PE NUMBER: 0303601F
PE TITLE: MILSATCOM Terminals

| Exhibit R-2, RDT&E Budget Item Justification | DATE: February 2006 |
|---|---|
| BUDGET ACTIVITY: 07 Operational System Development | PE NUMBER AND TITLE: 0303601F MILSATCOM Terminals |

| Cost ($ in Millions) | FY 2005 Actual | FY 2006 Estimate | FY 2007 Estimate | FY 2008 Estimate | FY 2009 Estimate | FY 2010 Estimate | FY 2011 Estimate | Cost to Complete | Total |
|---|---|---|---|---|---|---|---|---|---|
| Total Program Element (PE) Cost | 245.582 | 269.218 | 271.562 | 187.419 | 215.910 | 192.994 | 188.437 | Continuing | TBD |
| 2487 MILSATCOM Terminals | 245.582 | 269.218 | 271.562 | 187.419 | 215.910 | 192.994 | 188.437 | Continuing | TBD |

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

The Military Satellite Communications (MILSATCOM) Terminals program develops equipment enabling users to communicate via Milstar, Advanced Extremely High Frequency (AEHF), Ultra High Frequency (UHF) Follow-On (UFO), Wideband Gapfiller System (WGS), Defense Satellite Communication System (DSCS), Transformational Communications Satellite (TSAT), and other military and commercial satellites, to support tactical Air and Space Expeditionary Force (AEF) requirements and maintain essential connectivity for strategic forces. Program RDT&E currently supports the following efforts to include program operations and support:

1) Concept development work to identify commercial/military technology solutions to improve MILSATCOM terminal capabilities for the warfighters. Focus includes increasing throughput, facilitating sustainability, reducing footprint on user platform and supporting network.

2) Ground Multi-band Terminal (GMT) development. In addition to supporting the Air and Space Expeditionary Force requirement for increased information, GMT will replace Air Force Ground Mobile Forces (GMF) terminals with higher-capacity military communications to provide tactical ground forces with connectivity via the X- and Ka-bands on WGS, X-band on DSCS, and commercial C- and Ku-band on commercial satellites to significantly increase throughput for inter- and intra-theater tactical force information such as air tasking orders, battle damage assessments, and reconnaissance data. The RDT&E effort for GMT completed in FY05.

3) Family of Advanced Beyond Line-of-Sight Terminals (FAB-T) development. Increment 1 program will provide Extremely High Frequency (EHF) voice and data military satellite communications (MILSATCOM) for nuclear and conventional forces as well as airborne and ground command posts with connectivity to MILSTAR and Advanced EHF satellites. FAB-T Increment 2 will provide robust secure 2-way Ku/Ka band SATCOM capability on High Altitude Endurance (HAE) Intelligence, Surveillance and Reconnaissance (ISR) aircraft to operate with current and future Ku frequency band commercial satellites and Ka band on WGS. FAB-T Increment 3 will provide XDR+ capabilities to platforms requiring High Data Rate EHF (45 Mbps) and Processed Ka (311 Mbps) communications in support of TSAT. Also included in the FAB-T program is the Advanced Multi-band Communications Antenna System (AMCAS) that provides a multi-beam, multi-band antenna that enables simultaneous connectivity to more than one satellite. This antenna addresses limited aircraft external surface area, historically high antenna integration costs and aerodynamic and low observability restrictions. It enables airborne weapon systems to support the warfighter's need for higher data rates for while providing a common solution for each platform.

4) High Data Rate (HDR) Radio Frequency (RF) Ground Terminal Development. Develops terminals with transponded Ka-band HDR (274 Mbps) capabilities in support of the Distributed Common Ground System (DCGS) receipt of data from the Airborne ISR (AISR) platforms using FAB-T Inc 2 terminals. This bandwidth will be provided via the fourth and fifth WGS satellites. This terminal will also support the lower data rate (137 Mbps) provided by the first three WGS satellites.

| Exhibit R-2, RDT&E Budget Item Justification | DATE February 2006 |
|---|---|
| BUDGET ACTIVITY<br>07 Operational System Development | PE NUMBER AND TITLE<br>0303601F MILSATCOM Terminals |

5) Lasercom Development. Develops an Airborne Lasercom Terminal (ALT) to support optical communications for ISR and command and control aircraft; supports transformational communications initiatives which require laser transmission of sensor data at rates over 1 Gbps. The ALT will operate with TSAT.

