

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603728F Advanced Computing Technology
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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
Total Program Element (PE) Cost	7,520	7,748	4,507	5,932	6,782	8,349	8,522	8,701	Continuing	Continuing
2527 Software Life Cycle Tools	2,218	2,267	340	789	981	2,412	2,462	2,513	Continuing	Continuing
2530 Distributed Systems Reliability and Survivability	2,302	2,382	1,798	2,219	2,484	2,546	2,599	2,654	Continuing	Continuing
2532 Knowledge-Based Systems	3,000	3,099	2,369	2,924	3,317	3,391	3,461	3,534	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0	0

(U) **A. Mission Description:** This Advanced Technology Development program develops and demonstrates technologies needed to control cost, reduce risk, and increase efficiency and effectiveness of software and computers required for Air Force mission critical combat systems. The Air Force has experienced a dramatic escalation in the cost of acquiring and maintaining embedded computer software for increasingly complex military systems which must be reliable and survivable in the battlefield environment. The requirement for survivable tactical and strategic computing systems has driven the need for automatic integration and interoperability of multiple processing elements, automatic redistribution of data and functions, and location-independent access to data. Distributed processing techniques, which can dynamically reconfigure Command, Control, Communications, and Computer (C4) systems to accommodate lost components or nodes, are required to ensure survivable mission critical command and control functions.

(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 military utility and address warfighter needs.

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(U) C. Program Change Summary (\$ in Thousands):

	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>Total Cost</u>
(U) Previous President's Budget/FY 1999 PB	5,270	7,827	8,050	8,082	Cont
(U) Appropriated Value	5,613	7,827			
(U) Adjustments to Appropriated Value					
a. Congressional/General Reductions	-214	-79			
b. SBIR	-129				
c. Omnibus/Other Above Threshold Reprogrammings	-36				
d. Below Threshold Reprogrammings	2,286				
e. Rescissions					
(U) Other Adjustments to Budget Years Since FY 1999 PB			-3,543	-2,150	
(U) Current Budget Submit/FY 2000 PB	7,520	7,748	4,507	5,932	Cont

(U) Significant Program Changes: Changes to this program since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.

