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**Exhibit R-2, RDT&E Budget Item Justification:** PB 2016 Air Force **Date:** February 2015

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| <b>Appropriation/Budget Activity</b><br>3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 7: Operational Systems Development</i> | <b>R-1 Program Element (Number/Name)</b><br>PE 0401134F / <i>Large Aircraft IR Countermeasures (LAIRCM)</i> |
|--|---|

| 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  | -           | 4.116   | 4.672   | 6.802        | -           | 6.802         | 5.845   | 5.318   | 5.416   | 5.512   | Continuing       | Continuing |
| 674942: <i>Large Aircraft Infrared Counter Measures (LAIRCM)</i> | -           | 4.116   | 4.672   | 6.802        | -           | 6.802         | 5.845   | 5.318   | 5.416   | 5.512   | Continuing       | Continuing |
| Quantity of RDT&E Articles                                       | -           | -       | -       | -            | -           | -             | -       | -       | -       | -       |                  |            |

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

The Large Aircraft Infrared Countermeasures (LAIRCM) system is an evolutionary acquisition program that provides significantly improved defensive systems capability for DoD aircraft to counter the infrared (IR) man-portable air-defense systems (MANPADS) missile threat. The current LAIRCM system configuration [AN/AAQ-24V] consists of an ultra-violet missile warning sensor (MWS), a laser transmitter assembly, control interface unit (CIU) and processors to detect, track, jam and counter incoming IR missiles. The number of sensors and turrets per aircraft is determined by the size and signature of the aircraft. The system is fully automatic following system power-up. LAIRCM requirements are documented in the multi-command Operational Requirements Document (ORD) LAIRCM ORD 314-92, validated on 03 Aug 98. The system was first fielded on the C-17 aircraft.

The baseline program development is complete and consists of the small laser transmitter assembly (SLTA), ultra-violet MWS, processor, control interface unit (CIU) and a repeater (on some aircraft) to meet the need for advanced IR countermeasures. The Guardian Laser Transmitter Assembly (GLTA) is an upgrade to the baseline transmitter equipment to improve reliability, enhance performance, address obsolescence issues, reduce mass and improve overall functionality. First production GLTA delivery occurred in June 08.

Development of the Next Generation Missile Warning System (NexGen MWS) is complete and includes new hardware that improves capability. Baseline equipment (ultra-violet MWS) will be retrofitted with the NexGen MWS as it becomes available. Developmental test/operational test (DT/OT) was conducted in FY10 with initial operational test and evaluation (IOT&E) in FY11.

Per DoD direction, LAIRCM program will accomplish aircraft integration and testing and provide integration support/Hardware buys to incorporate LAIRCM on new platforms, upon request of AMC, AFSOC, multiple potential tanker aircraft variants, and other federal agencies. The last integration effort will be completed in FY14.

LAIRCM upgrades include, but are not limited to hardware and software upgrades and testing of the LAIRCM system to maintain defensive capability against new and emerging threats. Capabilities include engagement reporting (ER), Closed Loop Infrared Countermeasures (CLIRCM) and other emerging capabilities to upgrade/update system threat defeating ability.

Current and future efforts include Threat Analysis; Modeling, Simulation and Emulation Test; Hardware, Software and Firmware Upgrades; Virtual System Integration Lab (SIL) Development; and Studies and Analysis.