6) Joint Terminal Engineering Office (JTEO) provides tri-service coordination of terminal development, acquisition and fielding activities.

7) Mobile User Objective System (MUOS) terminal upgrade development has been terminated. MUOS will be backwards compatible with existing narrowband terminals and these terminals will ultimately be replaced by JTRS radios at their end of life.

This effort is funded in Budget Activity 7, Operational System Development because some of its programs have completed Milestone C reviews and are in production.

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

| | | FY 2005 | FY 2006 | FY 2007 |
|---|---|---|---|---|
| (U) | Previous President's Budget | 264.795 | 273.974 | 273.782 |
| (U) | Current PBR/President's Budget | 245.582 | 269.218 | 271.562 |
| (U) | Total Adjustments | -19.213 | -4.756 | |
| (U) | Congressional Program Reductions | | | |
| | Congressional Rescissions | -0.207 | -4.756 | |
| | Congressional Increases | | | |
| | Reprogrammings | -11.645 | | |
| | SBIR/STTR Transfer | -7.361 | | |

(U) Significant Program Changes:

In FY06, the Air Force merged the HDR-RF Airborne development and the Advanced Multi-band Communications Antenna System (AMCAS) with the FAB-T development program in support of evolving the family of terminals concept to merge related programs. HDR-RF Airborne became FAB-T Increment 2 as it reuses major components of Increment 1. The AMCAS antenna will be used on certain platforms in conjunction with FAB-T.

# Exhibit R-2a, RDT&E Project Justification

DATE: February 2006

BUDGET ACTIVITY: 07 Operational System Development

PE NUMBER AND TITLE: 0303601F MILSATCOM Terminals

PROJECT NUMBER AND TITLE: 2487 MILSATCOM Terminals

| Cost ($ in Millions) | FY 2005 Actual | FY 2006 Estimate | FY 2007 Estimate | FY 2008 Estimate | FY 2009 Estimate | FY 2010 Estimate | FY 2011 Estimate | Cost to Complete | Total |
|---|---|---|---|---|---|---|---|---|---|
| 2487 MILSATCOM Terminals | 245.582 | 269.218 | 271.562 | 187.419 | 215.910 | 192.994 | 188.437 | Continuing | TBD |
| Quantity of RDT&E Articles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |

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

The Military Satellite Communications (MILSATCOM) Terminals program develops equipment enabling users to communicate via Milstar, Advanced Extremely High Frequency (AEHF), Ultra High Frequency (UHF) Follow-On (UFO), Wideband Gapfiller System (WGS), Defense Satellite Communication System (DSCS), Transformational Communications Satellite (TSAT), and other military and commercial satellites, to support tactical Air and Space Expeditionary Force (AEF) requirements and maintain essential connectivity for strategic forces. Program RDT&E currently supports the following efforts to include program operations and support:

1) Concept development work to identify commercial/military technology solutions to improve MILSATCOM terminal capabilities for the warfighters. Focus includes increasing throughput, facilitating sustainability, reducing footprint on user platform and supporting network.

2) Ground Multi-band Terminal (GMT) development. In addition to supporting the Air and Space Expeditionary Force requirement for increased information, GMT will replace Air Force Ground Mobile Forces (GMF) terminals with higher-capacity military communications to provide tactical ground forces with connectivity via the X- and Ka-bands on WGS, X-band on DSCS, and commercial C- and Ku-band on commercial satellites to significantly increase throughput for inter- and intra-theater tactical force information such as air tasking orders, battle damage assessments, and reconnaissance data. The RDT&E effort for GMT completed in FY05.

