

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 2000	
BUDGET ACTIVITY 03 - Advanced Technology Development				PE NUMBER AND TITLE 0603726F Aerospace Info Tech Sys Integration					
COST (\$ in Thousands)	FY 1999 Actual	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	10,272	7,828	7,429	8,047	7,594	9,135	8,880	Continuing	TBD
632810 Advanced Image/Information/Optical Memory Technology Applications	8,023	3,520	4,368	5,022	5,693	6,827	6,961	Continuing	TBD
632863 Integrated Photonics	2,249	4,308	0	0	0	0	0	Continuing	TBD
634850 Collaborative C2	0	0	3,061	3,025	1,901	2,308	1,919	Continuing	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

Note: In FY 2001, the efforts in Project 632863, Integrated Photonics, will be conducted in PE 0603203F, Project 63665A. Prior to FY 2001, the efforts in Project 634850, Collaborative C2, were performed in PE 0603253F, Projects 632735 and 63666A.

(U) **A. Mission Description**  
 This program develops and demonstrates Aerospace Command, Control, Communications, and Intelligence (C3I) technologies for collaborative command and control with emphasis on a coalition/joint environment. This includes the areas of information and knowledge production, data fusion, data links, wideband storage, and processing, retrieval, and exploitation of C3I databases. A family of exploitation tools to extract information from multi-sensor data sources will be developed. An enabling fusion architecture to work with existing and future fusion engines will also be designed and built to correlate and integrate this information to produce a consistent knowledge of the battle space over a distributed and collaborative C2 environment. Information storage and retrieval technologies for secure global database distribution, of sufficient capacity and speed to meet Air Force requirements, will be developed. A collaborative C2 operations foundation between dispersed command centers will be developed to demonstrate split force operations and enable decision making in a distributed aerospace information framework. The resultant product of this program will be a consistent and complete battlespace representation that is a key component of the Battlespace Infosphere concept set forth in the Air Force Scientific Advisory Board Study SAB-TR-98-02, 'Information Management to Support the Warrior' dated October 19, 1998. Note: This PE title and mission description have been changed to reflect the realignment of the information technology research and development to achieve the goal of Information Dominance expressed in 'Joint Vision 2010' and the Air Force long-range strategic plan, 'Global Engagement.'

(U) **B. Budget Activity Justification**  
 This program is in Budget Activity 3, Advanced Technology Development, since it develops and demonstrates technologies for existing system upgrades and/or new system developments that have a military utility and address warfighter needs.

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	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>Total Cost</u>
(U) <b><u>C. Program Change Summary (\$ in Thousands)</u></b>				
(U) Previous President's Budget (FY 2000 PBR)	10,993	9,122	4,920	
(U) Appropriated Value	11,025	7,922		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-32			
b. Small Business Innovative Research	-322			
c. Omnibus or Other Above Threshold Reprogram		-43		
d. Below Threshold Reprogram	-341			
e. Rescissions	-58	-51		
f. Other				TBD
(U) Adjustments to Budget Years Since FY 2000 PBR			2,509	
(U) Current Budget Submit/FY 2001 PBR	10,272	7,828	7,429	TBD
(U) <b><u>Significant Program Changes:</u></b>				
In FY 2001, funds were added to increase emphasis on collaborative command and control.				

