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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603133D8Z / <i>Foreign Comparative Testing</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	64.500	21.715	24.277	24.970	-	24.970	25.416	25.909	26.406	26.966	Continuing	Continuing
313: <i>Foreign Comparative Testing</i>	64.500	21.715	24.277	24.970	-	24.970	25.416	25.909	26.406	26.966	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Foreign Comparative Testing (FCT) Program increases Joint Force readiness and lethality by providing near-term solutions to existing and future Department of Defense (DoD) capability gaps by leveraging the Research & Development (R&D) investments of allied nations and coalition partners. The Foreign Comparative Testing (FCT) Program Element (PE) evaluates prototypes derived from allied and partner nation technologies to provide the U.S. Armed Services, U.S. Special Operations Command (USSOCOM), and Defense agencies capabilities to counter emerging threats. FCT's broad reach across our allies and friendly foreign countries enables development of innovative, cost effective, and interoperable solutions to meet needs communicated by the Joint Chiefs of Staff and the Combatant Commanders. FCT projects are jointly conducted with the Military Services and USSOCOM. FCT strengthens alliances by facilitating international collaboration and evaluating technologies that increase interoperability while serving as a catalyst for teaming and other business relationships between international and domestic industries. Partner nations recognize the long-term value of the "two-way street" for Defense procurements FCT provides. Numerous successful projects have resulted in the licensed production of a qualified foreign item in the United States, including the creation of jobs and contributions to local economies. To date, companies from 34 states have benefited from FCT projects. FCT supports DoD best practices by incentivizing the use of prototyping and experimentation in advancing technological solutions to warfighter problems and acts as a hedge against threat developments. FCT enhances affordability by reducing development costs and risk, accelerating acquisition timelines, and increasing competition. Through increasing Joint lethality and readiness, strengthening alliances, and delivering affordable performance on accelerated timelines, FCT supports all three lines of effort outlined in the 2018 National Defense Strategy. FCT supports the FY2020 Administration R&D Budget Priority of Partnering with Industry by enabling rapid fielding of innovative technologies from the private sector that are easily adaptable to DoD needs. Authorized by Title 10, U.S. Code, Section 2350a (g), the FCT program is managed by the Office of the Under Secretary of Defense for Research and Engineering (OUSD R&E), Comparative Technology Office (CTO).

Measurable Outcomes:

- FCT projects will demonstrate capability objectives within 24-36 months.
- Over its 39 year history, FCT has a transition rate of 58% percent (355 out of 610) for completed projects. Of the 355 projects that tested successful, 278 (78%) resulted in follow on procurements of over \$11.000 billion.

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B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	24.199	24.532	25.041	-	25.041
Current President's Budget	21.715	24.277	24.970	-	24.970
Total Adjustments	-2.484	-0.255	-0.071	-	-0.071
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.441	-			
• Congressional Reduction	-2.000	-0.200	-	-	-
• FFRDC Reduction	-0.043	-0.055	-	-	-
• Other Program Adjustments	-	-	-0.071	-	-0.071

Change Summary Explanation

Congressional reductions were the result of directed efficiencies

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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
313: <i>Foreign Comparative Testing</i>	64.500	21.715	24.277	24.970	-	24.970	25.416	25.909	26.406	26.966	Continuing	Continuing

A. Mission Description and Budget Item Justification

The FCT Program Element funding supports projects that evaluate pre-Engineering and Manufacturing Development (pre-EMD) and proof of principle prototypes derived from innovative allied nation developed technologies to counter emerging threats. Individual projects typically average less than \$1.200 million each and complete within 24-36 months. Projects are proposed by the Military Services and SOCOM and are selected using a merit-based process that identifies the most promising, innovative, and cost-effective solutions to validated warfighter requirements, with an emphasis on transitioning technologies into current or future programs of record. Projects selected based on the potential to yield cost, schedule, or performance improvements over the status quo.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
<p>Title: Advanced Torpedo Warheads and Propulsion (Navy)</p> <p>Description: Evaluates allied nation torpedo technologies for potential insertion into the US Navy's Lightweight Torpedo (LWT) development program. This effort provides the potential to increase lethality through the use of shaped charged warheads and higher performing propulsion technology. This project began test plan development in 4Q FY 2018. This project continues in FY 2019 with FY 2019 funds.</p> <p>FY 2019 Plans: This project continues test planning and preparation in FY 2019 and will receive test articles in 3Q FY 2019. Comparative testing of the torpedoes will start in 4Q FY 2019. This project continues in FY 2020 with FY 2020 funds.</p> <p>FY 2020 Plans: Torpedo testing initiated in FY 2019 will continue in FY 2020. Evaluation and closeout reports are to be completed and a procurement decision rendered in 4Q FY 2020. If successful, this technology will transition to the Navy's LWT development program.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreases from FY 2019 to FY 2020 as final testing is completed.</p>	0.750	1.200	1.000
<p>Title: Cryo-cooler For Distributed Aperture System (Air Force)</p> <p>Description: This project combines a new cryo-cooler technology with leading edge infrared sensor technology to increase reliability, extend the life of sensor equipment, and reduce costs. This technology will also decrease cool down time enabling aircraft to meet critical launch timelines. This project initiated test planning in 2Q FY 2018, received test articles in 3Q FY 2018,</p>	1.780	-	0.160

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
and initiated test article integration in 4Q FY 2018. This project continues in FY 2019 with FY 2018 funds. This project will complete test article integration and initiate reliability testing in 3Q FY 2019 using FY 2018 funding.				
FY 2020 Plans: In FY 2020, a final test report will be produced and provided to the Procurement Decision Authority and a project close out report will be provided to the FCT Program. If successful, this technology will be procured by the Joint Program Office for Avionics, for aircraft integration.				
FY 2019 to FY 2020 Increase/Decrease Statement: Funding increases from FY 2019 to FY 2020 to complete final test reports.				
Title: Future X-Band Radar (Navy)		-	0.500	1.000
Description: Tests an off-the-shelf open-architecture Active Electronically Scanned Array (AESA) X-band aircraft radar for potential application to the Navy's Air and Missile Defense Radar (AMDR) program for ships. Currently, AMDR lacks a modern AESA X-band component to provide horizon surveillance against current and future threats. Initiated test planning in 4Q FY 2018. A contract was awarded for test article procurement late in 4Q FY 2018 using FY 2017 funding and therefore no FY 2018 funding was required. This project continues in FY 2019 with FY 2019 funds.				
FY 2019 Plans: Integration planning and test article development will be conducted in FY 2019. This project continues in FY 2020 with FY 2020 funds.				
FY 2020 Plans: Test articles will be received and laboratory testing will commence in 2Q FY 2020. This project will continue in FY 2021 with FY 2020 funding. If successful, the US Navy plans to compete and award an X-band Radar program to develop and produce an advanced sensor for employment in DDG Flight III and other surface combatants.				
FY 2019 to FY 2020 Increase/Decrease Statement: Funding increases from FY 2019 to FY 2020 to support shipboard integration and testing.				
Title: Long-Range Tactical Intelligence Surveillance and Reconnaissance (ISR) Targeting, and Strike System (Navy/USMC)		0.150	0.650	0.800
Description: This project evaluates the capabilities of a fully autonomous, recoverable, remotely operated, electro-optical, precision-guided loitering munition which can conduct ISR as well as locate and engage enemy targets. This provides Marine Corps commanders with a responsive strike capability to increase operational flexibility and shorten engagement timelines. If successful, initial transition would consist of a limited procurement with user evaluation by operational units prior to fielding with				

