#### PE NUMBER: 0602702F PE TITLE: Command Control and Communication

	Exhi	bit R-2, RDT	&E Budge	t Item Just	ification			DATE	Fobruary	2004
BUDGE 02 Ap	T ACTIVITY plied Research			PI <b>0</b>	E NUMBER AND	TITLE	ol and Comn	nunications	rebiuary	2004
	Cost (\$ in Millions)	FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	Cost to Complete	Total
	Total Program Element (PE) Cost	77.637	79.594	82.147	82.865	90.866	88.794	90.720	0.000	0.000
4519	Communications Technology	14.268	16.532	17.235	17.141	17.604	18.129	18.667	0.000	0.000
4594	Information Technology	23.109	28.600	25.511	25.557	28.224	28.610	28.484	0.000	0.000
4917	Collaborative Information Tech	15.530	7.746	5.637	5.197	5.297	5.456	5.616	0.000	0.000
5581	Command and Control (C2) Technology	24.730	26.716	33.764	34.970	39.741	36.599	37.953	0.000	0.000
(U)	base technologies to allow the warfighter Congress added \$1.2 million for the Grif Knowledge Management for Collaborati This program is Budget Activity 2, Appl technologies. B. Program Change Summary (\$ in M	to plan, assess, fiss Institute, \$4. ve Enterprise Ma ied Research, sin	execute, monito 0 million for N magement, and ce it develops	or, and re-plan leasures and Si \$1.0 million fo and determines	on the compres gnatures Intelli or Effects Base the technical f	ssed time scales igence Warfigh d Planning Exe easibility and n	required for to ter Visualizatio cution and Ass nilitary utility o	promorrow's conf on Tools, \$2.4 n essment. of evolutionary	flicts. Note: In million for Secu and revolution	FY 2004, ure ary <u>FY 2005</u>
(U)	Previous President's Budget						78.204	71	.674	82.764
(U)	Current PBR/President's Budget						77.637	79	0.594	82.147
(U)	Fotal Adjustments						-0.567	7	2.920	
(U)	Congressional Program Reductions									
	Congressional Rescissions							-0	0.680	
	Congressional Increases							8	3.600	
	Reprogrammings									
	SBIR/STTR Transfer						-0.567			
(U)	Significant Program Changes:									
	Not Applicable.									
			R-1 Sho	opping List - Item	No. 13-1 of 13-1	5			Exhibit R-2 (I	PE 0602702F)

Exh	ibit R-2a, F	RDT&E Pro	ject Justif	ication			DATE	February	2004
BUDGET ACTIVITY 02 Applied Research			F Q Q	PE NUMBER AND 0602702F Con Communicatio	TITLE	ol and	PROJECT NUME	BER AND TITLE	chnology
Cost (\$ in Millions)	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	Cost to	Total
Cost (\$ III MIIIIolis)	Actual	Estimate	Estimate	Estimate	Estimate	Estimate	Estimate	Complete	
4519 Communications Technology	14.268	16.532	17.235	17.141	17.604	18.129	18.667	0.000	0.000
Quantity of RDT&E Articles	0	0	0	0	0	0	0		
(U) <u>A. Mission Description and Budget Item</u> The Air Force requires technologies that en technologies will provide en route and dep assured connectivity with reliable, respons multi-level, secure, seamless networks; adv modular, programmable, low-cost software communications management and control,	<b>Justification</b> nable assured, loyed reachbac ive, affordable vanced commu e radios. It incl advanced com	worldwide con k communicat information ex nications proce udes technolog munications al	nmunications f ions for distrib xchange via all essors; anti-jan gies for advanc lgorithms, and	for an agile Exper- puted collaborati available comm n and low proba- ced processors a enabling comm	editionary Aero ve command a nunications me bility of interco nd devices, adv unication signa	ospace Force () nd control (C2 dia. This proj ept techniques vanced networ l processing te	EAF). These co 2). A rapidly de ect provides the ; lightweight, pl k protocols and echniques.	ommunication ployed EAF rec technologies fo hased array ante services, intelli	luires or: ennas; and gent
(U) <u>B. Accomplishments/Planned Program (</u> \$	<u>in Millions)</u>					<u>F</u> Y	<u>ř 2003</u>	<u>FY 2004</u>	<u>FY 2005</u>
(U) MAJOR THRUST: Develop assured and su	urvivable inform	mation and net	working techn	ologies enabling	g worldwide		5.254	5.583	6.022
<ul> <li>(U) In FY 2003: Developed technologies to imp Completed development of assured network critical infrastructure attacks. Developed se network services across multiple network se enable the dynamic creation of advanced inti- infrastructure devices.</li> <li>(U) In FY 2004: Continue to develop technolog systems (e.g., Joint Battlespace Infosphere ( systems technologies to improve survivabili securely managed enterprise network techno- security domains and coalitions. Continue of area dynamic creation of advanced informati- infrastructure devices</li> <li>(U) In FY 2005: Continue to develop technolog information systems (e.g., JBI). Complete of to improve survivability against critical infr</li> </ul>	s. prove quality of ting and inform curely manage ecurity domains formation delive gies to improve JBI)). Continu- ty against critic plogy to develor levelopment of tion delivery se gies to improve levelopment of astructure attac	f service for gl ation systems d enterprise ne s. Developed p rery services, if quality of serv ne developmen cal infrastructu p assured netwo programmabl rvices that are quality of serv assured netwo sured netwo	lobally distributechnologies to technologies to technologies to technologies to technologies and technologies are and technologies and technologies are and technologies and technologies are	tted information o improve survi ogy to develop a networking algo the underlying p ly distributed ini- tworking and in- ontinue develop cross multiple r algorithms that e f the underlying rability for globa ormation system of securely man-	systems. vability against assured orithms that ohysical formation formation nent of tetwork enable wide g physical ally distributed s technologies aged enterprise				
development of programmable networking a	algorithms that	enable wide a R- <u>1</u> Sh	rea dynamic cr opping List - Iten	reation of advantage $n No. 13-2 \text{ of } 13-1$	ced 5			Exhibit R- <u>2a (</u> F	PE 0602702F)

	Exhibit R-2a, RDT&E Project Ju	stification		February	2004
BUD( 02 A	ET ACTIVITY pplied Research	PE NUMBER AND TITLE 0602702F Command Control and Communications	PROJECT 4519 Co	NUMBER AND TITLE	chnology