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<b>RDT&amp;E BUDGET ITEM JUSTIFICATION SHEET (R-2A Exhibit)</b>								DATE <b>February 2000</b>	
BUDGET ACTIVITY <b>03 - Advanced Technology Development</b>				PE NUMBER AND TITLE <b>0603726F Aerospace Info Tech Sys Integration</b>				PROJECT <b>632810</b>	
COST (\$ in Thousands)	FY 1999 Actual	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
632810    Advanced Image/Information/Optical Memory Technology Applications	8,023	3,520	4,368	5,022	5,693	6,827	6,961	Continuing	TBD
<p>(U) <b><u>A. Mission Description</u></b>            This project develops and demonstrates techniques and algorithms to meet weapon systems requirements for processed and fused multi-source information needed for mission planning, navigation, targeting, and terrain analysis. It provides generic language translation processing techniques, state-of-the-art algorithms for Air Force exploitation of digitally processed image and spatial (i.e., latitude, longitude, and elevation) database products, automated capabilities to reference and display hypermedia (multi-media) information, and defensive information warfare technologies. This project also develops erasable optical data storage systems with high capacity and fast input/output speed for fighter aircraft (to provide fast airborne access to mission-oriented data and the digital terrain system) and electronic surveillance aircraft (for on-board sensor data recording, operational mission planning requirements, and large data storage requirements (i.e., high-volume, soft-copy, digital imagery exploitation)). Algorithms will be developed to automate the selection, retrieval, and downloading of information stored on mass storage devices that are distributed across the data network. Three-dimensional (3-D) memory systems will be developed for volumetric digital data storage. This new mass storage technology will demonstrate ultra-high data density and fast, parallel data access within a low-cost, compact system.</p>									
<p>(U) <b><u>FY 1999 (\$ in Thousands)</u></b></p>									
(U) \$1,376	Developed and demonstrated advanced imagery information, sensor fusion, and spatial database technologies to enhance warfighter mission planning, navigation, targeting, and terrain analysis.								
(U) \$1,657	Designed, developed, and demonstrated automated capabilities to harvest, process, disseminate, and display intelligence and sensor data to improve the sensor exploitation process.								
(U) \$2,351	Continued to develop and demonstrate 3-D optical information data handling, storage, and access technologies including erasable and read-only memories.								
(U) \$1,163	Continued to design, develop, and demonstrate optical disk and interface technologies that can be implemented in joint theater operations, including a parallel Write Once Read Many Times (WORM) 3-D memory and Jukebox Redundant Array of inexpensive devices.								
(U) \$1,476	Designed, developed, and demonstrated mission planning and rehearsal capabilities for theater battle management including semi-automated, objectives-based planning and assessment for Command and Control requirements.								
(U) \$8,023	Total								
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<b>03 - Advanced Technology Development</b>	<b>0603726F Aerospace Info Tech Sys Integration</b>	<b>632810</b>
(U) <u>A. Mission Description Continued</u>		
(U) <u>FY 2000 (\$ in Thousands)</u>		
(U) \$600	Develop and demonstrate advanced signal exploitation technologies. Develop and demonstrate advanced imagery and signal intelligence information, sensor fusion engine, and spatial database technologies to enhance warfighter mission planing, navigation, targeting, and terrain analysis. Develop and demonstrate a standard open fusion architecture with a sensor fusion capability to provide a complete and accurate representation in real-time of the current military situation.	
(U) \$1,220	Develop and demonstrate advanced data handling and event visualization technologies. Develop and demonstrate automated capabilities to locate, retrieve, process, distribute, and display intelligence and sensor data to improve the sensor exploitation process. Develop a decision support system to automate extraction, visualization, and analysis of information in text.	
(U) \$900	Develop and demonstrate advanced storage and memory technologies. Develop smart memory/associative recall information data handling, storage, and access technologies to enable advanced fusion processing techniques. Continue to develop and demonstrate optical disk and interface technologies that can be implemented in joint theater operations, including WORM devices.	
(U) \$800	Design, develop, and demonstrate mission planning and rehearsal capabilities for theater battle management, including the demonstration of software for joint Command and Control (C2) requirements.	
(U) \$3,520	Total	
(U) <u>FY 2001 (\$ in Thousands)</u>		
(U) \$1,100	Develop and demonstrate advanced signal exploitation technologies. Develop and demonstrate advanced imagery and signal intelligence information, adaptive sensor fusion engine, and spatial database technologies for transition to Common Operational Picture (COP). Continue to develop planning and assessment technologies to support strategy development and campaign assessment in a distributed environment supporting the battlespace infosphere.	
(U) \$2,044	Develop and demonstrate advanced data handling and event visualization technologies. Develop and demonstrate automated capabilities to access, extract, process, and display multi-source intelligence and sensor databases to improve the sensor exploitation process for near-real-time situational awareness. Develop and demonstrate event visualization, natural language processing for information extraction, collaborative analysis tools, situation, and activity assessment capability for decision support operations.	
