Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	957.160	113.445	144.847	69.376	-	69.376	-	-	-	-	-	-
484: *Combating Terrorism Technology Support (CTTS)*	957.160	113.445	144.847	69.376	-	69.376	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

At the direction of the former Acting Secretary of Defense, the Combating Terrorism Technical Support Office (CTTS program) remains in the Office of the Assistant Secretary of Defense for Special Operations and Low Intensity Conflict (OASD SO/LIC), but was transitioned to be the Irregular Warfare Technical Support Directorate (IWTSD). The FY 2020 NDAA directed an independent study by the Center for Naval Analyses that stated the optimum location for IWTSD (formerly CTTSO) was to remain in the OASD SO/LIC and that CTTSO fulfills a unique niche in DOD's research and development landscape, meeting needs other organizations do not. During the transition, IWTSD reviewed the subgroup focus areas and some of the subgroups were renamed.

IWTSD supports the National Defense Strategy (NDS), the Irregular Warfare Annex, and will give those identified peer-to-peer high interest areas increased priority. IWTSD also recognizes that many of the existing requirements already supports many of the high interest areas; to include, increasing lethal capability of U.S. forces at the squad and small unit level; countering Small Unmanned Aerial Systems (drones) overseas and domestically; tunnel detection and mapping in theater; novel body and vehicle armor; detecting, protecting against, and mitigating novel and wartime chemical threats; telematics; covert communications; and of special interest, the use of machine learning and artificial intelligence to enhance the capability of systems used by the military and lesson the workload on the individual users.

IWTSD will continue to focus its R&D activities to rapidly fill the immediate and critical capability gaps of military operators, intelligence analysts, and first responders that are at the leading edge of the fight or response. The FY21 Congressionally directed and funded cooperative 50-50 cost sharing of RDT&E projects with Israel to address countering small unmanned aerial vehicles and enhance detection of and operations in tunnels will continue in FY22 or until the funds are expended. Although COVID 19 has greatly impacted the nation, IWTSD was able to immediately transition to a telework environment and continue to collaborate and coordinate with users and industry using the virtual environment. While not optimum, this capability allowed IWTSD to continue to fill our user's capability gaps and help keep small businesses operating.

From a broader perspective, projects remain distributed among ten mission categories, in line with the interagency Technical Support Working Group (TSWG): Advanced Analytic Capabilities; Chemical, Biological, Radiological, Nuclear, and Explosives; Improvised Device Defeat/Explosives Countermeasures; Investigative and Forensic Science; Irregular Warfare and Evolving Threats; Personnel Protection; Physical Security; Surveillance, Collection, and Operations Support; Tactical Operations Support; and Training Technology Development. Each of these programs have long held and strong partnerships with the components of USSOCOM, the Services; and a large number of Defense Agencies.

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While supporting the NDS, the IWTSD program will also continue to identify capabilities to combat terrorism and irregular adversaries and quickly delivers these capabilities to U.S. Defense and interagency users, as well as international partners through rapid research and development, advanced studies, and technical innovation. IWTSD continues to expand its partnerships with other Defense and Interagency, as well as with our foreign partners' rapid development and acquisition organizations to leverage their expertise and prevent duplication as it tries to expedite and transition new and innovative capabilities for Defense and interagency users. IWTSD is unique in its approach, annually obtaining joint requirements directly from military and law enforcement operators, intelligence analyst, and first responders and discussing those requirements with industry even before released in a Broad Area Announcement (BAA).

The IWTSD program is a diverse, advanced technology development effort that capitalizes on interagency and international participation to demonstrate the utility and effectiveness of technology when applied to combating peer or near-peer forces, emerging threats, and combating terrorism requirements. This includes rapid technology capability development, testing products, proof-of-concept demonstrations in field applications, operational test and evaluations of prototypes, and coordinating the transition from development to operational use.

For FY 2022, the time from requirements to contracts has been shortened in order to provide solutions even more rapidly to the users and to ensure IWTSD is addressing the most near-term needs. As such, the Program Requirements Meetings with users will not occur until January, 2021 and contracts awards beginning by October or November 2021 (the start of FY 2022). IWTSD normally manages approximately 220 individual projects; while also reviewing proposals and negotiating contracts for another 70 requirements prior to the next fiscal year.

The IWTSD program identifies the projects fully or partially funded by Congressional appropriations for the IWTSD program. However, IWTSD also develops technology and provides support using external funds provided by other DoD and federal departments and international partnerships. These projects and support activities are not necessarily reflected in this justification R-2; but the number of activities do reflect positively on the trust and competence that IWTSD has earned throughout the Department of Defense and interagency to rapidly conduct critical RDT&E and provide innovative products. The available funding and number of requirements from users that IWTSD needs to address in FY 2022 has been reduced by 33% in accordance with the Defense Wide Review. Due to the Defense Wide Review budget reductions, IWTSD will ask Defense and Interagency partners to increase their funding contributions to help IWTSD address and fill their critical capability gaps.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	113.445	70.377	72.317	-	72.317
Current President's Budget	113.445	144.847	69.376	-	69.376
Total Adjustments	0.000	74.470	-2.941	-	-2.941
• Congressional General Reductions	-	-0.030			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	74.500			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustment	-	-	-2.941	-	-2.941

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Change Summary Explanation

FY 2022 reductions made to support higher priority requirements.

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Advanced Analytic Capabilities (AAC)	6.037	11.247	5.046

Description: The Advanced Analytics (AA) Subgroup's objective is to develop and deploy integrated analytic capabilities; enabling Commanders, Warfighters, and Mission Partners to share information and make better/faster decisions at the Strategic, Operational, and Tactical levels. AAC projects improve sense- making, decision-making, and data management across a range of mission areas.

FY 2021 Plans:

Enhance Survivability for Close Combat Formations. Complete development of a system capable of detecting, locating, recording, and analyzing sources of radiated electromagnetic energy for autonomous RF signal collection management.

Expand the Competitive Space. Complete development and demonstration of software capable of using open source and other available information to develop a detailed country model comprising iterative models for national, provincial, and local organizational elements across political, economic, military, socioeconomic and cultural domains. Complete development of a data ingestion, storage, formatting and processing system which refines and stores information-products both in a high-throughput data and application environment and deployable as remotely accessible images in support of edge analytics. Continue drone based analytics for in-field mission planning support. Continue development of a capability to inform crisis responses on how to assess the potential for social manipulation via bot networks during a crisis-situation, and develop intervention strategies for reducing the potential for social hysteria and violence. Initiate and complete development and operationalization of a computer vision algorithm in order to provide a capability to tag and track objects in a region of interest, training its algorithms on classified Full Motion Video (FMV) to increase accuracy and enhance its tracking capabilities in an operational environment.

Sustain Combating Terrorism. Continue development of algorithms and machine learning methodologies that leverage all available data from multiple sensor platform for tunnel detection. Initiate research and development of new capabilities for investigating and tracing the source of crypto-currency transactions using both commercial tools and intelligence sources.

Irregular Warfare as a Core Competency. Complete development and application of a deterministic open source information prototype that uses current anticipatory analytic approaches to enable forecasting over three to five years to better forecast and project geopolitical turmoil that will drive future Title 10 requirements. Initiate development of concepts for modernization of military radio frequency deception techniques using current technology focused on Publicly Available Information (PAI), (e.g., Social

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C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Media, Blogs, and URLs of Interest). Initiate development, testing, and evaluation of a vision-based machine-learning algorithm capable of capturing civil information and populating standardized survey questions in Esri Survey123 forms. ***FY 2022 Plans:*** Expand the Competitive Space. Complete drone based analytics for in-field mission planning support. Complete development of a capability to inform crisis responses on how to assess the potential for social manipulation via bot networks during a crisis-situation, and develop intervention strategies for reducing the potential for social hysteria and violence. Sustain Combating Terrorism. Complete development of algorithms and machine learning methodologies that leverage all available data from multiple sensor platform for tunnel detection. Complete research and development of new capabilities for investigating and tracing the source of crypto-currency transactions using both commercial tools and intelligence sources. Irregular Warfare as a Core Competency. Complete development of concepts for modernization of military radio frequency deception techniques using current technology focused on Publicly Available Information (PAI), (e.g., Social Media, Blogs, and URLs of Interest). Complete development, testing, and evaluation of a vision-based machine-learning algorithm capable of capturing civil information and populating standardized survey questions in Esri Survey123 forms. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Congressional adjustment made in FY 2021.			
Title: CHEMICAL, BIOLOGICAL, RADIOLOGICAL, NUCLEAR, AND EXPLOSIVES (CBRNE)	9.510	16.968	7.863
Description: The CBRNE subgroup's objective is to improve defense capabilities to meet tomorrow's CBRNE threats. To meet this objective, the subgroup focuses on rapid research, development, test and evaluation on threat characterization; materials attribution; personal protective equipment; detection of CBRNE materials at trace and bulk levels at point, proximity and stand-off distances; development of information resources and decision support tools to assist response elements with risk-based decision making; and consequence management for post-event activities. ***FY 2021 Plans:*** Enhance Survivability for Close Combat Formations. Complete the development of a solution that effectively decontaminates chemical and biological (CB) warfare agents on skin and wounds. Complete development of a low-cost detect-to-identify wearable sensing technology to inform chemical-specialist first responders and warfighters of the presence of a broad range of toxic industrial chemicals (TICs) and chemical warfare agents (CWAs) vapors. Complete development of a wearable solution that autonomously monitors, detects, and captures biological threat agents for identification. Initiate a self-contained, single use assay for the detection of synthetic opioids that will enable field-forward personnel to quickly and accurately test for fentanyl while			