	information delivery services, independent of the underlying physical infrastructure capabilities for self-organizing, self-healing, autonomous networking.	e devices. Initiate development of			
(U) (U)	MAJOR THRUST: Develop improved, higher bandwidth communications and sig provide secure, adaptive, covert, anti-jam, and assured global battlespace connectiv forces while reducing the equipment footprint.	nal processing technologies to ity to highly mobile aerospace	4.136	4.427	4.510
(U)	In FY 2003: Developed techniques to improve information assurance capabilities f precluding information attacks aimed at denial of service and quality of service deg communication technologies that enable a full spectrum of information superiority a joint/coalition environment. Investigated high performance wireless device and v improving affordability of critical Air Force command and control networks.	or mobile wireless networks by radation. Developed assured capabilities in wireless networks in vaveform technologies for			
(U)	In FY 2004: Continue development of information assurance technologies that will Global Information Grid in both wired and wireless networks for ground, air, and jo preclude information systems attacks, such as denial of service and degradation of develop high performance, adaptable, and re-configurable wireless devices to imple for improved robustness, security, and affordability of critical Air Force command development of higher performance video compression and modulation techniques high bandwidth information transmission and exploitation capabilities over wireles	l improve the robustness of the pint/coalition environments to device quality. Continue to ement new waveform technologies and control networks. Initiate that enable critical objectives for s channels.			
(U)	In FY 2005: Continue development of information assurance technologies that imp Information Grid in both wireline and wireless networks for air, space, ground, and preclude information systems attacks such as distributed denial of service and degra to develop high performance, adaptable, and reconfigurable wireless devices to imp technologies for improved robustness, security, and affordability of critical Air For- Continue development of higher performance video compression and modulation to objectives for high bandwidth information transmission and exploitation capabilitie the feasibility of implementation of above technologies, where applicable, to Joint ' compatible software radios.	prove the robustness of the Global joint/coalition environments to adation of device quality. Continue element new waveform ce command and control networks. echniques that enable critical s over wireless channels. Explore Factical Radio System or			
(U)					
(U)	MAJOR THRUST/CONGESSIONAL ADD: Develop cyber operations technologicommand, control, communications and intelligence. Note: This effort includes \$1 Congressional Add funding for the Griffiss Institute.	es for enabling worldwide .2 million in FY 2004	4.878	6.522	6.703
(U)	In FY 2003: Developed automated capabilities for damage assessment and recover computer and network forensics tools and data mining tools to assess coordinated in Developed detection and eradication techniques for malicious software. Investigate	y techniques. Developed nformation warfare attacks. ed active response technologies,			
Pro	ect 4519 R-1 Shopping List	- Item No. 13-3 of 13-15		Exhibit R-2a (F	PE 0602702F)
		243			

		Exhibit R-	2a, RDT&E	Project Jus	stification			DATE	February 2	2004
BUD 02 /	GET ACTIVITY Applied Research				PE NUMBER A 0602702F C Communica	ND TITLE command Con ations	trol and	PROJECT NUME	BER AND TITLE	hnology
(U)	detection of hidden data, and early In FY 2004: Continue to develop development of network forensics provide early warning notification Continue development of active re development of advanced correlati of intrusion detection techniques for protect command, control, commu coalition information elements	assessment of con automated capabil and data mining to Continue to deve sponse technologi on fusion technique or wireless networ nications, intellige	mplex informati ities for damage ools for detectin lop detection ar es. Complete w ues for defensiv ks. Initiate the c ence, and inform	on warfare attact e assessment and ag adversary info ad eradication ter york in detection e course of action levelopment of mation systems, a	ks. I recovery techn ormation warfare chniques for ma of hidden data. on analysis. Initia new tools and te and allow for int	iques. Continue e attacks and to licious code. Initiate the ate development chniques to egration of				
(U)	In FY 2005: Continue to develop development of network forensics warfare attacks and provide early v malicious code. Continue develop correlation fusion techniques for d techniques for wireless networks. systems and allow for integration of Total Cost	automated capabil . Continue develo warning notificatio ment of active res efensive course of Continue the deve of coalition inform	ities for damage pment of data n on. Continue to ponse technolog action analysis elopment of tool nation elements.	e assessment and nining tools for a develop detectio gies. Continue d . Continue deve s and techniques	l recovery techn letecting adversa on and eradicatio levelopment of a lopment of intru s to protect C4I	iques. Complete ary information on techniques fo advanced usion detection and information	e r	14.268	16.532	17.235
		···· • ···· · · • • • • • • • • • • • •						14.200	10.552	17.255
(0)	C. Other Program Funding Sun	<u>FY 2003</u> Actual	<u>FY 2004</u> Estimate	<u>FY 2005</u> Estimate	<u>FY 2006</u> Estimate	<u>FY 2007</u> Estimate	<u>FY 2008</u> Estimate	<u>FY 2009</u> Estimate	<u>Cost to</u> Complete	<u>Total Cost</u>
(U) (U)	Related Activities: PE 0603789F, C3I Advanced Development. This project has been coordinated through the									
(U)	Reliance process to harmonize efforts and eliminate duplication.									
(U)	<b>D. Acquisition Strategy</b> Not Applicable.									
