Exhibit R-2, RDT&E Budget Item Justification: FY 2018 Office of the Secretary Of Defense	Date: May 2017
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603648D8Z / *Joint Capability Technology Demonstration (JCTD)*

COST ($ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
Total Program Element	600.675	130.829	148.184	105.871	-	105.871	106.798	108.283	113.167	115.756	Continuing	Continuing
P648: *Joint Capability Technology Demonstration (JCTD)*	600.675	130.829	148.184	105.871	-	105.871	106.798	108.283	113.167	115.756	Continuing	Continuing

Note

The Joint Capability Technology Demonstration (JCTD) program supports the identification, development, and demonstration of game-changing technologies to satisfy Multi-Service and Combatant Commands (CCMDs) priorities. The JCTD program engages the interagency, international, and non-governmental partners to expand the Department of Defense's (DoD) access to innovation. It serves as the vehicle for CCMDs and Services to address strategic priority areas that present significant risk and suffer from inadequate investment as identified by the Chairman's Gap Assessment, Services science and technology roadmaps and other senior level guidance.

JCTD projects are executed in the following focus areas: electromagnetic spectrum maneuver; space capability resilience; autonomous systems; intelligence, surveillance and reconnaissance, asymmetric force application and information operations and analytics. The objective is to maintain U.S. technological superiority across the range of military operations. The JCTD program achieves this objective by reducing the cost of operations, and allowing for the rapid insertion of new capabilities within two to four years.

A. Mission Description and Budget Item Justification

JCTD funding is used to address near and mid-term CCMD and Joint Forces capability gaps. It provides a mechanism for DoD-wide prototyping and demonstration of game-changing technologies in operationally relevant environments. In FY 2016, the JCTD Program successfully completed the military utility assessment and transition of several JCTD prototypes that fielded affordable and sustainable solutions to meet immediate operational needs.

Key values demonstrated by the JCTD program are:

• Create a bridge from science and technology to operational use and formal acquisition.

• Accelerate fielding of decisive technical capabilities while mitigating operational risk to the warfighter.

• Leverage open architectures to enhance interoperability and promote affordability.

• The JCTD program delivers capabilities far quicker than the traditional DoD planning, programming, budgeting, and execution (PPBE) process. Recent examples include:

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1. The Advanced Weapons Enhanced by Submarine Unmanned Aerial Vehicles (UAV) against Mobile Targets (AWESUM) JCTD. The AWESUM JCTD developed a three inch diameter unmanned aerial system (UAS). The UAS is deployed from submarine countermeasure launchers. UAS control and sensor feeds are fully integrated into the submarine combat control system enabling rapid development of fire control solutions for torpedo and third party targeting, and battle damage assessment following engagements. AWESUM transitioned to U.S. Navy submarines in 2016.

2. In support of the Army Robotic Systems Joint Program Office, the Autonomous Mobility Applique Systems (AMAS) JCTD successfully developed, demonstrated and transitioned autonomous capabilities to the U.S. Army Route Clearance and Integration System Program of Record (PoR) that will be incorporated into existing Tactical Wheeled Vehicle (TWV) program of record. AMAS has completely changed the Army's future ground robotics plans and requirements and will have a lasting impact on future ground autonomous programs through the application of lessons learned and capability from the AMAS JCTD.

3. The High Speed Container Delivery System (HSCDS) JCTD developed a parachute system to offload up to eight container delivery system bundles at an elevation of 250 feet and 250 knots from C-130J and C-17 aircraft. This has significantly improved the accuracy of existing delivery systems while providing increased safety for the aircraft and friendly ground forces. HSCDS transitioned to the Army's Product Manager for Force Sustainment Systems, has been extensively used in Afghanistan and used to deliver humanitarian assistance to Yazidi people on Mount Sinjar, Iraq.

MEASURABLE OUTCOMES:

• JCTDs will demonstrate capability objectives within two to four years.
• The JCTD program will continue to achieve high transition rates. In FY 2016, 88 percent of completed JCTDs successfully transitioned. Seven of sixteen completed JCTDs transitioned to a new or existing Program(s) of Record. Seven transitioned to fieldable-prototypes (residual capabilities) sustained by non-JCTD funds in direct support of operations in theater. Two were returned to the technology base for further analysis and/or future use.

B. Program Change Summary ($ in Millions)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Previous President's Budget	132.258	148.184	115.975	-	115.975
Current President's Budget	130.829	148.184	105.871	-	105.871
Total Adjustments	-1.429	0.000	-10.104	-	-10.104
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	2.000	-			
• SBIR/STTR Transfer	-3.429	-			
• India Science & Technology baseline	-	-	-10.000	-	-10.000
• Baseline adjustment for higher priorities and requirements	-	-	-0.104	-	-0.104

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Change Summary Explanation

The FY 2016 $2.000 million reprogramming entry is the net of -$2.000 million to resource AT&L priority projects and a $4.000 million reprogramming to remunerate JCTD for funds extended to Emerging Capabilities Technology Development (Program Element 0603699D8Z) during 2016 for the Missile Defeat Project.

