTI would be applied as well.

⁶ In FY 2024, CIRI will be reaching the end of its period of performance and a New COE Topic (Procurement Sensitive) will be in the planning stages. FY 2024 funding for CIRI is being applied to this new COE topic (Procurement Sensitive pending posting of the Notice of Funding Opportunity).

⁷ In FY 2024, CRC will be reaching the end of its period of performance and a New COE Topic (Procurement Sensitive) will be in the planning stages. FY 2024 funding for CRC is being applied to this new COE topic (Procurement Sensitive pending posting of the Notice of Funding Opportunity).

Center for Accelerating Operational Efficiency (CAOE)

This Center conducts end user-focused research to enhance the application of analytic tools that support real-time decision making to address homeland security related threats and hazards. The Center also provides education and professional development to improve data management and analysis, to facilitate operations research and systems analysis, to identify the economic impact of security threats and hazards, and to critically assess future risks posed to DHS's mission.

- **Problem:** Our country's homeland security workforce faces complex challenges that require split-second decision making, wise allocation of scarce resources and accurately predicting consequences of natural and manmade disasters. In addition, constantly changing information requirements make it difficult to provide dynamic and adaptable tools and processes to address these challenges.
- **Solution:** The overarching goal of the Center is to develop tools and methods for all levels of the homeland security workforce (e.g., leaders, analysts, and operators) to improve predictions in order to enhance preparation and response; to optimize screening and border operations for threat detection; and to inform prevention policy through risk and cost analysis. The activities under this project include:

- Improving predictions to enhance preparation and response: CAOÉ’s work in predictive analytics in advancing methodologies in terms of ability to provide analytic results faster and with more accuracy. Researchers are examining methods to analyze real-time streaming data to provide almost real-time solutions so that DHS operations can react quicker to changing situations. Research applies techniques to improve the accuracy of the predictions and build confidence in the results, whether it be in decision support tools or evaluation of the performance of artificial intelligence.
- Optimizing screening and border operations for threat detection: CAOÉ simulation and modeling advances understanding of the characteristics of homeland security threats and homeland security operations. CAOÉ researchers are using analytics to identify where and what type of infrastructure should be in place to counter specific threats along with enabling increased apprehensions at ports of entry, improved threat detection, and/or reduction in operating costs.
- Informing prevention policy through risk and cost analysis: CAOÉ’s economic analysis and risk assessment capabilities are applied to DHS activities and mission areas, using “design science”. Researchers are using both qualitative case-studies methods and quantitative psychometric/econometric approaches. The resulting design improvements touch areas across DHS, including acquisition and operations, cyber critical infrastructure, as well as the performance of TSOs.
- **Justification:** The FY 2024 President’s Budget continues to provide \$4.9M for this project and will be used to advance research and test the utility of specific project developments. For example, funding will support applying developed metrics that assess the usefulness of artificial intelligence (AI) technologies when deploying processes that involve human AI teaming in the field. The Center will also develop training and education for the current and future homeland security workforce. In FY 2024, CAOÉ plans to conduct at least one education and outreach initiative such as seminar series, and summer education program to engage 10-20 undergraduate students in homeland security science and engineering, as well as develop at least one proof of concept of demonstration that uses AI technology to support HSE analysis tasks.
- **Impact:** Research outcomes will include analytical tools, technologies, and knowledge products for the homeland security workforce that may allow them to more accurately assess the analytical data they are collecting during operational duties. Outcomes may also improve threat detection, leading to increased identification of threats, at lower cost. The Center will produce new capabilities, test them in operational settings, and make validated solutions available and useful to homeland security professionals at all levels.

Type of Research

Basic, Applied, and Developmental

Technical Readiness Level

CAOE conducts a portfolio of projects currently at TRL-3 but can range from TRL-2 through TRL-7, from initial concept development to system prototypes tested in the field. Each COE conducts multiple projects across its research and education theme areas. The range of TRL levels changes throughout a COE's life cycle, with a progression toward more TRL levels at the higher end of the scale; however, even a later-phase COE portfolio may include lower range TRLs in its portfolios to address emerging risks.

Transition Plans

S&T works with the CAOEs to structure and position projects to align with customer needs, beginning from conception, through testing, and piloting in the field. Technology development activities sync with the scientific and program management milestones appropriate for each project. These efforts differ depending upon the research gap being addressed, but involve partnerships with technology providers, data owners, commercialization entities, DHS Components, and other public-sector agencies. Management methods are designed to reduce the technical and programmatic risks of new technologies to the point where industry and other Federal customers are willing to invest in technology commercialization or move towards direct acquisition. S&T manages planned, formal technical and strategic annual and biennial reviews to assess individual project performance against key performance parameters. These reviews readjust overall research portfolio investments to respond to market forces and customer demand.

Program managers work with the Office of General Counsel, the General Counsel of the performing institution(s), and COE Technology Commercialization Offices to support legal, privacy, market, and technology transfer elements of each project. DHS encourages COEs work with their technology transfer offices to attract investments, address legal concerns, and leverage university infrastructures to execute the plans necessary to enable long-term sustainment of technologies.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Developed an early prototype for a deep learning model that will support DHS Components in better understanding migration data in order to better allocate resources.	FY 2022 Q1	FY 2022 Q3	3
Hosted 10-20 undergraduate students for a STEM-based program that combines data analytics training and HSE problem sets.	FY 2022 Q3	FY 2022 Q4	-
	FY 2023		
Conduct at least one education and outreach initiative, such as the annual Hackathon, seminar series, and summer education program to engage 10-20 undergraduate students in homeland security science and engineering.	FY 2023 Q1	FY 2023 Q4	-
Develop at least one proof of concept for demonstration that uses AI technology to support HSE analysis tasks.	FY 2023 Q1	FY 2023 Q4	3
Implement results of Biennial Review in order to ensure the research remains relevant to DHS missions.	FY 2023 Q1	FY 2023 Q4	-
	FY 2024		
Conduct at least one education and outreach initiative, such as the annual Hackathon, seminar series, and summer education program to engage 10-20 undergraduate students in homeland security science and engineering.	FY 2024 Q1	FY 2024 Q4	-
Develop a new RFP targeting novel research in privacy, risk, or other relevant CAO domains.	FY 2024 Q1	FY 2024 Q4	-
Develop at least one proof of concept for demonstration that uses AI technology to support HSE analysis tasks.	FY 2024 Q1	FY 2024 Q4	3

Coastal Resilience Center of Excellence (CRC)

- **Problem:** Damage caused by floods and hurricanes poses a near-constant threat to lives and property. A lack of resilience to natural hazards at the individual and community level is contributing to the increasing public share of disaster response and recovery costs. As of July 9, 2021, there have been eight weather/climate disaster events with losses exceeding \$1.0B each to affect the United States. These events included one drought event, two flooding events, four severe storm events, and one winter storm event. Overall, these events resulted in the deaths of 331 people and had significant economic effects on the areas impacted. The 1980–2020 annual average is 7.1 events (CPI-adjusted); the annual average for the most recent five years (2016–2020) is 16.2 events (CPI-adjusted).¹
- **Solution:** This Center conducts research and education to enhance the Nation’s ability to safeguard people, infrastructure, and economies from natural hazards such as floods and hurricanes. It also considers the impact of future climate trends on coastal resilience. CRC’s work directly addresses key challenges associated with growing coastal vulnerability and assists S&T, FEMA, USCG, CISA and local communities in coordination with public and private sector partners. Coastal Infrastructure Resilience examines new methods to assess vulnerability and assist practitioners. Building Resilient Communities conducts research and education to help communities mitigate, recover, and adapt to natural hazard risks. Disaster Dynamics advances coastal storm surge and flood forecasting capabilities and communicates the results to improve coastal resilience through flood risk maps and other mechanisms. Education formulates and delivers resilience-oriented undergraduate and graduate courses, concentrations, minors, certificates, and training, with strong emphasis on Minority Serving Institutions.
- **Justification:** The FY 2024 President’s Budget does not include funding for this project CRC will reach the end of its period of performance in FY 2024. Funding for this project will be used to fund the research required to develop the new COE topic designation package, the creation of the Notice for Funding Opportunity, and management of the competition to stand up a new COE.
- **Impact:** CRC’s work produces tangible research and education results for use by DHS, other Federal agencies, State and local governments, and other relevant entities that help reduce the adverse impacts of coastal natural disasters on the Nation’s citizens, infrastructure, and economy.

