

PE NUMBER: 0305110F

UNCLASSIFIED

PE TITLE: Satellite Control Network (Space)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1999		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305110F Satellite Control Network (Space)				PROJECT 3276		
COST (\$ In Thousands)	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
3276 Satellite Control Network	62,554	55,812	61,918	85,064	96,428	41,818	32,956	34,019	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0	0

(U) A. Mission Description

(U) The Air Force Satellite Control Network (AFSCN) mission is to fly operational USAF and other DoD satellites. The AFSCN also provides launch & early orbit tracking operations in support of all major US launches. Air Force Space Command (AFSPC) performs operations and maintenance and Air Force Materiel Command (AFMC) performs modernization and sustainment of the system to meet requirements validated by a HQ USAF approved Operational Requirements Document (ORD). This program element contains funds for the development and acquisition of this integrated national satellite telemetry, tracking, commanding, and data relay capability to meet the requirements of the growing inventory of operational and developmental DoD, National, Civil, and Allied satellite systems. Improvement and Modernization efforts in command & control, communications, and range elements of the AFSCN will ensure DoD space systems are operationally ready to support the CINCs' warfighting requirements.

(U) The AFSCN is a global infrastructure of control centers, remote tracking stations (RTSs), and communications links that provide the highly reliable command and control, communications, and range systems required to support the nation's surveillance, navigation, communications, and weather satellite operations. The AFSCN is the DoD common user network that provides satellite state-of-health, tracking, telemetry, and commanding (TT&C) for the following operational satellite systems: Defense Meteorological Satellite Program (DMSP), Global Positioning System (GPS), Defense Satellite Communications System (DSCS), Defense Support Program (DSP), Fleet Satellite (FLEETSAT), Military Strategic and Tactical Relay Satellite (MILSTAR), the Navy's Ultra High Frequency Follow-On (UHF F/O), Skynet, NATO III/IV, and classified programs.

(U) AFSCN Improvement and Modernization (I&M): AFSCN I&M is an on-going program of replacements and upgrades which will replace non-standard, unsupportable equipment with more reliable, maintainable and standardized hardware and software. This new equipment will enable AFSPC satellite operations to be performed with fewer, less-skilled personnel and will significantly reduce hardware/software maintenance costs. The principal efforts within this program are: Network Operations Upgrades, Communications Upgrades, and Range Upgrades.

(U) NETWORK OPERATIONS UPGRADES: The current Resource Management System (RMS), which deconflicts and allocates network telemetry, tracking & command assets to support operational space vehicles, will be replaced with an automated, Year 2000-compliant system which includes network resource scheduling and orbit analysis functions to include ephemeris and events generation, radio frequency interference detection and collision avoidance. This evolution offers tremendous potential for reducing satellite control O&M costs through enhanced commonality and standardization, simplified operations, and automation. Commercial off-the-shelf (COTS) hardware and software will be procured for the new Resource Management System. The software portions will be modified to meet AFSPC's operational requirements.

