Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Defense Advanced Research Projects Agency	Date: April 2022
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602702E / *TACTICAL TECHNOLOGY*

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	-	230.211	207.515	221.883	-	221.883	262.105	324.422	307.681	299.931	-	-
TT-03: *NAVAL WARFARE TECHNOLOGY*	-	6.868	11.059	23.924	-	23.924	12.959	17.059	16.484	23.234	-	-
TT-04: *ADVANCED LAND SYSTEMS TECHNOLOGY*	-	86.864	54.060	67.157	-	67.157	80.305	98.603	100.147	93.897	-	-
TT-07: *AERONAUTICS AND SPACE TECHNOLOGY*	-	51.129	44.507	33.300	-	33.300	30.100	30.500	19.250	8.000	-	-
TT-13: *INFORMATION ANALYTICS TECHNOLOGY*	-	85.350	97.889	97.502	-	97.502	138.741	178.260	171.800	174.800	-	-

A. Mission Description and Budget Item Justification

The Tactical Technology Program Element is budgeted in the Applied Research Budget Activity because it supports the advancement of concepts and technologies to enhance the next generation of tactical systems. The Tactical Technology Program Element funds a number of projects in the areas of Naval Warfare, Advanced Land Systems, Aeronautics and Space Technology and Information Analytics Technology.

The Naval Warfare Technology project develops advanced technologies for application to a broad range of naval requirements. Enabling and novel technologies include concepts for expanding the envelope of operational naval capabilities to include the entire sea column such as improved situational awareness over large maritime environments, ship self-defense techniques, novel underwater propulsion modalities, high speed underwater vessels, improved techniques for underwater object detection and discrimination, long endurance unmanned surface vehicles, methods and techniques for servicing assets throughout the sea column, and high bandwidth communications. This project will also examine methods and architectures for distributing maritime operations to enable a more agile, survivable, and cost-effective fleet.

The Advanced Land Systems Technology project is developing technologies for enhancing U.S. military effectiveness and survivability in operations ranging from traditional threats to military operations against irregular forces that can employ disruptive or catastrophic capabilities, or disrupt stabilization operations, including competing in undergoverned spaces. Programs in this project will break the relative symmetry of land combat to give U.S. forces a decided advantage in the current and future ground battlefield. The emphasis is on developing affordable technologies that reduce reliance on consolidated forward-operating bases and required lines of communication, and provide small units and individual warfighters with hyper-mobility and hyper-lethality. This project will develop methods and technologies to expand the maneuver trade space to include the vertical dimension, including subterranean environments, as well as undergoverned spaces. It will leverage advances in artificial intelligence to enable integrated manned-unmanned operations and decrease warfighter exposure through the use of autonomous agents.

Aeronautics and Space Technology efforts will address high payoff opportunities that dramatically reduce costs associated with advanced aeronautical and space systems and/or provide revolutionary new system capabilities for satisfying current and projected military mission requirements. This includes advanced technology studies of revolutionary propulsion, vehicle, and launch concepts, sophisticated fabrication methods, and examination of novel materials and enabling technologies for

aeronautics and space system applications. Studies that also fundamentally change the calculus of battle including consideration of a mix of assets, platforms that are potentially disposable or with limited lifespans, and autonomous integration of space and air platforms in the tactical battlespace are included as well.

The Information Analytics Technology project develops technology for analyzing data and information arising from: 1) intelligence networks; 2) open sources, social and broadcast media, and other external sources; 3) sensors and signal/image processors; and 4) collection platforms and weapon systems. Technical challenges include processing huge volumes of diverse, incomplete, and uncertain data in tactically-relevant timeframes, and countering the information operations of sophisticated adversaries who seek to deceive, degrade, deny, and disrupt the U.S. information enterprise. Benefits sought include a deeper understanding of the evolving operational environment tailored to the needs of commanders at every echelon; an enhanced capability to plan, monitor, and control diverse military operations ranging from stabilization and information operations to combat engagements; and increased efficiency of core military functions such as national and homeland security, warfighter health and readiness, and defense support of law enforcement and civil authorities.

B. Program Change Summary ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	237.271	202.515	0.000	-	0.000
Current President's Budget	230.211	207.515	221.883	-	221.883
Total Adjustments	-7.060	5.000	221.883	-	221.883
• Congressional General Reductions	0.000	-10.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	15.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.580	0.000			
• SBIR/STTR Transfer	-7.640	0.000			
• Adjustments to Budget Year	-	-	221.883	-	221.883

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2021	FY 2022
Project: TT-04: *ADVANCED LAND SYSTEMS TECHNOLOGY*		
Congressional Add: *Counter Directed Energy Laser Eye Protection Research - Congressional Add*	4.000	-
Congressional Add Subtotals for Project: TT-04	4.000	-
Project: TT-13: *INFORMATION ANALYTICS TECHNOLOGY*		
Congressional Add: *AI Cyber Data Analytics (Data) - Congressional Add*	-	15.000
Congressional Add Subtotals for Project: TT-13	-	15.000
Congressional Add Totals for all Projects	4.000	15.000

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Defense Advanced Research Projects Agency	Date: April 2022
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602702E / *TACTICAL TECHNOLOGY*

Change Summary Explanation

FY 2021: Decrease reflects SBIR/STTR transfer offset by reprogrammings.

FY 2022: Increase reflects Congressional Add for AI, Cyber, Data Analytics offset by Congressional reduction.

FY 2023: FY 2023 funding increase reflects the fact that the FY 2022 President's Budget request did not include out-year funding.

