PE NUMBER: 0101127F
PE TITLE: B-2 SQUADRONS

| Exhibit R-2, RDT&E Budget Item Justification | DATE May 2009 |
|---|---|
| BUDGET ACTIVITY 07 Operational System Development | PE NUMBER AND TITLE 0101127F B-2 SQUADRONS |

| | Cost ($ in Millions) | FY 2008 Actual | FY 2009 Estimate | FY 2010 Estimate | FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost to Complete | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total Program Element (PE) Cost | 0.000 | 0.000 | 415.414 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | TBD |
| 5345 | B-2 Modernization | 0.000 | 0.000 | 415.414 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | TBD |

**(U) A. Mission Description and Budget Item Justification**

The B-2A Spirit is the world's most advanced long-range strike asset. The unique combination of range, precision payload and stealth (anti-access for both nuclear and conventional missions) characteristics allow the B-2 to target and destroy the highest value enemy targets, regardless of location, return home safely, and permit freedom of movement for follow-on forces such as F-22, F-35, and other Long Range Strike platforms. The array of planned RDT&E projects are necessary to both preserve this strategic advantage as well as increase the flexibility, lethality, and survivability of this national asset tasked across a broad spectrum, from tactical to national objectives. The Radar Modernization (RMP) and Aft Deck Programs address potential fleet grounding issues.

Avionics upgrades include, but are not limited to, RMP, Link-16 Center Instrument Display (CID)/In-Flight Replanner (IFR), Ultra High Frequency (UHF) Satellite Communication (SATCOM), Extremely High Frequency (EHF) SATCOM and Computers, Mode 5/S Identification Friend or Foe (IFF), Defensive Management System (DMS), Integrated Display Systems (IDS) and advanced, low detection data links upgrades. RMP changes the operating frequency of the radar to enable the B-2 to operate as the primary user worldwide in the future. Link-16 CID/IFR upgrade allows the B-2 access to theater tactical data links, improving on-board situational awareness while greatly enhancing the ability of the theater commanders to coordinate the B-2 with other assets. UHF SATCOM provides beyond line of sight secure communications to aircrews enabling verbal and data updates to missions. EHF SATCOM and Computers provides a secure, survivable communication and Net Ready infrastructure systems upgrade, preserving the critical ability to guarantee communication in a nuclear environment, as well as a basis for surveillance and reconnaissance. EHF SATCOM and Computers will provide a dramatic increase in the B-2 processing capability, paving the way for greater bandwidth and integration into the Global Information Grid (GIG), and Airborne Network Attack in an anti-access environment. Upgrades include extremely high frequency components and the computer infrastructure upgrades, such as but not limited to, flight management processors and onboard network components necessary to host new capability on the aircraft. Mode 5 provides enhanced combat identification of friend or foe functions for military Air Traffic Management; Mode S provides enhanced surveillance functions with commercial Air Traffic Management to allow operations in controlled air space. Integrated Display systems, radar, and Defensive Management System upgrades improve system performance, increase reliability and supportability, and counters grounding and hardware obsolescence. These system upgrades will transition from the current analog design to modern digital technology providing enhanced threat location, identification, and warning capability for improved survivability, and enabling increased flexibility in strike, moving target kill, and non-traditional surveillance/reconnaissance (SR), positioning the B-2 for increased combat lethality, becoming the world's premier anti-access moving target kill platform. Integrated Display Systems upgrade will provide processors, fiber optics, Ethernet, and associated architecture required to support advanced weapon system capabilities. The full display system upgrade includes Multi-function Display Units (MDU), discrete collector units, switching units, and the necessary wiring modifications to support the B-2 mission, precluding potential FY12 non-mission capabable events. The DMS upgrade includes improvements and counters obsolescence of the defensive management processors and threat emitter system. Defensive Management System upgrades and improved displays are essential to reducing non-mission capable events, meeting Aircraft Availability Improvement Program (AAIP) goals in this aging aircraft. New Triad (electro-magnetic pulse (EMP) hardening) requirements will test individual component and the

entire B-2 fleet at higher EMP levels for NC2 Survivability. Finally, advanced data links will permit B-2 to communicate with other stealth platforms in an anti-access environment to enhance situational awareness and to permit time-critical targeting and engagement.