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>Ground Combat Elements. Contract preparation was completed in 4Q FY 2018. This project continues in FY 2019 with FY 2019 funds.</p> <p>FY 2019 Plans: Test articles are scheduled for delivery in 2Q FY 2019. Live fire testing will be initiated in 3Q FY 2019. This project continues in FY 2020 with FY 2020 funds.</p> <p>FY 2020 Plans: In 2Q FY 2020, Phase II Live Fire testing will be completed. In 3Q FY 2020, an assessment report will be completed. A transition decision and close-out report will be completed in 4Q FY 2020.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding increases from FY 2019 to FY 2020 to support major test events.</p>				
<p>Title: Low Profile Satellite Communications (SATCOM) on the Move Antenna (Navy/USMC)</p> <p>Description: This project tests a low-profile dual-band (Ku/Ka) antenna with high tracking accuracy for vehicles to enable SATCOM on the move in rough terrain. This reduces the potential of adversaries targeting high value command and control vehicles while increasing operational utility. If successful, the technology will transition to Marine Corps Networks on the Move program of record. Contract preparation was completed in 4Q FY 2018. This project continues in FY 2019 with FY 2019 funds.</p> <p>FY 2019 Plans: Test articles are scheduled for delivery in 2Q FY 2019. Testing will be initiated in 3Q FY 2019. This project continues in FY 2020 with FY 2020 funds.</p> <p>FY 2020 Plans: Evaluation testing initiated in FY 2019 will continue in FY 2020. Evaluation and closeout reports are to be completed and a transition decision rendered in 4Q FY 2020.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreases from FY 2019 to FY 2020 as final testing is completed.</p>		0.235	0.585	0.250
<p>Title: Autonomous Anti-Submarine Warfare (ASW) Training Target (Navy)</p> <p>Description: Demonstrate the capabilities of an off-the-shelf autonomous underwater vehicle for ASW training. This system accurately replicates the acoustic signature of threat submarines and provides a significant enhancement in training effectiveness over the decades-old technology currently in use. Phase 1 testing conducted at the Atlantic Undersea Test & Evaluation Center during 4Q FY 2018. This project continues in FY 2019 with FY 2019 funds.</p>		0.874	0.276	-

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p><i>FY 2019 Plans:</i> Conduct phase 2 delta testing and evaluation in 2Q FY 2019. Complete final test and closeout report in 4Q FY 2019. If successful, the Navy anticipates purchasing ten ASW Training Targets under an Abbreviated Acquisition Program for approximately \$30M.</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Funding drops to zero in FY 2020 due to project completion.</p>				
<p><i>Title:</i> High Power Radio Frequency (HPRF) for Counter Unmanned Aerial Systems (CUAS) (Navy/USMC)</p> <p><i>Description:</i> This project integrates and tests HPRF directed energy source components with various off-the-shelf sensor technologies to provide a complete CUAS prototype system that provides the capability to detect, track, identify, engage and defeat low and slow UAS. Enhances DoD capabilities in Directed Energy focus area. In 3Q FY 2018, an enclosure was built to test the system against a UAS. A directed energy system from the UK has been purchased with delivery scheduled for 4Q FY 2018. This project continues in FY 2019 with FY 2019 funds.</p> <p><i>FY 2019 Plans:</i> Perform testing of directed energy source against UAS using beam steering in 2Q FY 2019. Writing technical report of results in 4Q FY 2019. If successful, this will transition into a Program of Record for the Marine Corps.</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Funding drops to zero in FY 2020 due to project completion.</p>		0.620	0.784	-
<p><i>Title:</i> Hybrid Vertical Take-off and Landing (VTOL)/Fixed Wing UAS (Navy)</p> <p><i>Description:</i> Most UAVs in the Navy inventory are large fixed-wing types which require a significant amount of runway and remote crew coordination for take-off or smaller quadcopters which lack the endurance and/or payload capacity of larger UAVs. This project will comparatively test off-the-shelf hybrid UAS equipped with rotary engines capable of vertical takeoff and landing and fixed wing flight for increased endurance and range. An analysis of alternatives was accomplished in 3Q FY 2018. Contract preparation for test article procurement was initiated in 4Q FY 2018. This project continues in FY 2019 with FY 2019 funds.</p> <p><i>FY 2019 Plans:</i> Receive test articles in 2Q FY 2019. Conduct comparative testing in 3-4Q FY 2019. If successful, this will transition into a Program of Record for the Marine Corps and the Navy.</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Funding drops to zero in FY 2020 due to project completion.</p>		0.510	0.610	-
<p><i>Title:</i> Maritime Precision Engagement for Naval Special Warfare (United States Special Operations Command (USSOCOM))</p>		1.500	0.500	-

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>Description: This project will integrate a non-line-of-sight (NLOS) missile system into a representative maritime test asset to test the performance and lethality of over-the-horizon precision strike capability. A NLOS missile system will provide Naval Special Warfare combatant craft with an organic capability to surgically engage high-value targets at range when Service-Common munitions and Close Air Support cannot be employed. This project initiated test planning in FY 2018. This project continues in FY 2019 with FY 2019 funds.</p> <p>FY 2019 Plans: This project will receive test articles in 1Q FY 2019 and conduct phase 1 static target testing during 2Q FY 2019, phase 2 dynamic target testing during 2-3Q FY 2019, and complete final test and closeout reports in 4Q FY 2019. If successful, this technology will transition to SOCOM's Program Executive Office Maritime for follow-on delta qualification testing and fielding.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding drops to zero in FY 2020 due to project completion.</p>				
<p>Title: More Reliable, Longer Endurance, More Power Unmanned Aerial Systems (UAS) (Army)</p> <p>Description: This project will comparatively test the performance of the Danielson Trident 100TD2 engine versus the existing MQ-5B Hunter engine. The Trident 100TD2 is a candidate engine for use in next generation UAS, and new production of existing UAS for foreign military sales because of its improved reliability, increased power, and reduced life cycle costs. The objective is to evaluate the performance of the Hunter and Trident 100TD2 engines using low quality fuels. Hunter UAS experienced significant performance decrease when low quality fuels are used. This project received phase 1 test articles in 1Q FY 2018, initiated phase 1 legacy engine baseline lab testing in 2Q FY 2018. This project continues in FY 2019 with FY 2019 funds.</p> <p>FY 2019 Plans: This project will complete phase 1 baseline lab testing and receive phase 2 test articles in 1Q FY 2019, conduct phase 2 Trident 100TD2 lab testing from 2-4Q FY 2019, and complete final test and closeout reports in 4Q FY 2020. If successful, the Army will pursue a flight demonstration prior to adoption into the Army's UAS Programs of Record.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding drops to zero in FY 2020 due to project completion.</p>		0.582	0.405	-
<p>Title: Pilot Physiology Based Autonomous Life Support System (Air Force)</p> <p>Description: This project will integrate and test a Pilot Physiological Monitoring and Warning System (PPMAWS) with a new digital breathing regulator that incorporates machine learning to autonomously control the flow of oxygen to military aircraft. This project will also evaluate an off-the-shelf Pilot Breath Monitoring System (PBAM) currently in use with the Finnish Air Force which requires no aircraft modification. These technologies could assist in preventing in-flight hypoxia, hypocapnia, and hyperoxia</p>		1.030	0.550	-