The decrease in the funding profile from FY 2017 to FY 2018 is due to a one-time funding increase to FY 2017 to support CCMD prototyping activities as well as FY 2018 base adjustments.

The FY 2018 base adjustment reflects a -$10.000 million India Science & Technology baseline transfer to Emerging Capabilities Technology Development (Program Element 0603699D8Z) to enable proper alignment and execution of the effort, and a -$0.104 million base adjustment for higher DoD priorities.

Exhibit R-2A, RDT&E Project Justification: FY 2018 Office of the Secretary Of Defense											Date: May 2017	
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
Title: Joint Multi-Platform Advanced Combat Identification (JMAC)	0.500	-	-
Description: JMAC will provide government-owned software that can be integrated into any sensor or Command and Control (C2) system to provide real-time identification of air threats, including Unmanned Aerial Systems (UAS), cruise missiles, rotary wing, military jets, and general aviation. The Department of Homeland Security also contributed funding to the JMAC JCTD. JMAC will be integrated into the National Capitol Region-Integrated Air Defense System (NCR-IADS) via upgrades to the improved-sentinel radar, the Next Generation Fire Control Radar, the NCR-IADS network, and the Joint Air Defense Operations Center (JADOC).			
FY 2016 Accomplishments: JMAC refined messaging architecture; developed stop, stare, and track mode interface; continued algorithm refinement and integrated sidecar processors. Integrated the Enhanced Regional Situation Awareness (ERSA) sensor to address the counter-unmanned air systems problem in the National Capitol Region. Conducted Field Demo two and three. Developed system integration and assessment plans. Refined concept of employment and tactics, techniques, and procedures. Fully demonstrated an improved combat identification capability by use of electronic identification (EID) in order to provide decision-makers with			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
an EID of either specific aircraft type or general classification of the airborne object. Transitioned JMAC within the NCR-IADS existing architecture as necessary to interrogate specific tracks of interest and to transmit those EID messages to the users. Updated NCR-IADS concept of employment and air defense systems tactics, techniques and procedures to employ EID capabilities.			
Title: Low Cost Attritable Strike Demonstration (LCASD) ***Description:*** LCASD will develop and demonstrate technologies that enable rapid design, manufacturing, test and deployment of very low cost (essentially expendable) airframes. The strategic objective is to challenge the cost paradigm associated with current airframe manufacturing. LCASD will conclude with a demonstration of an aircraft capable of 1000 nautical mile flight range and costing less than $3.000 million. This will be realized through a number of innovative prototyping and experimentation approaches that include new manufacturing technologies, very low cost life cycle control measures in the airframe design (i.e. reliability as needed, modeling and simulation for advance performance testing, etc.). The effort will also include use of engineered resilient systems (ERS) technology to develop fixed-wing trade space analysis tools to allow for rapid optimization and manufacturing of future systems. ***FY 2016 Accomplishments:*** Demonstrated suitable manufacturing techniques to control production and life cycle costs, developed and demonstrated ERS system to inform trade space of airframe design choices, prototyped initial airframe subsystems and tested for reliability. Prototyped final airframe and integration subsystem components to ready for flight demonstration. Conducted initial flight demonstration, validated ERS design trade space analysis tool. Conducted final flight demonstration. The proof of principle LCASD demonstration will drive future spirals of the Air Force low cost attritable airframe technology initiative and transition strategy. Other funding contributors to this program include Air Force Research Laboratory and Industry.	6.300	-	-
Title: Low Cost Cruise Missile (LCCM) ***Description:*** LCCM provides a decentralized autonomy capability for low-cost, conventional air-launched cruise missiles that will enable joint access and maneuver in the global commons. It will be capable of conducting networked integrated attacks, in-flight dynamic retargeting/reallocation and synchronized cooperative/saturation attacks. Flight demonstrations will be conducted using surrogate weapon platforms and will provide residual leave-behind payloads for transition to a full weapon system development program. Additional resources are provided by the United States Air Force Research Laboratory and the Office of Naval Research. ***FY 2016 Accomplishments:*** Project initiated in Q4 FY 2016. The integrated management team (IMT) drafted key program documentation to guide execution. IMT conducted initial critical subsystems integration design for the autonomous multi-mission air vehicles. Office of Naval	5.000	5.000	5.000

