A. Mission Description and Budget Item Justification

Cooperative Engagement Capability (CEC) significantly improves Battle Force Anti-Air Warfare (AAW) capability by coordinating all Battle Force AAW sensors into a single, real-time, composite track picture to support integrated fire control. CEC distributes sensor data from each USMC Command Control Unit, USA Aerostat, US Navy Ship, and US Navy Aircraft, or cooperating unit (CU), to all other CUs in the battle force through a real-time, line of sight, high data rate sensor and engagement data distribution network. CEC is highly resistant to jamming and provides accurate gridlocking between CUs. Each CU independently employs high capacity, parallel processing and advanced algorithms to combine all distributed sensor data into a fire control quality track picture which is the same for all CUs. CEC data is presented as a superset of the best AAW sensor capabilities from each CU, all of which are integrated into a single input to each CU's combat weapons system. CEC significantly improves our Battle Force defense in depth, including both local area and ship defense capabilities against current and future AAW threats. Moreover, CEC provides critical connectivity and integration of over-land air defense systems capable of countering emerging air threats, including land attack cruise missiles, in a complex littoral environment.

Each military Service funds CEC development for their combat systems. The CEC Program Office oversees CEC development for all services.

CEC consists of the Data Distribution System (DDS), the Cooperative Engagement Processor (CEP), and interface with Combat Systems and sensors. The DDS encodes and distributes own-ship sensor and engagement data and is a high capacity, jam resistant, directive system providing a precision gridlocking and high throughput of data. The CEP is a high capacity distributed processor that processes force levels of data in near real-time. The data is passed to the ship's combat system as high quality data for which the ship can cue its onboard sensors or use the data to engage targets without actually tracking them.

The Navy implemented a Signal Data Processor (SDP) approach to modify the current equipment to meet reduced size, weight, cost, power and cooling objectives. This SDP approach also supports continuity for interoperability improvements and program protection, as well as supporting open architecture initiatives, and comms independence. The SDP hardware complies with Category 3 Open Architecture Computing Environment (OACE) standards. The SDP-S is being fielded fleet-wide to all US Navy, USMC, US Army, and FMS CEC units.

A family of antennas approach will be used to satisfy CEC requirements with lower life cycle costs (procurement, installation, and maintenance) and reduced weight (on mast and below deck). These antennas enable future capability as well as providing a solution extensible to additional platforms. This effort for development and production of Common Array Block (CAB) antennas was competitively awarded in late FY2013.
In support of Interoperability, CEC will continue to work collaboratively with other Combat Systems programs (AWS, E-2C, E-2D, SSDS, CDLMS, C2P, and SGS/AC) to develop the software and implement design corrections and system changes. CEC will analyze the interactions of interoperability issues and impacts and provide collaboration for development of CEC and other system changes, develop the long term solutions, including the engineering process to validate small parts of developmental software ideas, and utilize M&S to validate design approaches in the systems engineering realm.

### B. Program Change Summary ($ in Millions)

<table>
<thead>
<tr>
<th></th>
<th>FY 2015</th>
<th>FY 2016</th>
<th>FY 2017 Base</th>
<th>FY 2017 OCO</th>
<th>FY 2017 Total</th>
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<tbody>
<tr>
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<td>Total Adjustments</td>
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<td>• Congressional Directed Reductions</td>
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<td>• Congressional Rescissions</td>
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<td>-</td>
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<tr>
<td>• Congressional Adds</td>
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<td>• Congressional Directed Transfers</td>
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<td>-81.475</td>
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</table>

**Change Summary Explanation**

FY 2015 funding is increased by $4.5M for OMNIBUS.
FY 2016 funding is reduced by $2.461M for Program Execution.
FY 2017 funding is increased by $5.9M for CEC Fire Control Loop Improvement Project and by $1.9M for CEC Increment 2.
FY 2017 funding is reduced by $89.275M due to the realignment from Program Element 0603658N to Program Element 0607658N.
A. Mission Description and Budget Item Justification

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### B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)