Type of Research

Basic, Applied, and Developmental

Technical Readiness Level

CRC conducts a portfolio of projects currently at TRL-7 but can range from TRL-2 through TRL-7, from initial concept development to system prototypes tested in the field. Each COE conducts multiple projects across its research and education theme areas. The range of TRL levels changes throughout a COE’s life cycle, with a progression toward more TRL levels at the higher end of the scale; however, even a later-phase COE portfolio may include lower range TRLs in its portfolios to address emerging risks.

¹ NOAA National Centers for Environmental Information (NCEI) U.S. Billion-Dollar Weather and Climate Disasters (2020). <https://www.ncdc.noaa.gov/billions/>, DOI: 10.25921/stkw-7w73

Transition Plans

OUP Program Managers work with the COEs to structure and position projects to align with customer needs, beginning from conception, through testing, and piloting in the field. OUP technology development activities sync with the scientific and program management milestones appropriate for each project. These efforts differ depending upon the research gap being addressed, but involve partnerships with technology providers, data owners, commercialization entities, DHS Components, and other public-sector agencies. OUP's management methods are designed to reduce the technical and programmatic risks of new technologies to the point where industry and other Federal customers are willing to invest in technology commercialization or move towards direct acquisition. OUP manages planned, formal technical and strategic annual and biennial reviews to assess individual project performance against key performance parameters. These reviews readjust overall research portfolio investments to respond to market forces and customer demand.

OUP Program Managers work with S&T's Office of General Counsel, the General Counsel of the performing institution(s), and COE Technology Commercialization Offices to support legal, privacy, market, and technology transfer elements of each project. DHS encourages COEs work with their technology transfer offices to attract investments, address legal concerns, and leverage university infrastructures to execute the plans necessary to enable long-term sustainment of technologies.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Completed implementation of technology transfer and transition plans for ADCIRC Prediction System (APS) TM .	FY 2022 Q1	FY 2022 Q4	7
Completed professional training and certification program for the Plan Integration for Resilience Scorecard TM .	FY 2022 Q1	FY 2022 Q4	7
Provided coastal flooding and storm surge guidance using the APSTM for hurricanes impacting the East and Gulf coasts to inform decision making for emergency management, hazard mitigation and post-storm damage estimations.	FY 2022 Q1	FY 2022 Q4	-
	FY 2023		
Conduct research to inform equitable administration and application of FEMA's Building Resilient Infrastructure and Communities (BRIC) program to marginalized groups, neighborhoods, and communities.	FY 2023 Q1	FY 2023 Q4	-
Provide coastal flooding and storm surge guidance using the APSTM for hurricanes impacting the East and Gulf coasts to inform decision making for emergency management, hazard mitigation and post-storm damage estimations.	FY 2023 Q1	FY 2023 Q4	7
Work with states, such as Rhode Island and Louisiana to enable use of ADCIRC Prediction System (APS) TM -coastal hazards modeling outputs for State emergency management agencies.	FY 2023 Q1	FY 2023 Q4	7
	FY 2024		
N/A	-	-	-

Criminal Investigations and Network Analysis (CINA)

CINA conducts end user-focused research to enhance investigation strategies to address transnational criminal organizations activities and other homeland security-related crimes. This COE also provides education and professional development to improve the cost-effectiveness of criminal investigations, prosecution, prediction, and prevention.

- **Problem:** Transnational criminal organizations are committing heinous crimes in both physical and cyber space. This COE focuses on a major, cross-cutting DHS mission area, criminal law enforcement, that the COEs have not yet addressed. While technological innovations promise continuing improvements in the quality of life for individuals around the globe, criminal organizations are capitalizing on these transformative advances to become more agile and expand their illicit activities. Sophisticated criminal networks can easily appear, disappear, and reorganize in response to opportunities and authority gaps. These networks function as complex social structures across the cyber and physical spaces, and operate at a variety of scales, ranging from local to international.
- **Solution:** The overarching goal of CINA is to develop tools and methods for agents, officers, and investigators to better coordinate investigative strategies with on-the-ground and cybersecurity activities to predict, thwart, and prosecute crime. The activities under this project include:
 - Criminal Network Analysis: Focusing on equipping HSE stakeholders with a thorough understanding and knowledge of criminal activity, its evolution, and convergence, CINA researches the structure of organized gangs, illicit supply networks, and cartels; furthering the development of tools to monitor and disrupt these activities.
 - Dynamic Patterns of Criminal Activity: This initiative seeks to improve prediction and forecasting for HSE stakeholders through the development of cutting-edge methods, agent-based models, and game theory to forecast criminal actions, gang activities, and threats to the United States. Studying the threats at the geographical, social, and cyber dimensions, can prevent, interdict, mitigate and deter homeland security threats or future losses.
 - Forensics: With the intent on developing and deploying state-of-the-art forensic methods, tools, and technologies within the HSE community, CINA leverages advancements in multimedia support, biometric characteristics and digital identifiers, allowing law enforcement officers to attribute malicious incidents with threat actors.
 - Criminal Investigative Processes: Intent on improving HSE end user investigative processes used to detect, pursue, and solve transnational criminal activity, this COE is focusing on solving complex investigative processes associated with human trafficking, cybercrimes, and money laundering.

- **Justification:** The FY 2024 President’s Budget continues to provide \$4.9M for this project and will be used to continue academic research focused on thwarting criminal networks and transnational crime by advancing tools available to law enforcement officers within the HSE and providing analysts and policy officials with insights into the networked structure of these illicit actors. In FY 2024, CINA plans to host at least six speakers as part of CINA’s Distinguished Speaker Series that provides homeland security-related thought leadership and that also results in quality video resources for the HSE.
- **Impact:** Research outcomes will include analytical tools, technologies, and knowledge products for the workforce. The Center will produce new capabilities, test them in operational settings, and make validated solutions available and useful to law enforcement agencies at all levels.

Type of Research

Basic, Applied and Developmental

Technical Readiness Level

CINA conducts a portfolio of projects that currently range from TRL-3 through TRL-6 but can range from TRL-2 through TRL-7, from initial concept development to system prototypes tested in the field. Each COE conducts multiple projects across its research and education theme areas. The range of TRL levels changes throughout a COE’s life cycle, with a progression toward more TRL levels at the higher end of the scale; however, even a later-phase COE portfolio may include lower range TRLs in its portfolios to address emerging risks.

Transition Plans

S&T works with CINA to structure and position projects to align with customer needs, beginning from conception, through testing, and piloting in the field. Technology development activities sync with the scientific and program management milestones appropriate for each project. These efforts differ depending upon the research gap being addressed, but involve partnerships with technology providers, data owners, commercialization entities, DHS Components, and other public-sector agencies. Management methods are designed to reduce the technical and programmatic risks of new technologies to the point where industry and other Federal customers are willing to invest in technology commercialization or move towards direct acquisition. S&T manages planned, formal, technical, and strategic annual and biennial reviews to assess individual project performance against key performance parameters. These reviews readjust overall research portfolio investments to respond to market forces and customer demand.

Program managers work with the Office of General Counsel, the General Counsel of the performing institution(s), and COE Technology Commercialization Offices to support legal, privacy, market, and technology transfer elements of each project. COEs work with their technology transfer offices to attract investments, address legal concerns, and leverage university infrastructures to execute the plans necessary to enable long-term sustainment of technologies.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Conducted six distinguished speaker series that bring in recognized authorities in CINA academic and operational topic areas.	FY 2021 Q1	FY 2022 Q2	1
Launched at least one educational course that will support a certificate program or CINA minor in CINA relevant academic disciplines.	FY 2021 Q1	FY 2022 Q2	-
Planned and hosted a CINA Futures Workshop that produces a workshop report capturing future challenges and potential solutions in CINA relevant scientific domains.	FY 2021 Q1	FY 2022 Q2	-
Provided HSI Cyber Crimes Center with a prototype of the Criminal Predictive Analytical Platform for Opioid Abuse software for user feedback and preliminary testing.	FY 2020 Q4	FY 2022 Q1	3
	FY 2023		
Conduct Biennial Review on all research, education, and CINA's Management efforts and provide actions and recommendations to be implemented in the next year's workplan.	FY 2023 Q1	FY 2023 Q4	-
Host six Distinguished Speaker events that provide homeland security thought leadership and result in quality video resources for the HSE.	FY 2023 Q1	FY 2023 Q4	-
In order to increase the Center's likelihood of self-sustainability, CINA will conduct market research and establish thorough transition/transfer plans for at least two projects.	FY 2023 Q1	FY 2023 Q4	5-6
	FY 2024		
Implement the recommended actions resulting from CINA's Biennial Review.	FY 2024 Q1	FY 2024 Q3	-
Conduct market research and identify relevant transition partners for the technologies resulting from at least three CINA projects. S&T PMs will utilize these reports to help inform the FY 2024 research portfolio.	FY 2024 Q1	FY 2024 Q4	-
Host at least six speakers as part of CINA's Distinguished Speaker Series that provides homeland security-related thought leadership and that also results in quality video resources for the HSE.	FY 2024 Q1	FY 2024 Q4	-

Critical Infrastructure Resilience Institute (CIRI)

This Center conducts research and education to enhance the resiliency of the Nation’s critical infrastructures, and the businesses and public entities that own and operate them. This research will provide a better understanding of risk management of catastrophic disruptions to infrastructure operations focusing on the dynamic interface between cyber and physical systems.