Pro	eject 4519		R	-1 Shopping List -	Item No. 13-4 of 1	3-15			Exhibit R-2a (P	E 0602702F)

	ExI	hibit R-2a, F	RDT&E Pro	oject Justif	ication			DATE	February	2004	
BUD( <b>02 A</b>	GET ACTIVITY pplied Research			F C C	PE NUMBER AND 0602702F Con Communicatio	TITLE nmand Contr ons	ol and	PROJECT NUME 4594 Informa	PROJECT NUMBER AND TITLE 4594 Information Technology		
	Cost (\$ in Millions)	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	Cost to	Total	
	Cost (\$ in Winnons)	Actual	Estimate	Estimate	Estimate	Estimate	Estimate	Estimate	Complete		
4594	Information Technology	23.109	28.600	25.511	25.557	28.224	28.610	28.484	0.000	0.000	
	Quantity of RDT&E Articles	0	0	0	0	0	0	0			
(U)	<b>A. Mission Description and Budget Iter</b> The Air Force requires technologies that information. This project improves global and precision needed to accomplish their information is fused to support the dynamic global information base for continued use affordable manner and include appropriate	<b>m Justification</b> improve and aut awareness at a missions. Glob nic planning and and historical a e access mechan	tomate their ca all levels, enab al awareness is l execution cyc analysis. The i nisms for our c	pability to gene ling warfighter s achieved by e ele via the globa nformation tec coalition partne	erate, process, n s to understand exploiting inforr al information e hnologies requi rs.	nanage, fuse, e: relevant milita nation provideo enterprise. Kno red to achieve	xploit, interpre ry situations of l by the Air Fo wledge, inforr this capability	et, and dissemina n a consistent ba orce and other genation, and data are developed u	ate timely and a asis, with the tir overnment agen are all archived nder this projec	ccurate neliness icies. The d in the ct in an	
(U)	<b>B.</b> Accomplishments/Planned Program (	( <mark>\$ in Millions</mark> )					<u>F</u> Y	<u>7 2003</u>	<u>FY 2004</u>	<u>FY 2005</u>	
(U)	MAJOR THRUST: Develop innovative m	ulti-sensor colla	aborative fusio	n technologies	in a fully distri	buted air and		5.538	6.637	6.813	
(U) (U) (U)	In FY 2003: Developed techniques to quat techniques for continuous tracking of milit fusion technologies for enemy threat predia In FY 2004: Continue to develop technique a new emerging information era. Continue tracking of militarily significant vehicles in technologies for enemy threat prediction the In FY 2005: Evaluate fusion techniques to analysis of a new emerging information era positive identification and continuous track development and evaluation of fusion tech fusion.	ntitatively evalu- arily significant ction based on r ues to quantitative e development of n the battlespace prough the use of determine opti a. Continue to of king of militarily nologies for energy	tate fusion algo t vehicles in the nulti-source fu vely evaluate fu of optimized me e. Continue de of multi-source mal algorithms develop optimi y significant ve emy threat prec	orithms. Devel e battlespace. I ision. usion algorithm ulti-source fusi evelopment and fusion. s based upon da zed multi-sour- ehicles in the b liction based or	oped multi-sound Developed and ins that support to ion techniques for evaluation of for ata available that ce fusion technia attlespace. Com n the use of multiplication of multiplication of the source of the sour	rce fusion evaluated he analysis of for continuous usion at support the ques for ttinue lti-source					
(U) (U) (U)	MAJOR THRUST: Develop higher level is achieve situational awareness at all comma In FY 2003: Developed intermediate infor time allocated to analysis and decision-mal techniques for a self or analysis data range	fusion and the e and levels for th mation extraction king, enabling the	nabling inform e dynamic plar on techniques t he ability to po	nation/knowled nning and exec that will reduce opulate knowled	ge base technol ution process. e data overload dge base system	ogies to and increase is. Developed		4.612	5.531	5.694	
Proi	ect 4594	sitory, and cont	R-1 Sh	onning List - Iten	n No. 13-5 of 13-1	5			Exhibit R-29 (F	PE 0602702E)	
110			N-1 01			~				- 00021021)	

BUDGET ACTIVITY       PENUMBER AND TILE GORMUNICATIONS       PROJECT NUMBER AND TILE 4594 Information aggregation methods required for rapid situational understanding.       PROJECT NUMBER AND TILE 4594 Information Technology         search techniques and information aggregation methods required for rapid situational understanding.       In IY 2004: Continue development of intermediate information extraction techniques to reduce data overload and increase time allocated to analysis and decision-making, enabling the ability to populate knowledge base systems. Continue development of antiming techniques for a self-organizing data repository and content-based extraction to support prediction of potential events in the world. Continue development of advanced web-based search techniques, data filtering techniques, and information aggregation methods required for rapid situational understanding.       PROJECT NUMBER AND TILE 4594 (Normation Search Continue development of intermediate information extraction techniques to decrease analysis time for decision making and enabling the ability to populate knowledge base systems. Continue development of advanced web-based search techniques, and information aggregation methods to take advantage of the explosion of available data on the Web required for rapid situational understanding.       2.886       3.606       3.948         (U)       MAIOR THRUST: Develop automatic and dynamically reconfigurable, affordable, scalable, distributed petalfop processing technologies for real-time command and control (C2) global information from globally distributed knowledge bases. Continue evaluation of architectures to support real-time requirements for dominant battlespace awareness. Initiat study of next generation information from globally distributed knowledge bases. Demonstrate architecture to support real-time requirements	Exhibit R-2a, RDT&E	Project Justification	DA	February	2004
<ul> <li>search techniques and information aggregation methods required for rapid situational understanding.</li> <li>In FY 2004: Continue development of intermediate information extraction techniques to reduce data overload and increase time allocated to analysis and decision-making, enabling the ability to populate knowledge base systems. Continue development of data mining techniques or a self-organizing data repository and conten-based extraction to support prediction of potential events in the world. Continue development of intermediate information extraction to davanced web-based search techniques, data filtering techniques, data filtering techniques, and information aggregation methods required for rapid situational understanding.</li> <li>In FY 2005: Continue development of one-based extraction to support reductification of potential events in the world. Continue development of one-based extraction to support reducting contrading and cuability to populate knowledge base systems. Continue development of web-based extraction to support required for rapid situational understanding.</li> <li>M FY 2005: Toevlop automatic and dynamically reconfigurable, affordable, scalable, distributed petaflop 2.886 3.606 3.948 processing technologies for real-ime command and control (C2) global information systems.</li> <li>In FY 2005: Develop automatic and dynamically reconfigurable, affordable, scalable, distributed petaflop control data mining technologies for rapid extraction of information from globally distributed knowledge bases. Fivaluate architecture to support real-time command and control (C2) global information from globally distributed knowledge bases. Dottime evaluation of architectures to support real-time requirements for dominant battlespace awareness. Initiate study of next generation information for globally distributed knowledge bases. Dottime vehologies (e.g., quantur computing) for C2 systems.</li> <li>In FY 2005: Dewolop modeling and simulation technologies (e.g., quantur comp</li></ul>	BUDGET ACTIVITY 02 Applied Research	PE NUMBER AND TITLE 0602702F Command Control and Communications	PROJECT NU 4594 Infor	JMBER AND TITLE mation Technol	ogy
