PE NUMBER: 0303601F
PE TITLE: MILSATCOM Terminals

## Exhibit R-2, RDT&E Budget Item Justification

DATE **February 2004**

BUDGET ACTIVITY
**07 Operational System Development**

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

| Cost ($ in Millions) | FY 2003 Actual | FY 2004 Estimate | FY 2005 Estimate | FY 2006 Estimate | FY 2007 Estimate | FY 2008 Estimate | FY 2009 Estimate | Cost to Complete | Total |
|---|---|---|---|---|---|---|---|---|---|
| Total Program Element (PE) Cost | 65.090 | 171.860 | 272.149 | 241.099 | 161.529 | 186.802 | 173.957 | Continuing | TBD |
| 2487 MILSATCOM Terminals | 65.090 | 171.860 | 272.149 | 241.099 | 161.529 | 186.802 | 173.957 | Continuing | TBD |

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

The MILSATCOM Terminals program develops equipment enabling users to communicate via Milstar, Advanced Extremely High Frequency (AEHF), Ultra High Frequency (UHF), Wideband Gapfiller System (WGS), Defense Satellite Communication System (DSCS), and other military satellites, as well as 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-band WGS, X-band DSCS, and commercial C- and Ku-band satellites to significantly increase throughput for inter- and intra-theater tactical force information such as air tasking orders, battle damage assessments, and reconnaissance data.

3) Family of Advanced Beyond-Line-of-Sight Terminals (FAB-T) development. FAB-T will develop robust, secure, survivable EHF voice and data satellite communications terminals for nuclear and conventional forces. FAB-T variants will provide ground and airborne command posts and other aircraft with connectivity to Milstar and AEHF satellites, while providing an open architecture terminal to support future increments for WGS, EHF payloads on polar and UHF Follow-on (UFO) satellites, Global Broadcast Service payloads and Transformational Communications satellites.

4) High Data Rate (HDR) Radio Frequency (RF) Terminals. Develops High Data Rate (HDR) RF terminals to operate with increased RF capacity on Wideband Gapfiller System and Transformational Communications Satellite System (TSAT) satellite providing 2-way Ka-band satellite communications for High Altitude Endurance (HAE) aircraft and to support the Distributed Common Ground System (DCGS) receipt of data rates up to 274 Mbps to satisfy Intelligence, Surveillance and Reconnaissance (ISR) requirements.

5) Lasercom Development. Develops a laser communications terminal to support optical communications for High Altitude Endurance Intelligence, Surveillance and Reconnaissance (ISR) aircraft (Global Hawk and U-2) and command and control aircraft (MC2A); supports transformational communications initiatives which require laser transmission of sensor data at rates above 1 Gbps over Transformational Communications satellites.

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

7) Advanced Multi-band Communications Antenna System (AMCAS) development. NOTE: The name of this program has been changed from Wideband Antenna program. AMCAS will provide a multi-beam, multi-band phased array antenna enabling simultaneous connectivity to more than one satellite aircraft. Addresses limited aircraft external surface area, historically high antenna integration costs, and aerodynamic and low observability restrictions. Enables airborne weapon systems to support the higher data needed for today's combat while eliminating he need to develop separate solutions for each platform to meet unique power and data rate requirements.

8) Mobile User Objective System (MUOS) terminal upgrade development is the next generation advanced narrowband satellite communications. MUOS-capable UHF

| Exhibit R-2, RDT&E Budget Item Justification | DATE February 2004 |
|---|---|
| BUDGET ACTIVITY 07 Operational System Development | PE NUMBER AND TITLE 0303601F MILSATCOM Terminals |

SATCOM users will be able to utilitze increases in bandwidth, gain and link availability.

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 2003 | FY 2004 | FY 2005 |
|---|---|---|---|---|
| (U) | Previous President's Budget | 71.293 | 173.831 | 241.906 |
| (U) | Current PBR/President's Budget | 65.090 | 171.860 | 272.149 |
| (U) | Total Adjustments | -6.203 | -1.971 | |
| (U) | Congressional Program Reductions | | | |
| | Congressional Rescissions | | -1.971 | |
| | Congressional Increases | | | |
| | Reprogrammings | -0.004 | | |
| | SBIR/STTR Transfer | -6.199 | | |

(U) Significant Program Changes:

None.

