| Exhibit R-2, RDT&E Budget Item Justification: PB 2016 Office of the Secretary Of Defense | Date: February 2015 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 2: *Applied Research* | **R-1 Program Element (Number/Name)**<br>PE 0602251D8Z / *Applied Research for the Advancement of S&T Priorities* |

| COST ($ in Millions) | Prior Years | FY 2014 | FY 2015 | FY 2016 Base | FY 2016 OCO | FY 2016 Total | FY 2017 | FY 2018 | FY 2019 | FY 2020 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | - | 33.543 | 41.905 | 48.226 | - | 48.226 | 48.088 | 53.039 | 56.873 | 57.602 | Continuing | Continuing |
| P227: *Applied Research for the Advancement of S&T Priorities* | - | 33.543 | 41.905 | 48.226 | - | 48.226 | 48.088 | 53.039 | 56.873 | 57.602 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The Applied Research for the Advancement of Science and Technology (S&T) Priorities program element (PE) enables the early launch of S&T applied research projects to shape Components' investments. The PE is oriented toward the design, development, and improvement of prototypes and new processes to meet general mission area requirements, and to translate promising research into solutions for military needs. Efforts are situated within DoD S&T priorities and focus areas and will include feasibility evaluations and non-system specific technology efforts. Investigations conducted in this PE facilitate concept exploration efforts and studies of alternative concepts. Efforts are formulated and managed by teams of subject matter experts drawn from the Office of the Secretary of Defense, the Military Services, and Defense Agencies. The PE also provides necessary support to the S&T Communities of Interest.

| B. Program Change Summary ($ in Millions) | FY 2014 | FY 2015 | FY 2016 Base | FY 2016 OCO | FY 2016 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 37.984 | 41.965 | 46.920 | - | 46.920 |
| Current President's Budget | 33.543 | 41.905 | 48.226 | - | 48.226 |
| Total Adjustments | -4.441 | -0.060 | 1.306 | - | 1.306 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | -3.218 | - | | | |
| • SBIR/STTR Transfer | -1.223 | - | | | |
| • FFRDC Sec 8104 | - | -0.060 | - | - | - |
| • Economic Assumptions | - | - | -0.117 | - | -0.117 |
| • Realignment for Higher Priority Programs | - | - | 1.423 | - | 1.423 |

**Change Summary Explanation**

FY 2016 internal realignment reflects funding for higher Departmental priorities and requirements.

| Exhibit R-2A, RDT&E Project Justification: PB 2016 Office of the Secretary Of Defense | | | Date: February 2015 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 2 | R-1 Program Element (Number/Name)<br>PE 0602251D8Z / *Applied Research for the Advancement of S&T Priorities* | Project (Number/Name)<br>P227 / *Applied Research for the Advancement of S&T Priorities* | |

| COST ($ in Millions) | Prior Years | FY 2014 | FY 2015 | FY 2016 Base | FY 2016 OCO | FY 2016 Total | FY 2017 | FY 2018 | FY 2019 | FY 2020 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P227: *Applied Research for the Advancement of S&T Priorities* | - | 33.543 | 41.905 | 48.226 | - | 48.226 | 48.088 | 53.039 | 56.873 | 57.602 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The Applied Research for the Advancement of Science and Technology (S&T) Priorities program element (PE) enables the early launch of S&T applied research projects to shape Components' investments. The PE is oriented toward the design, development, and improvement of prototypes and new processes to meet general mission area requirements, and to translate promising research into solutions for military needs. Efforts are situated within the seven DoD S&T priorities and focus areas and will include feasibility evaluations and non-system specific technology efforts. Investigations conducted in this PE facilitate concept exploration efforts and studies of alternative concepts. Efforts are formulated and managed by teams of subject matter experts drawn from the Office of the Secretary of Defense, the Military Services, and Defense Agencies. The PE also provides necessary support to the S&T Communities of Interest.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2014 | FY 2015 | FY 2016 |
|---|---|---|---|
| ***Title:*** Applied Research for the Advancement of S&T Priorities | 17.267 | 24.349 | 25.000 |
| ***Description:*** The S&T priorities include: Electronic Warfare (EW), Human Systems, Counter Weapons of Mass Destruction (CWMD), Engineered Resilient Systems (ERS), Data to Decisions (D2D), Autonomy, and Cybersecurity.<br><br>***FY 2014 Accomplishments:***<br>Conducted concept exploration efforts that focused on ERS, Autonomy, and D2D. Accomplishments within the areas included:<br><br>ERS:<br>- Extended ERS architecture development and established baseline knowledge management environment<br>- Developed advanced large data analysis and visualization capabilities<br>- Furthered ERS Tradespace capabilities through more comprehensive capture of workflow processes<br>- Developed ERS cloud-computing environment<br><br>Autonomy:<br>- Developed scenarios and requirements for sample mission types<br>- Designed audio anomaly detector hardware and supporting algorithms<br>- Completed early implementation of a goal reasoning model (Goal-Directed Autonomy) to provide an autonomous squad member the ability to self-select new goals when it encounters an unanticipated situation<br>- Developed predictive models of operator trust, understanding, and overload<br>- Developed multi-scale approaches to assessing confidence in human performance<br>- Completed a Tactical Battle Manager architecture definition and implementation | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2016 Office of the Secretary Of Defense | | Date: February 2015 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602251D8Z / *Applied Research for the Advancement of S&T Priorities* | **Project (Number/Name)**<br>P227 / *Applied Research for the Advancement of S&T Priorities* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2014 | FY 2015 | FY 2016 |
|---|---|---|---|

