

UNCLASSIFIED

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

DATE

February 2003

BUDGET ACTIVITY

07 - Operational System Development

PE NUMBER AND TITLE

0708612F Computer Resources Support Improvement Program

PROJECT

4851

COST (\$ in Thousands)	FY 2002 Actual	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	Cost to Complete	Total Cost
4851 Embedded Comp Res Spt Prog Impr	2,276	2,049	0	0	0	0	0	0	Continuing	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0	0

Note: Program terminated to meet higher AF priorities.

(U) **A. Mission Description**

This crosscutting program improves the support of mission-critical software intensive systems for numerous Air Force weapon systems. It validates, matures and supports the rapid transition of emerging software technologies to improve the capabilities of AF weapon systems in response to changing mission or changing threat requirements. This program also develops and transitions effective technologies to organizations in order to enhance their ability to develop, acquire, manage, and sustain mission critical software. This program is in Budget Activity 7, Operational System Development, because it provides support to operational systems.

(U) **FY 2002 (\$ in Thousands)**

- (U) \$0 Accomplishment/Planned Program
- (U) \$566 Continued developing technologies and methodologies to incrementally upgrade legacy systems to support their cost-effective employment and sustainment. Demonstrated, in designated aircraft, the processes and tools for wrapping embedded software, real-time object request broker technology, and emulation technology into fielded weapon systems. Transitioned these technologies to fighter and cargo aircraft.
- (U) \$80 Continued supporting the development of the Real-Time Defense Information Infrastructure Common Operating Environment. Continued developing and testing technologies to improve the effectiveness of systems performing real-time command and control (C2) missions. Evaluated the effectiveness of these approaches in implementing a seamless information exchange between the different platforms operating in the battlespace.
- (U) \$334 Continued the development of Assured Middleware for Real-Time Embedded Systems (AMRES). Completed 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. Matured and demonstrated the ability of AMRES to support real-time processes and fault-tolerant embedded systems.
- (U) \$522 Continued the Embedded Systems Interoperability Demonstration. Continued 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. Conducted simulation tests to evaluate real-time communications capabilities and performed affordability analyses for the demonstration.

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BUDGET ACTIVITY 07 - Operational System Development		PE NUMBER AND TITLE 0708612F Computer Resources Support Improvement Program
PROJECT 4851		
(U)	<u>A. Mission Description Continued</u>	
(U)	<u>FY 2002 (\$ in Thousands) Continued</u>	
(U)	\$550	Continued developing the Embedded Information System Re-engineering (EISR) technology demonstration. Completed development of an automated re-engineering capability to evolve software for embedded information systems. Completed development of the software tools to implement re-engineering technologies. Tested and demonstrated an EISR system with an established pilot program. Transitioned the EISR technologies to customers.
(U)	\$224	Continued 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 system concepts. Demonstrated the functionality of legacy Operational Flight Programs (OFPs) implemented in RT Java. Analyzed and compared the implementation of RT Java OFPs with current OFPs implemented in higher-order languages. Demonstrated the capability of RT Java OFPs to support the interoperability between the Command, Control, Communications, and Intelligence.
(U)	\$2,276	Total
(U)	<u>FY 2003 (\$ in Thousands)</u>	
(U)	\$0	Accomplishment/Planned Program
(U)	\$458	Continue development of technologies and methodologies that will incrementally upgrade legacy systems to support their cost-effective employment and sustainment. Conduct life cycle cost and trade off analyses of the different technologies and methodologies. Continue demonstrating, in designated aircraft, the processes and tools for wrapping embedded software, real-time object request broker technology, and emulation technology into fielded weapon systems. Continue transition of these technologies as they mature and are validated.
(U)	\$60	Develop and implement enhancements to the Reconfigurable Aerospace Computer Emulators to improve the reliability and maintainability of aging on-board aerospace computers. Continue validation of developed technologies to incrementally upgrade on-board computers with commercial microprocessor-based computer emulation technology. Demonstrate the backward compatibility of these technologies and enhancements with existing mission critical software.
(U)	\$60	Continue development of a Virtual Engineering Environment (VEE) for software development. Continue developing test environments incorporating new technologies and commercial-off-the-shelf (COTS) components. Conduct trade off analyses of these technologies and COTS components. Continue demonstrations to validate the effectiveness of VEE in supporting software development and sustainment for weapon systems. Transition VEE to selected weapon system programs.
(U)	\$515	Continue the Embedded Systems Interoperability Demonstration. Continue integration and testing of open systems hardware, software, and simulated tactical communications links. Continue simulation testing to evaluate the real-time communications capabilities of these open system components. Complete affordability analyses. Develop test plans and procedures to conduct flight testing that will evaluate the real-time
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(U) A. Mission Description Continued(U) FY 2003 (\$ in Thousands) Continued

communications capabilities of these components.

(U) \$320 Continue development of Embedded Information System Re-engineering (EISR) technologies. Complete development of an automated re-engineering capability to evolve software for embedded information systems. Continue development of the software tools necessary to implement re-engineering technologies. Continue testing and demonstrations of EISR technologies with pilot programs. Transition the EISR technologies to designated software support activities.

(U) \$420 Continue the development of Assured Middleware For Real-Time Embedded Systems. Develop Information Assurance (IA) techniques and technologies for embedded information systems in aerospace and ground-based platforms. Conduct domain analyses to define the requirements for IA technologies. Evaluate commercial-off-the-shelf (COTS) IA technologies and their capabilities in real-time environments. Conduct trade off analyses of these technologies and COTS components. Develop strategies for implementing multi-level secure real-time operating systems that support a secure real-time Common Object Request Broker Architecture.