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| <b>Appropriation/Budget Activity</b><br>3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 7: Operational Systems Development</i>   | <b>R-1 Program Element (Number/Name)</b><br>PE 0401134F / <i>Large Aircraft IR Countermeasures (LAIRCM)</i> |                            |
| <p>Threat Analysis: Threat analysis encompasses the activities to support threat exploitation analysis of a variety of threats (both known and emerging) against the current LAIRCM jam code with the intent of determining if jam code updates are required. Typical threat analysis activities include: Threat seeker characterization; model development for advanced threat IR seekers; development and testing of new infrared countermeasures concepts, techniques, and hardware; new technology assessment for potential incorporation into the LAIRCM system, and the evaluation/exploitation of new threats and threat characteristics relative to IRCM.</p> <p>Modeling, Simulation, and Emulation Testing: Modeling, simulation, and emulation activities verify and validate the information obtained from the threat analysis activities. These activities include: Evaluation of infrared countermeasures (IRCM) techniques used in defeating real threat hardware; developing and evaluating jam code; validating and verifying integration of LAIRCM system components to newly developed jam codes, software or hardware; evaluating system effectiveness; performing platform integration support tests; and conducting predictive risk reduction tests prior to Live Missile Fire Test (LMFT) or on aircraft flight testing.</p> <p>Hardware, Software, and Firmware Upgrades: Includes changes of any kind to any LAIRCM hardware components/support equipment with the purpose of adding capability, features, and enhancements which do not presently exist to ensure the LAIRCM system remains viable against current and emerging threats.<br/>-----Hardware upgrade activities include engineering tasks required to design, develop, test and produce new capabilities, features, and enhancements, and changes of any kind to any portion of LAIRCM hardware with the purpose of adding capability, features and enhancements which do not presently exist.<br/>-----Software upgrade activities include engineering tasks required to design, develop, and test the new or modified code that result in new capabilities, features, and enhancements and changes of any kind to any portion of LAIRCM software with the purpose of adding capability, features and enhancements which do not presently exist. Software upgrades can occur in any of the Line Replaceable Unit (LRU) Operation Flight Programs as well as any of the software residing in other LAIRCM-associated components including those systems which support development and test or the LAIRCM support equipment.<br/>-----Firmware upgrade activities include engineering tasks required to design, develop, and test the upgrades and those changes resulting from hardware and software updates/modifications as well as firmware upgrades which add new features.</p> <p>Virtual SIL Development: Incrementally design, develop, integrate, and test software code and purchase associated infrastructure (i.e., computers, servers, commercial-of-the-self (COTS) software, etc.) necessary to develop and implement a virtual SIL providing a critical capability for testing the LAIRCM system to ensure continued effectiveness against current and emerging threats.</p> <p>Studies and Analysis: Includes logistics, programmatic, and engineering studies and analysis activities to ensure continued system viability and sustainability and compliance with acquisition directives. These activities may include the evaluation of low cost/high payback opportunities to reduce software development/implementation cost, enhance production efficiency, and improve life cycle costs through increased reliability and reduced repair and return cost.</p> <p>Program management and administration efforts consist of, but are not limited to contract services and Government costs.</p> <p>This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.</p> |   |                            |

