RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: June 2001

BUDGET ACTIVITY: 07 - Operational System Development

PE NUMBER AND TITLE: 0708612F Computer Resources Support Improvement Program

PROJECT: 4851

COST ($ in Thousands)		FY 2000 Actual	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
4851	Embedded Comp Res Spt Prog Impr	0	3,326	2,376	2,432	2,504	2,575	2,692	2,729	Continuing	TBD
	Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0	0

Note: In FY 2001, funding was moved to this PE from PE 0708611F, Project 673090. FY 2003 - FY 2007 budget numbers do not reflect the DoD strategy review results.

(U) A. Mission Description

This program improves the support of mission-critical software intensive systems. It encompasses automation and standardization of support processes, advanced support methodologies, tools and environments, and readiness support to facilitate rapid turnaround of software in response to changing mission and/or changing threat requirements.

(U) FY 2000 ($ in Thousands)

(U) $0 Previously accomplished in PE 0708611F.

(U) $0 Total

(U) FY 2001 ($ in Thousands)

(U) $345 Continue developing adaptive software technologies. Develop and validate a design architecture for the embedded avionics application domain. Complete development of an application design methodology to integrate commercial and emerging technologies into platform-independent, resource adaptive applications. Conduct technology demonstrations in designated platforms. Transfer adaptive technologies to weapon systems to support embedded software that can respond to both mission profile changes and dynamic mission events.

(U) $165 Develop technologies and methodologies to upgrade legacy systems. Validate and mature specific proven technologies that will enable cost-effective, incremental improvements to fielded embedded information systems, allowing the affordable integration of legacy systems with other weapon systems and command and control platforms. Incorporate the use of open system standards in these technologies and methodologies.

(U) $340 Complete development of Reconfigurable Aerospace Computer Emulators to improve the reliability and maintainability of aging/obsolete on-board aerospace computers. Validate developed technologies to replace on-board computers with commercial microprocessor-based computer emulation technology. Demonstrate the methodologies developed to implement the incremental upgrades of on-board computers with new commercial-off-the-shelf processors, and demonstrate their backward compatibility with existing mission critical software.

(U) $75 Continue supporting the development of the Real-Time Defense Information Infrastructure Common Operating Environment. Develop and test

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(U) A. Mission Description Continued

(U) FY 2001 ($ in Thousands) Continued

technical approaches to integrate reuse and commonality to improve the effectiveness of systems performing real-time command and control missions.

(U) $250 Continue developing a Virtual Engineering Environment (VEE) for software development. Develop a test environment incorporating new technologies, commercial-off-the-shelf components, and existing technologies. Evaluate the capabilities of the VEE to significantly improve embedded software development and testing, and to reduce facility acquisition and maintenance costs. Demonstrate the effectiveness of VEE in supporting current and next generation weapon systems software development and test environments.

(U) $809 Complete development of the Weapon System Open Architecture (WSOA). Develop a 'virtual backplane' with an Open System Architecture to bridge the different embedded avionics and command, control, communications, and intelligence (C3I) systems across multiple aircraft platforms. Demonstrate and test the ability of the WSOA to support multiple requests for imagery, targeting data, and other situational information between fighter aircraft and an airborne C3I platform.

(U) $30 Develop technologies to implement Assured Middleware for Real-Time Embedded Systems (AMRES). Conduct trade off studies, and technical and cost benefits analyses between different real-time, fault-tolerance, and security concepts to implement an adaptable AMRES. Design the AMRES environment using the Real-Time Common Object Request Broker Architecture to integrate the components and concepts selected from the analyses.

(U) $55 Continue the Embedded Systems Interoperability Demonstration. Continue maturing the technologies developed under the WSOA to implement an interface between embedded systems operating on multiple tactical platforms with the C2 battlespace infosphere.

(U) $60 Continue development of the Embedded Information System Re-engineering Technology. Continue design and development of an automated re-engineering capability to evolve software for embedded information systems. Continue development of the software tools to implement re-engineering technologies.