<table>
<thead>
<tr>
<th>Title: E-2D</th>
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<th>FY 2017 Base</th>
<th>FY 2017 OCO</th>
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<td>3.500</td>
<td>0.000</td>
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</table>

**FY 2015 Accomplishments:**
N/A

**FY 2016 Plans:**
Support DSSC 2 CEC flight test and IV&V, and develop and incorporate corrective actions as required to support E-2D CEC DSSC 2 software Product Certification Panel. Support E-2D CEC AMIIP and NIFC-CA Enhancements requirements development, systems engineering, and software development efforts in conjunction with E-2D DSSC 3 software development. Assess impacts of SDP-S -005 development and fielding on E-2D, and conduct related systems engineering.

**FY 2017 Base Plans:**
N/A

**FY 2017 OCO Plans:**
N/A

<table>
<thead>
<tr>
<th>Title: B/L 2.1 INTEGRATION AND FOT&amp;E TESTING</th>
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<th>FY 2016</th>
<th>FY 2017 Base</th>
<th>FY 2017 OCO</th>
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</tr>
</thead>
<tbody>
<tr>
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<td>8.400</td>
<td>0.000</td>
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</tr>
</tbody>
</table>

**FY 2015 Accomplishments:**
Completed NIFC-CA Live Fire Test #3 at White Sands Missile Range. Conducted Phase 1 of CEC Operational Test (OT-D1A) of AN/USG-2B with Aegis Baseline 9A on USS CHANCELLORSVILLE (CG 62). Completed Developmental Testing (DT-D1C) of AN/USG-2B with Aegis Baseline 9C on USS JOHN PAUL JONES (DDG 53). Commenced Developmental Test (DT-D2) of AN/USG-2B with CVN 78.

**FY 2016 Plans:**
Continue support of NIFC-CA testing. Complete CEC Operational Test (OT-D1A) of AN/USG-2B with Aegis Baseline 9A on USS PRINCETON (CG 59). Complete Operational Test (OT-D1C) of AN/USG-2B with Aegis Baseline 9C on USS JOHN PAUL JONES (DDG 53) and USS ARLEIGH BURKE (DDG 51). Continue Developmental Test (DT-D2) of AN/USG-2B with CVN 78. Commence Developmental Test (DT-D3) of AN/USG-2B with DDG 1000.

**FY 2017 Base Plans:**
N/A

**FY 2017 OCO Plans:**
**Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy**

**Appropriation/Budget Activity**
1319 / 4

**R-1 Program Element (Number/Name)**
PE 0603658N / Cooperative Engagement

**Project (Number/Name)**
2039 / COOP Engagement

---

**B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)**

<table>
<thead>
<tr>
<th></th>
<th>FY 2015</th>
<th>FY 2016</th>
<th>FY 2017 Base</th>
<th>FY 2017 OCO</th>
<th>FY 2017 Total</th>
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<tbody>
<tr>
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</table>

**FY 2015 Accomplishments:**
Continued system improvements at Land Based Test Sites (LBTS) to accurately reflect CEC equipment in the fleet. Continued development of a CEC Adaptive Layer for Advanced Combat Baseline 16 (ACB-16) to include supporting Technical Interchange Meetings (TIM), Modeling and Simulation updates, and initial Wrap Around Simulation Program (WASP) development. Conducted CEC ACB 16 System Functional Review (SFR) and System Requirement Review (SRR). Continued to monitor Cyber/Information Assurance (IA) posture and program protection and began development of IA specific ECP’s. Began Common Array Block (CAB) antenna integration efforts. Commenced CVN-78 integration efforts to include land based testing.

**FY 2016 Plans:**
Significantly ramp up efforts to meet the rigor of the ACB-16 Preliminary Design Review (PDR); deliver CEC to CSEDS with a CEC system supporting the ACB-16 combat system prototype. Coincident with that, integrate with ACB-16’s updated sensors, find and resolve trouble reports and conduct associated analysis. Continue integration efforts for CEC with the CVN 78 combat system, including SSDS and the DBR. Continue to support on-ship CEC development and integration efforts with the DDG 1000 TSCE and MFR system. Complete IA focused ECPs and begin fielding across all platforms. Ramp up CAB antenna integration efforts to support Engineering Development Model (EDM) testing.