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<p>(U) COMMUNICATIONS UPGRADES: This effort will transition the current, costly point-to-point AFSCN communications network to a communications grid system that integrates government and commercial networks as technology becomes available. Several standardization efforts are being implemented to improve and modernize the communications and ground segment elements of the AFSCN, including: Archival recording systems to replace obsolete, manpower-intensive analog equipment with automated, standardized digital COTS systems; Wide Area Network Interface Units (WANIU) which standardize hardware and reduce O&M costs for performing multiplexing functions in the AFSCN, as well as provide an Asynchronous Transfer Mode (ATM) interface; and Operational Switch Replacement (OSR) to provide increased capacity, reliability, data quality, and user access.</p> <p>(U) RANGE UPGRADES: This effort will upgrade the current Automated Remote Tracking Station (ARTS) and other Range assets. Several integrated projects will standardize the remote tracking stations, upgrade and/or replace outdated equipment in order to reduce failures, correct operational deficiencies, and reduce operating and sustainment costs.</p> <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <p>(U) \$19,911 <u>Network Operations Upgrades:</u> (U) Developed, tested, and fielded Resource Scheduling, Basic Orbit Service, Control and Status, and Network Performance capabilities in primary locations. Began implementation of additional orbit service capabilities into RMS. Completed common HMI and common satellite control architecture study to finish Standard Satellite Control Subsystem effort and made results available to satellite SPOs.</p> <p>(U) \$31,325 <u>Communications Upgrades:</u> (U) Continued development, integration, and test of COTS archival recorder units at RTSs. Continued development, integration, and test of WANIUs into the AFSCN. Began development of OSR.</p> <p>(U) \$11,318 <u>Network Integration and Systems Engineering:</u> (U) Continued system engineering and integration of hardware/software to meet evolving satellite program requirements at the Operational Control Nodes (OCNs) and RTSs.</p> <p>(U) \$62,554 Total</p> <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <p>(U) \$4,415 <u>Network Operations Upgrades:</u> (U) Begin Resource Scheduling integration and test of orbit service at back-up operational location.</p> <p>(U) \$35,303 <u>Communications Upgrades:</u> (U) Complete Archival Recorder System. Continue developing Operational Switch Replacement. Support WANIU installation at RTSs and OCNs.</p> <p>(U) \$3,180 <u>Range Upgrades:</u> (U) Begin development of antenna upgrades. Current 1960's technology antennas are very expensive to maintain. Modern designs are available off-the-shelf to provide increased performance, reduced interference, and multi-frequency alternatives.</p> <p>(U) \$11,029 <u>Network Integration and Systems Engineering:</u></p>		
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<p>(U) Continue system engineering and hardware/software integration to meet evolving satellite program requirements at OCNs and RTSs.</p> <p>(U) \$1,885 Identified as a source for SBIR</p> <p>(U) \$55,812 Total</p> <p>(U) <u>FY 2000 (\$ in Thousands):</u></p> <p>(U) \$5,164 <u>Network Operations Upgrades:</u> (U) Begin Orbit Analysis Service follow-on development to provide radio frequency interference (RFI) and collision avoidance analysis capabilities for the orbital analysis system.</p> <p>(U) \$32,169 <u>Communications Upgrades:</u> (U) Continue OSR development. Complete WANIU and archival recorders.