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| <b>Exhibit R-2, RDT&amp;E Budget Item Justification: PB 2016 Air Force</b>  |                |  |                     | <b>Date:</b> February 2015 |                      |                |
| <b>Appropriation/Budget Activity</b><br>3600: Research, Development, Test & Evaluation, Air Force I BA 7:<br>Operational Systems Development  |                | <b>R-1 Program Element (Number/Name)</b><br>PE 0401134F I Large Aircraft IR Countermeasures (LAIRCM) |                     |                            |                      |                |
| <b>B. Program Change Summary (\$ in Millions)</b>   | <b>FY 2014</b> | <b>FY 2015</b>   | <b>FY 2016 Base</b> | <b>FY 2016 OCO</b>         | <b>FY 2016 Total</b> |                |
| Previous President's Budget   | 4.116          | 5.172  | 7.502               | -                          | 7.502                |                |
| Current President's Budget  | 4.116          | 4.672  | 6.802               | -                          | 6.802                |                |
| Total Adjustments   | -              | -0.500   | -0.700              | -                          | -0.700               |                |
| • Congressional General Reductions  | -              | -  |                     |                            |                      |                |
| • Congressional Directed Reductions   | -              | -0.500   |                     |                            |                      |                |
| • Congressional Rescissions   | -              | -  |                     |                            |                      |                |
| • Congressional Adds  | -              | -  |                     |                            |                      |                |
| • Congressional Directed Transfers  | -              | -  |                     |                            |                      |                |
| • Reprogrammings  | -              | -  |                     |                            |                      |                |
| • SBIR/STTR Transfer  | -              | -  |                     |                            |                      |                |
| • Other Adjustments   | -              | -  | -0.700              | -                          | -0.700               |                |
| <b>C. Accomplishments/Planned Programs (\$ in Millions)</b>   |                |  |                     | <b>FY 2014</b>             | <b>FY 2015</b>       | <b>FY 2016</b> |
| <b>Title:</b> LAIRCM Integration  |                |  |                     | 1.716                      | -                    | -              |
| <b>Description:</b> Continue Mobility Platform integration efforts to include Software development, and Hardware buys.  |                |  |                     |                            |                      |                |
| <b>FY 2014 Accomplishments:</b><br>Continued AC-130U and MC-130H integration efforts; Software and Hardware buys. Completes in 2015.  |                |  |                     |                            |                      |                |
| <b>FY 2015 Plans:</b><br>N/A  |                |  |                     |                            |                      |                |
| <b>FY 2016 Plans:</b><br>N/A  |                |  |                     |                            |                      |                |
| <b>Title:</b> Threat Analysis   |                |  |                     | 0.816                      | 2.054                | 1.887          |
| <b>Description:</b> Encompasses the activities to support threat exploitation analysis of a variety of threats against the current LAIRCM jam code with the intent of determining if jam code updates are required. |                |  |                     |                            |                      |                |
| <b>FY 2014 Accomplishments:</b><br>Continued work on Threat analysis in the Guided Weapon Evaluation Facility (GWEF), and Dynamic Infrared Missile Evaluation Facility (DIME)Lab.                                   |                |  |                     |                            |                      |                |
| <b>FY 2015 Plans:</b>   |                |  |                     |                            |                      |                |

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| <b>Appropriation/Budget Activity</b><br>3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 7: Operational Systems Development</i>  |  | <b>R-1 Program Element (Number/Name)</b><br>PE 0401134F / <i>Large Aircraft IR Countermeasures (LAIRCM)</i> |                |                |
| <b>C. Accomplishments/Planned Programs (\$ in Millions)</b>   |  | <b>FY 2014</b>  | <b>FY 2015</b> | <b>FY 2016</b> |
| Continue work on Threat analysis in the Guided Weapon Evaluation Facility (GWEF),and Dynamic Infrared Missile Evaluation Facility (DIME)Lab.<br><b>FY 2016 Plans:</b><br>Continue work on Threat analysis in the Guided Weapon Evaluation Facility (GWEF),and Dynamic Infrared Missile Evaluation Facility (DIME)Lab.   |  |   |                |                |
| <b>Title:</b> Modeling, Simulation and Emulation Testing<br><b>Description:</b> Activities that verify and validate the information obtained from threat analysis activities.<br><b>FY 2014 Accomplishments:</b><br>Continued work in Modeling, Simulation and Emulation Tests. This is a continued effort from LAIRCM Development in previous years.<br><b>FY 2015 Plans:</b><br>Continue work in Modeling, Simulation and Emulation Tests. This is a continued effort from LAIRCM Development in previous years.<br><b>FY 2016 Plans:</b><br>Continue work in Modeling, Simulation and Emulation Tests. This is a continued effort from LAIRCM Development in previous years. |  | 0.834   | 0.872          | 0.995          |
| <b>Title:</b> Hardware/Software/Firmware Upgrades<br><b>Description:</b> This program (Hardware/Software/Firmware Upgrades) is a new start. Includes changes of any kind to any LAIRCM hardware components/support equipment with the purpose of adding capability, features, and enhancements which do not presently exist to ensure the LAIRCM system remains viable against current and emerging threats.<br><b>FY 2014 Accomplishments:</b><br>N/A<br><b>FY 2015 Plans:</b><br>N/A<br><b>FY 2016 Plans:</b>   |  | -   | -              | 0.200          |