Armament upgrades include, but are not limited to, integration of new and/or advanced weapons on the B-2 to destroy a wider array of target sets, to include moving target sets and Hardened, Deeply Buried Targets (HDBT), as well as destroy more targets per sortie. Integration of the 30K lb class Massive Ordnance Penetrator (MOP) will provide the nation with the ability to hold additional HDBT targets at risk that are currently unachievable with 5K lb class penetrator munitions. The initial MOP Quick Reaction Capability (QRC) effort will be expanded to include a fully developed Launch Acceptability Region (LAR), single Smart Bomb Rack Controller (SBRC) per bay weapon control and monitor, and mixed carriage capability with Smart Bomb Rack Assemblies (SBRA). The B-2 is the only anti-access penetrating platform capable of carrying the MOP. The Moving Target Kill (MTK) effort will leverage a high precision munition such as the Small Diameter Bomb II (SDM II) as the mobile target kill munition forming the foundation to exploit the modularity and improved precision algorithms of Universal Armament Interface as well as high-resolution, streaming video for visual identification and precision targeting, both in the cockpit and via airborne networking. The MOP and MTK projects will design, develop, integrate, and test hardware and software required for carriage, jettison, and release of both weapons from the B-2. Finally, basic armament improvements include, but are not limited to, stores management hardware and software modernization and improvements to enable a simultaneous configuration of the Rotary Launcher Assemblies (RLA) and the Smart Bomb Rack Assemblies (SBRA), thus affording maximum strike flexibility.

Structures improvements include, but are not limited to, Aft Deck upgrade which addresses an interim and long term solution to persistent cracking of aft deck surfaces while preserving the key stealth characteristics that are vital to the survivability of the B-2; windshield redesign provides improved components and windshield manufacturing processes to remedy windshield cracking and electrical conductivity limitations; Proximity Sensor Logic Unit (PSLU) replacement counters obsolescence issues with electronic components, improving safety of maintainers working around various aircraft bay doors.

Engine improvements include, but are not limited to, the F-118 engine service life extension program. Stage 1 and 3 engine fan blade improvements will reduce engine changes, increasing aircraft availability. Engine upgrades are necessary to maintain commonality with the F110 engine core.

Low Observable (LO) programs include, but are not limited to, improvements to door edge treatments, tile protection system, Magnetic Radar Absorbing Material (MAGRAM) picture framing and other LO materials development, hot structures, tailpipe material improvements, nozzle bay doors, windshield low observable treatments, advanced topcoat system, radar frequency diagnostics and other LO diagnostic tools development such as improvements of the Signature Diagnostic System database, Low Observable Combat Readiness Model, and other low observable information systems. These upgrades decrease maintenance manhours and increase aircraft availability while improving/maintaining LO signature of the B-2 fleet.

Baseline support provides support of the B-2 flight test aircraft, maintains B-2 unique flight test infrastructure, ensures the B-2 training systems keep pace with aircraft system updates and counters obsolescence issues, ensures the Mission Planning System keeps pace with aircraft modifications and mission planning system updates, provides for other B-2 unique government costs, and also includes acquisition planning activities for future capabilities such as, but not limited to, Stores Management Processor/Infrastructure upgrades, Advanced Tactical Datalink capabilities, Port Transducer Upgrade, mixed weapon load-outs, Universal Armament Interface, and Global Positioning System (GPS) M-code receivers.