</p> <p>(U) \$15,478 <u>Range Upgrades:</u> (U) Begin Control and Status (C&S) Processor Upgrade development. Begin Standards Protocol requirements definition effort to address impact on AFSCN architecture of emerging space communications protocols being examined by DOD, NASA, and the International Standards Organization</p> <p>(U) \$9,107 <u>Network Integration and Systems Engineering:</u> (U) Continue system engineering and integration of hardware/software to meet evolving satellite program requirements at OCNs and RTSs.</p> <p>(U) \$61,918 Total</p> <p>(U) <u>FY 2001 (\$ in Thousands):</u></p> <p>(U) \$6,774 <u>Network Operations Upgrades:</u> Complete development of Orbit Analysis Service; begin development of Resource Scheduling Capacity Upgrade</p> <p>(U) \$21,226 <u>Communications Upgrades:</u> Complete OSR development; begin Defense Information System Network (DISN)-ATM connectivity development enabling AFSCN interface with DISN.</p> <p>(U) \$45,230 <u>Range Upgrades:</u> Begin Range Interoperability upgrade to integrate mission unique ground stations into the AFSCN; continue Standards Protocol development; begin effort to upgrade the Automated Remote Tracking Stations (ARTS) Space/Ground interface upgrade to receive, demodulate, decode, and format the new Staggered Quadrature Phase Shift Key (SQPSK) signal that is required by the SBIRS program; continue C&S Processor Upgrade.</p> <p>(U) \$11,834 <u>Network Integration and Systems Engineering:</u> (U) Continue system engineering and hardware/software integration to meet evolving satellite program requirements at OCNs and RTSs</p> <p>(U) \$85,064 Total</p> <p>(U) <u>B. Budget Activity Justification:</u> (U) This effort is in Budget Activity 7, Operational System Development, because it supports a fielded system.</p> <p>(U) <u>C. Program Change Summary (\$ in Thousands)</u></p>		
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BUDGET ACTIVITY 7 - Operational System Development			PE NUMBER AND TITLE 0305110F Satellite Control Network (Space)			PROJECT 3276				
	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>Total</u>					
(U) Previous President's Budget (FY 1999 PB)	73,496	56,622	100,645	101,383	Continuing					
(U) Appropriated Value	80,011	56,622								
(U) Adjustments to Appropriated Value										
a. Cong Gen Reductions	-4,513	-810								
b. SBIR	-2,013									
c. Omnibus and Other Above Threshold Reprogram	-501									
d. Below Threshold Reprogramming	-10,430									
(U) Adjustments to Budget Years since FY 1999 PB			-38,727	-16,319						
(U) Current Budget Submit/FY2000 PB	62,554	55,812	61,918	85,064	Continuing					
<p>(U) Significant Program Changes: (\$ in Thousands)</p> <p>FY98 below threshold reprogrammings to higher Air Force priorities as a result of descope of Human-Machine Interface/standardization effort and conclusion of Centralized Control and Monitor effort due to changed user requirements.</p> <p>FY99: 1,885 identified as a source for SBIR.</p> <p>FY00-01 adjustments funded higher Air Force and DoD priorities. Several I&M efforts were descoped or eliminated due to user acceptance of threshold vs objective values for AFSCN automation, data throughput, fault isolation, and orbit determination requirements; additional 13,800 adjustment in FY00 properly aligned funds to OPAF to purchase hardware for secure voice system.</p>										
<p>(U) D. <u>Other Program Funding Summary (\$ in Thousands)</u></p>										
	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>FY 2004</u>	<u>FY 2005</u>	<u>To</u>	<u>Total</u>
(U) Other Procurement, AF; Budget Activity: 03;	22,193	22,950	33,591	32,178	40,216	34,795	38,027	33,071	Continue	Continue
P-69; AFSCN										
<p><u>Related RDT&E:</u> Not applicable</p>										