- **Problem:** Federal and State governments and the private sector need industries and regional economies working again as soon as possible after catastrophic events, particularly in locales that also host critical infrastructure systems and industries. Therefore, DHS must understand the complex public and private sector linkages that comprise an infrastructure system and community, and how the severe stress of catastrophic events impacts them. Infrastructure systems are increasingly reliant upon cyber physical systems. Those systems may become compromised as a result of cyber-attacks. Infrastructure owners and operators need to understand how organizational risk and operational readiness is affected by cyber risks.
- **Solution:** CIRI explores the organizational, policy, business, and technical dimensions of critical infrastructure’s dependence on cyber assets. CIRI examines how computer hardware and software both contribute to and threaten resiliency and how industry makes decisions about cyber assets which contribute to resilience. The Center develops business cases for preparing for and mitigating the effects of catastrophic incidents with an emphasis on how computer hardware and software contribute to and threaten resiliency. The activities under this project include:
 - The Application of Critical Infrastructure Research in the Real-World: CIRI evaluates policy options and identifies, tests, and pilots’ technologies and non-material solutions to support effective decision-making in a collaborative risk management environment in real-world settings. Investigating areas from Cybersecurity Assurance for Critical Infrastructure to Electromagnetic Pulse (EMP) Risk Assessment and Mitigation Prioritization and Hybrid Quantum-Classical Reinforcement Learning, CIRI is leveraging existing publications, analyses, and verified and validated models to evaluate and select cross-sector issues that are amenable to real-world testing.
 - Understanding Resilient Critical Infrastructure Systems: Infrastructure systems are owned and operated by a variety of businesses and public entities, including municipal and other types of governments that vary in their knowledge of, and flexibility to manage catastrophic risk. To this end, CIRI is performing an Assessment and Measurement of Port Disruptions and will deliver a “proof-of-concept” framework that would allow port authorities to conduct contextually relevant threat-based assessments of port infrastructure.
 - The Business Case for Infrastructure Resiliency: Understanding how businesses that make up infrastructure systems make decisions before, during, and after a catastrophic event will assist in defining future policies, incentives, and programs. CIRI is analyzing government policies and regulations and the dynamics of risk insurance markets to determine their effects on the motivations and behavior of decision makers throughout the HSE. By assisting with cybersecurity framework implementation, modeling, and planning dynamic resiliency, and leveraging AI for Disaster Response, researchers are developing future options for policies, regulations, and market conditions that will properly incentivize decision makers to make timely and appropriate investments in infrastructure security and resilience.

- The Future of Resilience: By researching cloud-based delivery of training related to cyber risk management processes, CIRI is improving risk-based cybersecurity postures within individual companies and government agencies.
- **Justification:** The FY 2024 President’s Budget does not include funding for this project as CIRI will be ending its period of performance in FY 2024. Funding for this project will be used to fund the research required to develop the new COE topic designation package, the creation of the Notice for Funding Opportunity, and management of the competition to stand up a new COE.
- **Impact:** The Center’s work will result in data-rich quantitative analyses, technologies, and other tools that assist DHS and the critical infrastructure industry in understanding threats and vulnerabilities, risk management strategies, and costs and trade-offs of risk management decisions.

Type of Research

Basic, Applied and Developmental

Technical Readiness Level

CIRI conducts a portfolio of projects that currently range from TRL-3 through TRL-5 but can range from TRL-2 through TRL-7, from initial concept development to system prototypes tested in the field. Each COE conducts multiple projects across its research and education theme areas. The range of TRL levels changes throughout a COE’s life cycle, with a progression toward more TRL levels at the higher end of the scale; however, even a later-phase COE portfolio may include lower range TRLs in its portfolios to address emerging risks.

Transition Plans

S&T program managers work with the CIRI to structure and position projects to align with customer needs from proof of concept through testing, and piloting in the field. Technology development activities sync with the scientific and program management milestones appropriate for each project. These efforts differ depending upon the research gap being addressed, but involve partnerships with technology providers, data owners, commercialization entities, DHS Components, and other public-sector agencies. Management methods are designed to reduce the technical and programmatic risks of new technologies to the point where industry and other Federal customers are willing to invest in technology commercialization or move towards direct acquisition. S&T manages planned, formal technical and strategic annual and biennial reviews to assess individual project performance against key performance parameters. These reviews readjust overall research portfolio investments to respond to market forces and customer demand.

Program managers work with the Office of General Counsel, the General Counsel of the performing institution(s), and COE Technology Commercialization Offices to support legal, privacy, market, and technology transfer elements of each project. COEs work with their technology transfer offices to attract investments, address legal concerns, and leverage university infrastructures to execute the plans necessary to enable long-term sustainment of technologies.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Conducted testing and solicit end user feedback on artificial intelligence optimization approaches for strategic resource allocation and network design of resilient infrastructure with explicit characterizations of reachability (i.e., minimizing number of potentially isolated people or critical assets/locations) and equitability (i.e., measuring disparities of effects), specific to water distribution infrastructure owners and operators that would automate the generation of disaster-resilience upgrades to critical water distribution infrastructure systems. Feedback will be incorporated into approach to support the development of a beta-prototype software tool, user guide, and customer market segment report.	FY 2022 Q1	FY 2022 Q4	3-4
	FY 2023		
Begin preparation for the completion of all research and education project activities for the final year of the COE.	FY 2023 Q1	FY 2023 Q4	-
Facilitate development of a robust, competitive market for NG911 systems and enhance the assurance of resilient operational delivery of NG911 services by developing and implementing a sustainable, national-scale testing framework and capability to ensure interoperability, compatibility, and cybersecurity (in accordance with NIST standards) of NG911 components and systems and their supply chains.	FY 2021 Q4	FY 2023 Q4	5
Identify and conduct transition related activities to further at least two ongoing research projects.	FY 2023 Q1	FY 2023 Q4	-
Plan and implement final Annual Meeting bringing together researchers, DHS Component stakeholders, and potential commercialization and transition partners to discuss all research and education activities.	FY 2023 Q4	FY 2023 Q4	-
Research and develop methods and tools for enhancing resilience of water distribution and other infrastructure through scalable AI-based planning.	FY 2022 Q1	FY 2023 Q4	3-4
	FY 2024		
N/A	-	-	-

Cross Border Threat Screening and Supply Chain Defense (CBTS)

CBTS focuses on researching and developing solutions, protocols, and capabilities to support the identification of potential biological threats and/or hazards within the DHS operational environment that could disrupt critical infrastructure supply chains and the supporting operational activities conducted at ports of entry, land borders, and other critical nodes within the supply chain.