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

DATE **February 2004**

BUDGET ACTIVITY **07 Operational System Development**

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

PROJECT NUMBER AND TITLE **2487 MILSATCOM Terminals**

| Cost ($ in Millions) | FY 2003 Actual | FY 2004 Estimate | FY 2005 Estimate | FY 2006 Estimate | FY 2007 Estimate | FY 2008 Estimate | FY 2009 Estimate | Cost to Complete | Total |
|---|---|---|---|---|---|---|---|---|---|
| 2487 MILSATCOM Terminals | 65.090 | 171.860 | 272.149 | 241.099 | 161.529 | 186.802 | 173.957 | Continuing | TBD |
| Quantity of RDT&E Articles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |

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

The MILSATCOM Terminals program develops equipment enabling users to communicate via Milstar, Advanced Extremely High Frequency (AEHF), Ultra High Frequency (UHF), Wideband Gapfiller System (WGS), Defense Satellite Communication System (DSCS), and other military satellites, as well as 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-band WGS, X-band DSCS, and commercial C- and Ku-band satellites to significantly increase throughput for inter- and intra-theater tactical force information such as air tasking orders, battle damage assessments, and reconnaissance data.

3) Family of Advanced Beyond-Line-of-Sight Terminals (FAB-T) development. FAB-T will develop robust, secure, survivable EHF voice and data satellite communications terminals for nuclear and conventional forces. FAB-T variants will provide ground and airborne command posts and other aircraft with connectivity to Milstar and AEHF satellites, while providing an open architecture terminal to support future increments for WGS, EHF payloads on polar and UHF Follow-on (UFO) satellites, Global Broadcast Service payloads and Transformational Communications satellites.

4) High Data Rate (HDR) Radio Frequency (RF) Terminals. Develops High Data Rate (HDR) RF terminals to operate with increased RF capacity on Wideband Gapfiller System and Transformational Communications Satellite System (TSAT) satellite providing 2-way Ka-band satellite communications for High Altitude Endurance (HAE) aircraft and to support the Distributed Common Ground System (DCGS) receipt of data rates up to 274 Mbps to satisfy Intelligence, Surveillance and Reconnaissance (ISR) requirements.

5) Lasercom Development. Develops a laser communications terminal to support optical communications for High Altitude Endurance Intelligence, Surveillance and Reconnaissance (ISR) aircraft (Global Hawk and U-2) and command and control aircraft (MC2A); supports transformational communications initiatives which require laser transmission of sensor data at rates above 1 Gbps over Transformational Communications satellites.

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

7) Advanced Multi-band Communications Antenna System (AMCAS) development. NOTE: The name of this program has been changed from Wideband Antenna program. AMCAS will provide a multi-beam, multi-band phased array antenna enabling simultaneous connectivity to more than one satellite aircraft. Addresses limited aircraft external surface area, historically high antenna integration costs, and aerodynamic and low observability restrictions. Enables airborne weapon systems to support the higher data needed for today's combat while eliminating he need to develop separate solutions for each platform to meet unique power and data rate requirements.

8) Mobile User Objective System (MUOS) terminal upgrade development is the next generation advanced narrowband satellite communications. MUOS-capable UHF SATCOM users will be able to utilitze increases in bandwidth, gain and link availability.

| Exhibit R-2a, RDT&E Project Justification | | DATE February 2004 |
|---|---|---|
| BUDGET ACTIVITY<br>**07 Operational System Development** | PE NUMBER AND TITLE<br>**0303601F MILSATCOM Terminals** | PROJECT NUMBER AND TITLE<br>**2487 MILSATCOM Terminals** |

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 2003 | FY 2004 | FY 2005 |
|---|---|---|---|---|
| (U) | Continue concept/prototype demo/MILSATCOM Terminals roadmap/SATCOM funding | 1.002 | 3.307 | 3.785 |
| (U) | Continue Family of Advanced Beyond Line-of-Sight Terminals (FAB-T) development | 51.756 | 96.596 | 112.685 |
| (U) | Continue Ground Multi-band Terminal (GMT) development | 3.628 | 9.677 | 23.043 |
| (U) | JSTARS development to assume Airborne Battlefield Command and Control (ABCCC) role | 0.400 | 0.000 | 0.000 |
| (U) | Continue High Data Rate (HDR) RF Terminals | 4.806 | 29.340 | 81.669 |
| (U) | Continue Lasercom Terminals development | 3.498 | 14.401 | 28.736 |
| (U) | Continue Joint Terminal Engineering Office (JTEO) Support | | 7.322 | 7.687 |
| (U) | Continue Advanced Multi-band Communications Antenna System (AMCAS) development | | 11.217 | 9.052 |
| (U) | Initiate Mobile User Objective System terminal upgrades development | | | 5.492 |
| (U) | Total Cost | 65.090 | 171.860 | 272.149 |