(U) $220 Continue Real-Time (RT) Java for Embedded Systems to investigate RT Java applicability to the infosphere and embedded information system applications, in the context of open systems concepts, processes, and tools. Evaluate the capabilities and applicability of RT Java to the areas of architecture, distributed processing, and interoperability.

(U) $977 Develop air resources rapid reallocation tools to support the real-time automated allocation of embedded resources in a dynamic battlespace environment. Conduct requirements analyses to prioritize the development of reallocation technologies. Complete the system design and architecture using open system standards. Identify pilot programs to demonstrate the reallocation tools.

(U) $3,326 Total

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(U) A. Mission Description Continued

(U) FY 2002 ($ in Thousands)

(U)	$566	Continue the development of technologies and methodologies to incrementally upgrade legacy systems to support their cost-effective employment and sustainment. Demonstrate, in designated aircraft, the processes and tools for wrapping embedded software, real-time object request broker technology, and emulation technology in fielded weapon systems. Transition these technologies to fighter and cargo aircraft.
(U)	$80	Continue supporting the development of the Real-Time Defense Information Infrastructure Common Operating Environment. Continue developing and testing technologies to improve the effectiveness of systems performing real-time command and control (C2) missions. Evaluate the effectiveness of these approaches in implementing a seamless information exchange between the different platforms operating in the battlespace.
(U)	$334	Continue the development of Assured Middleware for Real-Time Embedded Systems (AMRES). Complete the design of the AMRES environment using commercial-off-the-shelf components and the Real-Time Common Object Request Broker Architecture to integrate all components. Mature and demonstrate the ability of AMRES to support real-time processes, fault-tolerance, and security in embedded systems.
(U)	$612	Continue the Embedded Systems Interoperability Demonstration. Continue research activities to leverage open systems hardware, software, and simulated tactical communications links to provide real-time communications between multiple tactical platforms, an airborne C2 platform, and the emerging battlespace infosphere. Conduct simulation tests to evaluate the real-time communications capabilities. Conduct affordability analyses to support the demonstration.
(U)	$560	Continue developing the Embedded Information System Re-engineering (EISR) technology demonstration. Complete development of an automated re-engineering capability to evolve software for embedded information systems. Complete development of the software tools to implement re-engineering technologies. Test and demonstrate an EISR system with an established pilot program. Transition the EISR technologies to customers.
(U)	$224	Continue Real-Time (RT) Java for Embedded Systems to investigate RT Java applicability to the infosphere and embedded information system applications, in the context of open systems concepts. Demonstrate the functionality of legacy Operational Flight Programs (OFPs) implemented in RT Java. Analyze and compare the implementation of RT Java OFPs with current OFPs implemented in higher-order languages. Demonstrate the capability of RT Java OFPs to support the interoperability between the Command, Control, Communications, and Intelligence.
(U)	$2,376	Total

(U) B. Budget Activity Justification

This program is in Budget Activity 7, Operational System Development, because it provides support to operational systems.

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DATE: June 2001

BUDGET ACTIVITY: 07 - Operational System Development

PE NUMBER AND TITLE: 0708612F Computer Resources Support Improvement Program

PROJECT: 4851

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

		FY 2000	FY 2001	FY 2002	Total Cost
(U)	Previous President's Budget (FY 2001 PBR)	0	2,356	3,363	TBD
(U)	Appropriated Value	0	3,356		
(U)	Adjustments to Appropriated Value				
	a. Congressional/General Reductions				
	b. Small Business Innovative Research				
	c. Omnibus or Other Above Threshold Reprogram				
	d. Below Threshold Reprogram				
	e. Rescissions		-30		
(U)	Adjustments to Budget Years Since FY 2001 PBR			-987	
(U)	Current Budget Submit/FY 2002 PBR	0	3,326	2,376	TBD

(U) Significant Program Changes:
In FY 2001, funding was moved to this PE from PE 0708611F, Project 673090.