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
Research worked with partner organizations to help reduce per unit costs of the autonomous platform. Team identified communications systems and standards used currently across the Department of Defense for airborne systems to determine the best option for LCCM. ***FY 2017 Plans:*** Conduct autonomous vehicle selection to include key subsystems needed for autonomous operations and contract production of initial group of vehicles. Develop the autonomy module's ability to sense the environment and execute counter measures based on Commander's intent type instructions or rules of engagement. Complete required program management documentation and planning for the Operational Utility Assessment. Coordinate IMT activities for initial delivery of six inch diameter vehicles in early FY 2018. ***FY 2018 Plans:*** Conduct surrogate weapon operational demonstrations of ingress formations. Pending successful demonstrations, LCCM will provide residual leave-behind payloads for transition to a full weapon system development program.			
Title: Low Cost Missile Defeat (LCMD)	18.124	50.000	-
Description: Low Cost Missile Defeat (LCMD) is a ballistic missile defense system designed to counter current and emerging weapons of mass destruction (WMD) and anti-access/area denial (A2/AD) threats. LCMD program execution has been structured using a building block approach; the FY 2015 step was a technology demonstration effort under the Deputy Assistant Secretary of Defense, Emerging Capability & Prototyping (DASD (EC&P)) to accelerate technology maturation. The concept of operations (CONOPS) for the system has been formulated to integrate LCMD into the existing National Ballistic Missile Defense (BMD) architecture and will prioritize the use of existing components and systems already fielded. LCMD is not designed as a replacement to existing BMD systems, but rather as a lower cost complementary/augmentative component to forward-deployed BMD assets. The LCMD capability will augment current BMD systems and mitigate threat vulnerabilities to U.S. personnel and strategic assets. ***FY 2016 Accomplishments:*** Successfully completed a system requirements review to further develop the concept. Successfully completed phase I design maturation and CONOPS development. Bench tested the attitude control system. Fabricated a bench top seeker optical train and cooling system. Designed the rocket motor and evaluated propellants. Completed systems requirements review. ***FY 2017 Plans:*** Five million dollars will be allocated to support LCMD input into an Analysis of Alternatives (AoA) study for the BMD low cost interceptor and data archiving to provide the DoD the intellectual property and knowledge base through completion of the LCMD system requirements review. The balance of FY 2017 funds are being held pending completion of the AoA. Future LCMD			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
development will be informed by the results of the AoA with funding for development in the out years coming from the JCTD Concept Development / Pre-EMD Prototypes.			
Title: Low Power Module (LPM) ***Description:*** Emerging Capability & Prototyping is combining efforts with Navy in developing a low-power modular counter-electro-optical-infra-red (C/EO-IR) sensor capability to counter intelligence, reconnaissance, surveillance and targeting (ISRT) systems. Details are classified. ***FY 2016 Accomplishments:*** Conducted effects testing and operational plan (OPLAN) analyses. Details are classified.	1.100	-	-
Title: Military Application of the Space Environment (MASE) ***Description:*** The MASE prototype demonstrates mature space environment technology to improve combat operations. The prototype will provide weapons system specific visualizations that will be integrated into operational plans and tactics, techniques, and procedures as decision aids to assess their utility for mission operations. Products will be evaluated using quantitative standard measures of performance, effectiveness, and outcome against theater operational requirements. A leave behind capability will provide residual capability at the conclusion of the prototype demonstration while a program of record is established. ***FY 2016 Accomplishments:*** Conducted end-to-end system/mission engineering to include sensor-to-shooter data flow/work flow, component technologies (model, applications and system effects), interfaces, and data exchanges. Generated user friendly mission planning tools with multiple effects and vetted graphical product suite, sensor laydown and types of data. Successfully completed a military utility assessment which directly contributed to the concept of operations development for the JCTD. ***FY 2017 Plans:*** Complete the final operational utility assessment. Finish end-to-end system/mission engineering and development of mission planning tool. Conduct final demonstration. Transition to Air Force Space Command for an extensive period of testing. Once the operational user requirement is tested and well understood, it will transition to combat air forces in Pacific Command. Complete the JCTD.	2.634	3.086	-
Title: Port Improvement via Exigent Repair (PIER) ***Description:*** PIER will deliver a dynamic, agile, cost effective (non-military construction) expeditionary engineering solution to rapidly repair damaged or degraded ports to a minimum level of serviceability after an attack or natural disaster. Agility is achieved through a smaller footprint, commercial off-the-shelf infusion, and quick reaction of theater-based repair assets (e.g. pre-packaged, pre-positioned). The intent of PIER is to assure continued logistics resiliency and freedom for our U.S. Forces to	2.368	2.608	2.104