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>events currently experienced by pilots, improving flight safety and aircraft availability. Supports DoD's Artificial Intelligence/ Machine Learning focus area. This project initiated test planning and test article contracts in 4Q FY 2018. This project continues in FY 2019 with FY 2019 funds.</p> <p>FY 2019 Plans: This project will receive PBAM test articles and will conduct centrifuge/altitude testing in 1Q FY 2019. This project will receive PPMAWS test articles in 2Q FY 2019 and conduct software/hardware integration in 3-4Q FY 2019. Pre-flight test data analysis and test reporting will occur during 2-4Q FY 2019. Complete PBAM flight test during 1-2Q FY 2020 using FY 2019 funds. Complete PPMAWS centrifuge and altitude testing in 2Q FY 2020 using FY 2019 funds. Complete PPMAWS flight test data packet in 3Q FY 2020 using FY 2019 funds. Complete final test and project closeout reports in 4Q FY 2020 using FY 2019 funds. If successful, PPMAWS is to be part of an upgrade to the Digital Joint Mounted Helmet Cuing System (DJHMCS) for fourth and fifth generation fighter aircraft. If successful, PBAM could be directly procured.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding drops to zero in FY 2020 due to project completion.</p>				
<p>Title: Three Dimensional (3D) Mapping at the Edge (USSOCOM)</p> <p>Description: Leverages state of the art artificial intelligence techniques to extract 3D surface models from multiple source data and load products onto forward deployed handheld devices in real-time. This project will deliver an advanced capability for the management, production and dissemination of geospatial mission data, including 3D elevation data, in an open standards-based format that supports operations in dismounted and/or disconnected environments using mobile devices. Enhances the DoD's capabilities in the Artificial Intelligence/Machine Learning focus area. This project leverages previous FCT investments that fielded a rapid 3D mapping capability and expanded to investigate delivery to mobile devices in austere locations. This project initiated test planning in 4Q FY 2018. This project continues in FY 2019 with FY 2019 funds.</p> <p>FY 2019 Plans: This project will conduct software design and integration in 2Q FY 2019 and conduct comparative testing during 3-4Q FY 2019. If successful, the technology will transition to USSOCOM's Program Executive Office for Special Reconnaissance, Surveillance and Exploitation as well as the National Geospatial-Intelligence Agency for follow-on operational testing and fielding.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding drops to zero in FY 2020 due to project completion.</p>		0.621	0.304	-
<p>Title: Rifle Accessory Control Unit</p> <p>Description: This project tests a rifle mounted device capable of controlling various weapon accessories or radios. This device enables Marines to maintain situational awareness without taking their hand off the weapon. If successful, this technology will</p>		0.357	0.326	-

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>be transitioned to the Program Manager for Marine Expeditionary Rifle Squad for follow on procurement and fielding. Phase I Squad Usability tests were completed in 1Q FY 2018. Environmental/shock testing was conducted in 2-3Q FY 2018. Phase II Platoon Usability tests were conducted in 3-4Q FY 2018. This project continues in FY 2019 with FY 2019 funds. If successful, this technology will be transitioned to the Program Manager for Marine Expeditionary Rifle Squad for follow on procurement and fielding.</p> <p>FY 2019 Plans: Phase III RACU/powered vest prototype integration and testing will be conducted during 1-3Q FY 2019. Final test and closeout reports will be completed in 4Q FY 2019.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding drops to zero in FY 2020 due to project completion.</p>				
<p>Title: Hostile Fire & PreShot Detection for Vehicle Protection Systems (Army)</p> <p>Description: FY 2019 New Start - This project comparatively tests technologies to autonomously detect and locate incoming hostile fire as well as potential threats before a shot is fired. These technologies will increase situational awareness and reduce response times leading to increased lethality and survivability for ground forces, especially in urban environments. Comparative evaluation data will be provided to Program Manager Vehicle Protection Systems to support follow-on procurement.</p> <p>FY 2019 Plans: Test planning initiated in 1Q FY 2019. Phase I hostile fire test articles will be received in 2Q FY 2019. Installation and test of hostile fire systems will commence in 3Q FY 2019. This project continues in FY 2020 with FY 2020 funds.</p> <p>FY 2020 Plans: Phase II Pre-shot detection systems will be demonstrated in 1Q FY 2020. Characterization testing will take place in 3Q FY 2020. Test report will be completed in 4Q FY 2020.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding increases in FY 2020 to support major test events.</p>		-	0.700	0.900
<p>Title: Active Expendable Decoys (Air Force)</p> <p>Description: FY 2019 New Start – This project evaluates expendable Digital Radio Frequency Memory countermeasures for use on 4th Generation Fighter aircraft. This technology provides increased protection against modern air-to-air and surface-to-air radio frequency guided missiles. If successful, the technology will transition to F-15, F-16, and F-18 electronic warfare programs for procurement.</p>		-	1.000	2.000

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p><i>FY 2019 Plans:</i> Test planning initiated in 1Q FY 2019. Contract preparation and award will take place in 2Q FY 2019. Test articles will be received in multiple increments starting in 3Q FY 2019. Phase I Characterization testing will take place in 4Q FY 2019. This project continues in FY 2020 with FY 2020 funds.</p> <p><i>FY 2020 Plans:</i> Phase II platform-specific testing will be conducted in FY 2020. This project continues in FY 2021 with FY 2021 funds.</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Funding increases in FY 2020 to support platform testing.</p>				
<p><i>Title:</i> Event-Based Sensing for Space & Directed Energy Applications (Air Force)</p> <p><i>Description:</i> FY 2019 New Start - This project comparatively tests neuromorphic imaging technology and algorithms. This technology enhances daytime ground/space-based space situational awareness and directed energy test and evaluation. If successful, the resulting prototype will enhance ground-based space situational awareness and the technology will be inserted into further space-based situational awareness technology development.</p> <p><i>FY 2019 Plans:</i> Test article cameras are to be received in 3Q FY 2019. Design for integration of camera into sensor applications is to be completed in 4Q FY 2019. This project continues in FY 2020 with FY 2020 funds.</p> <p><i>FY 2020 Plans:</i> Application-specific testing will occur throughout FY 2020. Tests are to be completed by 4Q FY 2020 with a closeout report.</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Funding decreases in FY 2020 due to project completion.</p>		-	0.500	0.456
<p><i>Title:</i> Improved Amphibious Track (Navy)</p> <p><i>Description:</i> FY 2019 New Start – Comparatively tests composite rubber track systems for Marine Corps and Army vehicles. This technology reduces weight, improves fuel economy and operational reach, reduces maintenance costs, and increases mobility. If successful, the best product will transition to Program Manager - Advanced Amphibious Assault and may transition to other tracked vehicles.</p> <p><i>FY 2019 Plans:</i></p>		-	0.800	1.600

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>Initiated test planning in 1Q FY 2019. Contract preparation and award will take place in 2Q FY 2019. Test articles will be received in 3Q FY 2019. Phase I characterization testing will commence in 4Q FY 2019. This project continues in FY 2020 with FY 2020 funds.</p> <p>FY 2020 Plans: Complete Phase I testing 1Q FY 2020. Conduct Phase II noise and obstacle testing in 2Q FY 2020. Phase III durability testing will be completed by 3Q FY 2020. The project is expected to complete in 4Q FY 2020.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding increases in FY 2020 to support major test events.</p>				
<p>Title: Synthetic Aperture Sonar for Mine Countermeasures Unmanned Underwater Vehicles (UUVs) (Navy)</p> <p>Description: FY 2019 New Start - This project tests a Synthetic Aperture Sonar payload with on-board automatic target recognition algorithms for Mine Countermeasure UUVs to increase detection range and resolution. This technology reduces the time required for mine countermeasure missions and post mission analysis. If successful, the technology will transition to Program Manager Naval Explosive Ordnance Disposal for inclusion on the Mk 18 UUV.</p> <p>FY 2019 Plans: Contract preparation and award will take place in 2Q FY 2019 with test articles received in 4Q FY 2019. Phase I test article integration will occur in 4Q FY 2019. This project continues in FY 2020 with FY 2020 funds.</p> <p>FY 2020 Plans: Phase 2 engineering trials will take place throughout FY 2020. Final test and closeout reports will complete in 4Q FY 2020.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreases from FY 2019 to FY 2020 as final testing is completed.</p>		-	0.860	0.220
<p>Title: Low Cost Innovative Projects (Projects Less Than One Million Dollars Each):</p> <p>Description: OSD CTO selected multiple low cost projects in the areas of Force Protection, Force Support, Anti-Access/Area Denial, Robotics and Autonomous Systems, Interoperability and Countering Unmanned Systems. These projects were selected to deliver proof of principle prototypes for evaluation, assessment, and Service adoption within 24 to 36 months.</p> <p>-Insensitive Munitions Fuze for the M67 Fragmentation Hand Grenade (Army): Comparatively tests off-the-shelf hand grenade fuzes to provide increased safety to the soldier while maintaining lethality for the widely used M67 fragmentation hand grenade. The M67 has been in use since the 1960's and does not meet current Insensitive Munitions safety standards. If successful, Army Program Executive Office Ammunition expects to acquire and field by FY 2023. Received technical data of candidate fuzes in 3Q FY 2018. Initiated test planning in 4Q FY 2018. This project continues in FY 2019 with FY 2019 funds.</p>		8.633	7.319	2.819