Exhibit R-2A, RDT&E Project Justification: PB 2023 Defense Advanced Research Projects Agency			Date: April 2022
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602702E / *TACTICAL TECHNOLOGY*	Project (Number/Name) TT-03 / *NAVAL WARFARE TECHNOLOGY*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
TT-03: *NAVAL WARFARE TECHNOLOGY*	-	6.868	11.059	23.924	-	23.924	12.959	17.059	16.484	23.234	-	-

A. Mission Description and Budget Item Justification

The Naval Warfare Technology project develops advanced technologies for application to a broad range of naval requirements. Enabling and novel technologies include concepts for expanding the envelope of operational naval capabilities to include the entire sea column such as improved situational awareness over large maritime environments, ship self-defense techniques, novel underwater propulsion modalities, high speed underwater vessels, improved techniques for underwater object detection and discrimination, long endurance unmanned surface vehicles, methods and techniques for servicing assets throughout the sea column, and high bandwidth communications. This project will also examine methods and architectures for distributing maritime operations to enable a more agile, survivable, and cost-effective fleet.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Multi-Azimuth Defense Fast Intercept Round Engagement System (MAD-FIRES)	3.512	7.157	18.639

Description: The Multi-Azimuth Defense Fast Intercept Round Engagement System (MAD-FIRES) program will develop a point defense system against today's most stressing threats by developing a highly maneuverable, medium caliber, guided projectile, fire sequencing and control system capable of neutralizing large threat raids of high speed, highly maneuverable targets. Leveraging recent advancements in gun hardening, miniaturization of guided munition components, and long-range sensors, MAD-FIRES advances fire control technologies, medium caliber gun technologies, and guided projectile technologies enabling the multiple, simultaneous target, kinetic engagement mission at greatly reduced costs. MAD-FIRES will achieve lethality overmatch through accuracy rather than size, thus expanding the role of smaller combat platforms into missions where they have been traditionally outgunned. MAD-FIRES, sized as a medium caliber system, enhances flexibility for installment as a new ship self-defense system. This phase of the project will mature and demonstrate key projectile technologies and subsystem elements. The final phase of system integration and supersonic testing is funded in PE 0603766E, Project NET-02.

FY 2022 Plans:
- Verify function and survival of the updated projectile after gun firing.
- Measure projectile maximum maneuver performance.
- Demonstrate closed-loop guidance of the projectile in flight.

FY 2023 Plans:
- Commence subsystems development, integration and testing.
- Mature critical technologies to enable future surrogate threat engagement demonstrations.
- Update Modeling, Simulation and Analysis (MS&A) toolset and perform gun-fired testing to validate MS&A tools.

FY 2022 to FY 2023 Increase/Decrease Statement:

Exhibit R-2A, RDT&E Project Justification: PB 2023 Defense Advanced Research Projects Agency		Date: April 2022
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602702E / *TACTICAL TECHNOLOGY*	**Project (Number/Name)** TT-03 / *NAVAL WARFARE TECHNOLOGY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
The FY 2023 increase reflects completing the current development phase with demonstrations of projectile technologies and subsystem elements.			
Title: Maritime Defense	3.356	3.902	5.285
Description: The Maritime Defense program will explore novel technologies and concepts of operations to mature capabilities to extend freedom of access, operations, and homeland defense in all parts of the maritime domain, including waterways, arctic areas, and the seabed. The program will investigate and mature technologies necessary for unmanned underwater vehicle (UUV) and unmanned surface vessel (USV) concepts for defense against large volumes of low-cost expendable platforms, including compressing the detect-to-engage sequence by exploiting localized networked sensors to rapidly detect, identify, and neutralize threats. Enabling technologies for advanced undersea systems, including a revolutionary propulsion concept, and novel approaches for maritime platform self-defense will be investigated. Novel technologies and concepts required for arctic and seabed operations, such as distributed sensing, navigation, and communications architectures, as well as including new technologies to enable long duration maritime platforms, will also be investigated. Finally, future concepts, approaches, and techniques will be identified to enable contested environment operations utilizing unmanned maritime platforms. ***FY 2022 Plans:*** - Mature conceptual design and conduct risk reduction activities for advanced underwater payloads and sensors. - Refine conceptual design in the development of advanced payloads and autonomy. - Conduct cost analysis and readiness level assessments for transition opportunities to follow-on research and development. ***FY 2023 Plans:*** - Initiate studies of novel underwater sensor systems and extended range maritime platforms. - Assess autonomous maritime platform integration with advanced payload capabilities. - Assess novel technologies and concepts for arctic operations. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The FY 2023 increase reflects broadening investigation utilizing unmanned maritime platforms for contested environments.			
Accomplishments/Planned Programs Subtotals	6.868	11.059	23.924

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Defense Advanced Research Projects Agency			Date: April 2022
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602702E / *TACTICAL TECHNOLOGY*	Project (Number/Name) TT-04 / *ADVANCED LAND SYSTEMS TECHNOLOGY*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
TT-04: *ADVANCED LAND SYSTEMS TECHNOLOGY*	-	86.864	54.060	67.157	-	67.157	80.305	98.603	100.147	93.897	-	-