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
maneuver and conduct agile strategic sealift and logistics. PIER will allow the Department to address the doctrine, organization, training, materiel, leadership, personnel, facility, and policy (DOTMLPF+P) concerns about its ability to conduct rapid port damage repair. The plan is to transition to the U.S. Army, U.S. Navy and the Defense Logistics Agency. ***FY 2016 Accomplishments:*** Designed and validated substructure technologies: pile capacity upgrade, pile bracing, pile cap repair, beam replacement, beam and cap upgrade. Conducted the first technical demonstration to prove the efficacy of multiple pile jacketing technologies for repairing damaged pier piles and to select the best technology for an operational utility assessment. These technologies allow for secondary components to strengthen the superstructure of the ports. The plan is to transition to the U.S. Army, U.S. Navy and the Defense Logistics Agency. ***FY 2017 Plans:*** Conduct the first limited operational utility assessment on the substructure technologies. Design and validate the superstructure technologies to repair deck craters and holes and over-bridging of gaps using the pier over-decking system. Conduct second technical demonstration. ***FY 2018 Plans:*** Design and validate the mooring and fender systems with an emphasis on assuring the structural integrity of elements required for safe operations. Conduct the final technical demonstration and operational utility assessment. Transition components to U.S. Army, U.S. Navy and Defense Logistics Agency.			
Title: Small Satellite Communications Network (SSCN) ***Description:*** SSCN provides an adaptive, self-healing, full-mesh network for assured communications, using a proliferated constellation of low-earth orbit satellites and advanced software defined radios. Details are classified. ***FY 2016 Accomplishments:*** Source selection was accomplished. Completed preliminary design review. Began the engineering, manufacturing and development phase (EMD). ***FY 2017 Plans:*** Finish EMD, begin laboratory testing of selected designs and anechoic chamber tests. Coordinate with launch share partner to ensure payload tests are conducted, evaluated and deficiencies resolved well in advance of launch date. Conduct on-orbit test with single design and final demonstration. The classified user will continue to use the system until it is no longer functional to explore large small satellites constellations for utility, resilience, reconstitution and technology adaptation. Complete the JCTD.	14.000	6.000	-
Title: Salty Siren	1.000	-	-

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
Description: Salty Siren will develop an indications and warning capability for countering anti-access/area-denial (A2/AD) missions. Details are classified. ***FY 2016 Accomplishments:*** Operationalized the field unit and conduced end-to-end acceptance testing. Transitioned to a classified user. Details are classified.			
Title: Ravenscraig ***Description:*** Ravenscraig will provide technical and operational characterization and countermeasures for a class of threat signals. Details are classified. ***FY 2016 Accomplishments:*** Continued development and demonstration. Conducted phase III component testing. Details are classified. ***FY 2017 Plans:*** Additional enhancements, features and capabilities for experimentation/demonstration. Complete the JCTD and transition to multiple classified users. Details are classified.	15.000	3.000	-
Title: Wasabi ***Description:*** Wasabi will produce a real-time common operational picture of adversary missile and space activity. Details are classified. ***FY 2016 Accomplishments:*** Implemented rule sets to enable collaboration with coalition partners. Details are classified.	4.000	-	-
Title: Combatant Commander (CCMD) Support, Transition Enabling and Strategic Project Operational Management ***Description:*** This effort is comprised of three programs that support the entire JCTD Program, separate from the specific JCTD projects. The three programs are (1) Unified CCMD Direct Support, (2) JCTD Pre-Transition and (3) Program Integration Office for execution of select, classified projects. (1) CCMD Direct Support: The CCMDs are essential in specifying capability needs, project development, demonstration, military utility assessment, and transition of JCTDs. The JCTD Program provides direct support to CCMDs enabling the CCMDs to provide an on-site JCTD operational manager. (2) JCTD Pre-Transition: In some cases, Service or Agency partner transition funding is not available for one to two years following the JCTD assessment phase due to Service or Agency commitments. In such cases, where there is a clear transition and the need to sustain the capability for a short time prior to availability of Service or Agency transition funds, the JCTD Pre-Transition fund may be used to meet that need. (3) Program Integration Office: Executes a select number of classified projects in areas such as electronic miniaturization,	22.421	23.000	19.896