(U) \$1,224	Develop and demonstrate advanced storage and memory technologies. Continue to develop smart memory and associative recall technologies for strategic and tactical applications. Continue development and demonstration of ultra-dense storage, and fast parallel access technologies for write-once, read-many and erasable memories. This technology enhances sensor exploitation for increased situational awareness and interactive simulation for distributed mission training.	
(U) \$4,368	Total	
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BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
<b>03 - Advanced Technology Development</b>	<b>0603726F Aerospace Info Tech Sys Integration</b>	<b>632810</b>
<p>(U) <b><u>B. Project Change Summary</u></b> Not Applicable.</p> <p>(U) <b><u>C. Other Program Funding Summary (\$ in Thousands)</u></b> (U) Related Activities: (U) PE 0602702F, Command, Control, and Communications (C3). (U) PE 0603789F, C3I Advanced Development. (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.</p> <p>(U) <b><u>D. Acquisition Strategy</u></b> Not Applicable.</p> <p>(U) <b><u>E. Schedule Profile</u></b> (U) Not Applicable.</p>		
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BUDGET ACTIVITY <b>03 - Advanced Technology Development</b>				PE NUMBER AND TITLE <b>0603726F Aerospace Info Tech Sys Integration</b>				PROJECT <b>632863</b>			
COST (\$ in Thousands)		FY 1999 Actual	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost	
632863	Integrated Photonics	2,249	4,308	0	0	0	0	0	Continuing	TBD	
<p>(U) <b><u>A. Mission Description</u></b>            Current electronic systems are susceptible to electromagnetic interference, electromagnetic pulse, and radio frequency (RF) interference. Size constraints, speed, and reliability also limit traditional electronic systems. Photonics-based systems process information in the form of light (photonics) signals and will provide major improvements in tactical and strategic Command, Control, and Communications (C3) systems by enabling small-size, high-performance, high-capacity, survivable alternatives to electronic-based systems. This project develops and demonstrates advanced hardware technology in optical processing, adaptive transmission, and nonlinear optical processing.</p> <p>(U) <b><u>FY 1999 (\$ in Thousands)</u></b></p> <p>(U) \$829      Developed, demonstrated, and tested analog and digital hardened optical component processing technologies to provide real-time data for pre- and post-mission analysis, as well as sensor integration and automatic target identification using multispectral surveillance systems.</p> <p>(U) \$841      Developed and demonstrated microwave/millimeter-wave photonics components, processing, and subsystems for advanced, optically-controlled, reconfigurable RF systems at increased frequencies.</p> <p>(U) \$579      Developed high performance optical control systems for Super High Frequency phased array antennas providing extremely wide angle coverage, broadband performance, and anti-jam capability for satellite communications. Started development of a True Time Delay processor.</p> <p>(U) \$2,249      Total</p> <p>(U) <b><u>FY 2000 (\$ in Thousands)</u></b></p> <p>(U) \$282      Develop, integrate, demonstrate, and test analog and digital optical micro-network processing technologies and components to provide real-time data for pre- and post-mission analysis, as well as sensor integration and automatic target identification using multispectral surveillance systems for air and space platforms.</p> <p>(U) \$1,956      Develop and demonstrate microwave/millimeter-wave photonics processing and subsystems for advanced, optically-controlled, radio frequency (RF) systems at increased frequencies.</p> <p>(U) \$700      Develop high performance control systems for RF phased array antennas providing extremely wide angle coverage, broadband performance, and anti-jam capability for Global Positioning System (GPS) applications. Continue to develop a photonics True Time Delay processor.</p> <p>(U) \$1,370      Complete development and demonstration of three-dimensional optical information data handling, storage, and access technologies including erasable and read-only memories.</p> <p>(U) \$4,308      Total</p>											
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<b>03 - Advanced Technology Development</b>	<b>0603726F Aerospace Info Tech Sys Integration</b>	<b>632863</b>