- **Problem:** Certain technological fields such as biology, bioengineering, and supply chain analytics are rapidly evolving. New biological threats and hazards have the potential to significantly affect the health and well-being of people, animals, and plants, and to subsequently affect the Nation's economy and critical infrastructure. DHS needs the ability to better understand current and emerging biological threats that are faced at POEs and land borders and that may affect critical infrastructure supply chains.
- **Solution:** Potential approaches include the utilization of innovative technologies (e.g., screening physical cargo and passengers, and data analysis to identify potential conditions that warrant greater scrutiny), optimized operational procedures, and a skilled workforce trained in latest methods to identify and respond to biological threats and their corresponding impact on health and the economy. The activities under this project include:
 - Detecting Biological Threats and Disruption to People and Global Supply Chains: Develop simplified, cost effective, interoperable, and broad-spectrum approaches to screen for biological threats. CBTS is analyzing the feasibility of using blockchain and/or other IoT technologies to capture and securely transmit information throughout the supply chain. Additionally, CBTS is utilizing a hand-held device to develop a new assay that can identify infections in people before they develop symptoms, as well as differentiate between viral and bacterial pathogens in less than one hour.
 - Data Integration and Analytics: Improve decision analysis in the field by developing innovative tools, methodologies, and processes to support DHS and its partners. Researchers are developing interoperable field-deployable software tools that integrate data from multiple data sources such as sensors, health records, import/exports, supply chains, private industry, and government partners to support decision makers.
 - Novel Operational Methods to Use Emerging Tools to Reduce Risk: Produce timely decision-making through meaningful data integration and representation from disparate sources via advanced Bayesian analysis applied to threat assessment outputs to inform future research, training, and policy.
 - Time Critical Response Support: Research Early Warning and Workforce Protection against Highly Contagious Infectious Diseases will provide all levels of operators the guidance necessary to understand evolving global threats. This will help DHS respond to and support efforts to mitigate rapidly developing incidents.
- **Justification:** The FY 2024 President's Budget continues to provide \$4.9M for this project, and will be used to aid DHS in reducing risks posed by biological threats and hazards encountered at borders, ports of entry, and within the global supply chain. By researching the countering

biological threats in supply chains, CBTS will assist DHS operations that protect the global supply chain and reduce the risk of exposing people and infrastructures to new and evolving biological threats. In FY 2024, CBTS plans to foster cross-border and transdisciplinary collaborations across Mexico, the United States, and Canada through a single research platform needed to assess the state of risk of U.S. supply chain across North America through at least two case studies.

- **Impact:** CBTS will strengthen DHS operational workforce, protect people, animals, and agriculture, and help to defend against threats to the global supply chain that, if comprised, would cause harm to public health and U.S. economy.

Type of Research

Basic, Applied and Developmental

Technical Readiness Level

CBTS conducts a portfolio of projects that currently range from TRL-2 through TRL-7, from initial concept development to system prototypes tested in the field. Each COE conducts multiple projects across its research and education theme areas. The range of TRL levels changes throughout a COE's life cycle, with a progression toward more TRL levels at the higher end of the scale; however, even a later-phase COE portfolio may include lower range TRLs in its portfolios to address emerging risks.

Transition Plans

S&T works with CBTS to structure and position projects to align with customer needs, beginning from conception, through testing, and piloting in the field. Technology development activities sync with the scientific and program management milestones appropriate for each project. These efforts differ depending upon the research gap being addressed, but involve partnerships with technology providers, data owners, commercialization entities, DHS Components, and other public-sector agencies. Management methods are designed to reduce the technical and programmatic risks of new technologies to the point where industry and other Federal customers are willing to invest in technology commercialization or move towards direct acquisition. S&T manages planned, formal technical and strategic annual and biennial reviews to assess individual project performance against key performance parameters. These reviews readjust overall research portfolio investments to respond to market forces and customer demand.

Program managers work with the Office of General Counsel, the General Counsel of the performing institution(s), and COE Technology Commercialization Offices to support legal, privacy, market, and technology transfer elements of each project. DHS encourages COEs work with their technology transfer offices to attract investments, address legal concerns, and leverage university infrastructures to execute the plans necessary to enable long-term sustainment of technologies.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Conducted a curriculum gap analysis and needs assessment of existing curriculum and develop course curriculum covering basic information about animal and plant infectious diseases and disease epidemiology.	FY 2020 Q3	FY 2022 Q3	7
Developed a hand-held device that can identify pre-symptomatic infections in people.	FY 2020 Q4	FY 2022 Q4	4
	FY 2023		
Conduct research that addresses known knowledge gaps related to border health, substandard, fraudulent, and counterfeit illegal medical supplies equipment, and how artificial intelligence (AI) can reduce biological risks. Develop case studies for specific supply chains of strategic value across North America (Mexico-U.S.-Canada) by addressing supply chains that vary by complexity and vary by evidence availability.	FY 2023 Q1	FY 2023 Q4	4
Develop a Truck Border Crossing Delays and Disruptions Economic Impact Assessment Model to provide a practical and efficient tool to help conduct economic impact analyses on border crossing changes. The IMPLAN input/output model will be used to translate empirical data into regional and national economic impacts, using the model's multipliers, for wage, labor, and production.	FY 2021 Q3	FY 2023 Q1	6
Examine how the homeland security enterprise can use data to discern relationships, detect anomalies, and display trends to mitigate a variety of risks to the supply chain; Demonstrate the effectiveness of models in identifying emerging supply chain risks.	FY 2023 Q1	FY 2023 Q4	3
	FY 2024		
Expand current research in the detection of biological threats through the use of data integration and analytics by initiating two new projects in African Swine Fever.	FY 2024 Q1	FY 2024 Q4	2-3
Foster cross-border and transdisciplinary collaborations across Mexico, the United States, and Canada through a single research platform needed to assess the state of risk of U.S. supply chain across North America through at least two case studies.	FY 2024 Q1	FY 2024 Q4	4

Current State of Border Security

- **Problem:** Challenges in border security revolve around allowing the necessary and beneficial movement of people and things (e.g., trade and tourism) while preventing harmful and destructive people and things from entering the country (e.g., smuggling, terrorism, drugs). Border protection is multi-faceted— and there are many, disparate groups of stakeholders involved in each issue. There are aspects of border security that involve state, local, tribal, territorial governments, private companies, critical infrastructure, and others. As DHS is faced with unprecedented levels of people arriving at the borders and works steadily to counteract the illicit movement of people and goods, resolving this humanitarian and National security crisis requires research to inform future policy and budget decisions.
- **Solution:** With border security investments that annually exceed \$5.0B, the FY 2022 enacted provided specific funding for S&T to “leverage its existing capabilities, programs, and partnerships, including DHS federally Funded Research and Development Centers for their independent, subject matter expert analysis and evaluation, to engage with CBP on the development of an independent assessment of the current state of border security.”
- **Justification:** The FY 2024 President’s Budget does not include funding for this project.
- **Impact:** The outcome of this assessment will contribute to a maturation of CBP’s capabilities by identifying a holistic portfolio-view of the current state of border security across the CBP enterprise (AMO, OFO, and USBP); providing a better understanding of capability gaps and their risk to mission execution; informing operational requirements development; and improving the management of current and planned acquisitions, staffing, and infrastructure development. This assessment will also contribute to a more detailed understanding of capabilities in each of the three specific areas of analysis defined in the regulation (people, technology, and infrastructure). Codification of these processes would allow CBP to improve the identification, assessment, analysis, and articulation of mission requirements and capability gaps and to identify potential resolution approaches. Well-structured and codified capability building processes should also link CBP’s mission and strategy with its workforce structure, technology investments, and infrastructure requirements and improve alignment of resources to these areas as appropriate.

Type of Research

Basic, Applied, and Developmental

Technical Readiness Level

N/A

Transition Plans:

The Committee directs S&T to provide, within 180 days of the date of enactment of this act, an initial report that includes a preliminary assessment of the efficacy and impact of technological solutions acquired and deployed within the past five years, personnel levels, as well as other related investments to address current border security needs. The Committee directs S&T to provide a final report 12 months after task award an initial

report that includes: 1) a final assessment of the efficacy and impact of border investments deployed within the past five years to address border protection needs, 2) recommendations for a decision support tool architecture that supports deployment of future technology solutions, and 3) an action plan based on the analyses and assessments.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Worked with CBP and other relevant Components to determine what is needed to execute award for Independent Assessment of the State of Border Security: Identifying Impact of Border Security Investments.	FY 2022 Q1	FY 2022 Q4	-
Conducted planning to execute award for Independent Assessment of the State of Border Security: Identifying Impact of Border Security Investments.	FY 2022 Q1	FY 2022 Q4	-
Prepared to execute award for Independent Assessment of the State of Border Security: Identifying Impact of Border Security Investments.	FY 2022 Q1	FY 2022 Q4	-
	FY 2023		
N/A	-	-	-
	FY 2024		
N/A	-	-	-

Soft-target Engineering to Neutralize the Threat RealitY (SENTRY; formerly Engineering Secure Environments from Targeted Attacks)

SENTRY develops strategies and innovative solutions to secure environments that are easily accessible to large numbers of people, such as crowded spaces and transportation systems, from targeted attacks that inflict grave injury to human life and property.