A. Mission Description and Budget Item Justification

The Advanced Land Systems Technology project is developing technologies for enhancing U.S. military effectiveness and survivability in operations ranging from traditional threats to military operations against irregular forces that can employ disruptive or catastrophic capabilities, or disrupt stabilization operations, including competing in undergoverned spaces. Programs in this project will break the relative symmetry of land combat to give U.S. forces a decided advantage in the current and future ground battlefield. The emphasis is on developing affordable technologies that reduce reliance on consolidated forward-operating bases and required lines of communication, and provide small units and individual warfighters with hyper-mobility and hyper-lethality. This project will develop methods and technologies to expand the maneuver trade space to include the vertical dimension, including subterranean environments, as well as undergoverned spaces. It will leverage advances in artificial intelligence to enable integrated manned-unmanned operations and decrease warfighter exposure through the use of autonomous agents.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Robotic Autonomy in Complex Environments with Resiliency (RACER)	20.941	31.600	45.924
Description: Multi-domain operations (MDO) environments present complex and challenging environments to ground combat platforms. Ground combat platforms must operate in a more distributed manner in these environments to gain a sustained tactical advantage and enhance Warfighter survivability. The Army intends to deploy autonomous robotic combat vehicles and optionally manned fighting vehicles to accomplish this objective. In order to meet the demands of an MDO environment, significant advances in perception, planning, and control algorithms are required to autonomously maneuver faster and more resiliently in complex and novel off-road environments. Maneuver environments are characterized by three-dimensional surfaces of highly compliant soils and vegetation, hundreds of positive and negative obstacle classes, no defined road networks or driving rules, and where use of terrain for survivability is critical. In order to achieve operationally relevant speeds and resilience to novel situations on the future battlefield, while simultaneously reducing the Soldier cognitive and communications burden and increasing battle space awareness, Robotic Autonomy in Complex Environments with Resiliency (RACER) will demonstrate game-changing autonomous ground combat vehicle mobility using a combination of simulation and advanced platforms. RACER will deliver autonomy algorithms using the latest in Artificial Intelligence (AI) and machine-learning techniques, a code repository, an off-road simulation environment tailored for military off-road autonomy development, tactical route planning methods and field-demonstrated off-road autonomous capabilities. The culmination of the RACER program will be to demonstrate fully autonomous maneuver on a military Unmanned Ground Vehicle (UGV) in a variety of militarily relevant environments.			
FY 2022 Plans: - Initiate Government-hosted field experiments of varying terrain and obstacle complexity. - Initiate large-scale demonstration platform (combat vehicle scale) preparations.			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Defense Advanced Research Projects Agency		Date: April 2022
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602702E / *TACTICAL TECHNOLOGY*	**Project (Number/Name)** TT-04 / *ADVANCED LAND SYSTEMS TECHNOLOGY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
- Demonstrate initial capabilities of off-road autonomy simulation technologies. - Determine off-road speeds and interventions comparable to best human driver capability. ***FY 2023 Plans:*** - Continue Government-hosted field experiments in increasingly complex terrain and obstacle classes. - Initiate development of tactically relevant routes for small-scale demonstration platforms using initial tactics versus an opposing force. - Deliver a simulation environment compared against real-world system performance and environments. - Deliver autonomy algorithm modules demonstrated in the real-world and compared against a simulation environment. - Begin testing on large-scale demonstration platform (combat vehicle scale) in increasingly complex and large-scale demonstrations. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The FY 2023 increase reflects the continuation of field demonstrations and initiation of large-scale demonstration platform (combat vehicle scale) commissioning.			
Title: Competing in Undergoverned Spaces	-	10.460	15.733
Description: A vast majority of U.S. technology is focused on gaining competitive advantage against near peer adversaries in kinetic engagements where there are known rules and players, concrete timelines and clear winners and losers. While these finite games are important, many critical engagements are closer to infinite contests--dynamic, diffuse high dimensionality interactions that play out over long periods with an ultimate goal of resetting the regional power and influence equilibrium. Competing in these contests is critical for successful stabilization and Humanitarian Assistance Disaster Relief (HADR) missions, as well as operations in undergoverned spaces. Some undergoverned spaces are geographic, where local governance is sufficiently weak such that internal or external parties can compete for influence over the local population. Some contested undergoverned spaces are more conceptual yet still very real, defined by virtual or physical domains that lack or regularly violate ethical, legal, social and institutional order such as supply chains or the cyber-domain. The Competing in Undergoverned Spaces will develop technologies that are focused on successfully competing in infinite contests by developing tools for situational awareness and interpretation of signals, constant acting, assessing and adapting (i.e., iterative Hypothesis A/B testing) and new ways of viewing experimentation from a foundation of asynchronous observations and actions. Specific areas of interest include information, influence or economic tools that rapidly adapt to the environment to yield specific effects that can be sensed. This includes developing new options to engage friendly/non-friendly local populations while minimizing the social impact of stabilization. Other areas of interest include sensing tools designed to update pre-existing models to support decision making, and decision tools designed to adapt to changing population or adversary actions. ***FY 2022 Plans:***			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Defense Advanced Research Projects Agency		Date: April 2022
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602702E / *TACTICAL TECHNOLOGY*	**Project (Number/Name)** TT-04 / *ADVANCED LAND SYSTEMS TECHNOLOGY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
- Initiate efforts to develop techniques for measuring and characterizing changes to structure and operation of an exemplar global system (e.g., food) at multiple time scales. - Identify potential approaches for bridging the gap between static risk analysis and real time monitoring for an exemplar global system (e.g., food). - Explore approaches to link diverse spectroscopy techniques to quantifiable local activity (e.g., economic, social). - Initiate the development of models to anticipate community dynamics through studies of how terrain, social structure, environment, etc. shape activity. - Begin the development of active sensing tools that reveal functional properties of local economic, political, or physical systems. ***FY 2023 Plans:*** - Test links between diverse spectroscopy techniques and quantifiable local activity (e.g., economic, social). - Continue development of models to anticipate community dynamics through studies of how terrain, social structure, environment, etc. shape activity. - Continue the development of active sensing tools that reveal functional properties of local economic, political, or physical systems. - Devise approaches to experimentation and assessment in high-dimensionality, subkinetic contests. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The FY 2023 increase is due to a shift from initial system design to development and demonstration.			
Title: Advanced Ground Technologies Concepts	-	-	5.500
Description: The Advanced Ground Technologies Concepts program aims to surmount key challenges associated with redefining access and delivery of effects to every aspect of the ground domain by using targeted investments that explore the feasibility of novel technical solutions, force capabilities and new concepts of operations. In particular, program investments encompass technologies that promise breakthroughs in enabling actionable situational awareness across diverse environments, Artificial Intelligence (AI) enabled autonomy for large scale integration of manned-unmanned ground force operations; intelligent ground mobility systems; advanced military robotic systems for urban operations; technologies expanding the effective ranges of surface-to-surface precision fires and technologies that expand the combined arms maneuver trade space to include the vertical dimension, interiors of buildings, and exploiting natural and man-made subterranean environments. ***FY 2023 Plans:*** - Mature conceptual design for technologies that enhance detection and tracking of large land targets in denied areas. - Mature framework for enhancing manned-unmanned teaming (MUM-T) operations and develop demonstration plans to field the framework.			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Defense Advanced Research Projects Agency		Date: April 2022
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602702E / *TACTICAL TECHNOLOGY*	**Project (Number/Name)** TT-04 / *ADVANCED LAND SYSTEMS TECHNOLOGY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
- Mature approaches for testing tactical autonomy in urban environments and develop demonstration framework. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The FY 2023 increase reflects program initiation.			
Title: Subterranean (SubT) Challenge ***Description:*** The DARPA Subterranean (SubT) Challenge is developing novel integrated solutions capable of mapping, navigating, and searching complex and dynamic terrains (tunnel systems, urban underground and cave networks); sensors and computation for perception in austere conditions; distributed information sharing in degraded communications environments; and collaborative autonomy enabling extended operations with minimal human intervention. The core objective of the SubT Challenge is to discover the solution(s) which best outperforms current approaches for manually and laboriously mapping and searching subterranean environments. Newly developed capabilities will span across four technology focus areas in autonomy, perception, networking, and mobility technologies. The program will increase the diversity, versatility, and robustness of relevant system technologies, capable of addressing the multi-faceted needs of a wide range of environments. Innovations are being explored in the context of a public-facing, broadly inclusive DARPA Challenge. ***FY 2022 Plans:*** - Facilitate deep tech commercialization and transfer opportunities. - Complete technology assessments, reference data collection, and prize award execution from the Final Event. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The FY 2023 decrease reflects completion of program.	21.800	4.000	-
Title: Urban Reconnaissance through Supervised Autonomy (URSA) ***Description:*** The Urban Reconnaissance through Supervised Autonomy (URSA) program is developing and demonstrating new autonomous agents and techniques that support a Blue Force Commander in managing the complexity and ambiguity of urban spaces by rapidly identifying and discriminating among potential threats during missions ranging from minutes to hours. The program uses perception-enabled autonomous vehicles to manage complexity and interactions with populations to drive down the ambiguity between peaceful civilians and threats. The program will create a system of autonomous ground and air platforms operating in conjunction with U.S. ground forces that monitor an area overtly to detect hostile forces and establish Positive Identification (PID) before any U.S. troops come into contact. Military units follow strict rules of engagement (ROEs) that prescribe an escalation of force appropriate with the level of hostilities and confidence that an individual is engaged in nefarious behavior. This program will establish a Legal, Moral, Ethical (LME) working group comprising multiple individuals (technologists, military, university professors, ethicists, legal experts) to develop an understanding of how escalation and/or de-escalation of force can and should be appropriately applied in the context of supervised autonomous systems. URSA is exploring scenarios and	19.000	8.000	-