This program is included in budget activity code 07, Operational System Development.

| Exhibit R-2, RDT&E Budget Item Justification | DATE May 2009 |
|---|---|
| BUDGET ACTIVITY<br>07 Operational System Development | PE NUMBER AND TITLE<br>0101127F B-2 SQUADRONS |

**(U) B. Program Change Summary ($ in Millions)**

| | | FY 2008 | FY 2009 | FY 2010 |
|---|---|---|---|---|
| (U) | Previous President's Budget | 0.000 | 0.000 | 0.000 |
| (U) | Current PBR/President's Budget | 0.000 | 0.000 | 415.414 |
| (U) | Total Adjustments | 0.000 | 0.000 | |
| (U) | Congressional Program Reductions | | | |
| | Congressional Rescissions | | | |
| | Congressional Increases | | | |
| | Reprogrammings | | | |
| | SBIR/STTR Transfer | | | |

(U) Significant Program Changes:

Changes to the FY10 budget are due to the of radar modernization program (RMP) nearing completion of development as it transitions to production, the re-alignment and ramp up of newer efforts (primarily EHF SATCOM and Computer), and the addition of funds for New Triad (EMP hardening testing) effort. FY09 and prior fiscal years are funded from PE 0604240F.

| Exhibit R-2a, RDT&E Project Justification | | | DATE: May 2009 |
|---|---|---|---|
| BUDGET ACTIVITY: 07 Operational System Development | PE NUMBER AND TITLE: 0101127F B-2 SQUADRONS | PROJECT NUMBER AND TITLE: 5345 B-2 Modernization | |

| Cost ($ in Millions) | | FY 2008 Actual | FY 2009 Estimate | FY 2010 Estimate | FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost to Complete | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5345 | B-2 Modernization | 0.000 | 0.000 | 415.414 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | TBD |
| | Quantity of RDT&E Articles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |

**(U) A. Mission Description and Budget Item Justification**

The B-2A Spirit is the world's most advanced long-range strike asset. The unique combination of range, precision payload and stealth (anti-access for both nuclear and conventional missions) characteristics allow the B-2 to target and destroy the highest value enemy targets, regardless of location, return home safely, and permit freedom of movement for follow-on forces such as F-22, F-35, and other Long Range Strike platforms. The array of planned RDT&E projects are necessary to both preserve this strategic advantage as well as increase the flexibility, lethality, and survivability of this national asset tasked across a broad spectrum, from tactical to national objectives. The Radar Modernization (RMP) and Aft Deck Programs address potential fleet grounding issues.

Avionics upgrades include, but are not limited to, RMP, Link-16 Center Instrument Display (CID)/In-Flight Replanner (IFR), Ultra High Frequency (UHF) Satellite Communication (SATCOM), Extremely High Frequency (EHF) SATCOM and Computers, Mode 5/S Identification Friend or Foe (IFF), Defensive Management System (DMS), Integrated Display Systems (IDS) and advanced, low detection data links upgrades. RMP changes the operating frequency of the radar to enable the B-2 to operate as the primary user worldwide in the future. Link-16 CID/IFR upgrade allows the B-2 access to theater tactical data links, improving on-board situational awareness while greatly enhancing the ability of the theater commanders to coordinate the B-2 with other assets. UHF SATCOM provides beyond line of sight secure communications to aircrews enabling verbal and data updates to missions. EHF SATCOM and Computers provides a secure, survivable communication and Net Ready infrastructure systems upgrade, preserving the critical ability to guarantee communication in a nuclear environment, as well as a basis for surveillance and reconnaissance. EHF SATCOM and Computers will provide a dramatic increase in the B-2 processing capability, paving the way for greater bandwidth and integration into the Global Information Grid (GIG), and Airborne Network Attack in an anti-access environment. Upgrades include extremely high frequency components and the computer infrastructure upgrades, such as but not limited to, flight management processors and onboard network components necessary to host new capability on the aircraft. Mode 5 provides enhanced combat identification of friend or foe functions for military Air Traffic Management; Mode S provides enhanced surveillance functions with commercial Air Traffic Management to allow operations in controlled air space. Integrated Display systems, radar, and Defensive Management System upgrades improve system performance, increase reliability and supportability, and counters grounding and hardware obsolescence. These system upgrades will transition from the current analog design to modern digital technology providing enhanced threat location, identification, and warning capability for improved survivability, and enabling increased flexibility in strike, moving target kill, and non-traditional surveillance/reconnaissance (SR), positioning the B-2 for increased combat lethality, becoming the world's premier anti-access moving target kill platform. Integrated Display Systems upgrade will provide processors, fiber optics, Ethernet, and associated architecture required to support advanced weapon system capabilities. The full display system upgrade includes Multi-function Display Units (MDU), discrete collector units, switching units, and the necessary wiring modifications to support the B-2 mission, precluding potential FY12 non-mission capabable events. The DMS upgrade includes improvements and counters obsolescence of the defensive management processors and threat emitter system. Defensive Management System upgrades and improved displays are essential to reducing non-mission capable events, meeting Aircraft Availability Improvement Program (AAIP) goals in this aging aircraft. New Triad (electro-magnetic pulse (EMP) hardening) requirements will test individual component and the entire B-2 fleet at higher EMP levels for NC2 Survivability. Finally, advanced data links will permit B-2 to communicate with other stealth platforms in an anti-access environment to enhance situational awareness and to permit time-critical targeting and engagement.