- **Problem:** DHS was founded after the 9/11 attacks to safeguard the country from threats, foreign and domestic. Two decades after the attacks, the U.S. faces an increasingly complex and evolving threat of targeted violence directed at soft targets and crowded places (STCP) – high density, unsecured spaces with limited security or protective measures, making them vulnerable to attack. These attacks result in lasting devastating effects on the individual, collective, and societal level to the American population; and to physical, psychological, and financial losses.
- **Solution:** The overarching goal of SENTRY is to develop next-generation tools and methodologies for detecting, deterring, mitigating, and responding to targeted attacks and to develop education and training programs to enhance the capabilities of the current and future homeland security workforce in this area. The activities under this project include:
 - Real-time Management of Threat Detection and Mitigation; This research thrust supports the protection of STCPs in real time operations by developing decision support systems that will be able to extract information from diverse, unconventional data; manage dynamic information collection for threat identification and confirmation; develop and recommend intervention strategies for threat mitigation; and adapt to unique characteristics of specific venues.
 - Advanced Sensing Technologies: This research thrust will develop new sensor and sensing system capabilities to detect and identify threats within STCPs (e.g., chemical and biological threats, explosives, UAVs, and weapons), including research and development of pervasive, inexpensive, networked sensors to detect unusual objects and concealed threats in crowds.
 - Threat Risk Detection, Prediction, and Deterrence: This research thrust will analyze risks to existing venues in which the architecture of the venues is already established using AI, ML, and game theory.
 - Layered Security Architectural Design and Simulation: This research thrust seeks to develop principles and techniques to design venues and environments that enhance the ability to protect against diverse attacks and will offer insights and tools that can guide risk-informed security planning and security system design, particularly when venues can have multiple security layers.
- **Justification:** The FY 2024 President’s Budget continues to provide \$4.9M for this project, and will be used for academic research on detecting, deterring, mitigating, and responding to targeted violence by researching and developing innovative solutions to secure environments that are easily accessible to large numbers of people, such as crowded spaces, built environments, and transportation systems. The Center will also develop training and education for the current and future homeland security workforce. In FY 2024, the SENTRY Center plans to conduct a second series of Advanced Development for Security Applications (ADSA) and Advanced Development and Processes for Tomorrow (ADEPT)

workshops attended by lead institution personnel, OUP officials, and engaged industry DHS Component personnel, and conduct Workforce Development / Professional Development (WDPD) additional Reconnect workshops, first responder training, hackathon, and community college modules.

- **Impact:** Research and education outcomes will foster a culture of “security by design” that provide intentional and flexible architecture solutions to thwart an adaptive adversary through the integration of novel engineering design concepts, technologies, and capabilities that detect, deter, mitigate, and respond to targeted attacks. The Center will produce new capabilities, test them in operational settings, and make validated solutions available and useful to homeland security professionals at all levels.

Type of Research

Basic, Applied, and Developmental

Technical Readiness Level

SENTRY conducts a portfolio of projects currently range from TRL-2 to TRL-3 but can range from TRL-2 through TRL-7, from initial concept development to system prototypes tested in the field. Each COE conducts multiple projects across its research and education theme areas. The range of TRL levels changes throughout a COE’s life cycle, with a progression toward more TRL levels at the higher end of the scale; however, even a later-phase COE portfolio may include lower range TRLs in its portfolios to address emerging risks.

Transition Plans

OUP Program Managers work with the COEs to structure and position projects to align with customer needs, beginning from conception, through testing, and piloting in the field. OUP technology development activities sync with the scientific and program management milestones appropriate for each project. These efforts differ depending upon the research gap being addressed, but involve partnerships with technology providers, data owners, commercialization entities, DHS Components, and other public-sector agencies. OUP’s management methods are designed to reduce the technical and programmatic risks of new technologies to the point where industry and other Federal customers are willing to invest in technology commercialization or move towards direct acquisition. OUP manages planned, formal technical and strategic annual and biennial reviews to assess individual project performance against key performance parameters. These reviews readjust overall research portfolio investments to respond to market forces and customer demand.

OUP Program Managers work with S&T’s Office of General Counsel, the General Counsel of the performing institution(s), and COE Technology Commercialization Offices to support legal, privacy, market, and technology transfer elements of each project. DHS encourages COEs work with their technology transfer offices to attract investments, address legal concerns, and leverage university infrastructures to execute the plans necessary to enable long-term sustainment of technologies.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Completed Review and Present to USST.	FY 2021 Q2	FY 2022 Q1	-
Recruited and appointed Federal advisors within DHS Components to serve on ESE Board of Directors.	FY 2022 Q1	FY 2022 Q2	-
S&T facilitated work-plan development workshop with cooperative agreement recipient.	FY 2022 Q1	FY 2022 Q2	-
	FY 2023		
Conduct a series of ADSA and ADEPT workshops attended by lead institution personnel, OUP officials, and engaged industry and DHS Component personnel.	FY 2023 Q1	FY 2023 Q4	-
Conduct Reconnect workshops, first responder training, hackathon, and community college modules as part of SENTRY Workforce Development and Professional Development portfolio.	FY 2023 Q1	FY 2023 Q4	-
Develop integrated case studies focused on school safety and secure surface transportation.	FY 2023 Q1	FY 2023 Q4	-
Identify at least two projects with transition potential and implement transition milestones with input from end users to be integrated into the work plan.	FY 2023 Q1	FY 2023 Q4	-
	FY 2024		
Conduct a second series of Advanced Development for Security Applications (ADSA) / Advanced Developments Encompassing Processes and Technologies (ADEPT) workshops attended by lead institution personnel, OUP officials, and engaged industry and DHS Component personnel.	FY 2024 Q1	FY 2024 Q4	-
Conduct Workforce Development/Professional Development (WDPD) projects to include Reconnect workshops, first responder training, hackathon, and community college modules.	FY 2024 Q1	FY 2024 Q4	-
Develop integrated case studies on two soft target environments. These case studies will be conducted along the lines of SENTRY's first case study on school safety, through engaging a broad range of experts in government, industry, and leveraging SENTRY's Practitioner Advisory Board (PAB).	FY 2024 Q1	FY 2024 Q4	-
Identify at least two projects with transition potential and implement transition milestones with input from end users and, or stakeholders to be integrated into the work plan.	FY 2024 Q1	FY 2024 Q4	3
Launch two new research and, or Workforce Development/ Professional Development (WDPD) projects as a result of stakeholder feedback.	FY 2024 Q1	FY 2024 Q4	2

Master of Business Administration/Security Technology Transition (MBA/STT)

- **Problem:** Technology development, transition, and procurement will always be a foundational element of DHS’s strategy for keeping pace with current and emerging threats. The success of DHS’s efforts is dependent not only on direct investments in research, development, and procurement, but is equally dependent upon a skilled workforce capable of moving the technologies into an operational setting.
- **Solution:** The MBA/STT program is a non-traditional COE that partners with an academic institution to develop an MBA with a concentration in STT. S&T investment in this space will be a “first of its kind” program aimed to build a cross-DHS Collaborative workforce with the capability and skillset needed to develop, acquire and implement operationally relevant technologies, understand and manage the process of technology transition, and reduce the barriers of technology transition that have historically derailed critical technological or operational improvements.
- **Justification:** The FY 2024 President’s Budget continues to provide \$2.0M for this project, and will be used to continue to fund the effort aimed to build a cross-DHS Collaborative workforce with the capability and skillset needed to develop, acquire and implement operationally relevant technologies, understand and manage the process of technology transition, and reduce the barriers of technology transition that have historically derailed critical technological or operational improvements.
- **Impact:** Through leadership development, the MBA/STT will advance the DHS workforce with the ability to successfully manage R&D projects, tools, and technologies and will provide an impact technology transition across all other DHS missions.

Type of Research

Basic, Applied, and Developmental

Technical Readiness Level

TRL does not apply to MBA/STT program. MBA/STT does not develop new technologies. The program is doing case study research.