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

| | | FY 2003 Actual | FY 2004 Estimate | FY 2005 Estimate | FY 2006 Estimate | FY 2007 Estimate | FY 2008 Estimate | FY 2009 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) | 31.824 | 35.628 | 27.665 | 8.861 | 121.757 | 152.994 | 223.574 | Continuing | TBD |
| (U) | Other Procurement, Air Force, 'MILSATCOM Space',Project 836780 (Budget Activity 3, P-74, PE 0303601F only) (1) | 4.267 | 22.452 | 26.555 | 100.180 | 106.717 | 116.391 | 131.062 | 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
PE 0603430F Advanced EHF
PE 0603845F Transformational Communications Satellite (TSat)
PE 0603432F Polar MILSATCOM (Space)

| Exhibit R-2a, RDT&E Project Justification | | DATE February 2004 |
|---|---|---|
| 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 0603854F Wideband Gapfiller System (Space)
PE 0604479F Milstar LDR/MDR Satellite Communications
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 FY03, the Air Force (AF) initiated development of the High Data Rate (HDR) RF terminals and Lasercom Terminals to operate with Wideband Gapfiller System (WGS) and Transformational Communications Satellites. Contract awards for HDR RF terminals will be split into HDR RF airborne and HDR RF ground. For both HDR RF pieces, the contracts will be awarded to provide capabilities incrementally and will be a combination of sole source and full and open competition acquisitions. In FY03, the AF also began development of the Lasercom terminal and plans to award multiple technology demonstration contracts to mature the optical aperture technologies and will also award an architecture definition effort contract. In FY04, the AF initiated the development of the Advanced Multi-band Communications Antenna System (AMCAS) Program and will award multiple technology demonstration contracts to mature the antenna technology with a follow on contract based on full and open competition to build the antenna. In FY05, AF will begin development of Mobile User Objective System (MUOS) terminal modifications to incorporate Software Communications Architecture (SCA) functionality so that the SCA compliant MUOS waveform can be used on the AIT radio. Modifications will be accomplished via sole source development contract to Raytheon due to the proprietary AIT radio software.