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| <b>Appropriation/Budget Activity</b><br>3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 7: Operational Systems Development</i>  |  | <b>R-1 Program Element (Number/Name)</b><br>PE 0401134F / <i>Large Aircraft IR Countermeasures (LAIRCM)</i> |                |                |
| <b>C. Accomplishments/Planned Programs (\$ in Millions)</b>   |  | <b>FY 2014</b>  | <b>FY 2015</b> | <b>FY 2016</b> |
| Changes of any kind to any LAIRCM hardware components/support equipment with the purpose of adding capability, features, and enhancements which do not presently exist to ensure the LAIRCM system remains viable against current and emerging threats.   |  |   |                |                |
| <p><b>Title:</b> Virtual SIL Development</p> <p><b>Description:</b> This program (Virtual SIL Development) is a new start. Incrementally design, develop, integrate, and test software code and purchase associated infrastructure (i.e., computers, servers, COTS software, etc.) necessary to develop and implement a virtual SIL providing a critical capability for testing the LAIRCM system to ensure continued effectiveness against current and emerging threats.</p> <p><b>FY 2014 Accomplishments:</b><br/>N/A</p> <p><b>FY 2015 Plans:</b><br/>N/A</p> <p><b>FY 2016 Plans:</b><br/>Incrementally design, develop, integrate, and test software code and purchase associated infrastructure (i.e., computers, servers, COTS software, etc.) necessary to develop and implement a virtual SIL providing a critical capability for testing the LAIRCM system to ensure continued effectiveness against current and emerging threats.</p>   |  | -   | -              | 3.016          |
| <p><b>Title:</b> Studies and Analysis</p> <p><b>Description:</b> Includes logistics, programmatic, and engineering studies and analysis activities to ensure continued system viability and sustainability and compliance with acquisition directives. These activities may include the evaluation of low cost/high payback opportunities to reduce software development/implementation cost, enhance production efficiency, and improve life cycle costs through increased reliability and reduced repair and return cost.</p> <p><b>FY 2014 Accomplishments:</b><br/>Initiated two year statutorily required Logistics (Product Support) Business Case Analysis (PSBCA). Worked logistics, programmatic, and engineering tasks to ensure continued systems viability and sustainability. This is a continued effort from LAIRCM Development in previous years.</p> <p><b>FY 2015 Plans:</b><br/>Continuation of the PSBCA which is a regulatory requirement to review and validate the program's overarching sustainment strategy. Initiate the Best Value IR Sensor Study which provides Headquarters Air Mobility Command (HQ AMC) with an IR sensor comparison of the current IR sensor and the newly developed advanced threat warning (ATW) sensor; purpose of</p> |  | 0.750   | 1.746          | 0.704          |

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| <b>Appropriation/Budget Activity</b><br>3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 7: Operational Systems Development</i> | <b>R-1 Program Element (Number/Name)</b><br>PE 0401134F / <i>Large Aircraft IR Countermeasures (LAIRCM)</i> |
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| <b>C. Accomplishments/Planned Programs (\$ in Millions)</b>  | FY 2014 | FY 2015 | FY 2016 |
|--|---------|---------|---------|
| analysis is to determine the best value IR sensor solution. Initiate the Virtual SIL Implementation Study which refines the virtual SIL concept into an executable program; deliverables include an implementation plan (allowing for the delivery of incremental capability) and a cost estimate. Virtual SIL reduces the amount of government furnished equipment needed for lab integration efforts and reduces overall life cycle costs associated with SIL activity.<br><br><b>FY 2016 Plans:</b><br>Complete the Product Support Business Case Analysis (PSBCA), Best Value IR Sensor Study, and Virtual SIL Implementation Study. |         |         |         |
| <b>Accomplishments/Planned Programs Subtotals</b>  | 4.116   | 4.672   | 6.802   |