3) Family of Advanced Beyond Line-of-Sight Terminals (FAB-T) development. Increment 1 program will provide Extremely High Frequency (EHF) voice and data military satellite communications (MILSATCOM) for nuclear and conventional forces as well as airborne and ground command posts with connectivity to MILSTAR and Advanced EHF satellites. FAB-T Increment 2 will provide robust secure 2-way Ku/Ka band SATCOM capability on High Altitude Endurance (HAE) Intelligence, Surveillance and Reconnaissance (ISR) aircraft to operate with current and future Ku frequency band commercial satellites and Ka band on WGS. FAB-T Increment 3 will provide XDR+ capabilities to platforms requiring High Data Rate EHF (45 Mbps) and Processed Ka (311 Mbps) communications in support of TSAT. Also included in the FAB-T program is the Advanced Multi-band Communications Antenna System (AMCAS) that provides a multi-beam, multi-band antenna that enables simultaneous connectivity to more than one satellite. This antenna addresses limited aircraft external surface area, historically high antenna integration costs and aerodynamic and low observability restrictions. It enables airborne weapon systems to support the warfighter's need for higher data rates for while providing a common solution for each platform.

4) High Data Rate (HDR) Radio Frequency (RF) Ground Terminal Development. Develops terminals with transponded Ka-band HDR (274 Mbps) capabilities in support of the Distributed Common Ground System (DCGS) receipt of data from the Airborne ISR (AISR) platforms using FAB-T Inc 2 terminals. This bandwidth will be provided via the fourth and fifth WGS satellites. This terminal will also support the lower data rate (137 Mbps) provided by the first three WGS satellites.

5) Lasercom Development. Develops an Airborne Lasercom Terminal (ALT) to support optical communications for ISR and command and control aircraft; supports transformational communications initiatives which require laser transmission of sensor data at rates over 1 Gbps. The ALT will operate with TSAT.

| Exhibit R-2a, RDT&E Project Justification | | DATE February 2006 |
|---|---|---|
| BUDGET ACTIVITY<br>07 Operational System Development | PE NUMBER AND TITLE<br>0303601F MILSATCOM Terminals | PROJECT NUMBER AND TITLE<br>2487 MILSATCOM Terminals |

6) Joint Terminal Engineering Office (JTEO) provides tri-service coordination of terminal development, acquisition and fielding activities.

7) Mobile User Objective System (MUOS) terminal upgrade development has been terminated. MUOS will be backwards compatible with existing narrowband terminals and these terminals will ultimately be replaced by JTRS radios at their end of life.

This effort is funded in Budget Activity 7, Operational System Development because some of its programs have completed Milestone C reviews and are in production.

| (U) | **B. Accomplishments/Planned Program ($ in Millions)** | FY 2005 | FY 2006 | FY 2007 |
|---|---|---|---|---|
| (U) | Continue concept/prototype demo/MILSATCOM Terminals roadmap/SATCOM funding | 3.790 | 3.823 | 3.925 |
| (U) | Completed Ground Multi-band Terminal (GMT) development | 3.401 | | |
| (U) | Continue Family of Advanced Beyond Line-of-Sight Terminals (FAB-T) development | 165.796 | 223.658 | 215.620 |
| (U) | Continue High Data Rate (HDR) RF Air (merged with FAB-T in FY06 to become FAB-T Inc 2) development | 21.302 | | |
| (U) | Continue Advanced Multi-band Communications Antenna System (AMCAS) development (merge with FAB-T in FY06) | 8.343 | | |
| (U) | Continue High Data Rate (HDR) RF Ground Terminal development | 4.503 | 6.437 | 9.721 |
| (U) | Continue Lasercom Terminals concept development | 31.298 | 27.410 | 34.203 |
| (U) | Continue Joint Terminal Engineering Office (JTEO) Support | 7.149 | 7.890 | 8.093 |
| (U) | Total Cost | 245.582 | 269.218 | 271.562 |