D2D:
- Performed live collection of wide area motion imagery data and detected anomalous events automatically
- Improved automatic threat assessment accuracy by 20 percent
- Improved tracking results from imagery by 30 percent

***FY 2015 Plans:***
Continue efforts within the ERS, Autonomy, and D2D areas. Plans are:

ERS:
- Release Version 1.1 and 1.2 ERS Architecture
- Develop lifecycle cost models that address the entire life of Air Force unmanned platforms
- Improve visualization and automated tradespace reduction techniques
- Use hi-fidelity, high-performance computing simulations to examine rotor blade performance on cargo rotorcraft
- Create a standard modeling library for the retention and use of UH-60 helicopter data
- Launch second release of ERS Knowledge Management environment

Autonomy:
- Develop virtual terrain and simulated entities to increase the complexity of autonomous squad behavior
- Construct three rotorcraft capable of autonomous and stable flight; demonstrate in simulation the software to perform mapping, task allocation, trajectory planning, and frontier identification
- Validate, refine, and further develop estimators of trust in Autonomy
- Demonstrate proof-of-concept Tactical Battle Management in virtual simulation

D2D:
- Integrate live text analytics with signals analysis
- Integrate target queuing framework from stored text data
- Integrate text and signals analysis into cloud architecture
- Demonstrate overall system performance

***FY 2016 Plans:***
Continue to conduct concept exploration efforts that focus on the S&T priority areas. In FY 2016, the challenge areas within the priorities include:

Autonomy:

| Exhibit R-2A, RDT&E Project Justification: PB 2016 Office of the Secretary Of Defense | | Date: February 2015 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602251D8Z / *Applied Research for the Advancement of S&T Priorities* | **Project (Number/Name)**<br>P227 / *Applied Research for the Advancement of S&T Priorities* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2014 | FY 2015 | FY 2016 |
|---|---|---|---|
| - Demonstrate trust optimization in Autonomy<br>- Automate learning of tactics to enhance validity of air combat effectiveness evaluation<br>- Enable manned and unmanned synchronized teaming in tactical reconnaissance, surveillance, and target acquisition missions<br><br>Engineered Resilient Systems:<br>- Continue systems analysis methods and tools<br>- Develop early concept engineering techniques<br>- Develop architecture and design analysis techniques<br>- Evaluate new approaches to analysis and testing<br><br>Data to Decisions:<br>- Improve algorithms for data fusion<br>- Improve understanding of user interactions<br><br>Cyber:<br>- Enhance mission assurance and effectiveness<br>- Develop techniques for operating securely in an insecure world<br>- Build upon cyber technology foundations<br><br>Counter Weapons of Mass Destruction:<br>- Continue to assess methods for systems integration<br>- Develop advanced signature detection and tracking techniques<br>- Develop methods of advanced radiation detection | | | |
| ***Title:*** S&T Communities of Interest | 16.276 | 17.556 | 23.226 |
| ***Description:*** The S&T Communities of Interest task facilitates cooperation and collaboration among Components and optimizes development of selected S&T efforts across the DoD enterprise. Efforts include technology roadmapping and the integration of technology planning to Department strategic objectives. Select technology areas are examined by the Communities of Interest and projects are initiated to address gaps or opportunities.<br><br>***FY 2014 Accomplishments:***<br>Provided technical support to all seventeen Communities of Interest. In collaboration with Components, initiated eight two-year projects to target technology opportunities and gaps identified by Communities of Interest. Projects initiated were:<br>- Reusable Military Launch Concepts | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2016 Office of the Secretary Of Defense | | Date: February 2015 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602251D8Z / *Applied Research for the Advancement of S&T Priorities* | **Project (Number/Name)**<br>P227 / *Applied Research for the Advancement of S&T Priorities* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2014 | FY 2015 | FY 2016 |
|---|---|---|---|
| - Analysis to Determine the Role of Pedigree-based Training and Licensure in the Certification of DoD's Autonomous Systems<br>- Foundations for Context-aware Information Retrieval for Proactive Decision Support<br>- Integrated SATCOM Tactical Resiliency Risk Reduction<br>- Cyber Operational Architecture Training System<br>- Adaptive Technologies for Language Training<br>- Accelerated Discovery to Delivery - Joint Service Research on Materials By-design and On-demand<br>- Technology Investigation and Assessment for the Development of Digital Read Out Integrated Circuits<br>***FY 2015 Plans:***<br>Continue to provide technical support to Communities of Interest. Initiate new set of projects to address technology opportunities or gaps identified by Communities of Interest.<br>***FY 2016 Plans:***<br>Continue to provide technical support to Communities of Interest. Initiate new set of projects to address gaps identified by Communities of Interest. | | | |
| **Accomplishments/Planned Programs Subtotals** | 33.543 | 41.905 | 48.226 |

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

**E. Performance Metrics**

Project performance metrics specific to each effort are identified in the project plans established by the program leads and the Communities of Interest. Individual project success will be monitored through these metrics.