| Exhibit R-2a, RDT&E Project Justification | | DATE May 2009 |
|---|---|---|
| BUDGET ACTIVITY<br>07 Operational System Development | PE NUMBER AND TITLE<br>0101127F B-2 SQUADRONS | PROJECT NUMBER AND TITLE<br>5345 B-2 Modernization |

Armament upgrades include, but are not limited to, integration of new and/or advanced weapons on the B-2 to destroy a wider array of target sets, to include moving target sets and Hardened, Deeply Buried Targets (HDBT), as well as destroy more targets per sortie. Integration of the 30K lb class Massive Ordnance Penetrator (MOP) will provide the nation with the ability to hold additional HDBT targets at risk that are currently unachievable with 5K lb class penetrator munitions. The initial MOP Quick Reaction Capability (QRC) effort will be expanded to include a fully developed Launch Acceptability Region (LAR), single Smart Bomb Rack Controller (SBRC) per bay weapon control and monitor, and mixed carriage capability with Smart Bomb Rack Assemblies (SBRA). The B-2 is the only anti-access penetrating platform capable of carrying the MOP. The Moving Target Kill (MTK) effort will leverage a high precision munition such as the Small Diameter Bomb II (SDM II) as the mobile target kill munition forming the foundation to exploit the modularity and improved precision algorithms of Universal Armament Interface as well as high-resolution, streaming video for visual identification and precision targeting, both in the cockpit and via airborne networking. The MOP and MTK projects will design, develop, integrate, and test hardware and software required for carriage, jettison, and release of both weapons from the B-2. Finally, basic armament improvements include, but are not limited to, stores management hardware and software modernization and improvements to enable a simultaneous configuration of the Rotary Launcher Assemblies (RLA) and the Smart Bomb Rack Assemblies (SBRA), thus affording maximum strike flexibility.

Structures improvements include, but are not limited to, Aft Deck upgrade which addresses an interim and long term solution to persistent cracking of aft deck surfaces while preserving the key stealth characteristics that are vital to the survivability of the B-2; windshield redesign provides improved components and windshield manufacturing processes to remedy windshield cracking and electrical conductivity limitations; Proximity Sensor Logic Unit (PSLU) replacement counters obsolescence issues with electronic components, improving safety of maintainers working around various aircraft bay doors.

Engine improvements include, but are not limited to, the F-118 engine service life extension program. Stage 1 and 3 engine fan blade improvements will reduce engine changes, increasing aircraft availability. Engine upgrades are necessary to maintain commonality with the F110 engine core.

Low Observable (LO) programs include, but are not limited to, improvements to door edge treatments, tile protection system, Magnetic Radar Absorbing Material (MAGRAM) picture framing and other LO materials development, hot structures, tailpipe material improvements, nozzle bay doors, windshield low observable treatments, advanced topcoat system, radar frequency diagnostics and other LO diagnostic tools development such as improvements of the Signature Diagnostic System database, Low Observable Combat Readiness Model, and other low observable information systems. These upgrades decrease maintenance manhours and increase aircraft availability while improving/maintaining LO signature of the B-2 fleet.