Transition Plans

OUP Program Managers work with the COEs to structure and position projects to align with customer needs, beginning from conception, through testing, and piloting in the field. OUP technology development activities sync with the scientific and program management milestones appropriate for each project. These efforts differ depending upon the research gap being addressed, but involve partnerships with technology providers, data owners, commercialization entities, DHS Components, and other public-sector agencies. OUP’s management methods are designed to reduce the technical and programmatic risks of new technologies to the point where industry and other Federal customers are willing to invest in technology commercialization or move towards direct acquisition. OUP manages planned, formal technical and strategic annual and biennial reviews to assess individual project performance against key performance parameters. These reviews readjust overall research portfolio investments to respond to market forces and customer demand.

University Programs – PPA**Centers of Excellence**

OUP Program Managers work with S&T’s Office of General Counsel, the General Counsel of the performing institution(s), and COE Technology Commercialization Offices to support legal, privacy, market, and technology transfer elements of each project. DHS encourages COEs work with their technology transfer offices to attract investments, address legal concerns, and leverage university infrastructures to execute the plans necessary to enable long-term sustainment of technologies.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
MBA STT students participated in at least two program facilitated engagements that promote industry networking.	FY 2022 Q1	FY 2022 Q4	-
Second cohort began the MBA Program.	FY 2022 Q2	FY 2022 Q3	-
The MBA STT performer (George Washington University) provided an Annual Review on MBA STT program progress to OUP, Industry Partners, and Board of Directors.	FY 2022 Q2	FY 2022 Q4	-
	FY 2023		
Cohort 1 of the MBA-STT Program graduates.	FY 2023 Q4	FY 2023 Q4	-
Develop Program Evaluation Study Plan.	FY 2022 Q4	FY 2023 Q1	-
Select third cohort from qualified DHS candidates.	FY 2022 Q4	FY 2023 Q1	-
Third cohort begins the MBA Program.	FY 2023 Q2	FY 2023 Q3	-
	FY 2024		
Cohort 2 of the MBA-STT Program graduates.	FY 2024 Q4	FY 2024 Q4	-
MBA STT Evaluation Study Interim Progress Review Brief 4.	FY 2024 Q1	FY 2024 Q3	-

National Counterterrorism, Innovation, Technology and Education (NCITE)

NCITE (formerly Terrorism Prevention Counterterrorism Research (TPCR) Center) directly supports the HSE counterterrorism missions and professionals with user-inspired projects that are necessary to prevent terrorism and improve security. NCITE identifies, mentors, and evaluates products from the academic community and only conducts research that makes a difference to the HSE and can be applied to operations.

- **Problem:** In the past few years, the DHS Intelligence Enterprise (IE) has shifted their priorities and resources to focus on immediate counterterrorism operations. This has reduced DHS IE's capability to develop, test, and implement innovative strategic methods to counter terrorism. DHS needs new technologies, protocols, and capabilities to support the IE's long-term strategic thinking and develop new approaches to terrorism prevention.
- **Solution:** The NCITE COE harnesses the universities' domain expertise to provide the DHS IE with analytic tools and strategic thinking. NCITE conducts a range of activities including basic and applied research, and education and training initiatives to support and enhance DHS analytic efforts in detecting, deterring, and preventing terrorism.
- **Justification:** The FY 2024 President's Budget continues to provide \$4.9M for this project, and will be used to fund research and development and technical expertise that aligns with the counterterrorism mission of this COE. The NCITE program will ensure that OUP can provide DHS Components with the greatest range of scientific and technical domains not available through other means and programs. In FY 2024, the NCITE COE plans to conduct market research and create transition plan for at least three projects within its portfolio and expose students to homeland security challenges by funding at least 15 students within research, education, and core management activities at the Center.
- **Impact:** The NCITE COE has the potential to impact the entire DHS IE, SLTT, and private and public partners by coordinating with the Intelligence and Analysis Counterterrorism Mission Center. NCITE COE's involvement includes conducting a range of activities including basic and applied research, and education and training initiatives to support and enhance DHS analytic efforts that are not currently being done by other organizations in the space.

Type of Research

Basic, Applied, and Developmental

Technical Readiness Level

NCITE conducts a portfolio of projects currently at TRL-3 but can range from TRL-2 through TRL-7, from initial concept development to system prototypes tested in the field. Each COE conducts multiple projects across its research and education theme areas. The range of TRL levels changes throughout a COE's life cycle, with a progression toward more TRL levels at the higher end of the scale; however, even a later-phase COE portfolio may include lower range TRLs in its portfolios to address emerging risks.

Transition Plans

OUP Program Managers work with the COEs to structure and position projects to align with customer needs, beginning from conception, through testing, and piloting in the field. OUP technology development activities sync with the scientific and program management milestones appropriate for each project. These efforts differ depending upon the research gap being addressed, but involve partnerships with technology providers, data owners, commercialization entities, DHS Components, and other public-sector agencies. OUP's management methods are designed to reduce the technical and programmatic risks of new technologies to the point where industry and other Federal customers are willing to invest in technology commercialization or move towards direct acquisition. OUP manages planned, formal technical and strategic annual and biennial reviews to assess individual project performance against key performance parameters. These reviews readjust overall research portfolio investments to respond to market forces and customer demand.

OUP Program Managers work with S&T's Office of General Counsel, the General Counsel of the performing institution(s), and COE Technology Commercialization Offices to support legal, privacy, market, and technology transfer elements of each project. DHS encourages COEs work with their technology transfer offices to attract investments, address legal concerns, and leverage university infrastructures to execute the plans necessary to enable long-term sustainment of technologies.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Conducted market assessment and determine market fit for at least two ongoing research projects.	FY 2022 Q2	FY 2022 Q4	-
Identified at least two projects with transition potential and implement transition milestones with input from end users to be integrated into the work plan.	FY 2021 Q2	FY 2022 Q2	3
	FY 2023		
Conduct Biennial Review on all research, education, and NCITE Management efforts and provide actions and recommendations to be implemented in the next year's workplan.	FY 2023 Q2	FY 2023 Q2	-
Expose students to homeland security challenges by funding at least 15 within research, education, and core management activities at the Center.	FY 2023 Q1	FY 2023 Q4	-
Identify, place, and fund four Innovation graduate fellowships.	FY 2022 Q2	FY 2023 Q4	-
Work with relevant DHS Components to create homeland security challenge areas, draft and release request for proposal for potential research projects.	FY 2023 Q3	FY 2023 Q4	-
	FY 2024		
Conduct market research and establish transition plans for the technologies resulting from at least three NCITE projects. S&T PMs will utilize these reports to help inform the FY 2024 research portfolio.	FY 2024 Q1	FY 2024 Q4	-
Expose students to homeland security challenges by funding at least 15 students within research, education, and core management activities at the Center.	FY 2024 Q1	FY 2024 Q4	-
NCITE will implement the recommended actions resulting from its Biennial Review.	FY 2024 Q1	FY 2024 Q3	-

New COE Topics #1 (Procurement Sensitive)

- **Problem:** DHS faces a myriad of complex threats and challenges in the execution of its duty to safeguard America and its people. In order to address the evolution of threats over time, DHS needs resources it can leverage to pursue long term research focused on these grand challenges and strengthens the creation of a capable workforce to enhance the homeland security.
- **Solution:** COEs are university-led consortia that work with industry, DHS Components, other government and homeland security agencies (Federal, State, and local), and first responders to develop critical technologies and analyses to secure the homeland. COEs also develop homeland security-related curricula and training.
- **Justification:** The FY 2024 President’s Budget continues to provide \$4.9M for this project, and will be used to plan for a new Center that aligns with DHS mission needs and priorities per the approved S&T COE Topic Designation Process. As part of the standard OUP planning and processes, S&T investigates new Center scopes and scientific areas to formulate potential COEs that will meet evolving DHS needs. In FY 2024, OUP plans to facilitate S&T work-plan development workshop with cooperative agreement recipient and recruit and appoint Federal advisors within DHS Components to serve on COE Board of Directors.
- **Impact:** COEs are university-led consortia with multiple partners from academia as well as potentially industrial partners. They bring a wealth of innovative thinking across a broad spectrum of technical fields. These consortia can respond to requests from DHS Components to address needs and fill gaps in science and technology research needs. The proposed increase in funding will strengthen the Nation’s investments in foundational, early-stage R&D at universities, to further secure our future and expand the scientific and technical outputs that Components rely on. COEs have developed more than 200 targeted tools, technologies, and knowledge products through COEs for use across the homeland security enterprise.