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

| | | FY 2005 Actual | FY 2006 Estimate | FY 2007 Estimate | FY 2008 Estimate | FY 2009 Estimate | FY 2010 Estimate | FY 2011 Estimate | Cost to Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|
| (U) | Aircraft Procurement, Air Force, Project 119992 (Budget Activity 5, P-27 and P-61, PE 0303601F only) (1) | 26.523 | 2.696 | 9.998 | 123.455 | 152.873 | 293.090 | 352.506 | Continuing | TBD |
| (U) | Other Procurement, Air Force, 'MILSATCOM Space', Project 836780 (Budget Activity 3, P-66, PE 0303601F only) (1) | 26.899 | 31.371 | 75.688 | 106.367 | 50.716 | 65.570 | 134.210 | Continuing | TBD |

(1) Spares Included

NOTE: Related RDT&E costs for MILSATCOM satellite systems to which terminal development is linked can be found in RDT&E Budget Item Justification Sheets for the following Program Elements (PEs):

PE 0303110F Defense Satellite Communication System (Space)

| Exhibit R-2a, RDT&E Project Justification | | DATE February 2006 |
|---|---|---|
| BUDGET ACTIVITY<br>07 Operational System Development | PE NUMBER AND TITLE<br>0303601F MILSATCOM Terminals | PROJECT NUMBER AND TITLE<br>2487 MILSATCOM Terminals |

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

PE 0603430F Advanced EHF MILSATCOM (Space)
PE 0603845F Transformational SATCOM (TSAT)
PE 0603432F Polar MILSATCOM (Space)
PE 0603854F Wideband Gapfiller System (RDT&E) Space
PE 0604479F Milstar LDR/MDR SATCOM (Space)
PE 0604240F B-2 (RDT&E)
PE 0101113F B-52 (RDT&E)
PE 0305207F RC-135 (RDT&E)
PE 0207581F Joint STARS (RDT&E)

**(U) D. Acquisition Strategy**

In FY04, the AF began the development for the FAB-T Increment 2 Ka/Ku SATCOM capability. Increment 2 will be developed in 2 phases. In FY05, Phase 1 was awarded and encompasses requirements definition to develop the Contractor Technical Requirements Document (CTRD) through SRR. Phase 2 will be awarded in FY06 for continuation of SDD.

In FY04 the Air Force began the Advanced Multi-Band Communications Antenna System (AMCAS) concept development phase. This effort is known as the AMCAS Technology Development Plan, which involves multiple studies to define the system architecture to be completed in FY07. The results of the studies will be used as a basis for awarding a System Design and Development (SDD) contract based on full and open competition.

In FY04, the Airborne Lasercom Terminal (ALT) program initiated first phase, the Concept and Architecture Development Study Phase, of the program. Four technology demonstration contracts were awarded in June 04 and two architecture development contracts were awarded in August 04. The results of these efforts, in conjunction with the results of a FAB-T sponsored effort conducted by the FAB-T prime contractor, will be used to plan the Risk Reduction and Design Development Phase of the ALT program. A set of flight demonstration risk reduction contracts are planned for award in FY06 and will run through FY08. The second phase of the program will feature the design and development of Engineering Development Models of terminals and is planned for award in FY09 and will run through FY12.

In FY04 the HDR RF-Ground progran began concept activities. Phase 1 is an application demonstration for a High Bandwidth High Throughput (HBHT) modem. The next phase ports the FAB-T Inc 2 developed Ka waveform into an HBHT modem. At the conclusion of these efforts, the program will intergrate an HBHT modem with the Ka waveform into a Ground Multi-band Terminal (GMT) for certification and production.