Baseline support provides support of the B-2 flight test aircraft, maintains B-2 unique flight test infrastructure, ensures the B-2 training systems keep pace with aircraft system updates and counters obsolescence issues, ensures the Mission Planning System keeps pace with aircraft modifications and mission planning system updates, provides for other B-2 unique government costs, and also includes acquisition planning activities for future capabilities such as, but not limited to, Stores Management Processor/Infrastructure upgrades, Advanced Tactical Datalink capabilities, Port Transducer Upgrade, mixed weapon load-outs, Universal Armament Interface, and Global Positioning System (GPS) M-code receivers.

This program is included in budget activity code 07, Operational System Development.

| Exhibit R-2a, RDT&E Project Justification | | DATE May 2009 |
|---|---|---|
| BUDGET ACTIVITY<br>07 Operational System Development | PE NUMBER AND TITLE<br>0101127F B-2 SQUADRONS | PROJECT NUMBER AND TITLE<br>5345 B-2 Modernization |

| | B. Accomplishments/Planned Program ($ in Millions) | FY 2008 | FY 2009 | FY 2010 |
|---|---|---|---|---|
| (U) | Continue B-2 baseline support to include developmental flight test aircraft modification and base of operations; Mission Planning, Trainer support, long range planning, studies, program integration activities, acquisition planning, and other government costs. | | | 13.192 |
| (U) | Continue development of Aft Deck, Low Observable improvements, Mode 5/S IFF, Proximity Sensor Logic Unit (PSLU), Moving Target Kill (MTK), Massive Ordnance Penetrator (MOP), Display Systems, Defensive Management System (DMS), Integrated Windshield Solution, Trainer Upgrades, and other airframe and avionics improvements. | | | 62.566 |
| (U) | Begin development of New Triad effort improving B-2 EMP hardening. | | | 8.110 |
| (U) | Continue development of EHF SATCOM and Computers to include Increment 1 Component Advanced Design (CAD), Increment 1 System Development and Demonstration (SDD) and design and fabricationof new and modified components for two test aircraft and two Force Development Evaluation (FDE) aircraft, and Increment 2 CAD and SDD | | | 281.163 |
| (U) | Continue development of Radar Modernization Program including continuing System Development and Demonstration (SDD) and design and fabrication of new and modified components for test aircraft and six developmental units. | | | 50.383 |
| (U) | Total Cost | 0.000 | 0.000 | 415.414 |

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

| | FY 2008 Actual | FY 2009 Estimate | FY 2010 Estimate | FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost to Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|
| (U) A/C Proc, AF, Modifications/BA05/B-2A | | | 283.955 | | | | | | Continuing | TBD |
| (U) A/C Prod, AF, Post Prod Support/BA07/B-2A/ICS (XX50) | | | 24.481 | | | | | | Continuing | TBD |
| (U) A/C Proc, AF, Post Prod Support/BA07/B-2A | | | 0.000 | | | | | | Continuing | TBD |
| (U) A/C Proc, AF, A/C Initial Spares/BA06/B-2A | | | 0.000 | | | | | | Continuing | TBD |
| (U) A/C Proc, AF, Depot Activation/BA07/B-2A | | | 19.214 | | | | | | Continuing | TBD |

| Exhibit R-2a, RDT&E Project Justification | | DATE May 2009 |
|---|---|---|
| BUDGET ACTIVITY<br>07 Operational System Development | PE NUMBER AND TITLE<br>0101127F B-2 SQUADRONS | PROJECT NUMBER AND TITLE<br>5345 B-2 Modernization |

**(U) D. Acquisition Strategy**

Key elements of the overall acquisition strategy include: use of sole source contract with a prime/integrating contractor (Northrop Grumman); use of cost plus award fee (CPAF) development contracts; and the combination of developmental upgrades with software sustainment blocks to minimize the number of software releases, aircraft downtime, and differences in fielded configurations.