(U) In FY 2005: Continue development of intermediate information extraction techniques to development of data mining techniques for self-organizing data repositories and content-based extraction to support identification of potential events in the world. Continue development of web-based search techniques, data filtering techniques, and information aggregation methods to take advantage of the explosion of available data on the Web required for rapid situational understanding. <ul> <li>(U)</li> <li>(U)</li> <li>(U) MAJOR THRUST: Develop automatic and dynamically reconfigurable, affordable, scalable, distributed petaflop</li> <li>(D) and the processor in-memory, content-addressable architecture for rapid extraction of information from globally distributed knowledge bases. Evaluated architecture to support real-time requirements for dominant battlespace awareness.</li> <li>(U) In FY 2004: Develop and demonstrate architectures for rapid extraction of information from globally distributed knowledge bases. Continue evaluation of architecture to support real-time requirements for dominant battlespace awareness. Initiate study of next generation information torm globally distributed knowledge bases. Continue evaluation of architectures to support real-time requirements for dominant battlespace awareness. Demonstrate architecture for rapid extraction of information from globally distributed knowledge bases. Demonstrate architecture for dominant battlespace awareness. Continue study of next generation information technologies (e.g., quantum computing) for C2 systems.</li> <li>(U) In FY 2003: Evaluated, exploited, and simulation technologies for next generation distributed collaborative decision support evironments. Initiate developed model abstraction and multi-resolution modeling techniques to reduce the complexity of existing high-resolution modelis and simulations for next generation distribut</li></ul>	<ul> <li>search techniques and information aggregation methods required fo</li> <li>(U) In FY 2004: Continue development of intermediate information exincrease time allocated to analysis and decision-making, enabling the Continue development of data mining techniques for a self-organizit support prediction of potential events in the world. Continue development data filtering techniques, and information aggregation methods required</li> </ul>	r rapid situational understanding. traction techniques to reduce data overload and the ability to populate knowledge base systems. Ing data repository and content-based extraction to to poment of advanced web-based search techniques, tired for rapid situational understanding.			
(U)       MAJOR THRUST: Develop automatic and dynamically reconfigurable, affordable, scalable, distributed petaflop       2.886       3.606       3.948         processing technologies for real-time command and control (C2) global information systems.       1       In FY 2003: Completed the processor-in-memory, content-addressable architecture for rapid extraction of information from globally distributed knowledge bases. Evaluated architecture to support real-time requirements for dominant battlespace awareness.       1       In FY 2004: Develop and demonstrate architectures for rapid extraction of information from globally distributed knowledge bases. Continue evaluation of architectures to support real-time requirements for dominant battlespace awareness. Initiate study of next generation information technologies (e.g., quantum computing and bio-molecular computing) for C2 systems.       1       In FY 2005: Demonstrate architecture for rapid extraction of information from globally distributed knowledge bases. Demonstrate architecture to support real-time requirements for dominant battlespace awareness. Continue study of next generation information technologies (e.g., quantum computing and bio-molecular computing) for C2 systems.       2       908       1.916       2.006         (U)       In FY 2005: Demonstrate architecture of model abstraction and multi-resolution modeling execution, and assessment environments.       2.908       1.916       2.006         (U)       In FY 2004: Covelop model abstraction and multi-resolution modeling techniques to reduce the complexity of existing high-resolution models and simulations for next generation distributed collaborative decision support environments, such as the Joint Synthetic Battlespace.<	(U) In FY 2005: Continue development of intermediate information ex- decision-making and enabling the ability to populate knowledge bas techniques for self-organizing data repositories and content-based e events in the world. Continue development of web-based search tech information aggregation methods to take advantage of the explosion situational understanding.	traction techniques to decrease analysis time for se systems. Continue development of data mining extraction to support identification of potential chniques, data filtering techniques, and a of available data on the Web required for rapid			
(1) MAJOR THRUST: Develop automatic and dynamically reconfigurable, attroated excluded, scalable, distributed petatlop       2.886       3.606       3.948         (1) In FY 2003: Completed the processor-in-memory, content-addressable architecture for rapid extraction of information from globally distributed knowledge bases. Evaluated architecture to support real-time requirements for dominant battlespace awareness.       10       In FY 2004: Develop and demonstrate architectures for rapid extraction of information from globally distributed knowledge bases. Evaluated architecture to support real-time requirements for dominant battlespace awareness. Continue evaluation of architectures to support real-time requirements for dominant battlespace awareness. Initiate study of next generation information technologies (e.g., quantum computing and bio-molecular computing) for C2 systems.       10       In FY 2005: Demonstrate architecture for rapid extraction of information from globally distributed knowledge bases. Demonstrate architecture to support real-time requirements for dominant battlespace awareness. Continue study of next generation information technologies (e.g., quantum computing and bio-molecular computing) for C2 systems.       2.908       1.916       2.006         (U)       In FY 2005: Develop modeling and simulation technologies for the next generation of planning, execution, and assessment environments.       2.908       1.916       2.006         (U)       In FY 2004: Complexity of existing high-resolution modelis and simulations for next generation distributed collaborative decision support environments, such as the Joint Synthetic Battlespace.       2.908       1.916       2.006         (U)       In F			<b>2</b> 00 f	2 60 6	2 0 4 0