(U) D. Other Program Funding Summary ($ in Thousands)

		FY 2000 Actual	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
(U)	AF RDT&E										
(U)	Other APPN										
(U)	PE 0708611F/3080	2,237									4,593
(U)	PE 0708611F/3400	19,417									19,417
(U)	PE 0708612F/3080		2,138	2,328	2,378	2,433	2,479	2,583	2,651	Continuing	Continuing
(U)	PE 0708612F/3400		13,988	14,410	13,782	14,151	14,162	15,023	14,957	Continuing	Continuing

(U) E. Acquisition Strategy

All major contracts within this Program Element were awarded after full and open competition.

(U) F. Schedule Profile

FY 2000	FY 2001	FY 2002

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(U) F. Schedule Profile Continued

		FY 2000				FY 2001				FY 2002			
		1	2	3	4	1	2	3	4	1	2	3	4
(U)	Adaptive Software Technology Development							*					
(U)	Incremental Upgrade of Legacy Systems						*					X	
(U)	Reconfigurable Aerospace Computer Emulator	*							X				
(U)	Real-Time DII COE Support **						*						X
(U)	Virtual Engineering Environment								X				
(U)	Weapon System Open Architecture							*					
(U)	Assured Middleware for Real-Time Embedded Systems							*			X		
(U)	Embedded Systems Interoperability Demonstration								X			X	
(U)	Embedded Information Systems Re-engineering			*			*						X
(U)	Real-Time Java for Embedded Systems							*					X
(U)	Air Resources Rapid Reallocation Tools								X				

X Denotes planned event

* Denotes completed event

** DII COE: Defense Information Infrastructure (DII) Common Operating Environment (COE)

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE: June 2001

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
07 - Operational System Development	0708612F Computer Resources Support Improvement Program	4851

(U) A. Project Cost Breakdown ($ in Thousands)

		FY 2000	FY 2001	FY 2002
(U)	Adaptive Software Technology Development		345	
(U)	Incremental Upgrade of Legacy Systems		165	566
(U)	Reconfigurable Aerospace Computer Emulator		340	
(U)	Real-Time Defense Information Infrastructure Common Operating Environment Support		75	80
(U)	Virtual Engineering Environment		250	
(U)	Weapon System Open Architecture		809	
(U)	Assured Middleware for Real-Time Embedded Systems		30	334
(U)	Embedded Systems Interoperability Demonstration		55	612
(U)	Embedded Information Systems Re-engineering		60	560
(U)	Real-Time Java for Embedded Systems		220	224
(U)	Air Resources Rapid Reallocation Tools		977	
(U)	Total		3,326	2,376

(U) B. 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 2000	Budget FY 2000	Budget FY 2001	Budget FY 2002	Budget to Complete	Total Program
Product Development Organizations										
SAIC	DO	Various	N/A	N/A			250		Continuing	TBD
TRW	DO	Various	N/A	N/A			285		Continuing	TBD
Boeing	DO	Various	N/A	N/A			1,906	1,398	Continuing	TBD
Lockheed-Martin	DO	Various	N/A	N/A			810	896	Continuing	TBD
Other (RT DII COE)			N/A	N/A			75	82	Continuing	TBD
Support and Management Organizations										
Test and Evaluation Organizations										

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE: June 2001
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(U) Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 2000	Budget FY 2000	Budget FY 2001	Budget FY 2002	Budget to Complete	Total Program
Product Development Property									
Support and Management Property									
Test and Evaluation Property									

Subtotals	Total Prior to FY 2000	Budget FY 2000	Budget FY 2001	Budget FY 2002	Budget to Complete	Total Program
Subtotal Product Development			3,326	2,376	TBD	TBD
Subtotal Support and Management						
Subtotal Test and Evaluation						
Total Project			3,326	2,376	TBD	TBD