# Exhibit R-3, RDT&E Project Cost Analysis

DATE: May 2009

BUDGET ACTIVITY: 07 Operational System Development

PE NUMBER AND TITLE: 0101127F B-2 SQUADRONS

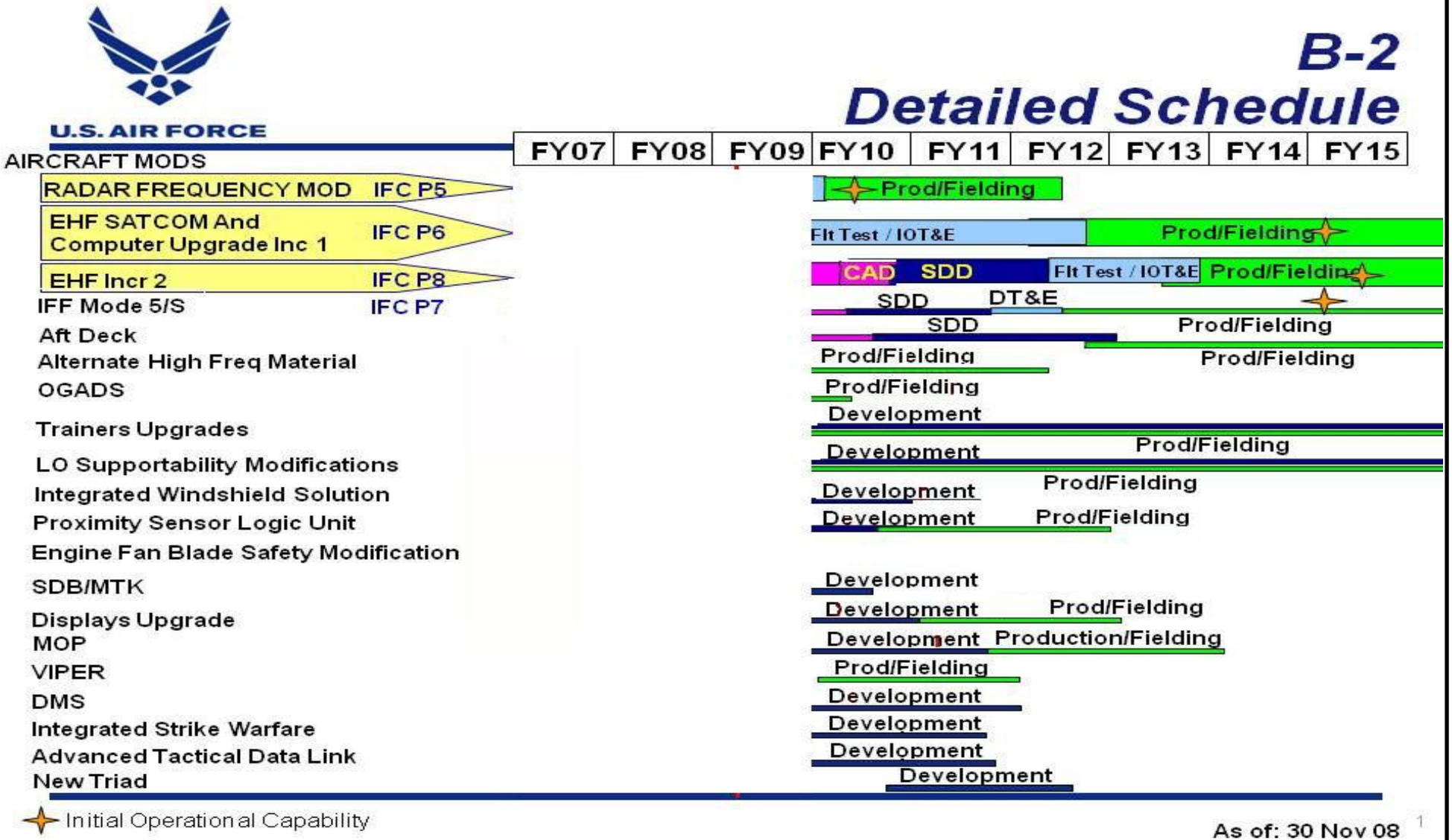
PROJECT NUMBER AND TITLE: 5345 B-2 Modernization