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

DATE: **February 2006**

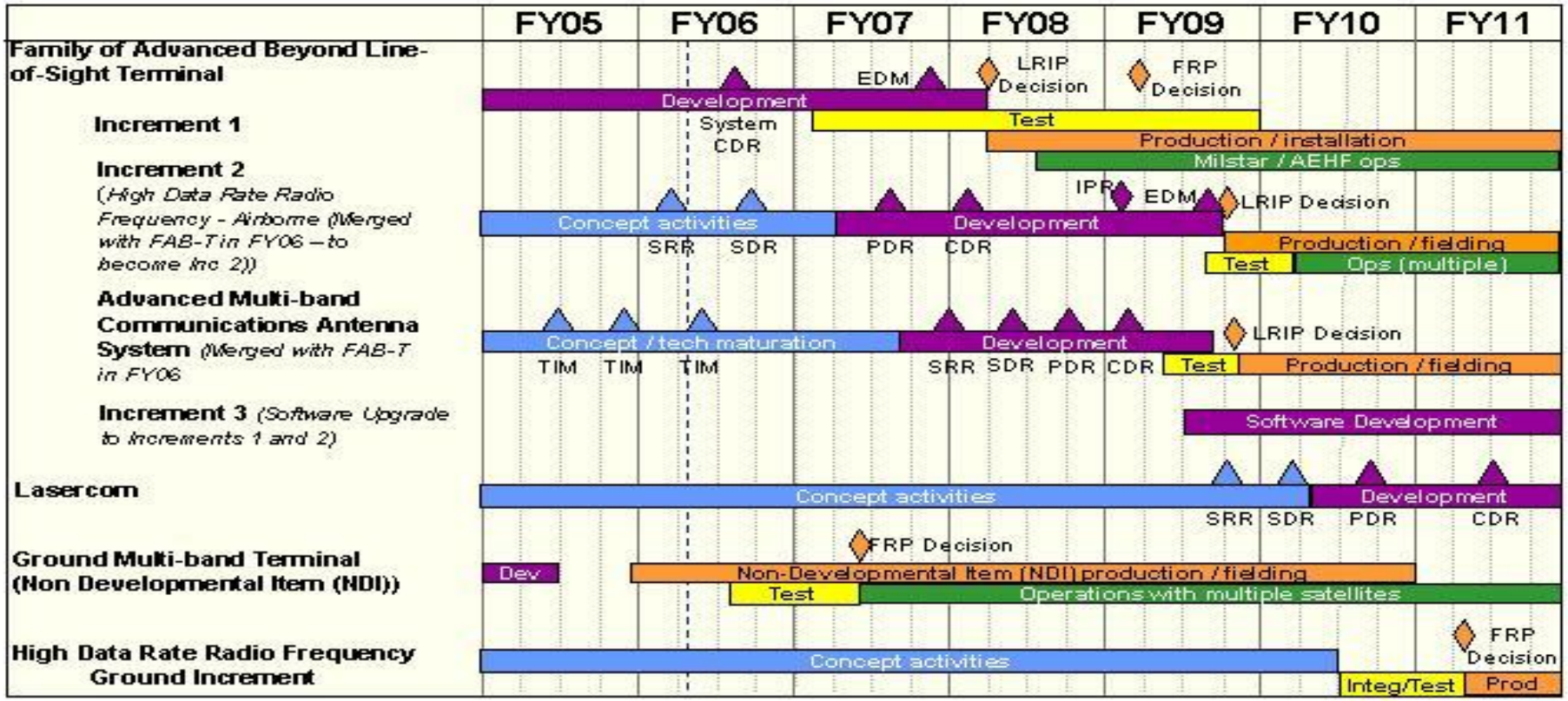
BUDGET ACTIVITY: **07 Operational System Development**