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Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
minimizing the handling hazards. Initiate development of a ruggedized, handheld system for rapid detection and identification of biological agents without requiring sample preparation or buffer solutions from users. Sustain CBRNE Units for Defense and the Homeland. Complete development of a low profile tactical SCBA to allow for working in confined spaces, tunnels, and similar access denied environments while providing high quality breathing air. Complete NIOSH certification of a 15-min CBRN protection escape hood capable of fitting in the pocket of a suit jacket. Complete development of an explosive trace detector with a limit of detection less than ten picograms for military and common homemade explosives. Complete the development of a novel, innovative non-encapsulating NFPA 1994 Class 1 protective ensemble that will provide Class 1 protection in a low-profile, tactical ensemble. Complete the development of low-cost, disposable multi agent detection paper (MADP) for the rapid, selective, and low cost detection of H, G, and V chemical warfare agents. The MADPs shall be able to detect HD, HN, GA, GB, GD, GF, VX, VR, and VS. Complete development of a new Universal Suit-Seal Interface to accommodate a broader range of masks and personal protective ensembles. Complete the development of a containment system for rapidly encapsulating and transporting objects contaminated with CB hazards, such as CWAs and TICs. Complete the assessment of National Institute for Occupational Safety and Health (NIOSH) certified CBRN respirator filter canisters when stored unpackaged and pre-affixed to respirators. Complete improving the ability to detect and characterize CB hazards in various subterranean (Sub-T) environments. Complete collecting empirical data on the transport of aerosol particles in an urban environment to improve mathematical models used for risk assessment and hazard response. Continue the development of a practical application of Surface Enhanced Spatially Offset Raman Spectroscopy (SESORS) for trace threat detection. Continue the development of a respiratory protective device designed for canines that can fit the general working dog population. Continue the development of evidence and consensus-based guidance for laundry protocols and decontamination confirmation for personal protective equipment after ricin, abrin, and pharmaceutical-based agent incidents. Continue optimizing the methodology for using Alternative Light Sources (ALS) systems to visualize and screen for pharmaceutical-based agent (PBA) threats. Continue to identify new and/or novel uses of existing technologies that can be used to rapidly degrade or destroy chemical munitions (CM) in a non- or semi-permissive environment through execution of an industry challenge. Continue identifying successful operational guidance for decontaminating fentanyl and its analogs. Continue development of a risk-based decision support model for skin decontamination in the case of dermal exposures to CWAs. Continue the redesign of the current vacuum sampling devices to accommodate collection of liquid samples for chemical or microbiological forensic analysis. Continue development of a man-portable system that can reliably detect explosives through continuous gas phase monitoring. Initiate development of a pocket sized Raman system capable of identifying unknown dark/colored materials, in addition to current detectable threats through non-metallic barriers. Initiate development of chemical detection tape that will classify both liquids and aerosols as G series, Blister, or V series agents. Initiate development of chemical/biological protective cover for a self-contained breathing apparatus (SCBA) and SCBA components. Initiate the development of a screening system capable of simultaneously screening passengers and bags carried by passengers for mass casualty weapons. Initiate development of a low-cost, tactical handheld Raman system capable of identifying explosives, TICs/toxic industrial materials (TIMs), drugs, and CWAs.			

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C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Integrate with the U.S. Interagency. Complete development of a test bed for the evaluation of cargo for contraband including special nuclear materials, explosives, drugs, and other potential materials of interest, utilizing muon tomography and electron stopping. Complete development of an advanced analytical database of improvised CB agent production methods. Complete development of an interface that integrates chemical detection data in real time to a central data sharing, management, and storage platform. Complete updating the current open source CB recipe inventory to include metadata on each discovered recipe and incorporating recipe and precursor information into a threat recognition guide. Complete development of an online database containing feedback on CBRNE detector field performance and test data. Complete to assess improvements to detection performance through use of novel swabs in currently fielded explosive trace detectors. Continue a multi-year test and evaluation program for the identification and rapid laboratory and field evaluation of emerging commercial and near-commercial explosive detection technologies to facilitate the acceleration, improvement, and fielding of promising capabilities. Continue testing and evaluation of a next generation sensors for use in trace, bulk, proximity, and stand-off detection of explosives-based threats. Continue evaluation of enhanced sampling materials and systems for CBRNE threats. Initiate the development of a system to effectively collect, aggregate, and share critical information related to biological samples and laboratory analysis results using a standard format that integrates with currently deployed responder networks. Initiate development of an explosive trace detection training tool that provides feedback to users as they practice hands-on trace collection. Strengthen Alliances. Complete development of a commercialized capability to produce aerosolized chemical and biological hazards for threat characterization. Complete improvement of a previous biological detector prototype to enhance performance and detection capabilities. Complete international laboratory round robin testing for facilities that are involved with response to biological incidents (e.g. bioterrorism, bio-crimes) in a safe no-fault environment. Continue the investigation of the detonation of improvised radiological dispersal devices (RDDs) in an urban environment to gain valuable emergency response and forensic information. Continue to identify common research and development gaps and initiate projects that improve the capabilities of military and civilian first responders in handling chemical, biological and radiological events. Continue to develop, validate, and/or share microbial assays and techniques for attribution of bioterrorist agents. Continue to compare the performance of two Joint Handheld Bio-Agent Identifiers so that informed decisions on future procurement and interoperability can be made. Support Relationships to Address Significant Terrorist Threats. Complete the systematic evaluation of gas forming reactions that could be used in improvised chemical devices. Continue the characterization of determining the effectiveness of novel delivery methods through empirical data to better understand the potential hazard and develop detection/mitigation methods for a broad range of materials delivered via those mechanisms. Continue to address emerging improvised CBR threats through international/interagency burden sharing and coordination groups. Hazardous Improvised Threat Information Data Exchange (HI-TIDE) brings together the IC, TSA, Modelers, S&T, and Policy community to rapidly address emerging current threats.			

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C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Enable U.S. Interagency Counterparts to Advance U.S. Influence and National Security Interests. Continue determination of operationally deployed detection techniques and systems could be further developed or exploited to provide additional chemical detection capabilities in a search environment. Continue enhancing mitigation techniques to reduce the impact of threat releases in transportation platforms and confined spaces. Initiate the evaluation of CB sensor systems in highly populated areas, provide data to optimize evacuation and response measures and refine best practices in response to a WMD in a large crowded space.			
FY 2022 Plans: Enhance Survivability for Close Combat Formations. Complete a self-contained, single use assay for the detection of synthetic opioids that will enable field-forward personnel to quickly and accurately test for fentanyl while minimizing the handling hazards. Continue development of a ruggedized, handheld system for rapid detection and identification of biological agents without requiring sample preparation or buffer solutions from users. Sustain CBRNE Units for Defense and the Homeland. Complete the development of a practical application of Surface Enhanced Spatially Offset Raman Spectroscopy (SESORS) for trace threat detection. Complete the development of a respiratory protective device designed for canines that can fit the general working dog population. Complete the development of evidence and consensus-based guidance for laundry protocols and decontamination confirmation for personal protective equipment after ricin, abrin, and pharmaceutical-based agent incidents. Complete optimizing the methodology for using Alternative Light Sources (ALS) systems to visualize and screen for pharmaceutical-based agent (PBA) threats. Complete to identify new and/or novel uses of existing technologies that can be used to rapidly degrade or destroy chemical munitions (CM) in a non- or semi-permissive environment through execution of an industry challenge. Complete identifying successful operational guidance for decontaminating fentanyl and its analogs. Complete development of a risk-based decision support model for skin decontamination in the case of dermal exposures to CWAs. Complete the redesign of the current vacuum sampling devices to accommodate collection of liquid samples for chemical or microbiological forensic analysis. Complete development of a man-portable system that can reliably detect explosives through continuous gas phase monitoring. Complete development of a pocket sized Raman system capable of identifying unknown dark/colored materials, in addition to current detectable threats through non-metallic barriers. Complete development of chemical detection tape that will classify both liquids and aerosols as G series, Blister, or V series agents Complete development of chemical/biological protective cover for a self-contained breathing apparatus (SCBA) and SCBA components. Complete development of a low-cost, tactical handheld Raman system capable of identifying explosives, TICs/toxic industrial materials (TIMs), drugs, and CWAs. Continue the development of a screening system capable of simultaneously screening passengers and bags carried by passengers for mass casualty weapons. Initiate the development of an oxygen supply system that will automatically activate in the case of poor air quality. Integrate with the U.S. Interagency. Complete the development of a system to effectively collect, aggregate, and share critical information related to biological samples and laboratory analysis results using a standard format that integrates with currently			