| (U) Cost Categories (Tailor to WBS, or System/Item Requirements) ($ in Millions) | Contract Method & Type | Performing Activity & Location | Total Prior to FY 2008 Cost | FY 2008 Cost | FY 2008 Award Date | FY 2009 Cost | FY 2009 Award Date | FY 2010 Cost | FY 2010 Award Date | Cost to Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (U) Product Development | | | | | | | | | | | | |
| Air Vehicle | Multiple | Various | | | | | | 397.549 | Oct-09 | Continuing | TBD | |
| Aircrew Training | Multiple | Various | | | | | | 1.955 | Jan-10 | Continuing | TBD | |
| Mission Planning | Multiple | Various | | | | | | 1.930 | Jan-10 | Continuing | TBD | |
| Engines | Multiple | Various | | | | | | 0.000 | | | 0.000 | |
| Subtotal Product Development | | | 0.000 | 0.000 | | 0.000 | | 401.434 | | Continuing | TBD | 0.000 |
| Remarks: | | | | | | | | | | | | |
| (U) Support | | | | | | | | | | | | |
| Other Government Costs | N/A | Various | | | | | | 9.246 | Oct-09 | Continuing | TBD | |
| Subtotal Support | | | 0.000 | 0.000 | | 0.000 | | 9.246 | | Continuing | TBD | 0.000 |
| Remarks: | | | | | | | | | | | | |
| (U) Test & Evaluation | | | | | | | | | | | | |
| Government Test | N/A | AFFTC | | | | | | 4.734 | Oct-09 | Continuing | TBD | |
| Subtotal Test & Evaluation | | | 0.000 | 0.000 | | 0.000 | | 4.734 | | Continuing | TBD | 0.000 |
| Remarks: | | | | | | | | | | | | |
| (U) Management | | | | | | | | | | | | |
| | | | | | | | | | | | 0.000 | |
| Subtotal Management | | | 0.000 | 0.000 | | 0.000 | | 0.000 | | 0.000 | 0.000 | 0.000 |
| Remarks: | | | | | | | | | | | | |
| (U) Total Cost | | | 0.000 | 0.000 | | 0.000 | | 415.414 | | Continuing | TBD | 0.000 |