Exhibit R-2A, RDT&E Project Justification: PB 2023 Defense Advanced Research Projects Agency		Date: April 2022
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602702E / *TACTICAL TECHNOLOGY*	**Project (Number/Name)** TT-04 / *ADVANCED LAND SYSTEMS TECHNOLOGY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
probing behaviors to enable identifying innocent civilians and individuals who pose a threat to U.S. Forces, allies, or non-combat civilians. This mission requires the integration and maturation of novel sensors, and unmanned ground and air vehicles which leverage current techniques in perspective and reactive autonomy to navigate cluttered urban environments. URSA is developing new search and engagement behaviors to disambiguate human actions and serve as evidence that a potential target is a threat. It is implementing new dimensions of evidence such as the human reactions to these engagements to improve confidence in its decisions, and building a novel framework for escalating and de-escalating nonlethal force. ***FY 2022 Plans:*** - Evaluate system performance with incremental field demonstrations in increasingly complex and varying urban environments. - Conduct the final system end-to-end performance evaluation in a live environment. - Conduct feasibility demonstration that will validate validity of the system in a live event. - Explore transition activities with Marine Corps Systems Command to assess potential application to emerging programs. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The FY 2023 decrease reflects completion of program with live capstone field demonstration.			
Title: Proportional Weapons ***Description:*** The Proportional Weapons program pursued a real-time capability to analyze and apply proportional effects for families of weapons that suppress or breach any external structure to neutralize threats, clear spaces at range, keep them intact, and minimize collateral damage. Novel approaches that are effective from the air or ground against several scales of threats while not being catastrophically destructive were needed. Current approaches to identifying, engaging, and assessing effects against evasive ground targets require significant human oversight combined with human semantic reasoning tied to rules of execution, resulting in slow and methodical engagements. Proportional Weapons studied systems that provided extended range and tunable effects. Proposed technical approaches are scalable for application to dismounted warfighters, vehicle-borne (air and ground) systems, or as human-in-the-loop payloads for future autonomous platforms.	2.000	-	-
Title: Mobile Force Protection (MFP) ***Description:*** The goal of the Mobile Force Protection (MFP) was to develop and demonstrate an integrated system capable of defeating a raid of self-guided small unmanned aircraft systems (sUAS) attacking a high value convoy on the move. By focusing on protecting mobile assets, the program emphasized low footprint solutions, in terms of size, weight, power (SWaP), and manning, which benefited other counter-UAS missions and resulted in more affordable systems. Defending in a variety of operating environments against these sUAS threats and associated concept of operations required several breakthroughs in affordable technology to sense, decide and act on a compressed timeline while mitigating collateral damage. The program developed solutions applicable to the defense of mobile ground and naval forces that can also potentially defeat more	4.320	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2023 Defense Advanced Research Projects Agency		Date: April 2022
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602702E / *TACTICAL TECHNOLOGY*	**Project (Number/Name)** TT-04 / *ADVANCED LAND SYSTEMS TECHNOLOGY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
conventional threats. The solutions are scalable and modular such that they can be deployed in multiple defense applications and do not become obsolete with evolving threat capability.			
Title: Underminer ***Description:*** The Underminer effort, an outgrowth of the Subterranean Challenge program, explored the development and integration of technologies that drill/bore and build the underground environment for tactical operations. Underminer explored creation and utilization of tunneling, drilling, and boring capabilities for systems at multiple scales. The program also examined multiple concepts of operation and considered creation and use of both temporary tunnels as well as rapid creation of tunnel networks.	8.763	-	-
Title: Squad X ***Description:*** The U.S. military achieves overmatch against its adversaries in certain regimes; however, this level of overmatch is not realized at the squad to individual dismounted warfighter level. The goal of the Squad X program was to leverage advances in real-time situational awareness and mission command; organic three-dimensional dismount mobility; extended range tracking, targeting, and response; and unmanned mobility and perception in order to create a squad with substantial combat overmatch. The concept of overmatch at the squad level included increased human stand-off, a smaller force density, and adaptive sensing to allow for responses at multiple scales. Squad X explored advanced wearable force protection, advanced organic squad level direct and indirect trajectory precision weaponry, and non-kinetic precision capabilities. The end result of the Squad X program was an individual dismount unit outfitted with sensors, weaponry, and supporting technology to achieve unit level overmatch as well as the overall integration of unmanned assets alongside the dismounts to create an advanced, dismounted small unit.	6.040	-	-
Accomplishments/Planned Programs Subtotals	82.864	54.060	67.157

	FY 2021	FY 2022
Congressional Add: Counter Directed Energy Laser Eye Protection Research - Congressional Add	4.000	-
FY 2021 Accomplishments: - Develop large-area coatings for counter laser eye protection by hardening windows to repel laser energy while providing high visible transmission and color neutrality.		
Congressional Adds Subtotals	4.000	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2023 Defense Advanced Research Projects Agency		Date: April 2022
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602702E / *TACTICAL TECHNOLOGY*	**Project (Number/Name)** TT-04 / *ADVANCED LAND SYSTEMS TECHNOLOGY*

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Defense Advanced Research Projects Agency			Date: April 2022
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602702E / *TACTICAL TECHNOLOGY*	Project (Number/Name) TT-07 / *AERONAUTICS AND SPACE TECHNOLOGY*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
TT-07: *AERONAUTICS AND SPACE TECHNOLOGY*	-	51.129	44.507	33.300	-	33.300	30.100	30.500	19.250	8.000	-	-