FY 1999: \$216 identified as a source for SBIR.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2A Exhibit)								DATE February 1999		
BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603728F Advanced Computing Technology				PROJECT 2527		
<i>COST (\$ In Thousands)</i>	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
2527 Software Life Cycle Tools	2,218	2,267	340	789	981	2,412	2,462	2,513	Continuing	Continuing
<p>(U) A. <u>Mission Description:</u> Advanced computer systems in Air Force weapon systems require software life cycle tools and technology to reduce costs, improve quality, and enhance productivity. This project develops, evaluates, and transitions new software technology that reduces cost, while improving software, systems, and productivity factors. It develops software life cycle support environments which incorporate both laboratory and commercial off-the-shelf (COTS) products. This project provides a vehicle for software technology integration, transition, and evaluation under operational and field conditions. Technologies for system requirements analysis, reuse of software components, software quality specification, measurement, assessment, and high performance (parallel) computer software engineering are also produced.</p> <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$561 Designed, developed, and tested technology for the capture and exploitation of design information for building systems that readily and economically evolve. Developed and tested technologies for packaging diverse software capabilities such as visualization, hyper-programming, and dynamic testing. - (U) \$1,406 Developed high performance, advanced parallel computer software and architecture for weapon and information system applications, including the Parallel Assessment Window System. - (U) \$251 Designed the capability to integrate program code of dynamic and static languages within the same module, and designed dynamic language software development tools. - (U) \$2,218 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$1,087 Demonstrate technology for the capture and exploitation of design information for building systems that readily and economically evolve. Demonstrate technologies for packaging diverse software capabilities such as visualization, hyper-programming, dynamic testing, and object-oriented languages to reduce life cycle costs of software intensive Air Force systems. - (U) \$831 Develop and test the ability to mathematically represent architectural, functional, and Quality of Service (safety, performance, reliability, security, fault tolerance, etc.) properties to enable automatic design analysis and performance evaluation of software systems. - (U) \$300 Develop and test the capability to integrate program code of dynamic and static languages within the same module, and develop and test dynamic language software development tools. - (U) \$49 Identified as a source for SBIR. - (U) \$2,267 Total 										
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BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - Advanced Technology Development	0603728F Advanced Computing Technology	2527
<p>(U) <u>FY 2000 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$140 Continue to demonstrate technology for the capture and exploitation of design information for building systems that readily and economically evolve - (U) \$100 Continue to develop and demonstrate the ability to mathematically represent architectural, functional, and Quality of Service (safety, performance, reliability, security, fault tolerance, etc.) properties to enable automatic design analysis and performance evaluation of software systems. - (U) \$100 Continue to demonstrate open-systems technology to reduce life cycle costs of Air Force software intensive systems. - (U) \$340 Total <p>(U) <u>FY 2001 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$481 Complete demonstration of technology for the capture and exploitation of design information for building systems that readily and economically evolve. Complete demonstration of technologies for packaging diverse software capabilities such as visualization, hyper-programming, dynamic testing, and object-oriented languages to reduce life cycle costs of Air Force software intensive systems. - (U) \$200 Complete development and demonstration of the ability to mathematically represent architectural, functional, and Quality of Service (safety, performance, reliability, security, fault tolerance, etc.) properties to enable automatic design analysis and performance evaluation of software systems. - (U) \$108 Apply advanced evolution-based system/software life cycle technologies and evaluate effects on productivity, product quality, and cost. - (U) \$789 Total <p>(U) B. <u>Project Change Summary - Description of Significant Changes:</u> Changes to this program since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.</p> <p>(U) C. <u>Other Program Funding Summary:</u></p> <p>(U) <u>Related Activities:</u></p> <ul style="list-style-type: none"> - (U) PE 0604740F, Computer Resource Management. - (U) PE 0701112F, Inventory Control Point Operation. - (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication. <p>(U) D. <u>Acquisition Strategy:</u> Not Applicable.</p> <p>(U) E. <u>Schedule Profile:</u> Not Applicable.</p>		
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BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603728F Advanced Computing Technology				PROJECT 2530		
<i>COST (\$ In Thousands)</i>	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
2530 Distributed Systems Reliability and Survivability	2,302	2,382	1,798	2,219	2,484	2,546	2,599	2,654	Continuing	Continuing
<p>(U) A. <u>Mission Description:</u> This project develops software technology to provide distributed computer information handling for future Command, Control, Communications, and Computer (C4) systems. These technologies integrate numerous heterogeneous processing networks and provide secure, seamless access to information. Future C4 systems must be reconfigurable, operate in real-time, and be survivable, as well as capable of integrating the full spectrum of multimedia data. These systems will operate in an "information pull" mode where the users' requests for information are filled without explicit action on the part of the user to locate, retrieve, or merge data. An object-oriented architecture provides a common perspective which integrates the communications control system and the distributed computing environment.</p> <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$1,533 Tested the design of mobile computing nodes in a heterogeneous distributed computing environment and demonstrated the utility of security mechanisms. - (U) \$327 Tested the design of techniques for managing multimedia data in distributed information systems. - (U) \$442 Tested adaptive, reconfigurable distributed computing environments across heterogeneous networks to support crisis management and survivability. - (U) \$2,302 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$1,179 Integrate information warfare technologies into multi-networked distributed computing environments. Demonstrate the ability to adapt to a limited bandwidth (low-speed) interconnection and to reconfigure the network in a distributed computing environment. - (U) \$525 Demonstrate the utility of artificial intelligent agents for the retrieval of multimedia data across a wide area network. - (U) \$611 Demonstrate adaptive, reconfigurable distributed computing environments across heterogeneous networks to support crisis management and survivability. - (U) \$67 Identified as a source for SBIR. - (U) \$2,382 Total 										