PE NUMBER AND TITLE: **0303601F MILSATCOM Terminals**

PROJECT NUMBER AND TITLE: **2487 MILSATCOM Terminals**

| (U) Cost Categories (Tailor to WBS, or System/Item Requirements) ($ in Millions) | Contract Method & Type | Performing Activity & Location | Total Prior to FY 2005 Cost | FY 2005 Cost | FY 2005 Award Date | FY 2006 Cost | FY 2006 Award Date | FY 2007 Cost | FY 2007 Award Date | Cost to Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (U) Product Development | | | | | | | | | | | | |
| GMT Development | CPAF | Harris Corp., Melbourne, FL | 37.267 | 0.978 | Oct-04 | | | | | 0.000 | 38.245 | 55.939 |
| FAB-T Development | CPAF | Boeing Corp., Anaheim, CA | 141.395 | 146.990 | Oct-04 | 208.199 | Oct-05 | 205.190 | Oct-06 | Continuing | TBD | |
| High Data Rate (HDR) RF Ground Terminal Development | TBD | TBD | | | | 2.516 | May-06 | 5.892 | Oct-06 | Continuing | TBD | |
| High Data Rate (HDR) RF Air Terminal Development (merged with FAB-T beginning in FY06) | CPAF | Boeing Corp., Anaheim, CA | | 13.787 | Oct-04 | | | | | | 13.787 | |
| Lasercom Terminal Development Studies | FFP | Various | 8.801 | 16.314 | Oct-04 | 19.605 | May-06 | 28.596 | Oct-06 | Continuing | TBD | |
| AMCAS Development (merged with FAB-T beginning in FY06) | TBD | TBD | | | | | | | | Continuing | TBD | |
| | | | | | | | | | | 0.000 | 0.000 | |
| Subtotal Product Development | | | 187.463 | 178.069 | | 230.320 | | 239.678 | | Continuing | TBD | 55.939 |
| Remarks: | | | | | | | | | | | | |
| (U) Support | | | | | | | | | | | | |
| Systems Engineering Support | CPAF | MITRE, Bedford MA | 154.267 | 22.532 | Oct-04 | 22.157 | Nov-05 | 16.650 | Nov-06 | Continuing | TBD | |
| Systems Engineering/Functional/Financial Support | Various | Various | 177.992 | 23.855 | Oct-04 | 11.677 | Oct-05 | 11.542 | Oct-06 | Continuing | TBD | |
| Financial Support (Beginning in FY04 totals included in Systems Engineering/Functional/Financial Support) | Various | Tecolote, Bedford MA | | | | | | | | Continuing | TBD | |
| Miscellaneous | Various | Various | 23.970 | 4.830 | Oct-04 | 4.281 | Oct-05 | 3.085 | Oct-06 | Continuing | TBD | |
| | | | | | | | | | | | 0.000 | |
| Subtotal Support | | | 356.229 | 51.217 | | 38.115 | | 31.277 | | Continuing | TBD | 0.000 |
| Remarks: | | | | | | | | | | | | |
| (U) Test & Evaluation | | | | | | | | | | | | |
| Various Programs | Various | AF Research Lab | 24.603 | 0.415 | Oct-04 | | | | | Continuing | TBD | |
| Miscellaneous T&E | Various | Various | 10.306 | 15.881 | Oct-04 | 0.783 | Oct-05 | 0.607 | Oct-06 | Continuing | TBD | |
| | | | | | | | | | | | 0.000 | |
| Subtotal Test & Evaluation | | | 34.909 | 16.296 | | 0.783 | | 0.607 | | 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 | | | 578.601 | 245.582 | | 269.218 | | 271.562 | | Continuing | TBD | 55.939 |

| Exhibit R-4, RDT&E Schedule Profile | | DATE: February 2006 |
|---|---|---|
| BUDGET ACTIVITY: 07 Operational System Development | PE NUMBER AND TITLE: 0303601F MILSATCOM Terminals | PROJECT NUMBER AND TITLE: 2487 MILSATCOM Terminals |




CDR: Critical Design Review
DT&E: Development Test & Evaluation
EDM: Engineering Design Model
FRP: Full Rate Production
IPR: Integrated Program Review
LRIP: Low Rate Initial Production
OT&E Operational Test & Evaluation
PDR: Preliminary Design Review
SDR: System Design Review
SRR: System Requirements Review
TIM: Technical Interchange Meeting

| Exhibit R-4a, RDT&E Schedule Detail | | DATE February 2006 |
|---|---|---|
| BUDGET ACTIVITY<br>**07 Operational System Development** | PE NUMBER AND TITLE<br>**0303601F MILSATCOM Terminals** | PROJECT NUMBER AND TITLE<br>**2487 MILSATCOM Terminals** |

| **(U) Schedule Profile** | FY 2005 | FY 2006 | FY 2007 |
|---|---|---|---|
| (U) FAB-T (Inc 1) Critical Design Review (CDR) | | 3Q | |
| (U) Began development of FAB-T Increment 2 | 1Q | | |
| (U) FAB-T (Inc 2) Preliminary Design Review (PDR) | | | 3Q |