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B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
<p>-Panoramic Infrared Sensor Test (Navy): Comparatively tests foreign naval panoramic Infrared sensors with autonomous detection capabilities to enhance shipboard detection and tracking of both surface and air targets to include low, slow, and small unmanned aerial systems. If successful, this technology will transition to the Navy's Program Executive Office for Integrated Warfare Systems 2 for insertion into the FFG(X) and CVN I-Stalker programs. Contract preparation was completed in 4Q FY 2018. This project continues in FY 2019 with FY 2019 funds.</p> <p>-105MM Family of Multi-Purpose Munitions (Army): This project evaluates advanced munitions for the Army's next-generation Mobile Protected Firepower platform. This technology provides selectable munitions capable of defeating dismounts hiding behind walls and lightly armored targets. If successful, the Army will pursue delta qualification testing prior to fielding. This project initiated test planning in 3Q FY 2018. This project continues in FY 2019 with FY 2019 funds.</p> <p>-Accurate Tracking & Unmanned Underwater Vehicle Navigation (Navy): This project tests sensors that enable the accurate real-time tracking of unmanned underwater systems without the need for a high-cost Inertial Navigation Systems. Current unmanned underwater vehicles use dead reckoning from a single GPS fix obtained at the start of the mission prior to submerging. If new technology can be shown to close capability gaps in current systems then transition strategies will be considered for both the UUV and ROV programs. In 4Q FY 2018, test articles were procured. This project continues in FY 2019 with FY 2019 funds.</p> <p>-Aerostable Penetrator (Army): Evaluates a foreign off-the-shelf 2.75 inch rocket motor integrated with a prototype U.S. developed flachette warhead to optimize lethality against light armor targets dispersed over an area. This project will demonstrate an affordable replacement solution for Cluster Munitions. If successful, this capability is anticipated to transition to the Army's Joint Attack Munition Systems Program Office. Received test articles in 2Q FY 2018 and initiated phase 1 baseline warhead testing in 3Q FY 2018. This project continues in FY 2019 with FY 2019 funds.</p> <p>-Aluminum Foam Blast Protection (Army): Evaluates a lightweight blast protection material for use in the storage and transportation of volatile munitions to increase safety and reduce costs. The material properties will be determined for applicability to various defense applications. If successful, the Army will evaluate the Insensitive Munitions characteristics of a packaging solution for the XM1128 rocket assisted 155mm munition. This project initiated test planning in 3Q FY 2018, received initial test articles and initiated phase 1 material testing in 4Q FY 2018. This project continues in FY 2019 with FY 2018 funds. This project will complete phase 1 testing in 2Q FY 2019, conduct phase 2 munitions packaging prototype evaluation in 3Q FY 2019, and complete final test and closeout reports in 4Q FY 2019 using FY18 funding.</p> <p>-Autonomous Aircraft Material Maintenance (Navy): Test a trailer-mounted, autonomous cold spray metallization technology for in-situ repair of corrosion damaged areas on aircraft. If successful, the technology will be available for follow-on procurement and fielding by the Navy's Fleet Readiness Centers. In 4Q FY 2018, conducted a repair demonstration on a V-22 tilt-rotor aircraft and H-1helicopter gearbox. This project continues in FY 2019 with FY 2019 funds.</p> <p>-Diagnostics/Prognostics Test for Traumatic Brain Injury (TBI) (USSOCOM): This project will conduct clinical studies to provide an assessment of the effectiveness of using a panel of specific micro ribonucleic acid (miRNA) biomarkers to objectively detect a traumatic brain injury. The ability to objectively diagnose a TBI within an acute time period (<15 min) allows medical providers to properly asses, evacuate, or return to duty military personnel instead of unnecessary prolonged observation or evacuation</p>			

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B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
<p>degrading unit readiness. If successful, the miRNA blood based biomarker panel would be incorporated as a diagnostic aid at military treatment facilities. Through the development of a portable diagnostic system (PDS), the Diagnostic/Prognostic Test for TBI will be incorporated into the Tactical Combat Casualty Care Set and Program of Record. This project initiated test planning in 2Q FY 2018, received test articles in 4Q FY 2018, and initiated phase 1 west coast study. This project continues in FY 2019 with FY 2019 funds.</p> <p>-Joint Acquisition Counter Electronics Evaluation (Air Force): This project tests a high power electromagnetic (HPEM) device for potential use in electronic warfare (EW) and counter-unmanned aerial systems (UAS) weapon systems. Performance will be tested against company's claims of power density improvement, power consumption, and employment as an HPEM for EW and counter-UAS applications. HPEM provides an option against counter-UAS swarms and counter electronics missions with functional non-kinetic kill against restricted targets and eliminates collateral damage. Enhances DoD capabilities in Directed Energy focus area. If successful, the technology will transition to the Counter-electronics High Power Microwave Advanced Missile Project in support of the U.S. Air Force Pacific Command (PACAF), U.S. Pacific Command (USPACOM), and Air Force Global Strike Command for precision strike missions. Additional counter-UAS applications for base defense will be explored. This project initiated test planning in 3Q FY 2018. This project continues in FY 2019 with FY 2019 funds.</p> <p>-Multi-Agent Identification Kit and Equipment (MIKE) Butt-pack (Army): Tests an off-the-shelf colorimetric chemical detection system currently in use with NATO assembled into a small, lightweight packaging configuration for U.S. military use. Enhances interoperability between U.S. and NATO forces and reduces resupply requirements, life cycle and procurement costs. If successful, the technology will be available for immediate purchase by Special Operations units and will be pursued for acquisition by the Army through the Guardian Joint Program Management Office. This project initiated test planning in 3Q FY 2018. This project continues in FY 2019 with FY 2019 funds.</p> <p>-Night Vision Device Capable Deck Status Display (Navy): This project evaluates a Deck Status Display currently in use with over ten countries that provides landing status to pilots through symbology instead of colors enabling safer night landing operations. If successful, this project will transition into a Program of Record under Naval Air Systems Command, PMA 251. Contract preparation was completed in 3Q FY 2018. This project continues in FY 2019 with FY 2019 funds.</p> <p>-Quantum Communication, Cryptography, and Networking for Secure Satellite Communications (Air Force): This project evaluates a Quantum Key Distribution System (QKDS) for application to high priority encryption requirements. QKDS enables secure encrypted communication without the need to pre-generate, store, and secure large numbers of encryption keys. Quantum cryptography technology promises secure encryption, while making network intrusion impossible without detection. Enhanced DoD capabilities in the Quantum science focus area. If successful, the technology will transition to the Air Force Space and Missile Systems Center (SMC) and the Air Force Global Strike Command for satellite payload and ground station applications. This project initiated test planning in 2Q FY 2018 and initiated phase 1 laboratory testing In 4Q FY 2018. This effort continues in FY 2019 with FY 2019 funds.</p> <p>-Reserve Battery for Munitions (Army): Comparative test of foreign off-the-shelf reserve battery solutions for use with medium caliber, mortar, and artillery applications to enhance the industrial base. If successful, the Army's Armaments Research</p>			