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
electronic countermeasures, advanced mobile ad hoc network communications, space situational awareness (SSA) intelligence surveillance and reconnaissance (ISR), sensor platforms and communications, and persistence surveillance. ***FY 2016 Accomplishments:*** Provided each of the CCMDs a JCTD liaison officer to enable CCMD staff participation in developing and executing Pre-Engineering and Manufacturing Development (Pre-EMD) prototypes while addressing the strategic priorities of the Department. Sustained selected projects until program of record funds are received. CCMD liaisons provided direct support and coordination for JCTD operational demonstrations and military utility assessments. Provided staffing support to the Program Integration Office. Developed and executed projects selected as a result of the technology assessment panels. Executed five classified projects. ***FY 2017 Plans:*** Continue to provide CCMD direct participation to enable CCMD staff participation in developing and executing Pre-EMD prototypes. Develop and execute projects selected as a result of the Technology Assessment Panels. Sustain selected projects until program of record funds are received. Execute a limited number of classified projects' military utility assessments. ***FY 2018 Plans:*** Continue to provide CCMD direct participation to enable CCMD staff participation in developing and executing Pre-EMD prototypes. Develop and execute projects selected as a result of the Technology Assessment Panels. Sustain selected projects until PoR funds are received. Execute a limited number of classified projects' military utility assessments.			
Title: JCTD Concept Development/Pre-Engineering and Manufacturing Development (Pre-EMD) Prototypes	6.890	25.680	62.901
Description: The JCTD program will develop projects as Pre-EMD prototypes to address broader Defense strategic initiatives in areas such as electromagnetic spectrum agility; space capability; autonomy systems and multi-domain technologies; countering weapons of mass destruction; and force application. Selected projects will leverage networks within the global research and engineering enterprise to include government labs and integration facilities, depots, academia, as well as traditional and non-traditional providers. Prototypes will utilize best practices to satisfy joint and cross-cutting needs and the Emerging Capability and Prototyping Office will work with the Services to identify means to streamline prototype transition into the acquisition systems where appropriate. ***FY 2016 Accomplishments:*** Conducted advanced prototyping activities focusing on Asymmetric Force Application, Space Capability Resilience, Electromagnetic Spectrum Agility, and Autonomous Systems. ***FY 2017 Plans:*** Conduct advanced prototyping activities focusing on: information operations and analytics, asymmetric force applications, autonomy and electromagnetic spectrum agility. Specific activities may include continued integration, subsystem and system level			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
demonstrations and assessments for multi-vehicle expendable platform/expendable payload concepts working collaboratively to deliver reconfigurable effects using non-traditional delivery methods, deployment of hybrid radio frequency-optical tactical communications and protected communications for small unmanned systems, automated and integrated space manufacturing capabilities, reconfigurable self-forming and self-healing space based communication networks, machine cognition to aid human task loading to deploy multiple platforms, sensors, and weapons in complex mission scenarios. ***FY 2018 Plans:*** Continue to conduct advanced prototyping activities in the following four (4) focus areas: - Asymmetric Force Application - The use of nontraditional technologies and symmetric approaches to provide a clear military advantage in protection, maneuver, and engagement. - Electromagnetic Spectrum Maneuver - The use of technologies to maneuver freely in the electromagnetic spectrum for offensive and defensive operations across multiple domains, e.g. air, maritime, land, space, and cyber. - Information Operations & Analytics - Efficiently and accurately exploit information collection and analytics technologies for seamless Processing, Exploitation, and Dissemination of all-source data and information as well as multi-domain Command and Control across Services, Combatant Commands, and Partner Forces. - Intelligence, Surveillance, and Reconnaissance (ISR) and Counter-ISR - Enhance the effectiveness of strategic integration of ISR capabilities as a force multiplier to provide decision makers with fused, actionable data and intelligence, and to deny the adversary ISR capability.			
Title: Enabling Technologies (ET) ***Description:*** The ET funds are used to assess or mature emerging capabilities that support the initiation of a Pre-Engineering and Manufacturing Development (Pre-EMD) prototype. Emerging Technology investments are small, short (less than one year) efforts that may lead to a prototype, depending on the final assessment and determination of technical maturity. ***FY 2016 Accomplishments:*** -Developed Autonomous Mission Package Planning and Execution (AMPPE): a risk reduction bench-top prototype of unmanned aerial systems that can autonomously perform Intelligence, Surveillance & Reconnaissance (ISR) and communications operations that responsively find and track moving high value targets while updating manned strike/Command and Control platforms operating out of threat range. - Conducted a high energy laser risk reduction study. - Conducted a space resilience study of developing a tactical over-the-horizon radar system. - Developed reconfigurable unmanned aircraft system (RUAS). A Government-owned canister-launched UAS prototype, with small airframe design (2.75 inch diameter with 19 inch and 23 inch lengths), to serve as a vehicle for integration with various	2.268	8.000	8.000