(U)       In FY 2003: Completed the processor-in-memory, content-addressable architecture for rapid extraction of information from globally distributed knowledge bases. Evaluated architecture to support real-time requirements for dominant battlespace awareness.         (U)       In FY 2004: Completed the processor-in-memory, content-addressable architecture to support real-time requirements for dominant battlespace awareness.         (U)       In FY 2004: Develop and demonstrate architectures to support real-time requirements for dominant battlespace awareness. Initiate study of next generation information technologies (e.g., quantum computing and bio-molecular computing) for C2 systems.         (U)       In FY 2005: Demonstrate architecture for rapid extraction of information from globally distributed knowledge bases. Demonstrate architecture for rapid extraction of moments battlespace awareness. Continue study of next generation information technologies (e.g., quantum computing and bio-molecular computing) for C2 systems.         (U)       U)       MAJOR THRUST: Develop modeling and simulation technologies for the next generation of planning, execution, and assessment environments.       2.908       1.916       2.006         (U)       In FY 2003: Evaluated, exploited, and developed model abstraction and multi-resolution modeling techniques to reduce the complexity of existing high-resolution models and simulations for next generation distributed collaborative decision support environments, such as the Joint Synthetic Battlespace.       2.908       1.916       2.006         (U)       In FY 2003: Evaluated, exploited, and multi-resolution modeling techniques to reduce the complexity of existing high-reso	(U) MAJOR THRUST: Develop automatic and dynamically reconfigure processing technologies for real-time command and control (C2) glu	able, affordable, scalable, distributed petaflop	2.886	3.606	3.948
<ul> <li>(U) In FY 2004: Develop and demonstrate architectures for rapid extraction of information from globally distributed knowledge bases. Continue evaluation of architectures to support real-time requirements for dominant battlespace awareness. Initiate study of next generation information technologies (e.g., quantum computing and bio-molecular computing) for C2 systems.</li> <li>(U) In FY 2005: Demonstrate architecture for rapid extraction of information from globally distributed knowledge bases. Demonstrate architecture to support real-time requirements for dominant battlespace awareness. Continue study of next generation information technologies (e.g., quantum computing and bio-molecular computing) for C2 systems.</li> <li>(U) MAJOR THRUST: Develop modeling and simulation technologies for the next generation of planning, execution, and assessment environments.</li> <li>(U) In FY 2003: Evaluated, exploited, and developed model abstraction and multi-resolution modeling techniques to reduce the complexity of existing high-resolution models and simulations for next generation distributed collaborative decision support environments, uch as the Joint Synthetic Battlespace.</li> <li>(U) In FY 2004: Complete model abstraction and multi-resolution modeling techniques to reduce the complexity of existing high-resolution modeling techniques to reduce the complexity of existing high-resolution modeling techniques to reduce the complexity of existing high-resolution modeling techniques to reduce the complexity of existing high-resolution modeling techniques to reduce the complexity of existing high-resolution modeling techniques to reduce the complexity of existing high-resolution modeling techniques to reduce the complexity of existing high-resolution models and simulations for next generation distributed collaborative decision support environments. Initiate development of decision support technologies, and their theoretical foundation, to support environments. Initiate development of decision su</li></ul>	<ul> <li>(U) In FY 2003: Completed the processor-in-memory, content-addressa information from globally distributed knowledge bases. Evaluated dominant battlespace awareness.</li> </ul>	able architecture for rapid extraction of architecture to support real-time requirements for			
<ul> <li>(U) In FY 2005: Demonstrate architecture for rapid extraction of information from globally distributed knowledge bases. Demonstrate architecture to support real-time requirements for dominant battlespace awareness. Continue study of next generation information technologies (e.g., quantum computing and bio-molecular computing) for C2 systems.</li> <li>(U)</li> <li>(U) MAJOR THRUST: Develop modeling and simulation technologies for the next generation of planning, execution, and assessment environments.</li> <li>(U) In FY 2003: Evaluated, exploited, and developed model abstraction and multi-resolution modeling techniques to reduce the complexity of existing high-resolution models and simulations for next generation distributed collaborative decision support environments, such as the Joint Synthetic Battlespace.</li> <li>(U) In FY 2004: Complete model abstraction and multi-resolution modeling techniques to reduce the complexity of existing high-resolution modeling techniques to reduce the complexity of existing high-resolution modeling techniques to reduce the complexity of existing high-resolution modeling techniques to reduce the complexity of existing high-resolution models and simulations for next generation distributed collaborative decision support environments. Initiate development of decision support technologies, and their theoretical foundation, to support</li> <li>Project 4594 R-1 Shopping List - Item No. 13-6 of 13-15 Exhibit R-2a (PE 0602702F)</li> </ul>	(U) In FY 2004: Develop and demonstrate architectures for rapid extraction knowledge bases. Continue evaluation of architectures to support re- awareness. Initiate study of next generation information technologic computing) for C2 systems.	ction of information from globally distributed eal-time requirements for dominant battlespace es (e.g., quantum computing and bio-molecular			
(U)       MAJOR THRUST: Develop modeling and simulation technologies for the next generation of planning, execution, and assessment environments.       2.908       1.916       2.006         (U)       In FY 2003: Evaluated, exploited, and developed model abstraction and multi-resolution modeling techniques to reduce the complexity of existing high-resolution models and simulations for next generation distributed collaborative decision support environments, such as the Joint Synthetic Battlespace.       1.916       2.006         (U)       In FY 2003: Evaluated, exploited, and developed model abstraction and multi-resolution modeling techniques to reduce the complexity of existing high-resolution models and simulations for next generation distributed collaborative decision support environments, such as the Joint Synthetic Battlespace.       1.916       2.006         (U)       In FY 2003: Evaluated, exploited, and developed model abstraction modeling techniques to reduce the complexity of existing high-resolution models and simulations for next generation distributed collaborative decision support environments. Initiate development of decision support technologies, and their theoretical foundation, to support         Project 4594       R-1 Shopping List - Item No. 13-6 of 13-15       Exhibit R-2a (PE 0602702F)	(U) In FY 2005: Demonstrate architecture for rapid extraction of inform Demonstrate architecture to support real-time requirements for dom next generation information technologies (e.g., quantum computing	nation from globally distributed knowledge bases. inant battlespace awareness. Continue study of and bio-molecular computing) for C2 systems.			