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B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
<p>Development and Engineering Center will pursue acquisition through either direct purchase from a foreign source or licensed production by a U.S. company. This project will complete phase 1 laboratory testing in 3Q FY 2018 and initiate phase 2 live fire testing in 4Q FY 2018. This effort continues in FY 2019 with FY 2019 funds.</p> <p>-Tactical Debriefing System (TADS) (Navy): This project evaluates a mission and military exercise debriefing tool currently in use with the Finnish Air Force to increase the quality of and reduce the time required to generate after action reviews. The system will be modified to support Electronic Warfare debriefing, a capability that does not currently exist. If successful, this technology will transition to the EA-18G and future naval aircraft mission debriefing systems. Test planning and contract preparation was initiated in 4Q FY 2018. This project continues in FY 2019 with FY 2019 funds.</p> <p>-Advanced Energy Storage and Power Batteries (Navy/USMC): Tests advanced lithium-ion batteries and new cell chemistries for military vehicle applications that will, at a minimum, double energy density. If successful, will allow one-for-two replacement of existing batteries, reducing logistics burden by 50 percent and new battery cell chemistries will be incorporated into existing US supply chain in 6T batteries for military vehicles and ships. Cycle life and low temperature performance testing were completed in 4Q FY 2018. Rate capability and safety testing to be conducted in 2Q FY 2019 using FY 2018 funds. Final test and closeout reports will be completed in 3Q 2019 using FY 2018 funds.</p> <p>-Aerial Ground Mapping for Characterizing Landing Zones (Air Force); Test airborne electromagnetic ground survey techniques currently used in commercial applications for characterizing landing zones for military aircraft. This technology will replace the current approach of inserting manned teams on the ground to perform the manually intensive, time consuming task of characterizing potential landing zones, often in hostile environments. If successful, the technology will transition to the Army Corps of Engineers, Engineer Research and Development Center to conduct follow-on operational testing prior to fielding. This project conducted baseline testing during 1-3Q FY 2018 and completed phase 1 test report in 4Q FY 2018. This project will conduct phase 2 initial system testing during 1-3Q FY 2019 and will complete phase 2 test reports in 4Q FY 2019 with FY 2018 funds.</p> <p>-Autogated White Phosphor Image Intensifying Tubes (USSOCOM):Tests auto-gated white phosphor image intensifier tubes integrated into existing night vision systems to enable greater detection, recognition, and identification ranges for head mounted goggles, hand held surveillance devices, and weapon mounted sights. If successful, the technology will transition to USSOCOM's Program Executive Office Special Operations Forces Warrior for integration into future Binocular Night Vision Device purchases. This project received test articles in 2Q FY 2018, conducted integration and testing in 2-3Q FY 2018, and user demonstrations in 4Q FY 2018. This project will complete final test and closeout reports in 1Q FY 2019 using FY 2018 funds.</p> <p>-Compact Long Range Observation System (USSOCOM): This project evaluates a lightweight, low-power, hand-held precision targeting device to enhance target observation, recognition, and identification of targets during day and night operations at long range. The device features new high operating temperature, mid-wave infrared multispectral technology and will be modified to incorporate U.S. Global Positioning System sensors for evaluation. If successful, the technology will transition to USSOCOM's Program Executive Office Special Operations Forces Warrior. This project received test articles in 2Q FY 2018, conducted integration and testing in 2-3Q FY 2018, and user demonstrations in 4Q FY 2018. This project will complete final test and closeout reports in 1Q FY 2019 using FY 2018 Funds.</p>			

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B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
<p>-Cruise Missile Gas Turbine Engine (Navy): Tests an off-the-shelf, multi-fuel turbine engine currently in use in various foreign missile systems to provide up to a 200 percent performance increase for legacy US Navy missile systems. If successful, this will transition to the Harpoon Block 2+ missile. In 2Q FY 2018, phase 1 Size, Weight, and Power requirements testing was completed. In 4Q FY 2018, Phase 2 fuel efficiency testing was completed. In 1Q FY 2019, flight testing on a missile is to be completed using FY 2018 funds. Final test and closeout reports to complete in 3Q FY 2019 using FY 2018 funds.</p> <p>-Efficient Turbocharged Internal Combustion Engine for UAS Application (Air Force): This project tests a commercially available aircraft engine to enhance the Long Endurance Aerial Platform (LEAP) UAS to meet increased altitude mission requirements. If successful, the technology will be procured for the LEAP program by US Special Forces Command and the Under Secretary of Defense for Intelligence. This project initiated test planning in 2Q FY 2018 and conducted lab testing in 3-4Q FY 2018. This project will complete final test and closeout reports in 1Q FY 2019 using FY2018 funds.</p> <p>-Enhanced Shipboard Navigation Capability (Navy); This project will evaluate the performance of a multi-constellation Global Navigation Satellite System receiver for US Naval surface ship and airborne applications to provide an additional navigation source in addition to GPS positioning and time solutions. If successful, the new sensor input will be transitioned in the PMW/A 170 GPTNS Program of Record. In 2Q FY 2018, receiver lab testing was completed. In 4Q FY 2018, the receivers were demonstrated during Trident Warrior 2018. Final test and closeout reports will be completed in 1Q FY 2019 with FY 2018 funds.</p> <p>-Fast In-Shore Attack Craft (FIAC) Asymmetric Force Engagement (Navy): This project evaluates the capabilities of a 2.75 inch "fire and forget" imaging infrared rocket versus existing laser guided rocket capabilities against FIAC swarms. If successful, the technology will be transitioned to the Office of Naval Research for additional evaluation and integration into defensive systems. Contract preparation was completed in 4Q FY 2018. Characterization and live-fire testing will be conducted in FY 2019 with FY 2018 funds.</p> <p>-Gallium Nitride (GaN) Amplifier Study of Space Environment Radiation Tolerance (Air Force): Comparatively tests foreign and domestic GaN technology in simulated space radiation environments. GaN offers 5 to 10 times performance improvement over legacy technology. Project success would result in more resilient satellite payloads that are able to survive in the harsh space radiation environment. Additionally, more efficient amplifiers could lead to reduced payload size, increased performance, and reduced procurement costs. Enhances DoD capabilities in the Space Preeminence focus area. If successful, the technology will transition to the Space and Missile Systems Center Global Positioning System Program Office for follow-on operational evaluation on the Navigation and Timing Satellite 3 (NTS-3) flight experiment. Test articles were received in 1Q FY 2018 and a test plan was developed. Concurrent phase 1 benchmark characterization testing and phase 2 radiation effects testing was initiated in 2Q FY 2018. Testing will be completed in 3Q FY 2019 and final test and closeout reports will be completed in FY 2019 with FY 2018 funds.</p> <p>-Gimballed Laser Target Designator (Navy): Tests a miniature 3-axis stabilized electro-optic/infrared turret payload with integrated laser designator on a Group 1 Puma UAS. If successful, Navy PMA-263 will procure additional Gimballed Laser Target Designators through the Combatting Terrorism Technical Support Office's Group 1 UAS Program of Record. Testing was</p>			