| <b>D. Other Program Funding Summary (\$ in Millions)</b>                                 |                |                |                               |                              |                                |                |                |                |                |                                   |                   |
|--|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
| <u>Line Item</u>   | <u>FY 2014</u> | <u>FY 2015</u> | <u>FY 2016</u><br><u>Base</u> | <u>FY 2016</u><br><u>OCO</u> | <u>FY 2016</u><br><u>Total</u> | <u>FY 2017</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> | <u>Cost To</u><br><u>Complete</u> | <u>Total Cost</u> |
| • APAF: BA05: Line Item #<br>LAIRCM: <i>Large Aircraft Infrared Countermeasures Mods</i> | 160.247        | 13.159         | 84.335                        | -                            | 84.335                         | -              | -              | -              | -              | -                                 | -                 |

**Remarks**

**E. Acquisition Strategy**  
Efforts awarded on an annual basis, exercising existing contract options, support threat analysis and system effectiveness. The LAIRCM program office partners with the Air Force Research Laboratory (AFRL) and the 782d Test Squadron to conduct threat analysis research and Modeling, Simulation, and Emulation Testing. AFRL contracts with the Guided Weapon Evaluation Facility (GWEF) to provide hardware-in-the-loop developmental test simulation capability on a level-of-effort (LOE) basis. AFRL's Dynamic Infrared Missile Evaluation (DIME) Laboratory performs threat analysis. The existing LAIRCM contract will be used to award the various study efforts.

**F. Performance Metrics**  
Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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| Exhibit R-3, RDT&E Project Cost Analysis: PB 2016 Air Force |                        |                                |             |  |            |         |            |  |            |             |            | Date: February 2015 |                  |            |                          |
|---|------------------------|--------------------------------|-------------|--|------------|---------|------------|--|------------|-------------|------------|---------------------|------------------|------------|--------------------------|
| Appropriation/Budget Activity                               |                        |                                |             | R-1 Program Element (Number/Name)                        |            |         |            | Project (Number/Name)                                      |            |             |            |                     |                  |            |                          |
| 3600 / 7  |                        |                                |             | PE 0401134F / Large Aircraft IR Countermeasures (LAIRCM) |            |         |            | 674942 / Large Aircraft Infrared Counter Measures (LAIRCM) |            |             |            |                     |                  |            |                          |
| <b>Product Development (\$ in Millions)</b>                 |                        |                                |             | FY 2014  |            | FY 2015 |            | FY 2016 Base   |            | FY 2016 OCO |            | FY 2016 Total       |                  |            |                          |
| Cost Category Item  | Contract Method & Type | Performing Activity & Location | Prior Years | Cost   | Award Date | Cost    | Award Date | Cost   | Award Date | Cost        | Award Date | Cost                | Cost To Complete | Total Cost | Target Value of Contract |
| LAIRCM S/W Upgrades for Platform Integration                | SS/T&M                 | NGC : Rolling Meadows, IL      | -           | 1.509  | May 2014   | -       |            | -  |            | -           |            | -                   | -                | 1.509      | -                        |
| Threat Analysis   | SS/CPAF                | DIME LAB : WPAFB, OH           | -           | 0.816  | Feb 2014   | 0.975   | Mar 2015   | 0.975  | Jan 2016   | -           |            | 0.975               | Continuing       | Continuing | -                        |
| Hardware/Software/Firmware Upgrades                         | SS/CPAF                | NGC : Rolling Meadows, IL      | -           | -  |            | -       |            | 0.200  | Mar 2016   | -           |            | 0.200               | Continuing       | Continuing | -                        |
| Virtual SIL Development                                     | SS/CPAF                | NGC : Rolling Meadows, IL      | -           | -  |            | -       |            | 3.016  | Feb 2016   | -           |            | 3.016               | Continuing       | Continuing | -                        |
| Studies and Analysis  | Various                | Various : Various,             | -           | 0.750  | Jul 2014   | 1.746   | Feb 2015   | 0.704  | Jan 2016   | -           |            | 0.704               | Continuing       | Continuing | -                        |
| <b>Subtotal</b>   |                        |                                | -           | 3.075  |            | 2.721   |            | 4.895  |            | -           |            | 4.895               | -                | -          | -                        |
| <b>Support (\$ in Millions)</b>                             |                        |                                |             | FY 2014  |            | FY 2015 |            | FY 2016 Base   |            | FY 2016 OCO |            | FY 2016 Total       |                  |            |                          |
| Cost Category Item  | Contract Method & Type | Performing Activity & Location | Prior Years | Cost   | Award Date | Cost    | Award Date | Cost   | Award Date | Cost        | Award Date | Cost                | Cost To Complete | Total Cost | Target Value of Contract |
| <b>Subtotal</b>   |                        |                                | -           | -  |            | -       |            | -  |            | -           |            | -                   | -                | -          | -                        |
| <b>Test and Evaluation (\$ in Millions)</b>                 |                        |                                |             | FY 2014  |            | FY 2015 |            | FY 2016 Base   |            | FY 2016 OCO |            | FY 2016 Total       |                  |            |                          |
| Cost Category Item  | Contract Method & Type | Performing Activity & Location | Prior Years | Cost   | Award Date | Cost    | Award Date | Cost   | Award Date | Cost        | Award Date | Cost                | Cost To Complete | Total Cost | Target Value of Contract |
| Various Test Organizations                                  | Various                | Various : Various,             | -           | 0.834  | Jun 2014   | 1.440   | Apr 2015   | 1.557  | Jan 2016   | -           |            | 1.557               | -                | 3.831      | -                        |
| <b>Subtotal</b>   |                        |                                | -           | 0.834  |            | 1.440   |            | 1.557  |            | -           |            | 1.557               | -                | 3.831      | -                        |
| <b>Management Services (\$ in Millions)</b>                 |                        |                                |             | FY 2014  |            | FY 2015 |            | FY 2016 Base   |            | FY 2016 OCO |            | FY 2016 Total       |                  |            |                          |
| Cost Category Item  | Contract Method & Type | Performing Activity & Location | Prior Years | Cost   | Award Date | Cost    | Award Date | Cost   | Award Date | Cost        | Award Date | Cost                | Cost To Complete | Total Cost | Target Value of Contract |
| A/C Survivability Division (Program Office)                 | Various                | Various:Various, ,             | -           | 0.207  |            | 0.511   |            | 0.350  |            | -           |            | 0.350               | -                | 1.068      | -                        |