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

DATE **February 2004**

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 2003 Cost | FY 2003 Cost | FY 2003 Award Date | FY 2004 Cost | FY 2004 Award Date | FY 2005 Cost | FY 2005 Award Date | Cost to Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (U) Product Development | | | | | | | | | | | | |
| GMT Development | CPAF | Harris Corp., Melbourne, FL | 28.046 | 2.650 | Nov-03 | 5.500 | Oct-03 | 19.500 | Oct-04 | Continuing | TBD | 55.939 |
| FAB-T Development | CPAF | Boeing Corp., Anaheim, CA | 3.670 | 42.234 | Oct-03 | 89.233 | Oct-03 | 95.700 | Oct-04 | Continuing | TBD | 236.349 |
| Joint STARS A-kit Development | AF-616 | ESC/JS, Hanscom AFB | 0.000 | 0.400 | Oct-03 | 0.000 | | 0.000 | | 0.000 | 0.400 | 0.400 |
| High Data Rate (HDR) RF Ground terminal study (Associated Contract Agreement) | TRN | Harris Corp., Melbourne, FL | 0.000 | 0.500 | Mar-03 | 0.880 | Feb-04 | 0.000 | | 0.000 | 1.380 | 1.380 |
| High Data Rate (HDR) RF Airborne terminal study (Associated Contract Agreement) | TRN | Boeing Corp., Anaheim, CA | 0.000 | 0.500 | Mar-03 | 0.000 | | 0.000 | | 0.000 | 0.500 | 0.500 |
| High Data Rate (HDR) RF Terminal Development | TBD | TBD | 0.000 | 0.000 | | 22.248 | Oct-03 | 75.255 | Oct-04 | Continuing | TBD | |
| Lasercom Terminal Development | TBD | TBD | 0.000 | 0.000 | | 8.714 | Oct-03 | 24.606 | Oct-04 | Continuing | TBD | |
| AMCAS Development | TBD | TBD | 0.000 | 0.000 | | 7.843 | Oct-03 | 7.288 | Oct-04 | Continuing | TBD | |
| MUOS Terminal Modification Development | TBD | TBD | 0.000 | 0.000 | | 0.000 | | 3.869 | Dec-04 | Continuing | TBD | |
| | | | | | | | | | | | 0.000 | |
| Subtotal Product Development | | | 31.716 | 46.284 | | 134.418 | | 226.218 | | Continuing | TBD | 294.568 |
| Remarks: | | | | | | | | | | | | |
| (U) Support | | | | | | | | | | | | |
| Systems Engineering Support | CPAF | MITRE, Bedford MA | 120.977 | 13.591 | Oct-03 | 17.231 | Oct-03 | 21.425 | Oct-04 | Continuing | TBD | |
| Systems Engineering/Functional/Financial Support | Various | Various | 162.734 | 3.102 | Oct-03 | 12.915 | Oct-03 | 14.796 | Oct-04 | Continuing | TBD | |
| Financial Support (Beginning in FY04 totals included in Systems Engineering/Functional/Financial Support) | Various | Tecolote, Bedford MA | 3.013 | 1.125 | Nov-03 | 0.000 | | 0.000 | | Continuing | TBD | |
| Miscellaneous | Various | Various | 20.075 | 0.688 | Oct-03 | 6.996 | Oct-03 | 4.059 | Oct-04 | Continuing | TBD | |
| | | | | | | | | | | | 0.000 | |