Type of Research

Basic, Applied, and Developmental

Technical Readiness Level

N/A

Transition Plans

OUP Program Managers work with the COEs to structure and position projects to align with customer needs, beginning from conception, through testing, and piloting in the field. OUP technology development activities sync with the scientific and program management milestones appropriate for each project. These efforts differ depending upon the research gap being addressed, but involve partnerships with technology providers, data owners, commercialization entities, DHS Components, and other public-sector agencies. OUP’s management methods are designed to reduce the technical and programmatic risks of new technologies to the point where industry and other Federal customers are willing to invest in technology

commercialization or move towards direct acquisition. OUP manages planned, formal technical and strategic annual and biennial reviews to assess individual project performance against key performance parameters. These reviews readjust overall research portfolio investments to respond to market forces and customer demand.

OUP Program Managers work with S&T’s Office of General Counsel, the General Counsel of the performing institution(s), and COE Technology Commercialization Offices to support legal, privacy, market, and technology transfer elements of each project. DHS encourages COEs work with their technology transfer offices to attract investments, address legal concerns, and leverage university infrastructures to execute the plans necessary to enable long-term sustainment of technologies.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Completed the planning and initiation of new Center.	FY 2021 Q3	FY 2022 Q4	-
	FY 2023		
Post Notice of Funding Opportunity.	FY 2022 Q4	FY 2023 Q2	-
Complete NOFO competition review and present results to USST.	FY 2023 Q2	FY 2023 Q4	-
	FY 2024		
Facilitate S&T work-plan development workshop with cooperative agreement recipient.	FY 2024 Q2	FY 2024 Q3	-
Recruit and appoint Federal advisors within DHS Components to serve on COE Board of Directors.	FY 2024 Q2	FY 2024 Q2	-

New COE Topic #2 (Procurement Sensitive)

- **Problem:** DHS faces a myriad of complex threats and challenges in the execution of its duty to safeguard America and its people. In order to address the evolution of threats over time, DHS needs resources it can leverage to pursue long term research focused on these grand challenges and strengthens the creation of a capable workforce to enhance the homeland security.
- **Solution:** COEs are university-led consortia that work with industry, DHS Components, other government and homeland security agencies (Federal, State, and local), and first responders to develop critical technologies and analyses to secure the homeland. COEs also develop homeland security-related curricula and training.
- **Justification:** The FY 2024 President’s Budget continues to provide \$4.9M for this project, and will be used to plan for a new Center that aligns with DHS mission needs and priorities per the approved S&T COE Topic Designation Process. As part of the standard OUP planning and processes, S&T investigates new Center scopes and scientific areas to formulate potential COEs that will meet evolving DHS needs. In FY 2024, OUP plans initiate a writing team to develop Notice of Funding Opportunity (NOFO) and conduct a COE competition and present selection recommendation to USST.
- **Impact:** COEs are university-led consortia with multiple partners from academia as well as potentially industrial partners. They bring a wealth of innovative thinking across a broad spectrum of technical fields. These consortia can respond to requests from DHS Components to address needs and fill gaps in science and technology research needs. The proposed increase in funding will strengthen the Nation’s investments in foundational, early-stage R&D at universities, to further secure our future and expand the scientific and technical outputs that Components rely on. COEs have developed more than 200 targeted tools, technologies, and knowledge products through COEs for use across the homeland security enterprise.

Type of Research

Basic, Applied, and Developmental

Technical Readiness Level

N/A

Transition Plans

OUP Program Managers work with the COEs to structure and position projects to align with customer needs, beginning from conception, through testing, and piloting in the field. OUP technology development activities sync with the scientific and program management milestones appropriate for each project. These efforts differ depending upon the research gap being addressed, but involve partnerships with technology providers, data owners, commercialization entities, DHS Components, and other public-sector agencies. OUP’s management methods are designed to reduce the technical and programmatic risks of new technologies to the point where industry and other Federal customers are willing to invest in technology

commercialization or move towards direct acquisition. OUP manages planned, formal technical and strategic annual and biennial reviews to assess individual project performance against key performance parameters. These reviews readjust overall research portfolio investments to respond to market forces and customer demand.

OUP Program Managers work with S&T’s Office of General Counsel, the General Counsel of the performing institution(s), and COE Technology Commercialization Offices to support legal, privacy, market, and technology transfer elements of each project. DHS encourages COEs work with their technology transfer offices to attract investments, address legal concerns, and leverage university infrastructures to execute the plans necessary to enable long-term sustainment of technologies.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
N/A	-	-	-
	FY 2023		
Conduct new Center of Excellence topic investigation and analysis.	FY 2022 Q4	FY 2023 Q2	-
	FY 2024		
Initiate writing team to develop Notice of Funding Opportunity (NOFO).	FY 2024 Q1	FY 2024 Q2	-
Conduct competition and present selection recommendation to USST.	FY 2024 Q3	FY 2024 Q4	-

New COE Topics #3 (Procurement Sensitive)

- **Problem:** DHS faces a myriad of complex threats and challenges in the execution of its duty to safeguard America and its people. In order to address the evolution of threats over time, DHS needs resources it can leverage to pursue long term research focused on these grand challenges and strengthens the creation of a capable workforce to enhance the homeland security.
- **Solution:** COEs are university-led consortia that work with industry, DHS Components, other government and homeland security agencies (Federal, State, and local), and first responders to develop critical technologies and analyses to secure the homeland. COEs also develop homeland security-related curricula and training.
- **Justification:** The FY 2024 President’s Budget provides \$4.9M for a new COE topic, and will be used to plan for new Centers that align with DHS mission needs and priorities per the approved S&T COE Topic Designation Process. As part of the standard OUP planning and processes, S&T investigates new Center scopes and scientific areas to formulate potential COEs that will meet evolving DHS needs.
- **Impact:** COEs are university-led consortia with multiple partners from academia as well as potentially industrial partners. They bring a wealth of innovative thinking across a broad spectrum of technical fields. These consortia can respond to requests from DHS Components to address needs and fill gaps in science and technology research needs. The proposed increase in funding will strengthen the Nation’s investments in foundational, early-stage R&D at universities, to further secure our future and expand the scientific and technical outputs that Components rely on. COEs have developed more than 200 targeted tools, technologies, and knowledge products through COEs for use across the homeland security enterprise.

Type of Research

Basic, Applied, and Developmental

Technical Readiness Level

N/A

Transition Plans

OUP Program Managers work with the COEs to structure and position projects to align with customer needs, beginning from conception, through testing, and piloting in the field. OUP technology development activities sync with the scientific and program management milestones appropriate for each project. These efforts differ depending upon the research gap being addressed, but involve partnerships with technology providers, data owners, commercialization entities, DHS Components, and other public-sector agencies. OUP’s management methods are designed to reduce the technical and programmatic risks of new technologies to the point where industry and other Federal customers are willing to invest in technology commercialization or move towards direct acquisition. OUP manages planned, formal technical and strategic annual and biennial reviews to assess

individual project performance against key performance parameters. These reviews readjust overall research portfolio investments to respond to market forces and customer demand.

OUP Program Managers work with S&T’s Office of General Counsel, the General Counsel of the performing institution(s), and COE Technology Commercialization Offices to support legal, privacy, market, and technology transfer elements of each project. DHS encourages COEs work with their technology transfer offices to attract investments, address legal concerns, and leverage university infrastructures to execute the plans necessary to enable long-term sustainment of technologies.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
N/A	-	-	-
	FY 2023		
N/A	-	-	-
	FY 2024		
Complete the planning and topic investigation of new Center.	FY 2024 Q1	FY 2024 Q4	-

New COE Topic #4 (Procurement Sensitive)

- **Problem:** DHS faces a myriad of complex threats and challenges in the execution of its duty to safeguard America and its people. In order to address the evolution of threats over time, DHS needs resources it can leverage to pursue long term research focused on these grand challenges and strengthens the creation of a capable workforce to enhance the homeland security.
- **Solution:** COEs are university-led consortia that work with industry, DHS Components, other government and homeland security agencies (Federal, State, and local), and first responders to develop critical technologies and analyses to secure the homeland. COEs also develop homeland security-related curricula and training.
- **Justification:** The FY 2024 President’s Budget provides \$4.9M for a new COE topic, and will be used to plan for a new Center that aligns with DHS mission needs and priorities per the approved S&T COE Topic Designation Process. As part of the standard OUP planning and processes, S&T investigates new Center scopes and scientific areas to formulate potential COEs that will meet evolving DHS needs.
- **Impact:** COEs are university-led consortia with multiple partners from academia as well as potentially industrial partners. They bring a wealth of innovative thinking across a broad spectrum of technical fields. These consortia can respond to requests from DHS Components to address needs and fill gaps in science and technology research needs. The proposed increase in funding will strengthen the Nation’s investments in foundational, early-stage R&D at universities, to further secure our future and expand the scientific and technical outputs that Components rely on. COEs have developed more than 200 targeted tools, technologies, and knowledge products through COEs for use across the homeland security enterprise.