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B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
<p>accomplished on a surrogate UAS at the Naval Air Systems Command Laser Range in 4Q FY 2018. Final test and closeout reports will be completed in 1Q FY 2019 with FY 2018 funds.</p> <p>-HALO Integration with Common Remotely Operated Weapon System (CROWS) (Army): The CROWS provides the capability to locate and attack targets while gunners remain under armor. The HALO system is an add-on image processor that enhances existing camera streams to allow for continuous standard and Infrared (IR) image "fusion" and a significant reduction in motion blur for the CROWS. The CROWS equipped with a HALO system will increase lethality and force protection by greatly improving image clarity and target recognition capability; and increase surveillance capability in a degraded visual environment. If successful, this capability is anticipated to transition to the CROWS Program of Record for the Army. This project initiated data characterization in 4Q FY 2018. This project continues in FY 2019 with FY 2019 funds.</p> <p>-H-1 Crash-Resistant, Ballistic-Tolerant, Fuel Cell Qualification (Navy): This project is testing a crash resistant fuel tank technology currently used in foreign military aircraft. The design of the platform specific representative prototype fuel cell was approved in 2Q FY 2018. Full scale testing was performed in 4Q FY 2018. If successful, the technology will transition to the Navy's H-1 Program Office for follow-on procurement and fielding. Due to Berry Amendment restrictions, the company will likely be required to partner with a U.S. company for production. Final test and closeout reports will be completed in 1Q FY 2019 with FY 2018 funds.</p> <p>-Compact High-Power Radio Frequency Technology for Vehicle & Vessel Stopping (Navy/USMC); This project tests a prototype non-lethal system capable of stopping vehicles and vessels using state of the art foreign microwave components designed for commercial use in medical imaging systems. Enhances the DoD capabilities in the directed energy focus area. In 3Q FY 2018, received test articles. In 4Q FY 2018, radio frequency characterization testing was completed. Developmental testing will be completed in Q1 FY2019 and final test and closeout reports will be completed in Q2 FY2019 with FY2018 funding.</p> <p>-Soldier Power with Inductive Recharge & Intelligent Textiles (SPIRIT) + Ultra Combat Connect (Army): This project comparatively tests wire-free data and power conductive textile and inductive recharge technologies integrated into soldier worn Modular Lightweight Load-carrying Equipment. This technology eliminates cumbersome external cables which reduces weight and provides for a wireless recharge capability. Phase I testing was completed in FY 2018. Complete Phase II lab testing in 2Q FY 2019 with FY 2018 funding. Complete Phase III field assessment in 3Q FY 2019 with FY 2019 funding. Final test and closeout reports are expected in 4Q FY 2019 with FY 2018 Funding.</p> <p>-Falcon Chemical Agent Sensor (Army): This project tests a lightweight standoff chemical agent detector with an advanced tunable infrared laser. This technology enables the identification and localization of chemical plume threats with higher sensitivity than currently deployed technology. Testing completed in FY 2018. Final test and closeout reports are expected in 1Q FY 2019 with FY 2018 funding.</p> <p>-Smartshooter Evaluation (Army): Evaluates an intelligent fire control system for assault rifles that is capable of identifying, selecting, and locking onto stationary or moving targets. This technology significantly improves shooter accuracy and probability of hit while reducing engagement times. If successful, the Army's Program Manager for Soldier Weapons will transition the technology into its Next Generation Fire Control development program. This project initiated test planning in 4Q FY 2018. This project continues in FY 2019 with FY 2019 funds.</p>			

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B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
<p>-Transparent Ceramic Armor (Army): This project evaluates armor technology that is fifty percent lighter and thinner than existing glass-based systems for application on rotary wing and other military platforms. This technology provides a cost effective solution versus competing products. If successful, the technology will be incorporated into the CH-47 Multi-Impact Transparent Armor System program of record. Initial test planning was conducted in 4Q FY 2018. This project continues in FY 2019 with FY 2019 funds.</p> <p>-Low-Cost Autonomous Target Classification (L-CATC) (Navy): This project will conduct at-sea testing of underwater passive acoustic sensors and associated processing software. This technology provides an increased probability of detection and classification for both surface and submerged vessels. Testing completed in FY 2018. Final test and closeout reports are expected in 1Q FY 2019 using FY 2018 funding.</p> <p>FY 2019 Plans:</p> <p>-Insensitive Munitions Fuze for the M67 Fragmentation Hand Grenade (Army): Conduct x-ray samples and chemical analysis in 1Q FY 2019. Conduct Insensitive Munitions tests in 2-4Q FY 2019. This project continues in FY 2020 with FY 2020 funds.</p> <p>-Panoramic Infrared Sensor Test (Navy): Test articles will be received in 3Q FY 2019. Phase 1 comparative pier-side testing will be initiated in 4Q FY 2019 and will result in down-select to the most capable systems. This project continues in FY 2020 with FY 2020 funds.</p> <p>-Autonomous Aircraft Material Maintenance (Navy): Complete testing in 1Q FY 2019. Complete final test and closeout reports in 3Q FY 2019.</p> <p>-105MM Family of Multi-Purpose Munitions (Army): Down select to occur in 1Q FY 2019. This project will accept delivery of Phase 1 anti-personnel area munition test articles in 3Q FY 2019 and will commence phase 1 testing in 4Q FY 2019. This project is scheduled to complete in FY 2020 with FY 2019 funds. Phase 2 high explosive test articles received in 2Q FY 2020. Phase 2 testing to occur in 3Q FY 2020 using FY 2019 funding. This project will complete with final test and closeout report in 4Q FY 2020 using FY 2019 funding.</p> <p>-Accurate Tracking & Unmanned Underwater Vehicle Navigation (Navy): Phase 1 laboratory testing of the system will be completed in 1Q FY 2019. Phase 2 platform integration is to be completed in 2Q FY 2019. Phase 3 operational demonstration of testing initiates in 3Q FY 2019. This project will continue in FY 2020 with FY 2019 funds. Phase 3 testing completes in 1Q FY 2020 using FY 2019 funding. Final test and closeout report will be submitted in 2Q FY 2020 using FY2019 funding.</p> <p>-Aerostable Penetrator (Army): This project will complete phase 1 testing in 1Q FY 2019, phase 2 prototype system testing in 2Q FY 2019, test reports in 3Q FY 2019, and final project closeout report in 4Q FY 2019.</p> <p>-Diagnostics/Prognostics Test for Traumatic Brain Injury (TBI) (Army): This project will complete phase 1 study in 1Q FY 2019. Initiate phase 2 east coast study in 2Q FY 2019. This project continues in FY 2020 with FY 2019 funds. Complete Phase 2 in 3Q FY 2020 using FY 2019 funding. Complete final test and closeout reports in 4Q FY 2020 using FY 2019 funding.</p> <p>-Joint Acquisition Counter Electronics Evaluation (Air Force): This project will conduct phase 1 testing for system efficiency, survivability, and effectiveness against simulated targets in an anechoic chamber in 1-3Q FY 2019. This project will initiate phase</p>			