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| <b>Exhibit R-4A, RDT&amp;E Schedule Details:</b> PB 2016 Air Force |   | <b>Date:</b> February 2015  |
| <b>Appropriation/Budget Activity</b><br>3600 / 7                   | <b>R-1 Program Element (Number/Name)</b><br>PE 0401134F / <i>Large Aircraft IR Countermeasures (LAIRCM)</i> | <b>Project (Number/Name)</b><br>674942 / <i>Large Aircraft Infrared Counter Measures (LAIRCM)</i> |

Schedule Details

| Events   | Start   |      | End     |      |
|--|---------|------|---------|------|
|  | Quarter | Year | Quarter | Year |
| Development Program and Remaining Integration          | 1       | 2014 | 2       | 2015 |
| Threat Analysis  | 1       | 2014 | 4       | 2020 |
| Modeling , Simulation, and Emulation Testing           | 1       | 2014 | 4       | 2020 |
| Studies and Analysis: Product Support BCA              | 4       | 2014 | 3       | 2016 |
| Studies and Analysis: Best Value IR Sensor Study       | 3       | 2015 | 1       | 2016 |
| Studies and Analysis: Virtual SIL Implementation Study | 3       | 2015 | 2       | 2016 |
| Virtual SIL Development                                | 2       | 2016 | 3       | 2017 |
| Hardware/Software/Firmware Upgrades                    | 2       | 2016 | 4       | 2020 |