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
payloads, maximum loitering between 60-90 minutes, and the ability to cruise at 50-60 knots, with an objective dash speed greater than 80 knots. ***FY 2017 Plans:*** Projects will continue to be used to assess or mature emerging capabilities that support the initiation of a Pre-Engineering and Manufacturing Development Prototypes. Selected efforts will be small, focused, and executable in less than one year and require a concrete deliverable prototype hardware and/or software, integrated subsystem or technology assessment report. ETs will be derived from the Emerging Capability and Prototyping Technical Assessment Panels. ***FY 2018 Plans:*** Projects will continue to be used to assess or mature emerging capabilities that support the initiation of a Pre-Engineering and Manufacturing Development Prototypes. Selected efforts will be small, focused, and executable in less than one year and require a concrete deliverable prototype hardware and/or software, integrated subsystem or technology assessment report, etc. ETs will be derived from the Emerging Capability and Prototyping Technical Assessment Panels.			
Title: Assured Command and Control using Emerging Nanosat Technology (ACCENT) ***Description:*** ACCENT places an adaptive filter algorithm into a nano-satellite receiver to mitigate radio frequency interference. This project's emphasis is to rapidly integrate the filter into a number of radios with an optional path to test in space using existing nano-satellite radios. ACCENT receives partner funds from the Office of Naval Research. ***FY 2016 Accomplishments:*** Selected and established the program's integration and management team (IMT). Produced and coordinated the program plan. Modeled and simulated the impact of the adaptive-filter into nano-satellite radios (laboratory tested). Began testing the radios in a laboratory environment. ***FY 2017 Plans:*** Receive and review modeling and simulation and technical demonstrations reports. Integrate designs for two different nano-satellites radios (Ultra High Frequency and S-Band). Produce framework to allow quick integration of filter into additional radios. Provide follow-up laboratory test results. ***FY 2018 Plans:*** Optimize adaptive algorithm and radios as needed to meet on-orbit performance goals. Incorporate and integrate adaptive algorithm and radio modification to improve performance. Test filter-algorithm in space with Prometheus Block 2. Produce on-orbit test results and military utility assessment reports. Plan to transition to Navy program executive office for space systems science and technology. Special Operations Command will upload the filter onto existing Prometheus satellites.	1.250	0.850	0.400
Title: Caribbean Collaborative Environment (CCE)	9.000	-	-

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
Description: The CCE project will develop and demonstrate a decision support system architecture to counter drug trafficking and national security concerns across the Caribbean. System will fuse multi-intelligence maritime and airborne data with big data analytics and visualization tools on an enterprise platform and provide an up-domain capability to higher classification levels. This will provide seamless actionable, sensitive but unclassified intelligence and warning information to the intelligence community, DoD, law enforcement and partner nations to allow timely command and control. ***FY 2016 Accomplishments:*** Developed a scalable prototype system on a laboratory test bed capable of ingesting multiple intelligence data sets, fusing it, and producing visualization tools that provide actionable information at the tactical edge. Demonstrated a decision support system that integrates data from remote sensing assets in an operationally relevant environment with an ability to share data and visualization tools among joint, interagency and partner nations. Began transition to U.S. Navy and U.S. Coast Guard.			
Title: High-altitude Attritable Link Offset (HALO) ***Description:*** HALO uses high altitude, low-cost balloons as communication relays in denied environments. It accomplished this by using the ultra-high frequency (UHF) spectrum and techniques that allow non-attribution to its source. The advanced technology resides at the user terminals on the ground, which receive data from the balloon-platforms, and subsequently perform the processing and communication receiver function that allows effective two-way communication in a contested environment. HALO receives partner funds from U.S. Air Force Air Combat Command and U.S. Air Force Life Cycle Management Center. ***FY 2016 Accomplishments:*** Developed hardware and software designs and initial algorithms using mathematical analysis and laboratory emulation to minimize technical risks. Performed initial laboratory demonstration of the beam forming capability. ***FY 2017 Plans:*** Create and refine adaptive beam forming algorithm capable of handling doppler spread, delay spread, gain control, phase noise and computational complexity. Conduct flight demonstration in a non-contested environment. ***FY 2018 Plans:*** Select and size a representative operational area and infuse environmental factors to perform extended testing and a military utility assessment. Complete the Concept of Operations. Successfully conduct a flight demonstration in a contested environment. Transition to U.S. Air Force and U.S. Navy program offices for production acquisition contracts.	2.370	4.910	4.340
Title: Jacob's Ladder ***Description:*** Jacob's Ladder uses emerging advanced electronics to allow the use of dedicated intelligence assets to provide tactically actionable targeting data to warfighters on a responsive and persistent timeline. This will significantly improve reaction	5.920	4.660	2.200