A. Mission Description and Budget Item Justification

Aeronautics and Space Technology efforts will address high payoff opportunities that dramatically reduce costs associated with advanced aeronautical and space systems and/or provide revolutionary new system capabilities for satisfying current and projected military mission requirements. This includes advanced technology studies of revolutionary propulsion, vehicle, and launch concepts, sophisticated fabrication methods, and examination of novel materials and enabling technologies for aeronautics and space system applications. Studies that also fundamentally change the calculus of battle including consideration of a mix of assets, platforms that are potentially disposable or with limited lifespans, and autonomous integration of space and air platforms in the tactical battlespace are included as well.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Advanced Aeronautics and Space Technologies*	3.000	3.500	9.500

Description: *Formerly Advanced Aeronautics Technologies

The Advanced Aeronautics and Space Technologies program examines and evaluates aeronautical and space technologies and concepts through applied research. These may include feasibility studies of novel or emergent materials, sensors and tactics for air and space platforms, launch vehicles, satellites, as well as manufacturing and implementation approaches. The areas of interest range from propulsion and power, guidance and control, concepts to enable novel air platforms, to innovative technologies and platform concepts to enable new missions and resilient operations for space systems, from low earth orbit to cislunar space. Aeronautics interest areas include hybrid electric/combustion propulsion concepts, small-scale air mobility solutions, and networking of both piloted and unpiloted air vehicles. Space interest areas include advanced or novel power and propulsion systems, novel sensors, advanced lightweight structures, advanced miniature radio frequency (RF) technology, navigation technologies, avionics, structures, and advanced communications. These studies may lead to the development of new programs, components or subsystems to enhance future aerospace platforms, or improvement of existing systems.

FY 2022 Plans:
- Continue conceptual design studies and demonstrate emerging technologies.
- Perform modeling and simulation that support future concepts and novel architectures.
- Identify and demonstrate feasible technologies for air platform defense.
- Examine concepts for advanced space technologies and perform laboratory demonstrations.

FY 2023 Plans:
- Refine conceptual design studies and test emerging technologies.

Exhibit R-2A, RDT&E Project Justification: PB 2023 Defense Advanced Research Projects Agency		Date: April 2022
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602702E / *TACTICAL TECHNOLOGY*	**Project (Number/Name)** TT-07 / *AERONAUTICS AND SPACE TECHNOLOGY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
- Extend and develop modeling and simulation that support future concepts and novel architectures. - Integrate feasible and practical technologies into systems level demonstration vehicles. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The FY 2023 increase reflects expansion of research into technologies and concepts for space systems ranging from low earth orbit to cislunar space.			
Title: Oversight ***Description:*** Oversight will develop and demonstrate a suite of autonomy technologies to provide constant custody of targets as a service for tactical operations in contested environments. Existing and emerging space systems will be evaluated. Proliferated Low Earth Orbit (p-LEO) satellite constellations and payloads will be leveraged due to their high-bandwidth, processing-on-the-edge capabilities in support of tactical, efficient, integrated missions at scale. Oversight will develop autonomous technology to enable advanced collaboration among constellations of satellites for target custody in contested environments where the numbers of targets is far greater than the number of satellites and sensors over the operating area. The Oversight program will culminate with a demonstration using existing on-orbit p-LEO assets combined with live, virtual and constructive terrestrial assets. ***FY 2023 Plans:*** - Perform systems engineering for a conceptual design. - Conduct analysis necessary to derive system requirements for track custody, resource management and infrastructure support. - Conduct assessment of government-owned applications and services that could be leveraged for system development. - Establish a government-owned modeling and simulation framework for evaluating performer algorithms. - Develop a software development kit and interface documents for incorporating software into the modeling and simulation framework. - Conduct trade studies and develop necessary algorithms for software applications and services. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The FY 2023 increase reflects program initiation.	-	-	23.800
Title: Control of Revolutionary Aircraft with Novel Effectors (CRANE) ***Description:*** The Control of Revolutionary Aircraft with Novel Effectors (CRANE) program is demonstrating revolutionary improvements in aircraft controls technology. The program will design, build, and flight test an aircraft able to fly and maneuver at altitude relying on state-of-the-art Active Flow Control (AFC) technology. AFC is a broad term that encompasses a range of technology approaches; it includes a number of control mechanisms which alter the aerodynamic flow field thru ejection or suction of fluid via an orifice on a lifting body. An emphasis of the program is assessing AFC component technologies, risk reduction and experimentation, integrated testing, fabrication and demonstration of a relevant scale novel and innovative aircraft. Technologies,	23.614	28.507	-