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<p>(U) E. <u>Acquisition Strategy:</u> The primary objective of the AFSCN I&M program is to reduce the cost of satellite control operations while maintaining or improving reliability, maintainability, operability, and capability of current systems. A combination of performance-based specifications and commercial/industrial specifications and standards was used for these acquisitions and was tailored to state only the Government's minimum performance needs. All development contracts were competitively awarded and utilized commercial practices and streamlining to the maximum extent possible. Starting in FY96, a new streamlined contracting strategy was implemented with the award of three new contracts. This strategy resulted in the Range & Communications Development Contract (RCDC), the Network Operations Upgrade Contract (NOUC), and the Network Integration Contract (NIC). Integration efforts had previously been spread across functional and contracting lines; but with the new AFSCN contracting strategy, the NIC contractor was given responsibility for inter-segment integration. Development upgrades are being designed to be flexible in meeting new satellite program requirements while minimizing sustainment costs by taking advantage of development efforts in satellite control over a large number of government and non-government development activities. These objectives can best be reached by developing systems with an open software design and a distributed system architecture using COTS products wherever feasible.</p> <p>(U) F. <u>Schedule Profile</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th colspan="3" style="text-align: center;"><u>FY 1998</u></th> <th></th> <th colspan="3" style="text-align: center;"><u>FY 1999</u></th> <th></th> <th colspan="3" style="text-align: center;"><u>FY 2000</u></th> <th></th> <th colspan="3" style="text-align: center;"><u>FY 2001</u></th> <th></th> </tr> <tr> <th></th> <th style="text-align: center;">1</th> <th style="text-align: center;">2</th> <th style="text-align: center;">3</th> <th style="text-align: center;">4</th> <th style="text-align: center;">1</th> <th style="text-align: center;">2</th> <th style="text-align: center;">3</th> <th style="text-align: center;">4</th> <th style="text-align: center;">1</th> <th style="text-align: center;">2</th> <th style="text-align: center;">3</th> <th style="text-align: center;">4</th> <th style="text-align: center;">1</th> <th style="text-align: center;">2</th> <th style="text-align: center;">3</th> <th style="text-align: center;">4</th> </tr> </thead> <tbody> <tr> <td><u>Communications Upgrades</u></td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>RTS archival installation initiation</td> <td></td><td></td><td></td><td></td> <td></td><td></td><td style="text-align: center;">X</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>WANIU Critical Design Review (CDR)</td> <td></td><td></td><td></td><td style="text-align: center;">*</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>OSR System Functional Review (SFR)</td> <td></td><td></td><td></td><td style="text-align: center;">*</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td><u>Network Operations Upgrades</u></td> <td></td><td></td><td></td><td></td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>HMI Standardization complete</td> <td></td><td></td><td></td><td style="text-align: center;">*</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td><u>Range Upgrades</u></td> <td></td><td></td><td></td><td></td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>Start Control and Status Upgrade</td> <td></td><td></td><td></td><td></td> <td></td><td></td><td></td><td></td> <td></td><td></td><td style="text-align: center;">X</td> <td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>Begin DISN-ATM Connectivity</td> <td></td><td></td><td></td><td></td> <td></td><td></td><td></td><td></td> <td></td><td></td><td></td><td></td> <td></td><td></td><td style="text-align: center;">X</td> <td></td> </tr> <tr> <td colspan="17">*=-completed; X=planned</td> </tr> </tbody> </table>													<u>FY 1998</u>				<u>FY 1999</u>				<u>FY 2000</u>				<u>FY 2001</u>					1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	<u>Communications Upgrades</u>																	RTS archival installation initiation							X										WANIU Critical Design Review (CDR)				*													OSR System Functional Review (SFR)				*													<u>Network Operations Upgrades</u>																	HMI Standardization complete				*													<u>Range Upgrades</u>																	Start Control and Status Upgrade											X						Begin DISN-ATM Connectivity															X		*=-completed; X=planned																
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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE February 1999	
BUDGET ACTIVITY 7 - Operational System Development						PE NUMBER AND TITLE 0305110F Satellite Control Network (Space)				PROJECT 3276	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>											
						<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>		
(U) Network Ops Upgrades (Command and Control Upgrades)						19,911	4,415	5,164	6,774		
(U) Communications Upgrades						31,325	35,303	32,169	21,226		
(U) Range Upgrades						0	3,180	15,478	45,230		
(U) Network Integration and Systems Engineering						11,318	11,029	9,107	11,834		
(U) Identified as a source for SBIR						0	1,885	0	0		
(U) Total						62,554	55,812	61,918	85,064		
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>											
Performing Organizations:											
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC*	Project Office EAC	Total Prior to FY 1998	Budget FY 1998	Budget FY 1999	Budget FY 2000	Budget FY 2001	To Complete	Total Program
*Only includes projections/options exercised to date											
Identified as a source for SBIR							1,885				
<u>Product Development Organizations</u>											
Multiple	Multiple	Multiple	72,296	72,296	72,296	0	0	0	0	0	72,296
Lockheed Martin	C/CPAF	Mar 96	126,000	130,140	32,266	31,325	35,303	32,169	21,226	continuing	continuing
Lockheed Martin	C/CPAF	Apr 96	52,258	118,400	22,349	19,911	4,415	5,164	6,774	continuing	continuing
AFSCN Upgrades	TBD	TBD	TBD	205,057	0	0	3,180	15,478	45,230	continuing	continuing
Lockheed Martin	C/CPAF	May 96	66,700	74,050	11,189	11,318	11,029	9,107	11,834	continuing	continuing
<u>Support and Management Organizations</u>											
N/A											
<u>Test and Evaluation Organizations</u>											
N/A											
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7 - Operational System Development					0305110F Satellite Control Network (Space)					3276	
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC*	Project Office EAC	Total Prior to FY 1998	Budget FY 1998	Budget FY 1999	Budget FY 2000	Budget FY 2001	To Complete	Total Program
Government Furnished Property: N/A											
Identified as a source for SBIR							1,885				
Subtotal Product Development			317,254	599,943	138,100	62,554	53,927	61,918	85,064	continuing	continuing
Subtotal Support and Management											
Subtotal Test and Evaluation											
Total Project			317,254	599,943	138,100	62,554	55,812	61,918	85,064	continuing	continuing

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