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	FY 2018	FY 2019	FY 2020
<p>2 wide area testing in 3Q FY 2019. This project will complete phase 2 testing in 1Q FY 2020 using FY 2019 funds. Phase 3 Operational Testing is planned for 2-4Q FY 2020 using FY 2019 funds.</p> <p>-Multi-Agent Identification Kit and Equipment (MIKE) Butt-pack (Army): This project will receive test articles in 1Q FY 2019, conduct prototype integration and lab testing in 2Q FY 2019, conduct field evaluation in 3Q FY 2019, and complete final test and closeout reports in 4Q FY 2019.</p> <p>-Night Vision Device Capable Deck Status Display (Navy): Test articles are to be received in 1Q FY 2019. Functional testing will be done in 2Q FY 2019. Environmental testing will be done in 4Q FY 2019. Project continues in FY 2020 using FY 2019 funding. Continue electro-magnetic and environmental testing in FY 2020 using FY 2019 funds. Also completing final evaluation reports with a recommendation in FY 2020 using FY 2019 funds.</p> <p>-Quantum Communication, Cryptography, and Networking for Secure Satellite Communications (Air Force): This project will complete phase 1 testing in 2Q FY 2019 and conduct phase 2 field testing in 3-4Q FY 2019. Project will continue in FY 2020 using FY 2019 funding. Phase 3 operational testing and final test and closeout reports are planned for FY 2020 using FY 2019 funds.</p> <p>-Reserve Battery for Munitions (Army): Phase 2 testing live fire/actual ballistic testing in the end item or surrogate carrier will be completed in FY 2019.</p> <p>-Tactical Debriefing System (TADS) (Navy): Phase 1 baseline comparison testing will be conducted in 1-2Q FY 2019. Phase 2 data link testing will be completed in 3Q FY 2019. Electronic Warfare data integration will commence in 4Q FY 2020 using FY 2019 funds. Final phase 2 integration and testing will complete in 2Q FY 2020 using FY 2019 funds. Final test and project closeout reports will be completed in 3Q FY 2020 using FY 2019 funds.</p> <p>-HALO Integration with Common Remotely Operated Weapon System (CROWS) (Army): This project will complete software modeling in 1Q FY 2019, lab prototype hardware development in 2Q FY 2019, lab prototype evaluation in 3Q FY 2020, and initiate field prototype hardware development in 4Q FY 2019.</p> <p>-Smartshooter Evaluation (Army): This project will receive test articles in 2Q FY 2019 and conduct phase 1 technical characterization in 3Q FY 2019. This project continues in FY 2020 with FY 2020 funds.</p> <p>-Transparent Ceramic Armor (Army): Contract preparation was initiated in 1Q FY 2019. Test articles will be received in 3Q FY 2019 and Phase I baseline testing will be initiated in 4Q FY 2019. This project continues in FY 2020 with FY 2019 funds. Phase I testing completes in 1Q FY 2020. Phase II performance testing will initiate in 2Q FY 2020 and complete in 3Q FY 2020 using FY 2019 funding. Final test and closeout reports will be submitted in 4Q FY 2020 using FY 2019 funding.</p> <p>-Energy Storage for Directed Energy Weapons & Sensors (Navy): This project comparatively tests foreign graphene based ultra-capacitors against industry leading domestic products. This technology enables high density energy storage necessary for advancing development of future directed energy weapons and sensors. Testing completed in FY 2018. Final test and closeout reports will be completed in 1Q FY 2019.</p> <p>-AT4 Confined Space Tandem Warhead (Army): FY 2019 New Start - This project evaluates a single-use, shoulder launched munition capable of defeating both armored and structural targets while being fired from an enclosed space. This technology eliminates the need for multiple weapons and increases effectiveness against urban structures and bunkers. If testing is</p>			

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	FY 2018	FY 2019	FY 2020
<p>successful, the Army will commence follow-on procurement and fielding. Test planning will be completed in 2Q FY 2019. Laboratory ammunition testing will be completed during FY 2019. This project continues in FY 2020 with FY 2020 funds.</p> <p>-Modular Airdrop Platform (Army): FY 2019 New Start - This project evaluates a reusable, modular airdrop pallet that uses an under-mounted airbag system for impact attenuation and is compatible for use on existing airdrop aircraft. This technology increases payload survivability and provides a rapid roll-on/roll-off capability which decreases rig/derig times. If testing is successful, the project will transition to Program Manager Force Sustainment Systems Cargo Aerial Delivery Program of Record. Contract preparation and award will take place in 1Q FY 2019 with test articles received in 3Q FY 2019. Ground testing will initiate in 3Q FY 2019. This project continues in FY 2020 with FY 2020 funds.</p> <p>-Rapid Obscuring System (Army): FY 2019 New Start - This project evaluates an off-the-shelf, 360 degree vehicle protection system currently fielded and in use with several NATO militaries. This technology increases survivability against anti-armor weapons. If testing is successful, the final test report will be presented to Program Manager Vehicle Protection Systems with recommendations for use on the Next Generation Combat Vehicle. Contract preparation and award will take place in 1Q FY 2019 with test articles received in 2Q FY 2019. Phase I testing to create cloud modeling parameters will take place during 2Q FY 2019. Phase II field testing of smoke grenades against relevant sensors will take place in 3Q FY 2019. The project will finish with a closeout report in 4Q FY 2019.</p> <p>-Uncooled 120 Hertz Longwave Infrared Focal Plane Arrays for Night Vision Sensors (Army): FY 2019 New Start - This project tests foreign focal plane array technologies with enhanced refresh rates and increased resolution for application to next-generation Night Vision Devices and Soldier Borne Sensors. This technology increases situational awareness and lethality. If successful, the arrays will transition to the Army for incorporation onto night vision sensor programs and Soldier Borne Sensors. Contract preparation and award will take place in 1Q FY 2019. Test articles received in 2Q FY 2019. Test planning and lab integration will take place throughout FY 2019. This project continues in FY 2020 with FY 2020 funds.</p> <p>-Magnetic Signature Duplicator Systems (Army): FY 2019 New Start - Comparatively tests vehicle mounted advanced magnetic signature duplicator systems against anti-tank landmine weapons. This technology may double the standoff range and addresses new threats to enable increased mobility of U.S. forces in contested near-peer combat environments. If successful, the technology will transition to Product Manager Counter Explosive Hazards for follow-on procurements. Contract preparation and award will take place in 3Q FY 2019 with test articles to be received at the beginning of 4Q FY 2019. Phase I mine neutralization testing will take place in 4Q FY 2019. This project continues in FY 2020 with FY 2020 funds.</p> <p>-Hydrogen Fuel Cell Technology for Small Unmanned Aerial Systems (Air Force): FY 2019 New Start - This project comparatively tests foreign fuel cell technology for Small Unmanned Aerial System applications with improved energy density and reliability. This technology improves performance while reducing costs and increasing competition. If testing is successful, the fuel cells will transition to the Desert Hawk Unmanned Aerial Vehicle program. Contract preparation and award will take place in 2Q FY 2019 with test articles received in 3Q FY 2019. Phase I laboratory testing will take place in 4Q FY 2019. This project continues in FY 2020 with FY 2020 funds.</p>			