Exhibit R-2A, RDT&E Project Justification: PB 2023 Defense Advanced Research Projects Agency		Date: April 2022
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602702E / *TACTICAL TECHNOLOGY*	**Project (Number/Name)** TT-07 / *AERONAUTICS AND SPACE TECHNOLOGY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
design tools and models developed and demonstrated under this program will be made available to all Services as well as the civilian aerospace sector for application to future air systems development. Beginning in FY 2023, this program is funded in PE 0603286E, Project AIR-01. ***FY 2022 Plans:*** - Complete development of conceptual design tools for AFC enabled aircraft. - Complete analysis and test activities resulting in preliminary design review. - Initiate detailed design, flight software and control law development. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The FY 2023 decrease reflects the program shift to PE 0603286E, Project AIR-01 as the programs enters into final detailed design and fabrication of the demonstration aircraft.			
Title: Gremlins ***Description:*** The Gremlins program is developing platform technologies that enable a new class of distributed warfare. The Gremlins concept envisions small air-launched unmanned systems that can be responsively dispatched in volley quantity from existing air platforms, fly into contested airspace, conduct a moderate duration mission, and be ultimately air recovered. Key enabling technologies for the concept include smaller developmental payloads that benefit from multiple collaborating host platforms. The Gremlins program will conduct risk reduction and development of the host platform launch and recovery capability and develop and demonstrate a recoverable Unmanned Air Vehicle (UAV) platform concept. Enabling platform technologies will include precision relative navigation, advanced computational modeling, small form factor payloads, compact propulsion systems, and highspeed digital flight control. The program will leverage these technologies, perform analytic trade studies, conduct incremental development, and ultimately demonstrate the potential for an integrated air-launched Gremlins unmanned platform capable of conducting distributed air operations. ***FY 2022 Plans:*** - Conduct flight test demonstrating full recovery capability of a Gremlins Air Vehicle. - Conduct flight analysis and reporting of airborne launch and recovery. - Perform design work for Intelligence Surveillance and Reconnaissance (ISR) payload integration. - Begin autonomy architecture integration into Gremlins system. - Conduct preliminary flight test demonstrating autonomy capability. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The FY 2023 decrease reflects program completion.	11.515	12.500	-
Title: OFFensive Swarm-Enabled Tactics (OFFSET)	8.000	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2023 Defense Advanced Research Projects Agency		Date: April 2022
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602702E / *TACTICAL TECHNOLOGY*	**Project (Number/Name)** TT-07 / *AERONAUTICS AND SPACE TECHNOLOGY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Description: The OFFensive Swarm-Enabled Tactics (OFFSET) program designed, developed, and demonstrated a swarm system architecture to advance the innovation, interaction, and integration of novel swarm tactics. The program examined enabling technologies for collaborative autonomy for large teams of unmanned systems, including unmanned ground and air capabilities through the use of both virtual, game-based and physical, live-fly testbeds. Key research thrusts included the development of advanced swarm tactics-centered autonomy and development of human-swarm teaming interface technologies. These combined enhancements facilitated insights and enabled employment of these collective systems to address current needs and defeat future threats. The program considered technologies supporting U.S. ground and air operations, extensible to other operating environments, requiring organic and/or tactical swarm capabilities, and leveraged low-cost, rapidly deploy-able, autonomous system technologies.			
Title: CounterSwarmAI ***Description:*** The objective of the CounterSwarmAI program was to develop systems for anticipating and defeating autonomous systems threats of the future. These adversary systems will likely employ advanced artificial intelligence (AI) and machine learning techniques which will inevitably lead to increased complexity and unpredictability of these advanced threats. CounterSwarmAI envisioned the development of disruptive technologies across the engagement kill chain, themselves AI-empowered, to directly combat these challenges. CounterSwarmAI decision software would directly interface with future and legacy defensive systems (kinetic and non-kinetic) to rapidly assess, optimally exploit, and efficiently defeat enemy autonomous systems threats. Innovative solutions would enable (a) autonomous systems which provide understanding and vulnerability exploitation through machine learning, (b) an integrated AI-equipped open architecture for multi-faceted swarm defense, and (c) integration and experimentation with live surrogate swarm threats against current fielded defensive systems.	5.000	-	-
Accomplishments/Planned Programs Subtotals	51.129	44.507	33.300

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Defense Advanced Research Projects Agency			Date: April 2022
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602702E / *TACTICAL TECHNOLOGY*	Project (Number/Name) TT-13 / *INFORMATION ANALYTICS TECHNOLOGY*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
TT-13: *INFORMATION ANALYTICS TECHNOLOGY*	-	85.350	97.889	97.502	-	97.502	138.741	178.260	171.800	174.800	-	-