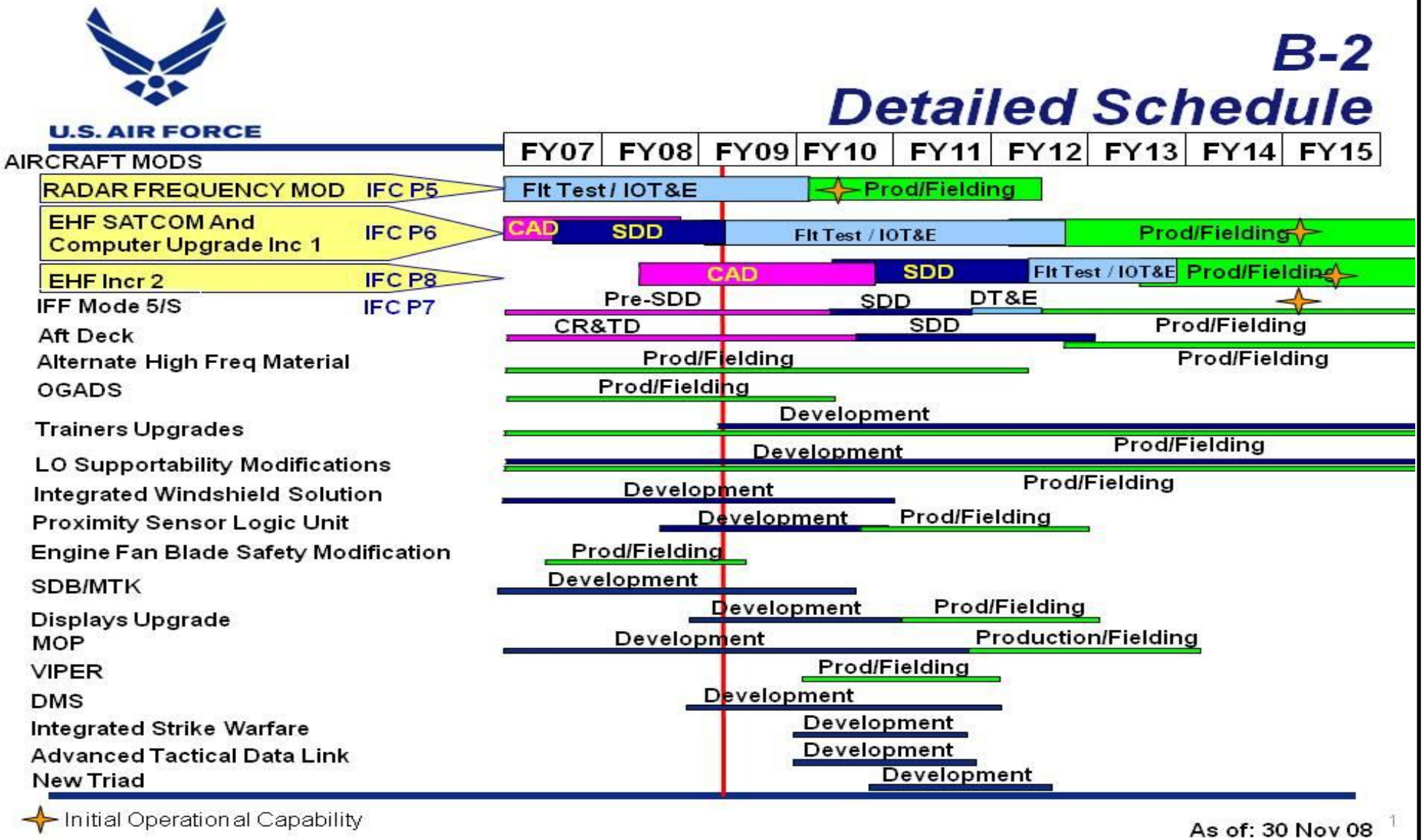
Award dates listed are the first incremental funding opportunity associated with each cost category.

| Exhibit R-4, RDT&E Schedule Profile | | DATE May 2009 |
|---|---|---|
| BUDGET ACTIVITY<br>07 Operational System Development | PE NUMBER AND TITLE<br>0101127F B-2 SQUADRONS | PROJECT NUMBER AND TITLE<br>5345 B-2 Modernization |

# B-2 Detailed Schedule



| Exhibit R-4, RDT&E Schedule Profile | | DATE May 2009 |
|---|---|---|
| BUDGET ACTIVITY<br>07 Operational System Development | PE NUMBER AND TITLE<br>0101127F B-2 SQUADRONS | PROJECT NUMBER AND TITLE<br>5345 B-2 Modernization |



| Exhibit R-4a, RDT&E Schedule Detail | | DATE May 2009 |
|---|---|---|
| BUDGET ACTIVITY<br>**07 Operational System Development** | PE NUMBER AND TITLE<br>**0101127F B-2 SQUADRONS** | PROJECT NUMBER AND TITLE<br>**5345 B-2 Modernization** |

| **(U) Schedule Profile** | FY 2008 | FY 2009 | FY 2010 |
|---|---|---|---|
| (U) Aft Deck Milestone B | | | 1Q |
| (U) Aft Deck SDD Contract Award | | | 2Q |
| (U) Mode S/5 IFF MS B Decision | | | 3Q |
| (U) Mode S/5 IFF SDD Contract Award | | | 3Q |
| (U) New Triad Contract Award | | | 2Q |

FY08 - FY09 efforts are addressed in PE 0604240F

**THIS PAGE INTENTIONALLY LEFT BLANK**