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603728F Advanced Computing Technology	PROJECT 2530
<p>(U) <u>FY 2000 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$836 Develop resource management techniques, quality-of-service metrics, and system-level modeling and simulation capability to provide survivability, timeliness, and mobility for applications by dynamically interacting with the global information grid. - (U) \$500 Develop technology that integrates offensive, defensive, and support forces into a cohesive model for planning, execution, and assessment in order to provide dynamic functional and scaleable reconfiguration for mobile aerospace command centers. - (U) \$462 Develop multi-user collaborative interaction technology for adaptive visualization and presentation within distributed air and space Command and Control environments to integrate joint force battle plan simulation, assessment, and implementation. - (U) \$1,798 Total <p>(U) <u>FY 2001 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$847 Continue to develop resource management techniques, quality-of-service metrics, and system-level modeling and simulation capability to provide survivability, timeliness, and mobility for applications by dynamically interacting with the global information grid. - (U) \$700 Continue to develop technology that integrates offensive, defensive, and support forces into a cohesive model for planning, execution, and assessment in order to provide dynamic functional and scaleable reconfiguration for mobile aerospace command centers. - (U) \$672 Apply interactive wall technology for multi-user access and continue to refine and implement visual force extractions for joint force battle plan simulation, assessment, and implementation - (U) \$2,219 Total <p>(U) B. <u>Project Change Summary - Description of Significant Changes:</u> Changes to this program since the previous President's Budget are due to higher priorities within the S&T Program.</p> <p>(U) C. <u>Other Program Funding Summary:</u></p> <p>(U) <u>Related Activities:</u></p> <ul style="list-style-type: none"> - (U) PE 0604740F, Computer Resource Management. - (U) PE 0701112F, Inventory Control Point Operation. - (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication. <p>(U) D. <u>Acquisition Strategy:</u> Not Applicable.</p> <p>(U) E. <u>Schedule Profile:</u> Not Applicable.</p>		
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BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603728F Advanced Computing Technology				PROJECT 2532		
<i>COST (\$ In Thousands)</i>	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
2532 Knowledge-Based Systems	3,000	3,099	2,369	2,924	3,317	3,391	3,461	3,534	Continuing	Continuing
<p>(U) A. <u>Mission Description:</u> Knowledge-based computer systems provide the capability to automatically solve reasoning problems. This effort develops computer technologies which automate the problem solving process associated with human thought. It has three major thrusts. The first, knowledge-based analysis, provides software tools and techniques to develop and evaluate knowledge-based intelligent information tools to support robust, real-time, large-scale information systems. The second, knowledge-based planning, applies artificial intelligence (AI) technology to provide increased cost-effectiveness in diverse planning applications such as air operations planning and execution management, employment and deployment planning, logistics planning, resource allocation, and scheduling processes. The third, knowledge-based software techniques, exploits knowledge-based methods to achieve major improvements in software development and support activities.</p> <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$441 Tested systematic tools and evaluation methodology for collaborative intelligent information systems capable of coordination, cooperation, and negotiation. - (U) \$1,898 Tested artificial intelligence planning and scheduling tools for imprecise environments. Tested strategies for efficient planning scenario generation in various military domains. - (U) \$661 Tested knowledge-based evolutionary design tools and developed capabilities to monitor and evaluate the satisfaction and capture of requirements and rationale for software systems. - (U) \$3,000 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$492 Develop dynamic data mining techniques and collaborative decision-based and knowledge-based agents for large-scale information systems. - (U) \$1,750 Demonstrate artificial intelligence planning and scheduling tools for imprecise environments and develop agents for adaptive replanning. Demonstrate strategies for efficient planning scenario generation in various military domains. - (U) \$781 Demonstrate knowledge-based evolutionary design tools and test capabilities to monitor and evaluate the satisfaction and capture of requirements and rationale for software systems. - (U) \$76 Identified as a source for SBIR. - (U) \$3,099 Total 										
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3 - Advanced Technology Development	0603728F Advanced Computing Technology	2532
<p>(U) <u>FY 2000 (\$ in Thousands):</u></p> <ul style="list-style-type: none">- (U) \$829 Test dynamic data mining techniques and collaborative decision-based and knowledge-based agents for large-scale information systems.- (U) \$1,153 Extend and evaluate knowledge-based technologies in continuous planning. Test planning and information-based agents for adaptive replanning, and integrate next-generation Command and Control technology into aerospace and Unmanned Combat Aerial Vehicle (UCAV) environments.- (U) \$387 Extend knowledge-based evolutionary design tools and demonstrate capabilities to monitor and evaluate the satisfaction and capture of requirements and rationale for software systems.- (U) \$2369 Total <p>(U) <u>FY 2001 (\$ in Thousands):</u></p> <ul style="list-style-type: none">- (U) \$826 Evaluate dynamic data mining techniques and collaborative decision-based and knowledge-based agents for large-scale information systems.- (U) \$1,645 Demonstrate knowledge-based technologies in continuous planning. Integrate and evaluate planning and information-based agents for adaptive replanning, and demonstrate next-generation Command and Control technology for aerospace and UCAV environments.- (U) \$453 Test knowledge-based evolutionary design tools and test capabilities to monitor and evaluate the satisfaction and capture of requirements and rationale for software systems.- (U) \$2924 Total <p>(U) B. <u>Project Change Summary - Description of Significant Changes:</u> Not Applicable.</p> <p>(U) C. <u>Other Program Funding Summary:</u></p> <p>(U) <u>Related Activities:</u></p> <ul style="list-style-type: none">- (U) PE 0604740F, Computer Resource Management.- (U) PE 0701112F, Inventory Control Point Operation.- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication. <p>(U) D. <u>Acquisition Strategy:</u> Not Applicable.</p> <p>(U) E. <u>Schedule Profile:</u> Not Applicable.</p>		
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