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Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

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deployed responder networks. Complete development of an explosive trace detection training tool that provides feedback to users as they practice hands-on trace collection. Continue a multi-year test and evaluation program for the identification and rapid laboratory and field evaluation of emerging commercial and near-commercial explosive detection technologies to facilitate the acceleration, improvement, and fielding of promising capabilities. Continue testing and evaluation of a next generation sensors for use in trace, bulk, proximity, and stand-off detection of explosives-based threats. Continue evaluation of enhanced sampling materials and systems for CBRNE threats. Strengthen Alliances. Complete the investigation of the detonation of improvised radiological dispersal devices (RDDs) in an urban environment to gain valuable emergency response and forensic information. Continue to identify common research and development gaps and initiate projects that improve the capabilities of military and civilian first responders in handling chemical, biological and radiological events. Continue to develop, validate, and/or share microbial assays and techniques for attribution of bioterrorist agents. Continue to compare the performance of two Joint Handheld Bio-Agent Identifiers so that informed decisions on future procurement and interoperability can be made. Support Relationships to Address Significant Terrorist Threats. Complete the characterization of determining the effectiveness of novel delivery methods through empirical data to better understand the potential hazard and develop detection/mitigation methods for a broad range of materials delivered via those mechanisms. Continue to address emerging improvised CBR threats through international/interagency burden sharing and coordination groups. Hazardous Improvised Threat Information Data Exchange (HI-TIDE) brings together the IC, TSA, Modelers, S&T, and Policy community to rapidly address emerging current threats. Enable U.S. Interagency Counterparts to Advance U.S. Influence and National Security Interests. Complete determination of operationally deployed detection techniques and systems could be further developed or exploited to provide additional chemical detection capabilities in a search environment. Continue enhancing mitigation techniques to reduce the impact of threat releases in transportation platforms and confined spaces. Continue the evaluation of CB sensor systems in highly populated areas, provide data to optimize evacuation and response measures and refine best practices in response to a WMD in a large crowded space. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Congressional adjustment made in FY 2021.			
Title: Explosive Ordnance Disposal/Explosive Operations (EOD/EXO)	10.252	13.640	5.873
Description: The EOD/EXO Subgroup's objective is to deliver capabilities to defeat or neutralize the continuum of terrorist improvised weapons and explosive devices. EOD/EXO improves the operational capabilities of the bomb disposal and explosive operations community, consisting of military EOD, combat engineers, special operations forces, and federal, state, and local bomb squads, by developing and delivering advanced tools and technologies, and decision support information to defeat improvised			

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terrorist devices. The EOD/EXO Subgroup identifies and prioritizes multi-agency end-user requirements in collaboration with military units, and federal, state, and local agencies. EOD/EXO actively works with vendors and end-users to deliver advanced prototype systems that provide greater efficiency and increased safety for Bomb Technicians who investigate, access, evaluate, and if needed, render safe or dispose of suspect devices. All development efforts undertaken are in support Presidential Policy Directive 17 (PPD-17), Countering Improvised Explosive Devices, and the National Bomb Squad Commanders Advisory Board (NBSCAB) National Strategic Plan. ***FY 2021 Plans:*** Sustain Combating Terrorism. Continue technological development, EOD/combat environment-specific ruggedization, and software training efforts for a humanoid robotic platform prototype for IED Defeat operations in urban environments. Continue conducting workshops that integrate Explosive Ordnance Disposal (EOD) and Public Safety Bomb Technicians (PSBT) with engineers and roboticists to collaboratively design and develop new capabilities for counter-IED operations, counter-tunnel operations and VBIED response. Continue development of a full color digital night vision system to aid in IED component identification and diagnostics. Complete development of an electronic UAS Guidebook for rapid identification and analysis of hazards from downed UAS platforms during response operations. Complete development of bomb disposal tools for deployment on, or by, small UAS-based platforms. Complete development of a hands-free bomb suit heads-up display that projects mission and sensor data onto the bomb suit helmet screen. Complete conducting requirement gathering events where bomb technicians evaluate and test current technologies in real world scenarios. Complete development and integration of an infrared camera into a high definition, live-streaming camera that displays images onto a wearable screen and aids in the identification of power supplies and other circuitry under load by differential heat signature. Complete development of library of IED circuits for training, which contains component lists, assembly instructions, and files for making printed circuit boards. Complete development of a remote chemical detection capability for EOD operations that allows identification, analysis, and technical characterization of explosives. Complete development of an artificial intelligence-based neural network that will process imagery captured by operators using high-definition cameras to aid in the location and identification of hazardous device indicators. Integrate with the U.S. Interagency. Complete development of a robot-mounted X-ray Backscatter system for VBIED diagnostics. Complete development of a 3D X-ray Imaging System to interrogate a suspected improvised explosive device (IED) and locate critical components. Complete development of a smartphone or tablet-based application that will allow bomb technicians to relay IED and IED incident information graphically to fellow bomb technicians in real-time. Complete development of a rapidly mountable backscatter X-ray system for small to medium sized robotic platforms. Complete research to produce customizable energetic tools to disrupt explosive devices in high risk environments. Initiate development a luminous and infrared marking spray and dispenser for tactical marking during urban and subterranean combat operations. Initiate development of large, labeled, robust, and realistic IED and IED component dataset for training future machine learning and artificial intelligence-based C-IED projects. Initiate development of a software program that will synthetically generate high quality images of IEDs and IED			

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C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
components to significantly reduce the cost burden of collecting threat device imagery datasets for future machine learning efforts and IED recognition applications. Initiate development of a comprehensive and shareable dataset that will include multi-angle photographs and x-ray images of microcontrollers and microsensors to augment future development of artificial intelligence-based IED threat recognition software. Strengthen Alliances. Continue bilateral information exchange between U.S.-based bomb technicians and members of the Israel National Police Bomb Disposal Division. Continue a bilateral effort with Australia DOD to evaluate, participate in, and influence future investment in countering improvised threat (CIT) technology to avoid duplication of effort and better direct resources for the integration of CIT sensor and effector technologies. ***FY 2022 Plans:*** Sustain Combating Terrorism. Continue technological development, EOD/combat environment-specific ruggedization, and software training efforts for a humanoid robotic platform prototype for IED Defeat operations in urban environments. Continue conducting workshops that integrate Explosive Ordnance Disposal (EOD) and Public Safety Bomb Technicians (PSTB) with engineers and roboticists to collaboratively design and develop new capabilities for counter-IED operations, counter-tunnel operations and VBIED response. Complete development of a full color digital night vision to aid in IED component identification and diagnostics. Integrate with the U.S. Interagency. Complete development a luminous and infrared marking spray and dispenser for tactical marking during urban and subterranean combat operations. Complete development of large, labeled, robust, and realistic IED and IED component dataset for training future machine learning and artificial intelligence-based C-IED projects. Complete development of a software program that will synthetically generate high quality images of IEDs and IED components to significantly reduce the cost burden of collecting threat device imagery datasets for future machine learning efforts and IED recognition applications. Complete development of a comprehensive and shareable dataset that will include multi-angle photographs and x-ray images of microcontrollers and microsensors to augment future development of artificial intelligence-based IED threat recognition software. Strengthen Alliances. Continue bilateral information exchange between U.S.-based bomb technicians and members of the Israel National Police Bomb Disposal Division. Continue a bilateral effort with Australia DOD to evaluate, participate in, and influence future investment in countering improvised threat (CIT) technology to avoid duplication of effort and better direct resources for the integration of CIT sensor and effector technologies. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Congressional adjustment made in FY 2021.			
Title: FORENSIC Exploitation and Identity Operations (FEIO)	11.312	13.316	6.224