A. Mission Description and Budget Item Justification

The Information Analytics Technology project develops technology for analyzing data and information arising from: 1) intelligence networks; 2) open sources, social and broadcast media, and other external sources; 3) sensors and signal/image processors; and 4) collection platforms and weapon systems. Technical challenges include processing huge volumes of diverse, incomplete, and uncertain data in tactically-relevant timeframes, and countering the information operations of sophisticated adversaries who seek to deceive, degrade, deny, and disrupt the U.S. information enterprise. Benefits sought include a deeper understanding of the evolving operational environment tailored to the needs of commanders at every echelon; an enhanced capability to plan, monitor, and control diverse military operations ranging from stabilization and information operations to combat engagements; and increased efficiency of core military functions such as national and homeland security, warfighter health and readiness, and defense support of law enforcement and civil authorities.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Semantic Forensics (SemaFor)	19.700	21.921	29.839
Description: The Semantic Forensics (SemaFor) program is developing technologies to defend against the falsification of multimedia and disinformation campaigns. Statistical detection techniques have been successful, but media generation and manipulation technologies applicable to imagery, voice, video, text, and other modalities are advancing rapidly. Purely statistical detection methods are now insufficient to detect these manipulations, especially when multiple modalities are involved. Existing media generation and manipulation algorithms are data driven and are prone to making semantic errors that provide defenders an opportunity for asymmetric advantage. SemaFor is developing semantic and statistical analysis algorithms that determine if media is generated or manipulated, attribution algorithms that infer if media originates from a particular organization or individual, and characterization algorithms that reason about whether media was falsified (generated or manipulated) for malicious purposes. SemaFor aims to create technologies to identify, deter, and understand adversary media falsification.			
FY 2022 Plans: - Implement algorithmic approaches for analyzing and reasoning about inconsistencies across multiple media instances, detecting falsification, and explaining the reasoning for detections. - Develop machine learning and other artificial intelligence techniques to attribute falsified media to particular adversarial elements and to characterize the intent of falsified media as benign or malicious. - Extend evaluations to social media and news feeds requiring multimodal reasoning and incorporate datasets informed by DoD and IC transition partners into challenge problems and evaluations.			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Defense Advanced Research Projects Agency		Date: April 2022
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602702E / *TACTICAL TECHNOLOGY*	**Project (Number/Name)** TT-13 / *INFORMATION ANALYTICS TECHNOLOGY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
- Collaborate with DoD and IC partners to assess adversarial threat scenarios and to identify areas for additional research effort. ***FY 2023 Plans:*** - Implement more advanced forms of machine learning and artificial intelligence in media falsification detection, attribution, and characterization techniques for emerging complex adversarial falsified media. - Extend datasets and evaluation efforts to include disinformation in technical documents, media collections, and diverse social media feeds. - Refine application programming interfaces to include multiple sources, and provide multimodal (image, video, audio or text) system enhancements based on input from DoD and IC transition partners and other stakeholders. - Begin development of software prototype to address adversarial threat scenarios and to facilitate a deeper understanding of the intent of falsified media. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The FY 2023 increase is due to ramping up of development of semantic techniques for reasoning about inconsistencies in potentially falsified multimedia, and expansion of prototyping and evaluation work.			
Title: Influence Campaign Awareness and Sensemaking (INCAS)	6.000	13.500	23.000
Description: The Influence Campaign Awareness and Sensemaking (INCAS) program is developing analyst-guided techniques, tools, and platforms for the DoD to detect and understand geopolitical influence campaigns in a rigorous, quantitative manner. Increasingly, competitors and adversaries are using influence operations to project soft power. Competitor and adversary influence campaigns can be overt in the form of anti-U.S. messaging, or they can be disguised in the form of complex narratives that seek to advance agendas harmful to U.S. interests. The U.S. Government and DoD need the capability to rapidly detect and understand competitor and adversary messaging campaigns and narratives within the context of the populations and groups for whom they are intended. To accomplish this, the program will develop and operationalize natural language processing, social network analysis, psychographics, and behavioral science-based technologies, and integrate these into a unified influence campaign modeling framework and sensemaking platform. INCAS aims to produce a suite of automated digital tools to enable analysts to better understand how information is being used by competitors and adversaries, and to quantitatively assess in real time and at scale the effects of influence campaigns across time and over multiple platforms. ***FY 2022 Plans:*** - Develop tools for extraction of influence indicators and demographic and psychographic target population attributes from social and other media messaging at scale. - Develop tools for dynamically segmenting target population based on response, incorporating parameters such as volume and emotion. - Develop testbed infrastructure and data provisioning ingest pipeline components for performance evaluations.			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Defense Advanced Research Projects Agency		Date: April 2022
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602702E / *TACTICAL TECHNOLOGY*	**Project (Number/Name)** TT-13 / *INFORMATION ANALYTICS TECHNOLOGY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
- Develop user interfaces for campaign modeling and conduct usability assessment in collaboration with military subject matter experts. ***FY 2023 Plans:*** - Extend tools for extraction of additional influence indicators and demographic and psychographic target population attributes from social and other media messaging at scale. - Formulate analytic techniques to identify adversary information operations playbooks, quantify the effectiveness of countermeasures and response strategies, and detect extremist radicalization and other threats from online data. - Develop tools that correlate influence indicators in messaging with population attributes to explain and anticipate responses, and analytics for assessing the threat, similarity, and confidence of campaign models. - Implement techniques in the testbed infrastructure and deploy technology to support experimentation by operational stakeholders. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The FY 2023 increase reflects continuation of work to develop and implement techniques in a modeling framework and sensemaking platform and initiation of efforts to evaluate the technology in collaboration with military stakeholders.			
Title: Adapting Cross-domain Kill-Webs (ACK)	14.400	11.700	8.000
Description: The Adapting Cross-domain Kill-Webs (ACK) program is assisting military decision makers with rapidly identifying and selecting options for tasking and re-tasking assets within and across organizational boundaries. Based on technologies developed in the Resilient Synchronized Planning and Assessment for the Contest Environment (RSPACE) program (previously budgeted in PE 0603766E, Project NET-01), ACK will assist users with selecting sensors, effectors, and support elements across military domains (space, air, land, surface, subsurface, and cyber) to form and adapt kill chains to deliver desired effects on targets. Today's Command and Control (C2) organizations and processes cannot support multi-domain warfighting concepts, especially during joint operations. ACK will address this challenge by utilizing a decentralized approach to allocating resources to tasks and assigning mission orders to assets, motivated by ideas developed in online commerce, sourcing, and supply chain management, such as bid requests and offers. The impact of ACK will be to accelerate asset re-allocation and assignment decision timelines to be on the order of minutes, and the output of ACK will be automated tools and decision aids to support the selection of the elements of a kill-chain and assignment of roles and responsibilities to each of the elements. Technology developed under this program will be transitioned to the Services. ***FY 2022 Plans:*** - Execute evaluation scenario to exercise algorithm cross-domain reasoning capabilities. - Evaluate cross-domain solution recommendations and user interface presentation. ***FY 2023 Plans:***			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Defense Advanced Research Projects Agency		Date: April 2022
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602702E / *TACTICAL TECHNOLOGY*	**Project (Number/Name)** TT-13 / *INFORMATION ANALYTICS TECHNOLOGY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
- Conduct evaluation capstone event. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The FY 2023 decrease reflects a shift from dynamic evaluation in testbed to final capstone demonstration with Services.			
Title: Data-Driven Discovery of Models (D3M) ***Description:*** The Data-Driven Discovery of Models (D3M) program is developing automated model discovery techniques and tools that enable non-expert users to create empirical models of real, complex processes and phenomena. The ability to understand the battlespace is driven increasingly by expert analysis of sensor and open source data. The DoD and IC communities are fundamentally limited by a shortage of domain-focused subject matter expert data scientists to construct empirical models that predict behaviors and anticipate contingencies during tactical and strategic planning. D3M is addressing this need by creating technologies that automate the construction of complex empirical models. D3M technologies include a library of data modeling primitives that are automatically selectable, automated approaches for composition of complex models from modeling primitives, and intuitive mechanisms for human-model interaction that enable curation of models by non-experts. D3M is focused on the types of empirical modeling problems commonly encountered by the DoD and IC. ***FY 2022 Plans:*** - Enhance automated machine learning tools for domain experts, analysts, and data scientists with causal explanations in support of critical domains, such as supply chain risk modeling. - Refine software modeling tools and systems in response to inputs from operational users. ***FY 2023 Plans:*** - Harden and transition software tools to DoD partners. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The FY 2023 decrease is the result of development work ramping down and the focus shifting to hardening of modeling tools for transition.	10.650	7.200	5.063
Title: Computational Cultural Understanding (CCU)* ***Description:*** *Formerly Culturally-aware IO Defense (CLAID) The Computational Cultural Understanding (CCU) program is creating cross-cultural language understanding technologies to improve a DoD operator's situational awareness and interactional effectiveness. CCU natural language processing technologies will recognize, adapt to, and recommend how to operate within the emotional, social, and cultural norms that differ across societies, languages, and group affinities. To support diverse and emergent use cases, CCU technologies will be engineered to require minimal-to-no training data in a local culture, while maximizing operator success during negotiations and other interactions	-	12.000	21.100