<ul> <li>(U) MAJOR THRUST: Develop modeling and simulation technologies for the next generation of planning, execution, 2.908 1.916 2.006 and assessment environments.</li> <li>(U) In FY 2003: Evaluated, exploited, and developed model abstraction and multi-resolution modeling techniques to reduce the complexity of existing high-resolution models and simulations for next generation distributed collaborative decision support environments, such as the Joint Synthetic Battlespace.</li> <li>(U) In FY 2004: Complete model abstraction and multi-resolution modeling techniques to reduce the complexity of existing high-resolution modeling techniques to reduce the complexity of existing high-resolution models and simulations for next generation distributed collaborative decision support environments. Initiate development of decision support technologies, and their theoretical foundation, to support</li> <li>Project 4594 R-1 Shopping List - Item No. 13-6 of 13-15 Exhibit R-2a (PE 0602702F)</li> </ul>	(U)	1 0/ 2			
<ul> <li>(U) In FY 2003: Evaluated, exploited, and developed model abstraction and multi-resolution modeling techniques to reduce the complexity of existing high-resolution models and simulations for next generation distributed collaborative decision support environments, such as the Joint Synthetic Battlespace.</li> <li>(U) In FY 2004: Complete model abstraction and multi-resolution modeling techniques to reduce the complexity of existing high-resolution models for next generation distributed collaborative decision support environments. Initiate development of decision support technologies, and their theoretical foundation, to support</li> <li>Project 4594</li> <li>R-1 Shopping List - Item No. 13-6 of 13-15</li> </ul>	(U) MAJOR THRUST: Develop modeling and simulation technologies and assessment environments.	for the next generation of planning, execution,	2.908	1.916	2.006
(U) In FY 2004: Complete model abstraction and multi-resolution modeling techniques to reduce the complexity of existing high-resolution models and simulations for next generation distributed collaborative decision support environments. Initiate development of decision support technologies, and their theoretical foundation, to support         Project 4594       R-1 Shopping List - Item No. 13-6 of 13-15	(U) In FY 2003: Evaluated, exploited, and developed model abstraction reduce the complexity of existing high-resolution models and simul decision support environments, such as the Joint Synthetic Battlespa	and multi-resolution modeling techniques to ations for next generation distributed collaborative ace.			
Project 4594         R-1 Shopping List - Item No. 13-6 of 13-15         Exhibit R-2a (PE 0602702F)	(U) In FY 2004: Complete model abstraction and multi-resolution mod existing high-resolution models and simulations for next generation environments. Initiate development of decision support technologie	eling techniques to reduce the complexity of distributed collaborative decision support es, and their theoretical foundation, to support			
	Project 4594 F	R-1 Shopping List - Item No. 13-6 of 13-15		Exhibit R-2a (F	PE 0602702F)

DUDGET ACTIVITY         PENJMEER AND TITLE         PROJECT NUMBER AND TITLE           02 Applied Research         (602702F Command Control and Communications         4594 Information Technology           10 In FY 2005: Continue to develop modeling and simulation technologies to support text generation planning execution and assessment any prediction. Prostopy and demonstrate decision support technologies for course of action assessment any prediction. Prostopy and demonstrate decision support technologies for course of action assessment any prediction. Prostopy and demonstrate decision support technologies for celectronic communications and special signals intelligence, imagery and measurement signatures to increase accuracy, correlation and timeliness of the information value to the decision maker. Note: This effort includes SA to million in FY 2004 Congressional Add funding for Measurement and Signature Intelligence Wardighter Visualization mols.         5.766         10.910         7.050           (U)         IN ALOR THRUST/CONGRESSIONAL ADD: Develop digital information exploitation technologies for electronic communications and special signals intelligence, imagery and measurement and signature intelligence Wardighter Visualization mols.         5.766         10.910         7.050           (U)         IN ALOR THRUST/CONGRESSIONAL ADD: Develop digital information exploitation in FY 2004 Congressional Add funding for Measurement and signature intelligence wardighter Visualization mols.         5.766         10.910         7.050           (U)         IN FY 2004: Continue development of advanced multi-sensor open systems techniques and automated analyst tools for exploining measurement and signature intelligence, hypers		Exhibit R-2a, RDT&E Project	ct Justification	DA	TE Februarv	2004
high-profile system concepts, such as the Joint Synthetic Battlespace and the Global Strike Task Force.         (U)       In FY 2005: Continue to develop modeling and simulation technologies to support next generation planning execution and sasessment environments. Develop adversarial behavior models and modeling technologies and the theoretical foundation to support high-profile system concepts; such as the Joint Synthetic Battlespace and Air Force Concepts of Operations.         (U)       MAJOR THRUST/CONGRESSIONAL ADD: Develop digital information exploitation technologies for electronic communications and special signals intelligence; imagery and measurement signatures to increase accuracy, correlation and timeliness of the information value to the decision maker. Note: This effort includes \$4.0 million in FY 2004 Congressional Add funding for Measurement and Signature Intelligence Warfighter Visualization Tools.       5.766       10.910       7.050         (U)       In FY 2004: Continue development of advanced multi-sensor open systems techniques and automated analyst tools for exploiting hyperspectral imagery, on-board video processing, new electronic signals, and speech intelligence products to achieve improved situational awareness. <ul> <li>indication and warning, and reporting capabilities. Research techniques and automated analyst tools                 for exploiting measurement and signature intelligence optication intelligence exploitation,                 and analysis tool aids.               (U)             IN Y 2005: Continue development of advanced multi-sensor and automated analyst tools for exploiting measurement and signature intelligence optication intelligence exploitation,                 and analysis tool aids.               (U)</li></ul>	BUD 02 /	GET ACTIVITY Applied Research	PE NUMBER AND TITLE 0602702F Command Control and Communications	PROJECT NU 4594 Infor	JMBER AND TITLE mation Technol	ogy