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

DATE **February 2004**

BUDGET ACTIVITY **07 Operational System Development**

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

PROJECT NUMBER AND TITLE **2487 MILSATCOM Terminals**

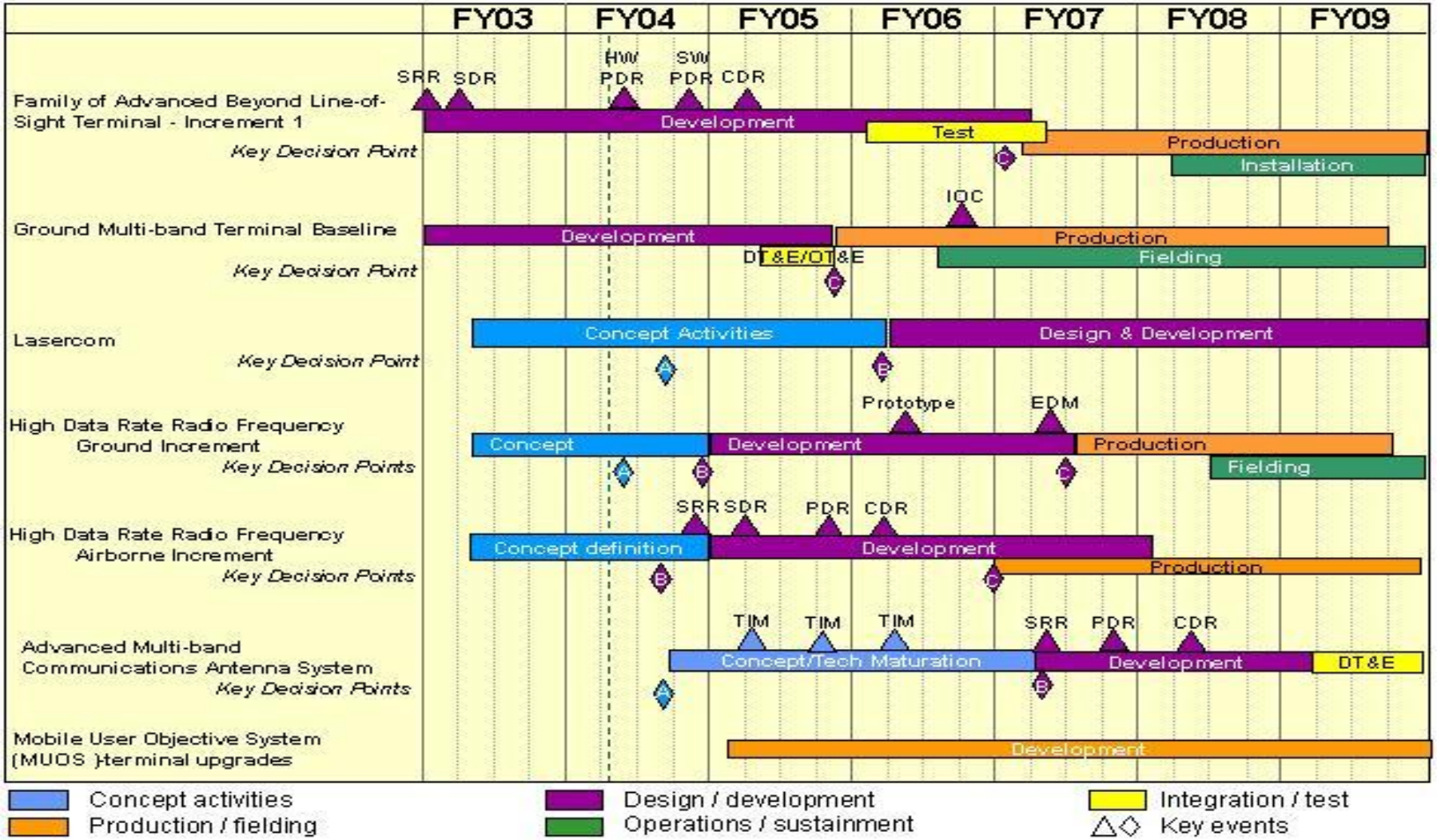
| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Subtotal Support | | | 306.799 | 18.506 | | 37.142 | | 40.280 | | Continuing | TBD | 0.000 |
| | Remarks: | | | | | | | | | | | | |
| (U) | Test & Evaluation | | | | | | | | | | | | |
| | Various Programs | Various | AF Research Lab | 24.603 | 0.000 | | 0.000 | | 4.388 | Oct-04 | Continuing | TBD | |
| | Miscellaneous T&E | Various | Various | 5.907 | 0.300 | Oct-03 | 0.300 | Oct-03 | 1.263 | Oct-04 | Continuing | TBD | |
| | | | | | | | | | | | | 0.000 | |
| | Subtotal Test & Evaluation | | | 30.510 | 0.300 | | 0.300 | | 5.651 | | 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 | | | 369.025 | 65.090 | | 171.860 | | 272.149 | | Continuing | TBD | 294.568 |

NOTE: Prior Year dollar amounts do not agree with last years document due to removal of the Raytheon FPIF/FFP from June 1985, Rockwell CPIF from August 1993 and ViaSat C/FFP from October 1995 contract lines. Nothing has been budgeted for these products since FY01 and no future work is planned on these projects.

# Exhibit R-4, RDT&E Schedule Profile

DATE
**February 2004**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT NUMBER AND TITLE |
|---|---|---|
| **07 Operational System Development** | **0303601F MILSATCOM Terminals** | **2487 MILSATCOM Terminals** |




AoA: Analysis of Alternatives
CDR: Critical Design Review
IOT&E: Initial Operational Test & Evaluation
SRR: System Requirements Review
PDR: Preliminary Design Review
EDM: Engineering Design Model
SDR: System Design Review
TIM: Technical Interchange Meeting

# Exhibit R-4a, RDT&E Schedule Detail

DATE
**February 2004**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT NUMBER AND TITLE |
|---|---|---|
| **07 Operational System Development** | **0303601F MILSATCOM Terminals** | **2487 MILSATCOM Terminals** |

| | **Schedule Profile** | FY 2003 | FY 2004 | FY 2005 |
|---|---|---|---|---|
| (U) | JSTARS development of Airborne Battlefield Command and Control Center (ABCCC) communications capability | 4Q | | |
| (U) | Begin Initial Development of High Data Rate (HDR) RF Terminals | 2Q | | |
| (U) | Begin Initial Development of Lasercom Terminals | 2Q | | |
| (U) | Award Technology Maturation contracts for Lasercom Optical Apertures | | 3Q | |
| (U) | Award Technology Maturation contracts for Advanced Multi-band Communications Antenna System (AMCAS) | | 3Q | |
| (U) | Begin Mobile User Objective System (MUOS) terminal upgrades development | | | 1Q |