<p>(U) <b><u>A. Mission Description Continued</u></b></p> <p>(U) <u>FY 2001 (\$ in Thousands)</u></p> <p>(U) \$0 Effort moved to PE 0603203F, Project 63665A.</p> <p>(U) \$0 Total</p> <p>(U) <b><u>B. Project Change Summary</u></b> Not Applicable.</p> <p>(U) <b><u>C. Other Program Funding Summary (\$ in Thousands)</u></b></p> <p>(U) Related Activities:</p> <p>(U) PE 0602702F, Command, Control, and Communications (C3).</p> <p>(U) PE 0603789F, C3I Advanced Development.</p> <p>(U) PE 0603203F, Advanced Aerospace Sensors.</p> <p>(U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.</p> <p>(U) <b><u>D. Acquisition Strategy</u></b> Not Applicable.</p> <p>(U) <b><u>E. Schedule Profile</u></b> Not Applicable.</p>		
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BUDGET ACTIVITY 03 - Advanced Technology Development				PE NUMBER AND TITLE 0603726F Aerospace Info Tech Sys Integration				PROJECT 634850			
COST (\$ in Thousands)		FY 1999 Actual	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost	
634850	Collaborative C2	0	0	3,061	3,025	1,901	2,308	1,919	Continuing	TBD	
<p>(U) <b><u>A. Mission Description</u></b>            This project develops and demonstrates technologies for the next generation of distributed collaborative environments, which will provide cross disciplinary information to a decision maker when, where, and how it is needed. Technologies developed will permit advanced integrated information architectures for the near-real-time transfer of large volumes of information over existing and future command, control, and communications systems. The application of these new technologies will allow reconfiguration and adaptation of existing operational aerospace systems to support seamless integrated operations, and facilitate an affordable implementation of the battlespace infosphere concept. These are enabling technologies for collaborative command and control, simulation-based acquisition, and distributed mission training.</p> <p>(U) <b><u>FY 1999 (\$ in Thousands)</u></b>            (U) \$0 Previously accomplished in PE 0603253F.            (U) \$0 Total</p> <p>(U) <b><u>FY 2000 (\$ in Thousands)</u></b>            (U) \$0 Previously accomplished in PE 0603253F.            (U) \$0 Total</p> <p>(U) <b><u>FY 2001 (\$ in Thousands)</u></b>            (U) \$1,087 Develop and demonstrate next generation distributed collaborative environments. Assess and demonstrate the application of these technologies to simulation-based acquisition, pre-planning for distributed mission training, and problem solving for a lean and agile Expeditionary Aerospace Force.</p> <p>(U) \$974 Define and develop integrated aerospace information architectures. Define and develop integrated information architectures that enable information collection assets on airborne and space platforms to be automatically optimally tasked, and the collected information shared in near-real-time among expeditionary aerospace forces. Assess the application of these technologies to the time-critical target domain. Develop and demonstrate aerospace architecture technology to provide an affordable battlespace infosphere operation. This will allow reconfiguration and adaptation of existing operational aerospace systems to support seamless integrated operations.</p> <p>(U) \$1,000 Develop technology to increase aerospace platform information transfer capacity. Develop technology to increase aerospace platform information transfer capacity for exchange of time-critical threat, sensor, and command and control information between aircraft and cooperating space, airborne, and surface communication assets. Continue the development of communications technologies that support collaborative command and control. Complete a space-based air traffic communications and positioning brassboard demonstrating the capability to meet Federal</p>											
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<p>(U) <b><u>A. Mission Description Continued</u></b></p> <p>(U) <b><u>FY 2001 (\$ in Thousands) Continued</u></b></p> <p>Aviation Administration and International Civil Aviation Organization directed Global Air Traffic Management requirements in fighter and bomber aircraft.</p> <p>(U) \$3,061 Total</p> <p>(U) <b><u>B. Project Change Summary</u></b></p> <p>Not Applicable.</p> <p>(U) <b><u>C. Other Program Funding Summary (\$ in Thousands)</u></b></p> <p>(U) Related Activities:</p> <p>(U) PE 0602702F, Command, Control, and Communications (C3).</p> <p>(U) PE 0603789F, C3I Advanced Development.</p> <p>(U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.</p> <p>(U) <b><u>D. Acquisition Strategy</u></b></p> <p>Not Applicable.</p> <p>(U) <b><u>E. Schedule Profile</u></b></p> <p>(U) Not Applicable.</p>		
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