Type of Research

Basic, Applied, and Developmental

Technical Readiness Level

N/A

Transition Plans

OUP Program Managers work with the COEs to structure and position projects to align with customer needs, beginning from conception, through testing, and piloting in the field. OUP technology development activities sync with the scientific and program management milestones appropriate for each project. These efforts differ depending upon the research gap being addressed, but involve partnerships with technology providers, data owners, commercialization entities, DHS Components, and other public-sector agencies. OUP’s management methods are designed to reduce the technical and programmatic risks of new technologies to the point where industry and other Federal customers are willing to invest in technology commercialization or move towards direct acquisition. OUP manages planned, formal technical and strategic annual and biennial reviews to assess

individual project performance against key performance parameters. These reviews readjust overall research portfolio investments to respond to market forces and customer demand.

OUP Program Managers work with S&T’s Office of General Counsel, the General Counsel of the performing institution(s), and COE Technology Commercialization Offices to support legal, privacy, market, and technology transfer elements of each project. DHS encourages COEs work with their technology transfer offices to attract investments, address legal concerns, and leverage university infrastructures to execute the plans necessary to enable long-term sustainment of technologies.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
N/A	-	-	-
	FY 2023		
N/A	-	-	-
	FY 2024		
Initiate the planning and topic investigation of new Center.	FY 2024 Q1	FY 2024 Q4	-

Minority Serving Institutions (MSI)
Research and Development
Technology Readiness Level Exhibit
(Dollars in Thousands)

	FY 2022 Enacted	FY 2023 Enacted	FY 2024 President's Budget
Minority Serving Institutions (MSI)	\$7,657	\$7,657	\$5,157

Minority Serving Institutions

This program enhances the capabilities of MSI to develop homeland security-related science, technology, engineering, and mathematics research and curricula, and prepare MSI students for successful homeland security careers. Current MSI programs, include the Scientific Leadership Award (SLA) program, the Summer Research Team (SRT) program, Homeland Security Professional Opportunities for the Student Workforce to Experience Research (HS POWER), and Homeland Security Internships for the Department of Homeland Security (HSID). The programs provide research opportunities and experiential learning, as well as homeland security course content and training in areas critical to homeland security while building enduring partnerships with the COEs. With targeted investments, S&T expects significant returns in the development of a future, diverse workforce that is well postured to take RDT&E positions critical to the success of homeland security enterprise.

- Problem:** Federal security agencies need diverse, well-qualified analysts and technologists to enter the homeland security science and engineering workforce. The identification, recruitment and retention of these individuals is necessary to secure a diversified workforce.
- Solution:** MSIs which include Asian American and Native American Pacific Islander-Serving Institutions (AANAPISI), Hispanic Serving Institutions (HSI), Historically Black Colleges and Universities (HBCU), and Native American Serving Institutions will design innovative homeland security related science, technology, engineering, and math (STEM) curricula; support academic enhancements; provide student experiential learning opportunities; and support homeland security-relevant research projects or initiatives with significant involvement of early career faculty and in coordination with DHS COEs.
- Justification:** The FY 2024 President’s Budget provides \$5.2M for this project and will be used in support of Executive Order 13985: Advancing Racial Equity and Support for Underserved Communities and to address SI’s Initiative: Diversity, Equity, and Inclusion. Specifically, to support continued homeland security related STEM research and work-based learning opportunities at MSIs across the United States, to include U.S. Territories and Tribal Nations. This aims to produce a diverse talent pool well postured to take RDT&E positions critical to the success of homeland security. Funds will also be used to facilitate engagements with the Nation's MSIs, which include HBCUs, HSIs, Asian American, Native American, and Pacific Islander-Serving Institutions, and Tribal Colleges and Universities, and provide student

work-based learning opportunities through science and engineering teaching initiatives, curriculum development, and scholarships. Additionally, funding will support capacity building efforts to provide MSI R&D access and support to Homeland Security critical needs by ensuring diverse and multivariate points of view are applied while seeking capabilities for Homeland Security. In FY 2024, MSI plans to continue research and work-based learning/internship programs partnering with Federal National Labs in priority DHS focus areas, to include Cyber Security, AI, and areas applicable to space-based security and resilience.

- **Impact:** MSI students will enter careers within the public and private HSE, thus increasing diversity and representation within the future homeland security RDT&E workforce. Additionally, funding provides MSIs faculty access and enhances capacity to support research opportunities to ensure that the HSE benefits from diverse research perspectives.

Type of Research

Basic, Applied, and Developmental

Technical Readiness Level

The MSIs conduct a portfolio of projects currently at TRL-2 but can range from TRL-2 through TRL-7, from initial concept development to system prototypes tested in the field. Each portfolio conducts multiple projects across its research and education theme areas. The range of TRL levels changes throughout a portfolio's life cycle, with a progression towards more TRL levels at the higher end of the scale; however, even a later-phase portfolio may include lower range TRLs in its portfolios to address emerging risks.

Transition Plans

S&T works with the MSIs to structure and position projects to align with customer needs, beginning from conception, through testing, and piloting in the field. Technology development activities sync with the scientific and program management milestones appropriate for each project. These efforts differ depending upon the research gap being addressed, but involve partnerships with technology providers, data owners, commercialization entities, DHS Components, and other public-sector agencies. Management methods are designed to reduce the technical and programmatic risks of new technologies to the point where industry and other Federal customers are willing to invest in technology commercialization or move towards direct acquisition. S&T manages planned, formal technical and strategic annual and biennial reviews to assess individual project performance against key performance parameters. These reviews readjust overall research portfolio investments to respond to market forces and customer demand.

Program managers work with the Office of General Counsel, the General Counsel of the performing institution(s), and MSI Technology Commercialization Offices to support legal, privacy, market, and technology transfer elements of each project. MSIs work with their technology transfer offices to attract investments, address legal concerns, and leverage university infrastructures to execute the plans necessary to enable long-term sustainment of technologies.

Project Schedule

Research & Development Description	Planned Start Date	Planned Completion	TRL Level(s)
	FY 2022		
Launched internship programs for undergraduate and graduate students to conduct DHS mission-relevant research with private industry and government partners.	FY 2022 Q2	FY 2022 Q4	-
Launched one to two DHS mission related RDTE research projects in partnership with the MSI Research and Development Consortium.	FY 2022 Q2	FY 2022 Q4	2
	FY 2023		
Award five to six Scientific Leadership Award grants to MSIs to help develop and strengthen homeland security related STEM curriculum.	FY 2023 Q3	FY 2023 Q4	-
Continue research and experiential learnings/internship programs partnering with the Federal National Labs in priority DHS focus areas, to include Cyber Security and AI.	FY 2023 Q3	FY 2023 Q4	-
Kickoff FY 2023 Summer Research Team (SRT) internship program for MSI students and faculty members.	FY 2023 Q2	FY 2023 Q3	-
Launch two to three high-level DHS research projects in partnership with the MSI Research and Development Consortium.	FY 2023 Q1	FY 2023 Q4	2
	FY 2024		
Continue DHS mission related CBP research project in partnership with the MSI Research and Development Consortium.	FY 2024 Q1	FY 2024 Q1	-
Continue DHS mission related integrative use case development in partnership with the MSI Research and Development Consortium and Universities Space Research Association.	FY 2024 Q1	FY 2024 Q2	-
Continue research and work-based learning/internship programs partnering with Federal National Labs in priority DHS focus areas, to include Cyber Security, AI, and areas applicable to Space-based security and resilience.	FY 2024 Q2	FY 2024 Q4	-
Kickoff FY 2024 Summer Research Teams (SRT) internship program for MSI students and faculty members.	FY 2024 Q2	FY 2024 Q4	-