**FY 2017 Base Plans:**
N/A

**FY 2017 OCO Plans:**
N/A

<table>
<thead>
<tr>
<th></th>
<th>7.331</th>
<th>7.302</th>
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<tr>
<td><strong>Title:</strong> NETWORK ENABLED ELECTRONIC DEFENSE SYSTEM (NEEDS)</td>
<td></td>
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</tbody>
</table>

**FY 2015 Accomplishments:**
Continued analysis, definition and development of NEEDS capability, system architecture and design, external interface requirements, development of prototype implementation, evaluation of real time processing load, development of WASP capabilities, development of recorded data playback capability, support for TIMs, Interface Control Working Groups (ICWG), and In-Process Reviews (IPR). Conducted Preliminary Design Review (PDR). Refined NEEDS algorithms, and Modeling and Simulation (M&S) capabilities. Developed
### B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)

<table>
<thead>
<tr>
<th>FY 2015</th>
<th>FY 2016</th>
<th>FY 2017 Base</th>
<th>FY 2017 OCO</th>
<th>FY 2017 Total</th>
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<tr>
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</table>

#### FY 2016 Plans:
Continue analysis, definition and development of NEEDS capability, system architecture and design, external interface requirements, development of prototype implementation, evaluation of real-time processing load, development of WASP capabilities, and development of recorded data playback capability, and support for TIMs, Interface Control Working Groups (ICWG) and In-Process Reviews (IPR). Conduct Critical Design Review (CDR). Begin iterative Code Unit and Test (CUT) software development process. Continue to collect real-world data in Software Integration Laboratory (SIL) to refine initial NEEDS Software Module and update M&S capabilities. Continue to refine Technical Performance Measures (TPM) and CEC Critical Test Integration (CTI) Notebook.

#### FY 2017 Base Plans:
N/A

#### FY 2017 OCO Plans:
N/A

**Title:** FIELD ACTIVITIES

**Articles:**

<table>
<thead>
<tr>
<th>FY 2015 Accomplishments:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continued Field activity support of CEC development and fielding efforts, (including SE/IA, Technical Direction Agent, In-Service Engineering, Integrated Logistics Support planning) and program management support.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FY 2016 Plans:</th>
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</thead>
<tbody>
<tr>
<td>Continue field activity support of CEC development and fielding efforts (including SE/IA, Technical Direction Agent, In-Service Engineering, Integrated Logistics Support planning) and program management support. Support ongoing Common Array Block (CAB) Antenna development effort by providing close coordination with shipyards to refine the CAB Antenna fielding plan for both forward-fit and backfit platforms. Participate in discussions to identify and resolve CEC training systems limitations for pier-side Fleet Synthetic Training (FST) events and ensure appropriate CEC configuration after each event.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FY 2017 Base Plans:</th>
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<tbody>
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<td></td>
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</tbody>
</table>
### B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)

<table>
<thead>
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<tbody>
<tr>
<td><strong>Title:</strong> LINK 16/INTEROPERABILITY</td>
<td>0.800</td>
<td>5.200</td>
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<tr>
<td><strong>FY 2015 Accomplishments:</strong></td>
<td>Continued development of Far Term Interoperability Improvement Project (FTIIP) approach.</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FY 2016 Plans:</strong></td>
<td>Commence development of Far Term Interoperability Improvement Project (FTIIP) software. Coordinate Development and Integration requirements across all FTIIP programs. Commence integration of FTIIP software.</td>
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<td></td>
<td></td>
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<tr>
<td><strong>FY 2017 Base Plans:</strong></td>
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<tr>
<td><strong>Title:</strong> COMMON ARRAY BLOCK (CAB) ANTENNA</td>
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<tr>
<td><strong>FY 2015 Accomplishments:</strong></td>
<td>Conducted Preliminary Design Review (PDR) and began development and testing of Engineering Design Model (EDM) CAB-Ship and CAB-Expeditionary antenna systems to inform system trades, refine system models, optimize thermal capacities, and refined path for final design.</td>
<td></td>
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<tr>
<td><strong>FY 2016 Plans:</strong></td>
<td>Conduct Critical Design Review (CDR) and commence build and test of EDMs of the CAB-Ship antenna.</td>
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<tr>
<td><strong>FY 2017 Base Plans:</strong></td>
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**Exhibit R-2A, RDT&E Project Justification:** PB 2017 Navy  
**Date:** February 2016