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Description: The FEIO subgroup's objective is to advance combating terrorism capabilities in investigative and forensic science. FEIO supports joint, interagency, and other partners who apply investigative and forensic science methods, means, or practices to forensic intelligence or investigations. To meet this objective, the subgroup focuses on rapid research, development, test and evaluation of new and advanced technology, equipment, forensic techniques, and investigative tools, as well as development of information resources and on support tools for risk-based decision-making and rapid exploitation of evidence. Projects emphasize rapid and field deoxyribonucleic acid (DNA) analysis, identification of insider threat within agencies, pre-blast and post-blast forensic examination, electronic evidence data acquisition and analysis, sensitive site exploitation, forensic intelligence, and criminalistics. ***FY 2021 Plans:*** Sustain Combating Terrorism: Complete the development and fielding of an automatic video file search and analysis tool for any user defined object to collect evidence and intelligence. Complete the development of new forensic procedures to collect and analyze simultaneous both DNA evidence and latent fingerprint evidence found on adhesive tape and related media. Complete development of a cross-domain digital forensics capability that utilizes smart filtering, artificial intelligence, automated multimedia analysis, and malware detection to create a comprehensive "clean" and relevant view of the exportable data and make it available to other operational networks. Complete development and fielding of a system that analyzes audio recordings to find and classify sounds and noises of law enforcement interest and intelligence value. Complete development of advanced Latent Quality Metric software that standardizes and makes the latent print comparison workflow more efficient and accurate. Complete development of a rugged, mobile, forensic alternative light source for better visualization and photographing of trace evidence. Complete development of an automated process to enhance the clarity, detail, and pixel level of low resolution images. Complete the development of techniques that increases the cognitive load in persons being interviewed to obtain more information and make better credibility assessments. Complete the development of a DNA analytic process that separates out DNA in mixed samples by using microhaplotype technology. Complete the development of a microwave DNA extraction process for faster and better field preparation of DNA samples. Complete development of an electro-optical handheld device that identifies persons at a distance using both infrared and visible light. Complete the development of a small rugged system that automatically documents incident sites and crime scenes with images, photos, sketches, and 3-D visualizations with accurate measurements. Initiate development of a software application that evaluates data from a polygraph exam to determine if any countermeasures were used by the interviewee. Initiate development of a set of techniques for evidence disclosure during investigative interviews to optimize the acquisition of credible information from the interviewee. Initiate development of polygraph sensors that are minimal or non-contact with the body and acquire physiological measurements for credibility assessment. Initiate development of a software development kit that is			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
compatible with all known USG biometric file types and supports multiple programing languages for biometric records to ensure interoperability and data sharing across federal agencies. ***FY 2022 Plans:*** Sustain Combating Terrorism: Complete development and fielding of an electro-optical and infrared (EO/IR) handheld prototype system for human identification and scene analysis and for day and nighttime collection of facial imagery and objects. Complete development and fielding of a flat-bed LASER light scanning system that captures pre- and post-processed latent prints and can be used in laboratory and field environments. Complete development and fielding of a software application that evaluates data from a polygraph exam to determine if any countermeasures were used by the interviewee. Complete the development and fielding of a set of techniques for evidence disclosure during investigative interviews to optimize the acquisition of credible information from the interviewee. Complete development and fielding of polygraph sensors that are minimal or non-contact with the body and acquire physiological measurements for credibility assessment. Complete development and fielding of a gait recognition software system capable of matching and identifying gait/walking signatures in video files regardless of camera angles. Complete the development and fielding of a software development kit that is compatible with all known USG biometric file types and supports multiple programing languages for biometric records to ensure interoperability and data sharing across federal agencies. Initiate the research, development, and production of a field handbook to guide law enforcement and forensic personnel to optimize exploitation of incident scenes. Initiate development of a multi-purpose dye that can sprayed at incident scenes to visual latent prints and touch DNA. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Congressional adjustment made in FY 2021.			
Title: Indirect Influence and Competition (I2C) ***Description:*** The I2C subgroup develops new concepts and capabilities for warfighters and interagency partners. In accordance with the National Defense Strategy, projects emphasize preparation to defeat adversaries, including great powers' proxies and irregular surrogates, and succeed in a wide range of contingencies in both physical and informational domains. In order to establish and reinforce IW as a core competency, I2C will engage in operational assessment, concept development, and independent validation of unique prototype capabilities to identify, confront, and defeat evolving threats across the range of military operations as well as those below the threshold of conventional war. ***FY 2021 Plans:*** Expand the Competitive Space. Complete a project to understand advanced multimedia developments in order to broaden the U.S. Government's options to detect and counter the emerging threat of manipulated adversarial multimedia. Complete an effort to explore the emerging blockchain technologies and the risks and opportunities posed by them with respect to United States	9.090	13.741	6.082

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
national security interests to improve US Government understanding of the Encrypted Ledger and expand options for emerging fronts in the competitive space. Complete an effort to provide a capability that enables DoD, Interagency, and international users to access and leverage publicly available information, providing increased situational awareness by leveraging Artificial Intelligence (AI)/Machine Learning (ML) technologies and state-of-the-art analytic Tool Kits in order to counter a range of threats in the information environment, effectively expanding the competitive space. Complete development of a capability that can deploy, through air drop, large quantities of containers with payloads of electronic devices that will land within a predesignated area safely. The deployment containers will draw the attention of the local populace in both the air and on the ground, will float and be watertight. This will provide Military Information Support Operations (MISO) operators the ability to deliver more complex and tailored messages to targeted populations in a safe and controllable manner, advancing the current capability of leaflet drop operations and expanding the competitive space for inform and influence effects. Complete research exploring the rapidly evolving field of Deep Fakes to evaluate its effect and evaluate options for detecting and countering adversary actions in this emerging facet of the expanded competitive space. Create the Geppetto tool to automate rapid detection of deep fakes. Complete the development of a tool to support decision makers managing digital operations with some form of predictive advice as to how people will respond to a choice of different types of interventions. In this way decision making will be improved not only for planning purposes, but also for the development of capability underpinned by a behavioral science evidence base. This contributes to more effective cyber plans and ultimately operations in order to more effectively expand the competitive space. Complete validation of the puppet-and-driver Deep Fakes effort to validate the benchmarked algorithm performance so agencies can make independent decisions on how to best implement the Geppetto tool. Initiate Synthetic Text Detection to equip non-technical experts with an application, tool, plug-in, or other similar technical solution that can be standalone, updateable, and capable of identifying synthetically generated text, even after it may have been edited or further enhanced by humans. If successful, this project would represent an extreme enhancement over current human (manual) analysis. Integrate with the US Interagency. Complete a plug-in for the Tactical Assault Kit (TAK) that will provide an operational Command, Control, Communications, Computers and Intelligence tool that is rapid, scalable, flexible, simple and collaborative in nature. It will run seamlessly between Android, Windows and iOS devices and will provide a secure, digital collaborative environment with planning tools that will provide Joint, Interagency, Intergovernmental and Multinational forces the ability to operate with increased agility in the joint, dynamic, and fluid operational environment with greater integration with the U.S. Interagency. Irregular Warfare as a Core Competency. Complete a study to review and evaluate existing Tactics, Techniques, and Procedures (TTP) for the integration and conduct of Operations in the Information Environment (OIE) at the tactical level of war. This effort will begin to identify requirements for OIE capabilities and integration at that level in order to identify effective TTPs for propagation across the joint force. The study will provide additional recommendations to help close identified gaps and supports the establishment of irregular warfare as a core competency. Continue project to support MISO operators by integrating cutting edge commercial technologies and applications into a toolkit that consist of advanced equipment that reflect the technology and communications infrastructure in the diverse set of environments in which MISO operates to expand the competitive space and capabilities of our partners. The toolkit shall be influence-specific, standardized and by design be interchangeable, to include			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
capabilities that can be procured on the local economy of the country of interest. Initiate the SOF Enabled Cyber Toolkit to provide SOF an enterprise-level ability to provide "last mile" cyber-enabled activities in order to bridge the gap between tactical and higher echelons of cyber capability. Strengthen Alliances. Complete efforts with the United Kingdom's Defense Science and Technology Laboratory to sponsor field research in Estonia and model development to determine if the theory of conceptual transfer can be repeated and, if so, incorporated into a model to better predict how non-western people will react to outside influence. Benefits of this research will include improved understanding of how language affects cognition, thereby enabling US forces to expand the competitive space as they better understand and prevent the bias that may be introduced into collection and analysis tools, particularly in cases where vast amounts of collected data will be used to train AI. Continue the development of a combined, joint and multi-national information sharing platform to collect and analyze photographs, videos, audio recordings, and general text-based information via precise crowd sourcing techniques. The technical approach will provide the capability to conduct facial, object and ISIL branded recognition. An Android-based application will also be available that can be customized for a specific region, language, and purpose to use for crowd-sourced media collection. The project is enhancing the ability of information programs working with allied and/or partner nations to collect, search, retrieve, view and analyze photos, audio, and video for use, thereby strengthening alliances and expanding the competitive space to confront terrorist and other threats in the information environment. Sustain Combating Terrorism. Continue a Remote Advise and Assist (RAA) project to examine conditions that would lead to successful RAA operations in a full spectrum environment and then develop and field advanced RAA prototypes in order to test the ability of advisors to continue mentoring partners remotely. By having a robust RAA capability, advisors will be able to significantly enhance time with their partners when physical access is severely restricted. By being able to advise partners in a real time operational environment, the time period needed to enhance that partner's capacity can be significantly reduced, leading to more sustainable and efficient combating terrorism operations. Observations will examine how to advance virtual communications between advisors and partners during operations, supporting crucial relationships to address significant terrorist threats at the tactical and operational levels.			
FY 2022 Plans: Expand the Competitive Space. Continue Synthetic Text Detection to equip non-technical experts with an application, tool, plug-in, or other similar technical solution that can be standalone, updateable, and capable of identifying synthetically generated text, even after it may have been edited or further enhanced by humans. If successful, this project would represent an extreme enhancement over current human (manual) analysis. Irregular Warfare as a Core Competency. Continue project to support MISO operators by integrating cutting edge commercial technologies and applications into a toolkit that consist of advanced equipment that reflect the technology and communications infrastructure in the diverse set of environments in which MISO operates to expand the competitive space and capabilities of our partners. The toolkit shall be influence-specific, standardized and by design be interchangeable, to include capabilities			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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Title: Protection, Survivability, and Recovery (PSR) ***Description:*** The Protection, Survivability, and Recovery Subgroup's objective is to develop new equipment, reference tools, and standards to improve the protection of personnel. Projects focus on putting innovative tools such as automated information management systems, communication devices, tagging, tracking and locating devices, mobile surveillance systems, as well as personal and vehicle protection equipment in the hands of personnel. ***FY 2021 Plans:*** Enhance Survivability for Close Combat Formations. Complete the investigation of the root causes of poor armor fit among U.S law enforcement agencies and identify corrective actions and standard procedures to ensure proper fit to body armor users across the anthropometric spectrum of law enforcement professionals. Complete development of biomarker identification for brain injury using magnetic resonance imaging (MRI) and magnetic resonance spectroscopy (MRS) to monitor neurochemical biomarkers	17.165	17.516	8.538