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B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
<p>-Small Size, Weight, and Power (SWaP) Midwave Infrared (MWIR) Camera for Small Unmanned Aerial Systems (Air Force): FY 2019 New Start - This project evaluates a low-cost, small SWaP day/night camera integrated into an optical payload for Group 1 Unmanned Aerial Systems. This effort enables affordable fielding of MWIR technology while increasing competition and reducing technical risk for Small Unmanned Aerial System programs. If testing is successful, the camera will transition to the Tactical Offboard Sensing program. Contract preparation and award will take place in 1Q FY 2019 with test articles received by 3Q FY 2019. Phase I laboratory testing to be completed in 4Q FY 2019. This project continues in FY 2020 with FY 2019 funds. Phase II integration and performance testing will finish in 1Q FY 2020 using FY 2019 funds. Phase III operational testing will finish in 2Q FY 2020 using FY 2019 funds. Project will complete with a final closeout report in 3Q FY 2020 using FY 2019 funds.</p> <p>-Enhancing DoD Circuit Card Repair (Navy): FY 2019 New Start - This project evaluates a portable, off-the-shelf system for testing of printed circuit boards. This technology enables circuit card analysis and repair at the organizational and intermediate levels which improves readiness and reduces maintenance costs. If successful, the Naval Sea Systems Command will purchase an additional 26 units for enhancing circuit card capability DoD-wide. Contract preparation and award will occur in 3Q FY 2019. Test articles will be received in 4Q FY 2019. This project will continue in FY 2020 with FY 2020 funds.</p> <p>-Passive, Fixed Sonar Targets (Navy): FY 2019 New Start - This project evaluates a passive, non-electronic, omni-directional, fixed target for calibrating Continuous Active Sonar systems on Naval platforms. This technology improves pre-deployment sonar accuracy tests which increases confidence and readiness. If successful, the technology will transition to Naval Sea Systems Command for fielding. Contract preparation and award will take place in 2Q FY 2019 with test articles received in 3Q FY 2019. Phase I testing in a controlled acoustic environment will take place in 4Q FY 2019. This project continues in FY 2020 with FY 2019 funds. Phase II suitability testing will take place in 2Q FY 2019 at Atlantic Undersea Test and Evaluation Center using FY 2019 funds. The project is projected to finish in 3Q FY 2020.</p> <p>-Simultaneous Multi-Channel Modem (USSOCOM): FY 2019 New Start - This project evaluates an off-the-shelf device that autonomously disaggregates and transports data over multiple networks simultaneously. This technology enables secure real-time streaming of high definition full motion video in austere environments with limited communication infrastructure. If successful, will transition to SOCOM Program Executive Office Command Control Communications Computers and Intelligence. Contract preparation and award will take place in 2Q FY 2019 with test articles received early in 3Q FY 2019. Developmental testing will take place in 3Q FY 2019 with operational testing of full motion video transfer in 4Q FY 2019. This project continues in FY 2020 with FY 2020 funds.</p> <p>FY 2020 Plans:</p> <p>-Insensitive Munitions Fuze for the M67 Fragmentation Hand Grenade (Army): Conduct down select in 1Q FY 2020. Conduct fragmentation testing and lethality analysis in 2-3Q FY 2020. Complete final test and close-out reports in 4Q FY 2020. Funding decreases in FY 2020 due to project completion.</p> <p>-Panoramic Infrared Sensor Test (Navy): In FY 2020, Shipboard Testing will be conducted. Final test and closeout report will be completed in 4Q FY 2020.</p>			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603133D8Z / <i>Foreign Comparative Testing</i>	Project (Number/Name) 313 / <i>Foreign Comparative Testing</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>-Smartshooter Evaluation (Army): This project will continue with live fire testing throughout FY 2020. Final test and closeout reports will be submitted in 4Q FY 2020.</p> <p>-AT4 Confined Space Tandem Warhead (Army): Phase 4 live fire ammunition testing will take place in 1-2Q FY 2020. The project will complete in 3Q FY 2020 with a closeout report.</p> <p>-Modular Airdrop Platform (Army): Demonstration airdrop at Fort Bragg will take place in 4Q FY 2020. The project will conclude by the end of FY 2020 with a closeout report.</p> <p>-Uncooled 120 Hertz Longwave Infrared Focal Plane Arrays for Night Vision Sensors (Army): Phase I size weight and power verification will complete in 1Q FY 2020. Phase II frame rate verification will also complete in 1Q FY 2020. Phase III sensitivity testing will complete in 2Q FY 2020. Phase IV thermal time constant verification will complete in 3Q FY 2020. Phase V extended solar exposure testing will complete in 4Q FY2020. The project will close in 4Q FY 2020 with a closeout report.</p> <p>-Magnetic Signature Duplicator Systems (Army): Phase II Operational Testing will occur in 3Q FY 2020. The project will complete with a closeout report in 4Q FY 2020.</p> <p>-Hydrogen Fuel Cell Technology for Small Unmanned Aerial Systems (Air Force): Phase II operational testing will occur throughout FY 2020. Project will complete with a final closeout report in 4Q FY 2020.</p> <p>-Enhancing DoD Circuit Card Repair (Navy): Phase I acceptance testing will complete in 1Q FY 2020. Phase II information assurance evaluation will complete in 2Q FY 2020. Phase III demonstrations by maintenance personnel in the field will complete in 3Q FY 2020. The project will complete in 4Q FY 2020 with the closeout report.</p> <p>-Simultaneous Multi-Channel Modem (USSOCOM): Operational testing will complete in 1Q FY 2020. The project will finish with a closeout report in 2Q FY 2020.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 funding commitment is reduced as currently selected projects complete their 24-36 month evaluation and are transitioned.</p>				
<p>Title: Foreign Comparative Testing Prototype Development Focus Areas</p> <p>Description: Previously funded effort. The FCT program will select new projects to evaluate allied/partner nation technologies that address emerging DoD capability gaps and provide substantial cost, schedule, and/or performance benefit to the warfighter. As projects are selected they will be reported individually. Prototype development will be aligned to the 2018 National Defense Strategy (NDS) to deliver increased readiness and a more lethal Joint Force while strengthening alliances, attracting new partners, and achieving greater performance and affordability.</p> <p>FY 2019 Plans: During FY 2019, FCT will prioritize selecting projects supporting the NDS and DoD modernization priorities including: - Fully Networked Command Control and Communications - Space</p>		4.073	6.408	13.765

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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
<ul style="list-style-type: none"> - Missile Defense - Cybersecurity – Offense and Defense - Nuclear Modernization - Hypersonics – Offense and Defense - Directed Energy - Machine Learning and Artificial Intelligence - Secure Trusted On-shore Microelectronics - Quantum Technology <p>In addition to the above areas of technology development, FCT will select programs that resolve emergent urgent operational needs with field-ready allied technologies and programs that promise substantial life-cycle cost savings/avoidance in fielded systems.</p> <p>FY 2020 Plans: During FY 2020, FCT will prioritize selecting projects supporting the NDS and DoD modernization priorities:</p> <ul style="list-style-type: none"> - Fully Networked Command Control and Communications - Space - Missile Defense - Cybersecurity – Offense and Defense - Nuclear Modernization - Hypersonics – Offense and Defense - Directed Energy - Machine Learning and Artificial Intelligence - Secure Trusted On-shore Microelectronics - Quantum Technology <p>In addition to the above areas of technology development, FCT will select programs that resolve emergent urgent operational needs with field-ready allied technologies and programs that promise substantial life-cycle cost savings/avoidance in fielded systems.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: The FY 2018 and FY2019 funding levels are lower than the baseline for these focus area, which is listed under FY 2020. This is because once projects are selected and funded during the years of execution (FY 2018/FY 2019), the funds for these projects are reported elsewhere in the R-2. Projects have not been selected for FY 2020.</p>			
Accomplishments/Planned Programs Subtotals	21.715	24.277	24.970

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C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

D. Acquisition Strategy

Successful FCT projects support capability acquisition in several ways: technology upgrade insertion into a current platform or program providing greater capability or prolonging the life of the weapon system, informed/refined requirements for planned systems, or direct transition/procurement. FCT leverages the Services' and Defense Agencies' most efficient and effective acquisition approaches for rapid prototyping. This includes using Other Transaction Authorities and new or existing contract vehicles within middle-tier acquisition strategy.

E. Performance Metrics

-Project performance metrics for FY 2020 will include specific details to each effort and include measures identified in individual project plans. Project completions and successes are monitored against schedules and deliverables stated in the proposals and statements of work. The metrics include items such as target milestone dates, specific performance measures, fielding dates, and demonstration goals.

Measurable Outcomes:

-FCTs will demonstrate capability objectives within 24-36 months.

-In FY 2018, FCT had a transition rate of 67 percent (4 of 6) for completed projects and contributed to the DoD Performance Goal of supporting efforts and projects which engage Joint and interagency partners to address Joint Force and Combatant Command capability gaps.