(U) \$216 Continue analyses of Real-Time (RT) Java for Embedded Systems to investigate RT Java applicability to the infosphere and embedded information system applications. Continue demonstrations of the functionality of legacy Operational Flight Programs (OFPs) implemented in RT Java. Continue analyses of the implementation of RT Java OFPs with current OFPs implemented in higher-order languages. Continue demonstrations of the capability of RT Java OFPs to support the interoperability between the Command, Control, Communications, and Intelligence.

(U) \$2,049 Total

(U) FY 2004 (\$ in Thousands)

(U) \$0 Accomplishment/Planned Program

(U) \$0 No Activity

(U) \$0 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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(U) **C. Program Change Summary (\$ in Thousands)**

	<u>FY 2002</u>	<u>FY 2003</u>	<u>FY 2004</u>	<u>Total Cost</u>
(U) Previous President's Budget	2,353	2,094	2,250	TBD
(U) Appropriated Value	2,376	2,094		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-23	-22		
b. Small Business Innovative Research	-66			
c. Omnibus or Other Above Threshold Reprogram		-23		
d. Below Threshold Reprogram				
e. Rescissions	-11			
(U) Adjustments to Budget Years Since FY 2003 PBR			-2,250	
(U) Current Budget Submit/FY 2004 PBR	2,276	2,049	0	TBD
(U) <u>Significant Program Changes:</u>				
Not applicable.				

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

	<u>FY 2002</u>	<u>FY 2003</u>	<u>FY 2004</u>	<u>FY 2005</u>	<u>FY 2006</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>	<u>Cost to</u>	<u>Total Cost</u>
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	
(U) AF RDT&E										
(U) Other APPN										
(U) PE 0708612F/3080	2,314	2,069	0	0	0	0			Continuing	Continuing
(U) PE 0708612F/3400	14,410	8,794	0	0	0	0			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 2002FY 2003FY 2004

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(U) F. Schedule Profile Continued

	<u>FY 2002</u>					<u>FY 2003</u>					<u>FY 2004</u>			
	1	2	3	4	1	2	3	4	1	2	3	4		
(U) Enterprise Strategy for Aging Avionics														
(U) Embedded Systems Interoperability Demonstration			*			X								
(U) Embedded Information Systems Re-engineering			*				X							
(U) Assured Middleware for Real-Time Embedded Systems		*					X							
(U) Incremental Upgrade of Legacy Systems			*				X							
(U) Reconfigurable Aerospace Computer Emulator						X								
(U) Real-Time DII COE Support**			*											
(U) Virtual Engineering Environment							X							
(U) Real-Time Java for Embedded Systems			*			X								

Notes

X Denotes planned event

* Denotes completed event

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

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

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

	<u>FY 2002</u>	<u>FY 2003</u>	<u>FY 2004</u>
(U) Enterprise Strategy for Aging Avionics	0	0	0
(U) Embedded Systems Interoperability Demonstration	522	515	0
(U) Embedded Information Systems Re-engineering	550	320	0
(U) Assured Middleware for Real-Time Embedded Systems	334	420	0
(U) Incremental Upgrade of Legacy Systems	566	458	0
(U) Reconfigurable Aerospace Computer Emulator	0	60	0
(U) Real-Time Defense Information Infrastructure Common Operating Environment Support	80	0	0
(U) Virtual Engineering Environment	0	60	0
(U) Real-Time Java for Embedded Systems	224	216	0
(U) Total	2,276	2,049	0

(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)(U) Performing Organizations:

<u>Contractor or</u> <u>Government</u> <u>Performing</u> <u>Activity</u>	<u>Contract</u> <u>Method/Type</u> <u>or Funding</u> <u>Vehicle</u>	<u>Award or</u> <u>Obligation</u> <u>Date</u>	<u>Performing</u> <u>Activity</u> <u>EAC</u>	<u>Project</u> <u>Office</u> <u>EAC</u>	<u>Total Prior</u> <u>to FY 2002</u>	<u>Budget</u> <u>FY 2002</u>	<u>Budget</u> <u>FY 2003</u>	<u>Budget</u> <u>FY 2004</u>	<u>Budget to</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
<u>Product Development Organizations</u>										
SAIC	DO	Various	N/A	N/A	50	0	0	0	Continuing	TBD
TRW	DO	Various	N/A	N/A	220	0	0	0	Continuing	TBD
Boeing	DO	Various	N/A	N/A	814	1,045	0	0	Continuing	TBD
Lockheed-Martin	DO	Various	N/A	N/A	992	814	0	0	Continuing	TBD
Raytheon	DO	Various	N/A	N/A	200	190	0	0	Continuing	TBD
<u>Support and Management Organizations</u>										
<u>Test and Evaluation Organizations</u>										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

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(U) Government Furnished Property:

<u>Item</u>	<u>Contract</u> <u>Method/Type</u> <u>or Funding</u>	<u>Award or</u> <u>Obligation</u> <u>Date</u>	<u>Delivery</u> <u>Date</u>	<u>Total Prior</u> <u>to FY 2002</u>	<u>Budget</u> <u>FY 2002</u>	<u>Budget</u> <u>FY 2003</u>	<u>Budget</u> <u>FY 2004</u>	<u>Budget to</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
<u>Product Development Property</u>									
<u>Support and Management Property</u>									
<u>Test and Evaluation Property</u>									
<u>Subtotals</u>				<u>Total Prior</u> <u>to FY 2002</u>	<u>Budget</u> <u>FY 2002</u>	<u>Budget</u> <u>FY 2003</u>	<u>Budget</u> <u>FY 2004</u>	<u>Budget to</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
Subtotal Product Development					2,276	2,049	0	TBD	TBD
Subtotal Support and Management									
Subtotal Test and Evaluation									
Total Project					2,276	2,049	0	TBD	TBD