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
for post-traumatic stress disorder and mild traumatic brain injury. Complete development of enhanced performance personal body armor and production processes to enable successful completion of first articles tests and subsequent fielding. Complete the development of a multi-modal system to detect, identify and mitigate unmanned aerial threats to tactical vehicles and other mobile platforms in terrestrial and maritime environments. Complete development of a system capable of UAS detection, geolocation, tracking and disruption for the protection of dismounted soldiers and operators. Complete development of a multi-threat helmet to provide impact, ballistic and blast protection for law enforcement officers. Complete development of an air deployable unmanned aerial system that is capable of dashing ahead of the V-22 and providing at least 8.5 minutes of overhead intelligence, surveillance and reconnaissance (ISR) at the landing zone or drop zone prior to the force arrival. Complete the development of a vehicle mounted, tethered aerial platform capable of carrying a wide variety of payloads to fill various mission needs. Continue development of a man packable system that reduces or eliminates the radar, electronic, thermal, infrared, visual or acoustic signatures of a dismounted soldier. Continue development of innovative materials for use in advanced armor systems. Continue development of advanced ceramic materials with enhanced mechanical properties for use in novel armor applications. Continue development of a two dimensional polymer material with superior strength to weight ratio for large scale synthesis and use in lightweight armor applications. Initiate development of a standard 7.62 x 39mm projectile test surrogate to provide a standard test round for body armor test protocols. Initiate development of a standardized transparent armor for non-tactical armored vehicles with a ~30% reduction in weight and thickness while achieving a threshold ballistic rating of VPAM VR9. Continue development of a skin applique for ballistic protection of the extremities from blast propelled fragmentation and debris. Initiate development of an eye protection system in the form of a face shield or glasses that provides the operator protection from frequencies of laser light while allowing enough visible light for the operator to see. Initiate development of a spectacle lens capable of achieving goggle ballistic requirements while maintaining current spectacle form factor and weight. Enhance Lethality for Close Combat Formations. Complete the development of a heads up display unit to be integrated into an existing helmet system and provide day and night display of data elements of interest to the operator. Integrate with the U.S. Interagency. Complete development of a 360 degree, real time sensor system to provide streaming video and anomaly detection to vehicle platforms on the move. Initiate development of a tracking device that will work in disadvantaged/denied GPS environments with no additional equipment (e.g., geo-located tags, repeaters, signal boosters). Complete development of a discrete, self-adhesive patch that provides silent, tactile stimulation to provide personnel with emergency notifications. Continue test and evaluation of two C-UAS radar systems and of a capture/carry UAS. Continue integration of two RF detection system into kinetic C-UAS system. Continue development of a multi-mission UAS that could perform C-IED and C-UAS missions on top of ISR missions. Initiate development of an advanced optical detection system to detect small UAS. Initiate development of a radar system to detect small UAS in urban environments. Initiate development of a capture/carry C-UAS system.			
FY 2022 Plans:			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Enhance Survivability for Close Combat Formations. Complete development of a two dimensional polymer material with superior strength to weight ratio for large scale synthesis and use in lightweight armor applications. Complete development of advanced ceramic materials with enhanced mechanical properties for use in novel armor applications. Complete development of innovative materials for use in advanced armor systems. Complete development of a standard 7.62 x 39mm projectile test surrogate to provide a standard test round for body armor test protocols. Complete development of a man packable system that reduces or eliminates the radar, electronic, thermal, infrared, visual or acoustic signatures of a dismounted soldier. Complete development of a spectacle lens capable of achieving goggle ballistic requirements while maintaining current spectacle form factor and weight. Continue development of an eye protection system in the form of a face shield or glasses that provides the operator protection from frequencies of laser light while allowing enough visible light for the operator to see. Initiate development of advanced materials for use in vehicle armor systems for all federal government. Initiate development to increase ballistic protection and reduce weight for body armor. Continue development of a standardized transparent armor for non-tactical armored vehicles with a ~30% reduction in weight and thickness while achieving a threshold ballistic rating of VPAM VR9. Complete development of a skin applique for ballistic protection of the extremities from blast propelled fragmentation and debris. Integrate with the U.S. Interagency. Complete development of a tracking device that will work in disadvantaged/denied GPS environments with no additional equipment (e.g., geo-located tags, repeaters, signal boosters). Initiate development of an increased situational awareness system for law enforcement and military applications. Complete test and evaluation of two C-UAS radar systems and of a capture/carry UAS. Complete development of an advanced optical detection system to detect small UAS. Complete development of a capture/carry C-UAS system. Complete development of a multi-mission UAS that could perform C-IED and C-UAS missions on top of ISR missions. Continue development of a radar system to detect small UAS in urban environments. Continue integration of two RF detection system into kinetic C-UAS system. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Congressional adjustment made in FY 2021.			
Title: Expeditionary Force Protection (EFP) ***Description:*** Rapidly develop and transition physical security/force protection capabilities and technologies to support forward deployed and domestic first responders, military, interagency, and international partners in the focus areas of Blast Effects and Mitigation; Maritime Security; Screening, Observation, Detection, and Protection; and, Subterranean Activities. Emphasize these technology development efforts primarily for expeditionary advance based operations, forward operating bases, along the U.S. borders, mass transportation and commerce nodes, in maritime port and littoral environments, U.S. embassies and consulates, and in support of large-scale public venues. ***FY 2021 Plans:*** FY2021 Plans:	7.955	11.926	6.767