<table>
<thead>
<tr>
<th>Appropriation/Budget Activity</th>
<th>R-1 Program Element (Number/Name)</th>
<th>Project (Number/Name)</th>
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<tbody>
<tr>
<td>1319 / 4</td>
<td>PE 0603658N / Cooperative Engagement</td>
<td>2039 / COOP Engagement</td>
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**B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)**

<table>
<thead>
<tr>
<th>FY 2015</th>
<th>FY 2016</th>
<th>FY 2017 Base</th>
<th>FY 2017 OCO</th>
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<tbody>
<tr>
<td>N/A</td>
<td></td>
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</table>

**FY 2016 Plans:**
Support NIFC CA Increment 1 refinement against increasingly challenging test cases at White Sands Missile Range (WSMR) and At-Sea with test support, model updates, post-analysis, and software updates. Also begin development of NIFC CA Increment 2 capability with Interface Design Description (IDD) refinement, model updates and development of initial software loads for test at WSMR. Conduct System Functional Review (SFR) and System Requirement Review (SRR).

**FY 2017 Base Plans:**
N/A

**FY 2017 OCO Plans:**
N/A

**Title:** AIR AND MISSILE DEFENSE RADAR (AMDR)

**Articles:**

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<tr>
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<tr>
<td>N/A</td>
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**FY 2015 Accomplishments:**
N/A

**FY 2016 Plans:**

**FY 2017 Base Plans:**
N/A

**FY 2017 OCO Plans:**
N/A

**Title:** FIRE CONTROL LOOP IMPROVEMENT INITIATIVE (FCLIP) PHASE 2

<table>
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<th>FY 2017 Base</th>
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<td>0.000</td>
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</tbody>
</table>
B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)

FY 2015 Accomplishments:
N/A

FY 2016 Plans:
Commence development efforts for Fire Control Loop Improvement Project (FCLIP) phase 2. Coordinate FCLIP improvements with host combat system and other combat system elements. Integrate the updated FCLIP software to accomplish improved air object tracking, to include new interface to Close In Weapon System (CIWS) Sensor and updated interface to the SPQ-9B radar system.

FY 2017 Base Plans:
N/A

FY 2017 OCO Plans:
N/A

Accomplishments/Planned Programs Subtotals 41.158 73.786 0.000 0.000 0.000

C. Other Program Funding Summary ($ in Millions)

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<td>18.100</td>
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<td>• OPN/2606: CEC</td>
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<td>• O&amp;M,N/0206626M: USMC</td>
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<td>30.570</td>
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D. Acquisition Strategy
CEC Acquisition Strategy (AS) approved by OSD (AT&L) on 19 January 2010. CEC Acquisition Plan (AP) approved September 2013. Full Rate Production for CEC AN/USG-3B variant approved April 2014.
Contracts:
Common Array Block (CAB) antenna - contract competitively awarded 4Qtr FY2013.
CEC Design Agent/Engineering Services (DA/ES) follow-on sole source contract awarded 4Qtr FY2013.
CEC Production - New contract competitively awarded in 2Qtr FY2015.
CEC DA/ES contract will be competitively awarded 1Qtr FY2019.