<ul> <li>(U)</li> <li>(U) MAJOR THRUST/CONGRESSIONAL ADD: Develop digital information exploitation technologies for electronic communications and special signals intelligence, imagery and measurement signatures to increase accuracy, correlation and timeliness of the information value to the decision maker. Note: This effort includes \$4.0 million in FY 2004 Congressional Add funding for Measurement and Signature Intelligence Warfighter Visualization Tools.</li> <li>(U) In FY 2003: Developed advanced multi-sensor open systems techniques and automated analyst tools for exploiting hyperspectral imagery, on-board video processing, new electronic signals, and speech intelligence products to achieve improved situational awareness.</li> <li>(U) In FY 2004: Continue development of advanced multi-sensor open systems techniques and automated analyst tools for exploiting measurement and signature intelligence, hyperspectral imagery, on-board video processing, new electronic signals, moving target indicator, and speech intelligence products for improved situational awareness, indication and warening, and reporting capabilities. Research techniques in steganography, steganalysis, and watermarking of imagery, video and speech intelligence products to roboard video processing, new electronic signals, moving target indicator, and speech intelligence products to reboard video processing, new distribution and signature intelligence, commercial sources and hyperspectral imagery, on-board video processing, new digital electronic signals, moving target indicator, and speech intelligence products to feed an information fusion process for insport of the decision maker. Continue development of techniques in steganography, steganalysis, watermarking and digital data forensics for imagery, video and speech information protection and authentication, intelligence exploitation, and analysts' tool aids.</li> <li>(U) In FY 2003: Developed information Protection and Authentication.</li> <li>(L) CONGRESSIONAL ADD: Information Protection and Aut</li></ul>	(U)	high-profile system concepts, such as the Joint Synthetic Battlespace and the In FY 2005: Continue to develop modeling and simulation technologies to su execution and assessment environments. Develop adversarial behavior mode action assessment and prediction. Prototype and demonstrate decision suppor foundation to support high-profile system concepts; such as the Joint Synthet Operations.	e Global Strike Task Force. support next generation planning els and modeling techniques for course of ort technologies and the theoretical tic Battlespace and Air Force Concepts of			
<ul> <li>(U) In FY 2003: Developed advanced multi-sensor open systems techniques and automated analyst tools for exploiting hyperspectral imagery, on-board video processing, new electronic signals, and speech intelligence products to achieve improved situational awareness.</li> <li>(U) In FY 2004: Continue development of advanced multi-sensor open systems techniques and automated analyst tools for exploiting measurement and signature intelligence, hyperspectral imagery, on-board video processing, new electronic signals, moving target indicator, and speech intelligence products for improved situational awareness, indication and warring, and reporting capabilities. Research techniques in steganography, steganalysis, and watermarking of imagery, video and speech for information protection and authentication, intelligence exploitation, and analysis tool aids.</li> <li>(U) In FY 2005: Continue development of advanced multi-sensor and automated analyst tools for exploiting measurement and signature intelligence, commercial sources and hyperspectral imagery, on-board video processing, new digital electronic signals, moving target indicator, and speech intelligence products to feed an information fusion process in support of the decision maker. Continue development of techniques in steganography, steganalysis, watermarking and digital data forensics for imagery, video and speech information protection and authentication, intelligence exploitation, and analysts' tool aids. Initiate investigation of new techniques to improve open systems techniques for multi-sensor exploitation for enhanced indications and warning and situational awareness.</li> <li>(U) CONGRESSIONAL ADD: Information Protection and Authentication.</li> <li>(L) In FY 2004: Not Antonic hiding, steganography, and eganographic detection, decoding, and countermeasure techniques for data embedding, tamper detection and proofing, image and video content authentication.</li> <li>(L) In FY 2004: Not Anonicable</li> </ul>	(U) (U)	MAJOR THRUST/CONGRESSIONAL ADD: Develop digital information communications and special signals intelligence, imagery and measurement s correlation and timeliness of the information value to the decision maker. No FY 2004 Congressional Add funding for Measurement and Signature Intellig	exploitation technologies for electronic signatures to increase accuracy, ote: This effort includes \$4.0 million in gence Warfighter Visualization Tools.	5.766	10.910	7.050