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
times and provide greatly enhanced targeting information for warfighters. Jacob's Ladder receives partner funds from the Assistant Secretary of the Army, Acquisition Logistics Technology. ***FY 2016 Accomplishments:*** Selected and established program's integration and management team (IMT). Produced and coordinated program plan. Received and approved system requirements document (SRD), preliminary engineering design and preliminary design review (PDR) data package. ***FY 2017 Plans:*** Receive and approve critical design review (CDR) data package for three flight units, one engineering development unit, one flight qualification unit and three ground stations. Assemble, integrate and test flight units and ground stations. ***FY 2018 Plans:*** Complete integration, conduct mission readiness review, deliver flight units and conduct performance checkout testing. Conduct joint military utilization assessment (JMUA) and deliver report; retain residual capability and document Lessons Learned. Pending a successful JMUA, Jacob's Ladder will be submitted into the Joint Capabilities Integration and Development System acquisition process.			
Title: India Science and Technology Focus Area ***Description:*** The India Science and Technology (S&T) Focus Area is a Secretary of Defense directed project designed to deepen and streamline defense cooperation between the U.S. and India. By sharing research resources, capabilities, and expertise, the United States and India can jointly develop technological innovations needed to enable our defense industrial bases to support our militaries now and in the future. Further, development of vibrant S&T cooperation is a key step in building an enduring partnership. ***FY 2017 Plans:*** Continue to develop and execute cooperative S&T projects initiated in FY 2015 and FY 2016. Additional cooperative S&T areas targeted include: munitions development, advanced manufacturing, micro-power grids, and other identified project areas. In FY 2018, the India Science and Technology Focus project and related funding will be transferred to Emerging Capabilities Technology Development (Program Element 0603699D8Z) to enable proper alignment and execution of the allocated funds.	-	10.000	-
Title: Atmospheric Propagation of High Energy Lasers (APHL) ***Description:*** APHL is a joint U.S. - India JCTD that will develop new atmospheric propagation models and compensation techniques to maximize high energy laser propagation in urban atmospheric conditions. It will characterize the atmosphere in five categories: aerosol scattering, molecular absorption, thermal blooming, deep turbulence and refraction. These characteristics	3.150	0.260	-

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
of the atmosphere are very important in urban environments due to the effects they will have on laser propagation and power on target for military applications. The U.S. Navy is also contributing funds to support APHL activities. ***FY 2016 Accomplishments:*** Created atmospheric propagation of extinction coefficients and turbulence in urban environments. Characterized aerosols through environmental measurements using extinction imagers and other meteorological instruments and developed a database that will be used in creating propagation models of the environment. ***FY 2017 Plans:*** Validate propagation models by performing outdoor laser propagation experiments by measuring laser characteristics such as laser wave front, turbulence, thermal blooming and power in the bucket. Experiments will be conducted through non-invasive technology (i.e. cameras and algorithms to determine the levels of energy propagated through urban environments at different distances). Develop and validate the atmospheric compensation models for beam control technology to maximize laser propagation in urban environments. Complete the JCTD and transition data, models, and database to the DoD High Energy Laser-Joint Technology Office and the India Defence Research Development Organisation.			
Title: Experimental and Computational Studies of Blast and Blunt Traumatic Brain Injury ***Description:*** This project is a joint U.S. - India JCTD that will yield a mechanistic understanding of blast and blunt related mild traumatic brain injury (TBI) that will serve as the basis for developing effective personal protective equipment designed to prevent or mitigate TBI; tools for rapidly screening and diagnosing service members involved in potentially concussive events; and effective therapies for treating and rehabilitating service members with blast and blunt related TBI. In addition, the project will enhance the DoD's ability to use advanced imaging tools and techniques for both diagnostics and prognostics. ***FY 2016 Accomplishments:*** Developed, validated, and cross-validated computational models for blast injury for TBI using imaging techniques and histological procedures, and assessed changes in behavior and cognition. Developed anatomically accurate head and brain models for blast and brain injuries from clinical and experimental data. Developed a master dose response curve using a field-validated blast injury rat model. Compared the blunt and blast data and developed a scaling ratio for use among the various models. Conducted experiments and tests in U.S. DoD laboratories. Completed the JCTD and transitioned data and models to the U.S. Army for designing personal protection devices and for use in theatre and in military health system clinical practices and the India Defence Research Development Organisation.	1.904	-	-
Title: Small Intelligent Autonomous System for Situational Awareness	1.500	-	-