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Support Relationships to Address Significant Terrorist Threats. Complete development and false alarm rate testing of an automatic target recognition system for on the move, standoff IED detection. Complete development and testing of a handheld anomaly detection wand to detect both non-metallic and metallic objects concealed under or in clothing to support checkpoint screening and security personnel. Continue the development and testing of a series of scaled tests on various types of masonry constructions subjected to blast loading. Continue development of algorithms using machine learning for the detection of threats in Computed Tomography (CT) and x-ray screening systems. Integrate with the U.S. Interagency. Complete development and testing of a small-unmanned aerial system (sUAS) to safely conduct reconnaissance of discovered illicit sites and conduct routine inspections. Complete development and testing of a less-than-lethal-weapon (LLW) prototype that fires pepper projectiles with improved accuracy at extended ranges, enabling engagement of adversaries from a safer distance. Complete the development and testing of an algorithm that will automatically detect metallic and non-metallic weapons in baggage (e.g. guns and knives) and integrate the algorithm into an existing carry-on baggage x-ray system. Continue development and testing of a fast-running ultra-high performance concrete slab model, WAC-U, and improved tools for design, protective use, and vulnerability assessments. Continue test and evaluation of Ethylene-vinyl Acetate (EVA) laminated glass to determine its blast protection performance as compared to Polyvinyl Butyral (PVB) laminated glass. Continue development and testing of a relocatable tower system with additional mast height, updated surveillance and communications technologies capable of transmitting real time imagery and geolocations between Command and Control sites and field operators. Initiate development of a commercially available access delay system for use at sensitive locations where the threat of manual attack and hostile incursions on the facility is high. Strengthen Alliances. Complete development of a comprehensive database of COTS systems for pre-detonation and protection against direct impact munitions. Complete integration of Human Injury Prediction (HIP) for Vulnerability Assessment and Protection Option (VAPO) 7 to effectively and accurately model the effects of an explosive event. These effects include air blast propagation, fragmentation effects and patterns, human injury models, etc. Complete testing and deliver a vehicle pre-breaching system, which is designed to provide additional physical security to operators and passengers during breaching operations. Complete testing, assessment, evaluation, and training on emerging explosive threat models for personnel, vital equipment, and facilities protection against VBIED attacks. Continue development of an advanced active diver thermal protection system for long exposure dives, including SEAL Delivery Vehicle (SDV) operations. Continue test and evaluation of an interoperable, detect-to-defeat capability to provide waterside security (ports and harbors) and against underwater littoral threats. Continue leveraging assets and capabilities in the area of HME materials characterization to support research efforts. Continue hosting bi-annual data exchange with foreign partners to leverage assets and capabilities to support each country's research efforts in the area of maritime security. Continue hosting bi-annual data exchange with foreign partners to exchange research/info on physical protection of facilities, to include but not limited to: entry control points, vehicle barriers, blast/forced entry mitigation, and sensitive material destruction.			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Sustain Combating Terrorism. Complete development and testing of the Anti-Terrorism Planner (ATP) Bridge with updates for high-pressure concrete and modern cables and stays for modeling and threat assessment of bridges in the US and overseas. Continue the development and evaluation of a novel ship-to-shore fuel transport system with two different designs for an amphibious towable container that mitigates risk to personnel and fuel loss in the event of an attack. Continue operational test & evaluation of a lighter and hardened ship-to-shore fuel transport prototype to address mobility and compatibility requirements. Continue the development and testing of an unmanned underwater vehicle prototype, used with existing US Navy Electronic Harbor Security System (EHSS) and ARGUS expeditionary harbor security system for littoral threats. Initiate development of an enhanced harbor security capability through the integration of a passive and active acoustic sensor system. Irregular Warfare as a Core Competency. Complete and deliver an analytic tool that will predict specific subterranean activities. Complete development a subterranean geophysical survey kit. Complete development and delivery of a realistic, modular subterranean training fixture, made of novel materials and configured above ground that replicates a communications and GPS-denied environment. Complete development and evaluation of an Active Seismic Imaging (ASI) systems. Complete development and improvement of a proven ground based system that has been integrated onto a new type of aerial platform for detection of subterranean targets. Complete development and testing of a scanning system which will be able to maneuver independently inside confined spaces and provide situational awareness through live video feed. Complete development and testing of a subterranean communications system. Complete development of a mapping capability for subterranean, that creates unique 2D and 3D maps in real time. Complete development of a scanning drone system that is capable of operating inside a confined space. Complete development of a self-propelled module that can advance through confined spaces providing command and control and life support. Complete development of a tethered unmanned aerial vehicle that will safely conduct reconnaissance of confined spaces. Complete development of system that employs transmitters and receivers to detect a particular geophysical phenomenon. Complete operational test and evaluation of mobile lateral and vertical scanning technology to locate specific subterranean targets. Complete operational test and evaluation of a mobile system for standoff detection and mapping of geophysical phenomenon. Continue adaptation of a proven land system to an airborne detection system. Continue development of materials and methods for subterranean target destruction and collect data for modeling tools. Continue develop software for subterranean detection capability from ground surface indicators. Continue development and evaluation of an airborne system that can detect specific subterranean aspects without requiring line of sight. Continue development of a capability to neutralize subterranean targets. Continue development of a kinetic means in neutralizing tunnel shafts. Continue development of a passive sensor that will have the ability to detect subterranean targets. Continue development of a platform that integrates land-based sensors for conducting advanced geology surveys. Continue development of a platform that utilizes a network of airborne sensors to detect subterranean targets. Continue development of a system for detection of unique geology phenomena and testing and evaluation of the prototypes' performance in representative sites. Continue development of a tactical and easy-to-use tool, and the associated tactics, techniques and procedures that will enable an operator to monitor obstacles from a safe distance, in			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
underground confined structures. Continue development of a vertical tripod mounted subterranean detection system. Continue development of algorithms using multiple data sources for improved subterranean detection. Continue development of an early warning detection system capable of monitoring long strips of area in the ground and/or water. Continue development of an operational capability to discover and map known and unknown subterranean shafts within a network. Continue development of unattended ground sensor systems to enable deployment, detection and tracking of targets in various geology environments. Continue modification of a system to enable subterranean communication among a network of multiple users and at longer ranges. Continue the identification methods to monitor chemical and biological hazards in a subterranean environment, and how to assess the risk to the operator and operations. Continue development of unattended sensors that include several sensing modalities that detect and track human activity and sends data to a command and control station. Continue development, integration and operational test and evaluation of an extended coverage system for border protection. Continue to deliver a subterranean operations pilot course that will provide Department of Defense and Interagency a holistic overview of the operational level considerations for planning and executing missions. Initiate a framework to rapidly evaluate new counter tunnel concepts, technologies and applications. Initiate development and evaluation of a system to enable subterranean communication for self-positioning among a network of multiple users and at longer ranges. Initiate development of an intelligence, surveillance and recognizance system for subterranean targets. Initiate development of a subterranean augmented reality and virtual reality training and tactical application. Initiate development of a system capable of mapping a subterranean network. Initiate development of an airborne variant subterranean detection system. Initiate development of three (3) subterranean fixtures for testing emerging technologies. Initiate development of a subterranean entry tool mitigating force exposure and enhancing force protection.			
FY 2022 Plans: Support Relationships to Address Significant Terrorist Threats. Complete development and testing of algorithms using machine learning for the detection of threats in Computed Tomography (CT) and x-ray screening systems. Continue the development and testing of a series of scaled tests on various types of masonry constructions subjected to blast loading. Integrate with the U.S. Interagency. Complete development and testing of a fast-running ultra-high performance concrete slab model, WAC-U, and improved tools for design, protective use, and vulnerability assessments. Complete test and evaluation of Ethylene-vinyl Acetate (EVA) laminated glass that will determine its blast protection performance as compared to Polyvinyl Butyral (PVB) laminated glass. Complete development and testing of a relocatable tower system with additional mast height, updated surveillance and communications technologies capable of transmitting real time imagery and geolocations between Command and Control sites and field operators. Complete development of a commercially available access delay system for use at sensitive locations where the threat of manual attack and hostile incursions on the facility is high.			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Strengthen Alliances. Complete development and testing of an advanced active diver thermal protection system for long exposure dives, including SEAL Delivery Vehicle (SDV) operations. Complete development of an advanced active diver thermal protection system for long exposure dives, including SEAL Delivery Vehicle (SDV) operations. Complete integration of Human Injury Prediction (HIP) for Vulnerability Assessment and Protection Option (VAPO) 7 to effectively and accurately model the effects of an explosive event. Continue leveraging assets and capabilities in the area of HME materials characterization to support research efforts. Continue hosting bi-annual data exchange with foreign partners to leverage assets and capabilities to support each country's research efforts in the area of maritime security. Continue hosting bi-annual data exchange with foreign partners to exchange research/info on physical protection of facilities, to include but not limited to: entry control points, vehicle barriers, blast/ forced entry mitigation, and sensitive material destruction. Sustain Combating Terrorism. Complete the development and evaluation of a novel ship-to-shore fuel transport system with a down select of one tire design for an amphibious towable container that mitigates risk to personnel and fuel loss in the event of an attack. Complete operational test & evaluation of a lighter and hardened ship-to-shore fuel transport prototype to address mobility and compatibility requirements. Complete test and evaluation of an interoperable, detect-to-defeat capability to provide waterside security (ports and harbors) and against underwater littoral threats. Complete development of an enhanced harbor security capability through the integration of a passive and active acoustic sensor system. Complete the development of an unmanned underwater vehicle prototype, used with existing US Navy Electronic Harbor Security System (EHSS) and ARGUS expeditionary harbor security system for littoral threats. Complete operational test & evaluation of ATM-UPS in a fleet exercises and Department of Defense battle lab events. Complete operational test & evaluation of an unmanned underwater vehicle prototype in a fleet exercises and Department of Defense battle lab events. Initiate development and test an autonomous underwater vehicle capable of detect-to-defeat capability to provide waterside security (ports and harbors) and against underwater littoral threats. Enhance Survivability for close combat formations. Initiate development of an optical radar based system capable of providing CAT 1 coordinates supporting combat troops while also providing force protection. Initiate development Develop and design a Digital PTZ (Pan Tilt Zoom) camera and focusable thermal camera with a human detection range of 2KM and Identification of Intention (IOI) at 1KM. Irregular Warfare as a Core Competency. Complete develop software for subterranean detection capability from ground surface indicators. Complete development and conduct operational test and evaluation of a capability to neutralize subterranean targets. Complete development and conduct operational test and evaluation of a passive sensor that will have the ability to detect subterranean targets. Complete development and conduct operational test and evaluation of an operational capability to discover and map known and unknown subterranean shafts within a network. Complete development and evaluation of a system to enable subterranean communication for self-positioning among a network of multiple users and at longer ranges. Complete development and evaluation of an airborne system that can detect specific subterranean aspects without requiring line of sight. Complete			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
development of an intelligence, surveillance and recognizance system for subterranean targets. Complete development of a platform that utilizes a network of airborne sensors to detect subterranean targets. Complete development of a scanning drone system that is capable of operating inside a confined space. Complete development of a subterranean augmented reality and virtual reality training and tactical application. Complete development of a system capable of mapping a subterranean network. Complete development of a system for detection of unique geology phenomena and testing and evaluation of the prototypes' performance in representative sites. Complete development of materials and methods for subterranean target destruction and collect data for modeling tools. Complete development of three (3) subterranean fixtures for testing emerging technologies. Complete development of unattended sensors that include several sensing modalities that detect and track human activity and send data to a command and control station. Complete development, integration and operational test and evaluation of an extended coverage system for border protection. Complete modification of a system to enable communication among a network of multiple users and at longer ranges. Complete the identification methods to monitor chemical and biological hazards in a subterranean environment, and how to assess the risk to the operator and operations. Continue a framework to rapidly evaluate new counter tunnel concepts, technologies and applications. Continue adaptation of a proven land system to an airborne detection system. Continue development of a kinetic means in neutralizing tunnel shafts. Continue development of a platform that integrates land-based sensors for conducting advanced geology surveys. Continue development of a tactical and easy-to-use tool, and the associated tactics, techniques and procedures that will enable an operator to monitor obstacles from a safe distance, in underground confined structures. Continue development of a vertical tripod mounted subterranean detection system. Continue development of algorithms using multiple data sources for improved subterranean detection. Continue development of an airborne variant subterranean detection system. Continue development of an early warning detection system capable of monitoring long strips of area in the ground and/or water. Continue development of unattended ground sensor systems to enable deployment, detection and tracking of targets in various geology environments. Continue to deliver a subterranean operations pilot course that will provide Department of Defense and Interagency a holistic overview of the operational level considerations for planning and executing missions. Initiate the development of training materials, conduct a technology assessment, and finalize an end-user graphical user interface. Initiate development of an autonomous and improved scanning system, capable of operating inside a confined space. Initiate and deliver an analytic tool with expanded capability with the incorporation of machine learning and associated training modules that will predict specific subterranean activities. Initiate development and improvement of a subterranean geophysical survey kit that will include a simplified deployment interrogation kit, data analysis and data processing. Initiate development of a miniaturized scout system for subterranean environments. Initiate development of a modified self-propelled module that can advance through confined spaces providing command and control and life support. Initiate development of a subterranean drilling technology. Initiate development of a system for tactical confined space life support. Initiate development of sensor package mounted on a support mammal for subterranean operations. Initiate development of a subterranean entry tool mitigating force exposure and enhancing force protection.			