E. Performance Metrics
- Complete the adaptive layer development for the E-2D aircraft. Provide technical support for installation and integration in the Northrop Grumman Systems Integration Laboratory, on board the test aircraft and support the Developmental testing. Continue E-2D Advanced Hawkeye aircraft CEC integration efforts.
- Continue AEGIS Advance Capability Builds CEC integration and demonstration efforts.
- Continue Naval Integrated Fire Control - Counter Air (NIFC-CA) CEC integration and demonstration efforts.
- Continue Crypto Modernization Tech Refresh efforts.
### Exhibit R-3, RDT&E Project Cost Analysis: PB 2017 Navy

#### Appropriation/Budget Activity
1319 / 4

#### R-1 Program Element (Number/Name)
PE 0603658N / Cooperative Engagement

#### Project (Number/Name)
2039 / COOP Engagement

#### Date: February 2016

### Product Development ($ in Millions)

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**Remarks**

Explanations for the use of "WR and Reqn" in the Contract method & type column are as follows:
- When using "WR", these documents are sent to Navy activities who obligate funding on their vehicles to accomplish tasking for CEC. These activities are the only ones who can accomplish these tasks for the program.
- E-2D Integration/NIFC-CA "Various/TBDs" are for classified programs and several document types.

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**Remarks**

Explanation for the use of "WR" in the "Contract method & type" column are as follows:

When using "WR", these documents are sent to Navy activities who obligate funding on their vehicles to accomplish tasking for CEC. These activities are the only ones who can accomplish these tasks for the program.

Test support also includes the following funding for ACB integration support:

FY14 - $3.0M

### Management Services ($ in Millions)

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### Project Cost Totals

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**Remarks**

**Exhibit R-3, RDT&E Project Cost Analysis:** PB 2017 Navy

**Date:** February 2016

**Appropriation/Budget Activity**
1319 / 4

**R-1 Program Element (Number/Name)**
PE 0603658N / Cooperative Engagement

**Project (Number/Name)**
2039 / COOP Engagement
### Exhibit R-4, RDT&E Schedule Profile: PB 2017 Navy

**Program Element (Number/Name):** PE 0603658N / Cooperative Engagement

**Project (Number/Name):** 2039 / COOP Engagement

**Date:** February 2016

#### Fiscal Year Schedule Profile

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#### Acquisition Milestones
- [ ] CBB Date 6
- [ ] CBB Date 6
- [ ] CBB Date 6
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#### Program Milestones
- [ ] CAS FOR
- [ ] CAS FOR
- [ ] CAS FOR
- [ ] CAS FOR
- [ ] CAS FOR
- [ ] CAS FOR

#### Contracts
- [ ] CEC Sole Source Production Contract
- [ ] CEC Competitive Production Contract
  - [ ] Contract Award
- [ ] CEC Signal Data Processor - Sierra (SDP-S) Contract (Current)
  - [ ] Contract Award
- [ ] CEC SDP-S Competitive Production Contract
  - [ ] Contract Award
- [ ] CEC Sole Source Design Agent/Engineering Services (DA/ES) Contract
  - [ ] Contract Award
- [ ] CEC DAE/ES Competitive Contract
  - [ ] Contract Award

#### Test & Evaluation
- [ ] DT-ID BSC 40 on AN/UGG-14
- [ ] DT-ID BSC 40 on AN/UGG-14
- [ ] DT-ID BSC 40 on AN/UGG-14
- [ ] DT-ID BSC 40 on AN/UGG-14
- [ ] DT-ID BSC 40 on AN/UGG-14
- [ ] DT-ID BSC 40 on AN/UGG-14
- [ ] DT-ID BSC 40 on AN/UGG-14
- [ ] DT-ID BSC 40 on AN/UGG-14

**Legend:**
- [ ] Actual Milestone Completion
- [ ] Planned Milestone Completion
- [ ] Planned Event Start/Completion
- [ ] Current Date

---

**Source:** UNCLASSIFIED

**UNCLASSIFIED**

**Date:** February 2016

**Appropriation/Budget Activity:**
- 1319 / 4

**R-1 Program Element (Number/Name):**
- PE 0603658N / Cooperative Engagement

**Project (Number/Name):**
- 2039 / COOP Engagement

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**Navy**

**Page 15 of 17**

**R-1 Line #59**

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**Navy**

---
### Schedule Details

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## Exhibit R-4A, RDT&E Schedule Details: PB 2017 Navy

**Date:** February 2016

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