Exhibit R-2A, RDT&E Project Justification: PB 2023 Defense Advanced Research Projects Agency		Date: April 2022
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602702E / *TACTICAL TECHNOLOGY*	**Project (Number/Name)** TT-13 / *INFORMATION ANALYTICS TECHNOLOGY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
in the field. CCU will create new component technologies for the discovery of sociocultural norms, cross-cultural emotion recognition, and communicative change detection. The program will incorporate these component technologies into a prototype platform to assist military users with cross-cultural dialogue. ***FY 2022 Plans:*** - Initiate development of novel techniques for sociocultural analysis, including the analysis of norms, emotions, and important changes in communication, and of multimodal datasets demonstrating sociocultural norms, emotions, and shifts in these behaviors. - Initiate development of component technologies for automated dialogue assistance during cross-cultural interaction, including detection of sociocultural context, identification of the need for assistance, and dialogue remediation, for a culture-language pair. - Develop techniques to enable self-directed learning of concepts of increasing complexity, and capabilities for human-machine dialogue to simulate human-like instructional experiences. - Formulate a modeling capability for group affinities present in a local population that enables rapid detection and characterization of targeted mis/disinformation attacks and adversary influence operations. ***FY 2023 Plans:*** - Develop means to analyze interactions between sociocultural norms and emotional feedback, and extend development to a second culture-language pair. - Evaluate technologies for sociocultural analysis and cross-cultural dialogue assistance within negotiation scenarios of interest, such as discovery of local perspectives on an issue, gathering of logistical information, or requesting access to resources. - Develop means to understand indefinite or relative concepts such as distance, size, or weight, and integrate concept acquisition framework to automated systems. - Develop an initial integration testbed and evaluate cross-cultural language understanding and situational awareness technologies. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The FY 2023 increase reflects ramping up of development and implementation of technologies for cross-cultural language understanding and situational awareness.			
Title: Resilient Supply-and-Demand Networks (RSDN) ***Description:*** Resilient Supply-and-Demand Networks (RSDN) seeks to develop supply-chain risk management analytics to detect systemic vulnerabilities and improve resilience in supply and demand networks. At present, the federation of supply-chain information into confidential silos obscures a system-wide view, inhibiting comprehensive risk-focused analysis of supply and demand networks. RSDN will develop techniques for modeling both the broad level of the supply-chain network and the detailed level of individual procurement agreements. Network analytics and visualizations will be created to reveal emerging	-	-	10.500

Exhibit R-2A, RDT&E Project Justification: PB 2023 Defense Advanced Research Projects Agency		Date: April 2022
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602702E / *TACTICAL TECHNOLOGY*	**Project (Number/Name)** TT-13 / *INFORMATION ANALYTICS TECHNOLOGY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
fragilities and enable deep situational awareness of systemic vulnerabilities and potential disruptions. Blind spots due to hidden interdependencies can lead to fragility in supply chains. To address this problem, a stress-testing framework will be developed that enables repeatable scenario analysis of strategic vulnerabilities in supply and demand networks, automated analysis and discovery of patterns of risk, and evaluation of alternative risk mitigation strategies. ***FY 2023 Plans:*** - Develop semantically rich representations of contractual relationships as the basis for visualizing supply and demand networks as graphs. - Develop an initial library of vulnerability analytics and visualizations to expose and understand strategic risks in supply and demand networks. - Begin development of a stress-testing framework to illuminate the propagation of shocks through a supply and demand network based on realistic scenarios. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The FY 2023 increase reflects program initiation.			
Title: Modeling Adversarial Activity (MAA) ***Description:*** The Modeling Adversarial Activity (MAA) program is developing technologies for generating high-confidence indications and warnings for weapons of mass terror (WMT) activities. WMT pathways consist of networks or links among individuals, groups, organizations, and other entities that act to promote or enable the development, procurement, possession, transportation, or proliferation of WMTs and related capabilities. Monitoring and controlling WMT pathways is essential to denying access to WMT technology, knowledge, materials, expertise, and weapons. MAA will create template graph models reflecting prototypical WMT pathways, develop methods for creating merged activity graphs by aligning entities across multiple intelligence modalities, develop algorithms to match large-scale empirical activity graphs with pathway models, and create synthetic data sets at scale to support development and testing of WMT activity detection techniques. MAA technology development is being coordinated with operational partners. ***FY 2022 Plans:*** - Harden graph analysis techniques and transition software capabilities to operational partners. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The FY 2023 decrease reflects program completion.	10.729	6.100	-
Title: Causal Exploration of Complex Operational Environments ***Description:*** The Causal Exploration of Complex Operational Environments program is developing advanced modeling, analysis, simulation, and visualization tools to enable command staffs to rapidly and effectively design, plan, and manage missions in	13.400	5.468	-

Exhibit R-2A, RDT&E Project Justification: PB 2023 Defense Advanced Research Projects Agency		Date: April 2022
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602702E / *TACTICAL TECHNOLOGY*	**Project (Number/Name)** TT-13 / *INFORMATION ANALYTICS TECHNOLOGY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
complex operational environments. The U.S. military increasingly operates in remote and unstable parts of the world where mission success depends heavily on cooperation with a wide variety of stakeholder groups on civil, economic, and military matters. These groups typically include host nation government organizations, local civilian groups, and non-governmental organizations, each of which has priorities, sensitivities, and concerns that may differ significantly. Current mission design and planning technologies do not adequately model the range of options or the inherent uncertainties. This program is developing tools to create causal, computational models that represent the most significant relationships, dynamics, interactions, and uncertainties of the operational environment including political, military, economic, and social factors. These tools will enable command staffs to design and quantitatively assess potential courses of action in complex operational environments. ***FY 2022 Plans:*** - Harden the system and transition to operational users. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The FY 2023 decrease reflects program completion.			
Title: Warfighter Analytics using Smartphones for Health (WASH) ***Description:*** The Warfighter Analytics using Smartphones for Health (WASH) program is developing analytic techniques for continuous and real-time assessment of warfighter activities based on the multiple sensor data streams generated by modern smartphones. Smartphone sensors provide a rich source of information that can be used to identify a user's activities and environment and also provide a proximity detection capability. WASH will create a scalable proximity detection capability that addresses strong privacy considerations. ***FY 2022 Plans:*** - Evaluate algorithms to associate a user's activity and environment and label those activities accordingly. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The FY 2023 decrease reflects program completion.	10.471	5.000	-
Accomplishments/Planned Programs Subtotals	85.350	82.889	97.502

	FY 2021	FY 2022
Congressional Add: AI Cyber Data Analytics (Data) - Congressional Add ***FY 2022 Plans:*** - Develop neurosymbolic autonomy solutions focused on reinforcement learning, planning, and transfer learning capabilities with improved performance and trustworthiness.	-	15.000
Congressional Adds Subtotals	-	15.000

Exhibit R-2A, RDT&E Project Justification: PB 2023 Defense Advanced Research Projects Agency		Date: April 2022
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602702E / *TACTICAL TECHNOLOGY*	**Project (Number/Name)** TT-13 / *INFORMATION ANALYTICS TECHNOLOGY*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A