FY 2021 to FY 2022 Increase/Decrease Statement:			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Congressional adjustment made in FY 2021.			
Title: SURVEILLANCE, COLLECTION AND OPERATIONS SUPPORT	13.008	18.162	8.626
Description: Identify high-priority user requirements and special technology initiatives focused primarily on countering terrorism through offensive operations. Enhance US intelligence capabilities to conduct retaliatory or preemptive operations and reduce the capabilities and support available to terrorists and other adversaries as directed. ***FY 2021 Plans:*** Expand the Competitive Space, Enhance Survivability for Close Combat Forces, Integrate with the U.S. Interagency, and Sustain Combating Terrorism to Advance U.S. Influence and National Security Interests: Complete development of a new miniaturized Ultra High Frequency Band antenna or family of antennas. Complete classified project to develop a specialized antenna system. Complete classified project to develop waveform identification system. Complete classified project to develop a Media Exploitation capability. Complete Classified Personal Electronic Device (PED) Detect Signature Management effort. Complete Classified Surveillance and Signature Management effort to develop a low observable HD AV system. Complete Classified Neural Net Special Communications effort. Complete Classified Field Processing Technical Collection effort. Complete Classified Alternative Waveform Special Communications effort. Complete Classified Data Obscuration Special Communications effort. Complete development of a Specialized High-Power Battery System (HPBS) for man portable applications. Continue development and testing of a single compact, gimbaled next generation Hyperspectral Imagery (HSI) aerial sensor in both SWIR and LWIR wavebands and provide industry standard data outputs. Continue spiral development of the Enhanced CALYPSO RFIC and integrated transceiver devices. Continue Classified Integrated Air Defense Geo-Location Technical Collection effort. Initiate classified Signature Management Project to develop a Persona Management capability. Initiate classified Technical Collection Project to develop new communication protocols that support counter surveillance operations. Initiate classified Special Communications Project to develop a new Thin Film antenna technical capability. Initiate classified Special Communications Project to develop a new short-range communications capability. Initiate classified Special Communications Project to develop a new Steerable Antenna technical capability. Strengthen Alliances and Sustain Combating Terrorism to Advance U.S. Influence and National Security Interests: Complete effort to develop a Hebrew Language Aptitude Battery (HILAB) Test capability. Complete development of High Altitude Pseudo Satellite payloads. Continue development and demonstration of a low profile tactical radio system with optimized performance. The system will enable ready exchange of information between mobile tactical users in a form factor that provides the flexibility to customize the configuration and achieve communications without or in an area with degraded infrastructure. ***FY 2022 Plans:*** Expand the Competitive Space, Enhance Survivability for Close Combat Forces, Integrate with the U.S. Interagency, and Sustain Combating Terrorism to Advance U.S. Influence and National Security Interests: Complete development and testing of a single compact, gimbaled next generation Hyperspectral Imagery (HSI) aerial sensor in both SWIR and LWIR wavebands and provide			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
industry standard data outputs. Complete spiral development of the Enhanced CALYPSO RFIC and integrated transceiver devices. Complete Classified Integrated Air Defense Geo-Location Technical Collection effort. Continue classified Signature Management Project to develop a Persona Management capability. Continue classified Technical Collection Project to develop new communication protocols that support counter surveillance operations. Continue classified Special Communications Project to develop a new Thin Film Antenna technical capability. Continue classified Special Communications Project to develop a new short-range communications capability. Continue classified Special Communications Project to develop a new Steerable Antenna technical capability. Initiate development of enhanced capabilities against vehicular signals of interest and Cyber Convergent Technologies. Initiate development of field technical surveillance capabilities against peer/ near peer adversaries and terrorist threats through development or enhancement of Multi-intelligence collection systems, customized tagging, tracking and locating capabilities and counter surveillance capabilities. Initiate the development of non-standard and specialized communications and technical collection capabilities to combat terrorists and other highly technical adversaries. Initiate development of signature management capabilities and new techniques that protect the force and support the collection and targeting process. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Congressional adjustment made in FY 2021.			
Title: Tactical Offensive Support (TOS)	21.058	10.993	8.943
Description: The Tactical Offensive Support subgroup's mission is to execute rapid research and development projects that enhance capabilities of DoD and Interagency special operations tactical teams engaged in finding, fixing, and finishing terrorists. This includes federal law enforcement agencies to combat domestic terrorism. The development focus is enabling small tactical units by providing state of the art overmatch capabilities in: Offensive Systems; Unconventional Warfare, Counter-Insurgency Support; Tactical Communications; Tactical Reconnaissance, Surveillance, and Target Acquisition Systems; Specialized Infiltration, Access and Exfiltration Systems; and Survivability Systems. ***FY 2021 Plans:*** Enhance Lethality for Close Combat Formations Complete testing and optimization of barrel length, rifling twist rate, and suppression of the .300 Blackout rifle platform in conjunction with an underwater supercavitating ammunition. Complete test and evaluation of stabilized weapon mounts for employment on ground vehicles, airframes, and maritime platforms and when incorporating integrated fire control systems and auto-targeting technology. Complete development and testing of dual purpose improvised conventional munitions that comply with US safety standards and the US Cluster Munitions Policy of less than 1% UXO after firing the munition. Complete development of a small-unmanned aerial system that provides tactical ISR and enhanced lethality and is compliant with DoD cyber and encryption policies for UAS. Complete ammunition development that improves probability of hit at extended ranges by improving muzzle velocity, extreme spread and ballistic coefficient. Complete development of a window-breaching device for snipers that enables a single operator to remove glass obstructions prior to shooting. Complete development of a 120mm mortar			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
system with an advanced targeting system for installation and employment on a 5-ton Medium Tactical Vehicle (MTV) capable of lethal target engagement from a short halt out to 7 kilometers. Complete development of a reusable VTOL ISR capability that is able to work cooperatively for persistent effects. Continue development of a mid-wave infrared thermal sight for use on lightweight medium machine guns and sniper rifles to enhance target identification. Continue development, delivery, and live fire troop training of sniper ballistic and downwind sensor systems to US, UK, Australia, and Canada to increase first round hit capability. Continue development of a next generation Lightweight Medium Machine Gun (LWMMG) and lightweight ammunition to give operators a distinct advantage in both the extended and close-in fight and be able to transition rapidly from mounted operations to dismounted operations. Continue development of a family of intermediate caliber weapon systems, including ammunition, for use in close quarters combat, marksmen, and individual weapon system roles to improve probability of hit. Continue to develop a hybrid dual-channel medium range weapon sight to perform in the near infrared and long wave infrared that provides a tactical advantage in detection and interdiction of targets at distance. Continue to develop a beyond line of sight loitering aerial missile, that is capable of locating and engaging enemy targets, armored and unarmored vehicles. The missile will provide advanced tactical situation and real-time video display that controls the missile throughout its mission using an intuitive interface with automated modes, which relieve the operator from most of the burdens associated with piloting an airborne loitering missile. Continue development of weapon system and supermatch, subsonic, signature-on-target and armor piercing ammunition to increase hit potential by 50% at extreme distances. Initiate development of a low cost, hand-launched, fast VTOL loitering munition that employs Electro-Optical and Infrared sensors for both day and night operations to improve SOF force protection and rapid attack capability. Initiate development of a machine gun round that allows operators to observe impact of their shots, make shot corrections and increase hit potential all without the threat of compromise, by the enemy. Initiate development of a ballistically matched Enhanced Performance Round (EPR) that allows snipers to transition from match grade rounds to EPR, thereby improving speed of engagement, accuracy and penetration. Enhance Survivability for Close Combat Formations Complete development of a man-portable (dismounted/static), on the move (vehicle mounted), and kinetic kill anti-drone system kit that is capable of detection, tracking, identification, and defeating a small Unmanned Aircraft System (sUAS). Complete lightweight ammunition packaging (LAP) for small caliber ammunition for Special Operations Forces, to include ammunition cans which lighten operational load and reduce packaging weight. Complete development and testing of a thermal camouflage material for soldier uniforms, vehicles, and hide sites. Complete development of an electronic warfare kit optimized for use in subterranean and complex urban terrain. Complete development of a remotely operated integrated lighting harness system for canines that operates based on mission activities. Complete High Frequency (HF) mobile ad-hoc network radio with a counter electronic warfare capability for tactical operators that is interoperable with legacy SOF HF radios. Complete development of tactical sUAS platform that enables operators with no sUAS flight experience to perform accurate maneuvers for indoor and outdoor ISR missions.			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Continue to develop a tactical deployment and recovery capability for US and UK Navy SOF surface, subsurface and air assets that increases environmental protection and signature reduction while ensuring direct interoperability between US and UK forces. Continue to develop an overmatch optic that provides instant range, tracking and firing solution for multiple drones, which enables operators to kill drones at extended ranges during day and night operations. Initiate development of a wireless detonating device with programmable receivers that is interoperable with legacy demolitions. Initiate development of a rugged camera system that is mounted to rifle optics to collect and send data without interfering with normal operator activities. ***FY 2022 Plans:*** Enhance Lethality for Close Combat Formations Complete development of a mid-wave infrared thermal sight for use on lightweight medium machine guns and sniper rifles to enhance target identification. Complete development, delivery, and live fire troop training of sniper ballistic and downwind sensor systems to US, UK, Australia, and Canada to increase first round hit capability. Complete development of a next generation Lightweight Medium Machine Gun (LWMMG) and lightweight ammunition to give operators a distinct advantage in both the extended and close-in fight and be able to transition rapidly from mounted operations to dismounted operations. Complete development of a family of intermediate caliber weapon systems, including ammunition, for use in close quarters combat, marksmen, and individual weapon system roles to improve probability of hit. Complete development of a hybrid dual-channel medium range weapon sight to perform in the near infrared and long wave infrared that provides a tactical advantage in detection and interdiction of targets at distance. Complete development of a beyond line of sight loitering aerial missile, that is capable of locating and engaging enemy targets, armored and unarmored vehicles. The missile will provide advanced tactical situation and real-time video display that controls the missile throughout its mission using an intuitive interface with automated modes, which relieve the operator from most of the burdens associated with piloting an airborne loitering missile. Complete development of weapon system and supermatch, subsonic, signature-on-target and armor piercing ammunition to increase hit potential by 50% at extreme distances. Complete development of a low cost, hand-launched, fast VTOL loitering munition that employs Electro-Optical and Infrared sensors for both day and night operations to improve SOF force protection and rapid attack capability. Complete development of a machine gun round that allows operators to observe impact of their shots, make shot corrections and increase hit potential all without being compromised. Complete development of a ballistically matched Enhanced Performance Round (EPR) that allows snipers to transition from match grade rounds to EPR, thereby improving speed of engagement, accuracy and penetration. Enhance Survivability for Close Combat Formations Complete development of a tactical deployment and recovery capability for US and UK Navy SOF surface, subsurface and air assets that increases environmental protection and signature reduction while ensuring direct interoperability between US and UK			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
forces. Complete development of an overmatch optic that provides instant range, tracking and firing solution for multiple drones, which enables operators to kill drones at extended ranges during day and night operations. Complete development of a wireless detonating device with programmable receivers that is interoperable with legacy demolitions. Complete development of a rugged camera system mounted on rifle optics to collect and send data without interfering with normal operator activities. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY21 includes Congressional Plus-up funding.			
Title: Human Performance and Training (HPT) ***Description:*** The HPT Subgroup's objective is to provide SOF, DoD, and the interagency with agile, rapid response, R&D capabilities for optimizing performance in the operational environment and increasing readiness for tomorrow's threats. To meet this objective, the subgroup develops human-centered technologies that are performance outcome focused in the areas of immersive learning technology, human performance tools and techniques, and innovative training and educational concepts. HPT's capabilities are implemented globally to prepare for critical missions in any operational environment to identify, disrupt, and defeat threats. ***FY 2021 Plans:*** Build a More Lethal Force: Continue the development of an AC-130J Virtual Reality Combat Mission Trainer to enable operational crews to engage in mission tasks within a simulated environment that replicates sensory information of real-world mission performance found in joint mission essential task (JMET) environments. Initiate the development of an interactive and dynamic Full Motion Video (FMV) Processing Exploitation, and Dissemination (PED) desktop training simulator and program of instruction that trains SOF analysts to SOF-specific FMV PED tactics, techniques, and procedures; methodologies; and product standards. Irregular Warfare as a Core Competency: Complete the development and delivery of a synthetic Internet sandbox to enable intelligence analysts and information operations personnel to train on tools and methodologies for the collection, analysis, and exploitation of adversaries' online information, as well as engaging in large-scale Unconventional Warfare (UW) exercises, while mitigating the challenges and risks associated with training on the publicly visible Internet. Complete the development of an intelligent tutoring system that will instruct Soldiers in how to integrate and interpret operations, intelligence, and civil information within the Common Operating Picture for enhanced situational awareness and reduced cognitive workload. Enhance Survivability for Close Combat Formations: Complete the development of an immersive mixed reality (MR) simulator for training specific emergency procedures (EPs) for the MK-16 self-contained diving rig often used for Mine Countermeasures operations. Initiate the design and development of a multi-sensory (e.g., visual, auditory, tactile) and immersive military freefall jump master simulator to enhance classroom training and rehearsal of spotting techniques and aircraft procedures over virtual drop zones (DZ) modeled after real world DZs prior to going up in the air. Sustain Combating Terrorism: Complete the development of a virtual reality (VR) based training system for Public Safety Bomb Technicians and Military Explosive Ordnance Disposal forward teams to practice sensitive site exploitation skills with realistic lab	8.058	17.338	5.414