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
Description: This project is a joint U.S. - India JCTD that will enable warfighters to obtain critical real-time situational awareness information in tactical situations and provide the capability to conduct manned and unmanned reconnaissance and surveillance operations. ***FY 2016 Accomplishments:*** Developed and tested platform agnostic algorithms that provided real-time automated image and video processing on small autonomous unmanned air systems. Developed and tested situational awareness algorithms that can detect objects and events, recognize surroundings, and perform three dimensional reconstructions. Conducted a final test and demonstration in multiple scenarios (i.e. flying in and out of buildings and through terrains with varying degrees of vegetation and urbanization). Completed the JCTD and transitioned deliverables to the U.S. Army Program Executive Office for Intelligence, Electronic Warfare and Sensors and the India Defence Research Development Organisation.			
Title: Improving Cognitive Models and Artificial Cognition ***Description:*** This project is a joint U.S. - India JCTD that will create architectures and modules that monitor and predict fatigue, provide new interaction capabilities, and allow autonomous systems to learn through interactive tasks. The overall architecture, which will use a combination of adaptive control of thought—rational and logic architecture will be demonstrated on two separate tasks: finding people and finding objects. The goal is to build the basic level architecture to learn how to find people and objects by improving embodied cognition, human robot interaction, and interactive task learning. ***FY 2016 Accomplishments:*** Developed embodied cognition models (i.e. fatigue and emotions). Tested these models in a simulated environment at the U.S. Navy Laboratory for Autonomous Systems Research. Integrated human level interaction (i.e. vision, gesture, and touch) into cognitive architectures. ***FY 2017 Plans:*** Create task learning modules and teach the system how to look for people and objects with task learning modules. Create a computational system based on logic architecture. Develop mechanisms reflecting degradation in perceptual and motor deficits associated with the vigilance decrement. ***FY 2018 Plans:*** Integrate adaptive control of thought—rational embodied and logic architecture. Conduct final tests. Complete the JCTD and transition to the U.S. Marine Corps Warfighting Lab for integration into future marine urban operations, the U.S. Navy Explosive Ordnance Disposal Technology Division for use in explosive ordnance disposal, the U.S. Special Operations Command for use in finding people and the U.S. Border Patrol and the India Defence Research Development Organisation.	1.130	1.130	1.030
Title: Cognitive Tools for Target Detection System	3.000	-	-

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
Description: This project is a joint U.S. - India JCTD that will improve human analyst target detection performance through computer vision algorithms for target detection, human computer interaction, and cognitive enhancement. ***FY 2016 Accomplishments:*** Developed visual media reasoning system for target detection of streaming or live video. Developed aerial target detection to apply to other domains such as un-manned aerial vehicle and security surveillance. Developed and tested prototypes of more efficient user interfaces and information visualizations to augment target and pattern detection. Developed multi-sensory interfaces to enable direct and natural manipulation of images, video, and information. Used transcranial electrical stimulation to enhance the cognitive capabilities and attentional skills of the analyst. Trained intelligence analysts and conducted experiments. Completed the JCTD and transitioned to the U.S. National Geospatial Intelligence Agency, the U.S. Army Intelligence and Security Command and the India Defence Research Development Organisation.			
Accomplishments/Planned Programs Subtotals	130.829	148.184	105.871

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Successful JCTDs can transition to acquisition via one of several methods:
- The JCTD addresses a documented capability gap in an existing program of record (PoR). The existing PoR can acquire, further develop, sustain, and provide the capability under existing program documentation.
- The capabilities address capability gaps that naturally fit with an existing PoR, but program documentation addressing the new capabilities does not exist. In these cases, existing PoR documentation (such as the Capabilities Development Document or Capabilities Production Document) is revised to include the new capabilities from the JCTD, and the JCTD capabilities transition to the PoR.
- The capabilities address a current operational need without requiring PoR changes. In these cases, the JCTD capabilities may transition directly to operational use, with sustainment (operations and maintenance) funding arranged through the gaining command.
- The capabilities may be widely applicable commodity products, useful to many commands. In these cases, the commodity products listed on General Services Administration schedule, and made available for purchase by any commands needing the capability, using procurement funds.
- Results of JCTD can be used to inform the research and engineering, acquisition, or requirements process.

E. Performance Metrics

Strategic Goals Supported:
- Develop and demonstrate a prototype that fills a Joint capability gap

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- Demonstrate a capability to address a DoD key strategic gap
- Develop a prototype that informs the acquisition and requirements process
- Independent Assessment Capability
- Successful military utility assessment (MUA)

MEASURABLE OUTCOMES:

• JCTDs will demonstrate capability objectives within 24-48 months:

• The JCTD program will continue to achieve high transition rates. In FY 2016, 88 percent of completed JCTDs successfully transitioned. Seven of sixteen completed JCTDs transitioned to a new or existing Program(s) of Record. Seven transitioned to fieldable-prototypes (residual capabilities) sustained by non-JCTD funds in direct support of operations in theater. Two were returned to the technology base for further analysis and/or future use.