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
equipment in simulated field and lab settings. Complete the development of photorealistic immersive training environments to replicate high-risk scenarios and standardize curriculum for Explosive Ordnance Disposal technicians and other operators. Support Relationships to Address Significant Terrorist Threats: Complete the development of a multi-sensory (e.g., visual, auditory, tactile) immersive tactical decision making training simulator that features realistic character representation, reaction, and interaction through response to natural language processing and force application. Expand the Competitive Space: Initiate the design and development of a Program of Instruction to teach SOF Operators advanced cyber and electronic warfare skills for cyber defense, resilience, and the increased integration of cyber capabilities into the full spectrum of military operations. . ***FY 2022 Plans:*** Build a More Lethal Force: Complete the development of an AC-130J Virtual Reality Combat Mission Trainer to enable operational crews to engage in mission tasks within a simulated environment that replicates sensory information of real-world mission performance found in joint mission essential task (JMET) environments. Continue the development of an interactive and dynamic Full Motion Video (FMV) Processing Exploitation, and Dissemination (PED) desktop training simulator and program of instruction that trains SOF analysts to SOF-specific FMV PED tactics, techniques, and procedures; methodologies; and product standards. Initiate the development of immersive learning technology that adapts based on individual skills, behavioral responses and physiological responses during the evolution of a scenario to better prepare personnel for operational environments that are always dynamic and evolving. IW as a Core Competency: Continue the design and development of a Program of Instruction to teach SOF Operators advanced cyber and electronic warfare skills for defense, resilience, and the increased integration of such capabilities into the full spectrum of military operations. Initiate the development of training that leverages emerging human performance technologies and the latest research to improve decision-making and mental agility, optimize performance, enhance effectiveness, and boost resilience. Enhance Survivability for Close Combat Formations: Continue the design and development of a multi-sensory (e.g., visual, auditory, tactile) and immersive military freefall jump master simulator to enhance classroom training and rehearsal of spotting techniques and aircraft procedures over virtual drop zones (DZ) modeled after real world DZs prior to going up in the air. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Congressional adjustment made in FY 2021.			
Accomplishments/Planned Programs Subtotals	113.445	144.847	69.376

D. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

D. Other Program Funding Summary ($ in Millions)

Remarks

N/A

E. Acquisition Strategy

N/A