<ul> <li>(U) In FY 2004: Continue development of advanced multi-sensor open systems techniques and automated analyst tools for exploiting measurement and signature intelligence, hyperspectral imagery, on-board video processing, new electronic signals, moving target indicator, and speech intelligence products for improved situational awareness, indication and warning, and reporting capabilities. Research techniques in steganography, steganalysis, and waremarking of imagery, video and speech for information protection and authentication, intelligence exploitation, and analysis tool aids.</li> <li>(U) In FY 2005: Continue development of advanced multi-sensor and automated analyst tools for exploiting measurement and signature intelligence, commercial sources and hyperspectral imagery, on-board video processing, new digital electronic signals, moving target indicator, and speech information protection and authentication, intelligence products to feed an information fusion process in support of the decision maker. Continue development of techniques to improve open systems techniques for multi-sensor exploitation for enhanced indications and warning and situational awareness.</li> <li>(U)</li> <li>(U) CONGRESSIONAL ADD: Information Protection and Authentication.</li> <li>(U) In FY 2003: Developed information hiding, steganography, and digital watermarking to protect and authenticate data within Air Force and DoD information systems. Developed and evaluated steganographic detection, decoding, and countermeasure techniques for data embedding, tamper detection and proofing, image and video content authentication, authentication, authentication, authentication, and secure information dissemination.</li> <li>(I) In FY 2004: Not Applicable</li> </ul>	(U)	In FY 2003: Developed advanced multi-sensor open systems techniques and hyperspectral imagery, on-board video processing, new electronic signals, an improved situational awareness.	d automated analyst tools for exploiting and speech intelligence products to achieve			
<ul> <li>(U) In FY 2005: Continue development of advanced multi-sensor and automated analyst tools for exploiting measurement and signature intelligence, commercial sources and hyperspectral imagery, on-board video processing, new digital electronic signals, moving target indicator, and speech intelligence products to feed an information fusion process in support of the decision maker. Continue development of techniques in steganography, steganalysis, watermarking and digital data forensics for imagery, video and speech information protection and authentication, intelligence exploitation, and analysts' tool aids. Initiate investigation of new techniques to improve open systems techniques for multi-sensor exploitation for enhanced indications and warning and situational awareness.</li> <li>(U)</li> <li>(U) CONGRESSIONAL ADD: Information Protection and Authentication.</li> <li>(I) In FY 2003: Developed information hiding, steganography, and digital watermarking to protect and authenticate data within Air Force and DoD information systems. Developed and evaluated steganographic detection, decoding, and countermeasure techniques for data embedding, tamper detection and proofing, image and video content authentication, authentication, in FY 2004: Not Applicable</li> </ul>	(U)	In FY 2004: Continue development of advanced multi-sensor open systems is for exploiting measurement and signature intelligence, hyperspectral imagery electronic signals, moving target indicator, and speech intelligence products is indication and warning, and reporting capabilities. Research techniques in st watermarking of imagery, video and speech for information protection and ar and analysis tool aids.	techniques and automated analyst tools y, on-board video processing, new for improved situational awareness, teganography, steganalysis, and uthentication, intelligence exploitation,			
<ul> <li>(U)</li> <li>(U) CONGRESSIONAL ADD: Information Protection and Authentication.</li> <li>(U) CONGRESSIONAL ADD: Information Protection and Authentication.</li> <li>(U) In FY 2003: Developed information hiding, steganography, and digital watermarking to protect and authenticate data within Air Force and DoD information systems. Developed and evaluated steganographic detection, decoding, and countermeasure techniques for data embedding, tamper detection and proofing, image and video content authentication, and secure information dissemination.</li> <li>(U) In FY 2004: Not Applicable</li> </ul>	(U)	In FY 2005: Continue development of advanced multi-sensor and automated measurement and signature intelligence, commercial sources and hyperspectr new digital electronic signals, moving target indicator, and speech intelligence process in support of the decision maker. Continue development of techniqu watermarking and digital data forensics for imagery, video and speech inform intelligence exploitation, and analysts' tool aids. Initiate investigation of new techniques for multi-sensor exploitation for enhanced indications and warnin	d analyst tools for exploiting ral imagery, on-board video processing, ce products to feed an information fusion les in steganography, steganalysis, mation protection and authentication, w techniques to improve open systems ng and situational awareness.			
<ul> <li>(U) CONGRESSIONAL ADD: Information Protection and Authentication.</li> <li>(U) In FY 2003: Developed information hiding, steganography, and digital watermarking to protect and authenticate data within Air Force and DoD information systems. Developed and evaluated steganographic detection, decoding, and countermeasure techniques for data embedding, tamper detection and proofing, image and video content authentication, and secure information dissemination.</li> <li>(L) In FY 2004: Not Applicable</li> </ul>	(U)					
(I) In FY 2004: Not Applicable	(U) (U)	CONGRESSIONAL ADD: Information Protection and Authentication. In FY 2003: Developed information hiding, steganography, and digital water within Air Force and DoD information systems. Developed and evaluated st countermeasure techniques for data embedding, tamper detection and proofin authentication, and secure information dissemination.	ermarking to protect and authenticate data teganographic detection, decoding, and ng, image and video content	1.399	0.000	0.000
	(U)	In FY 2004: Not Applicable.				
Project 4594         R-1 Shopping List - Item No. 13-7 of 13-15         Exhibit R-2a (PE 0602702F)	Pro	ject 4594 R-1 Shoppi	ing List - Item No. 13-7 of 13-15		Exhibit R-2a (F	PE 0602702F)

		Exhibit R-	2a, RDT&E	Project Ju	stification			DATE	February 2004	
BUDGET <b>02 App</b>	ACTIVITY lied Research			PE NUMBER AND TITLE 0602702F Command Control and Communications				PROJECT NUMBER AND TITLE 4594 Information Technology		
(U) In I (U) Tot	FY 2005: Not Applicable. tal Cost							23.109	28.600 25.511	
(U) <u>C.</u>	Other Program Funding Sum	<u>mary (\$ in Milli</u>	<u>ons)</u>							
(U) Re (U) PE De Th cou (U) Re eff	Plated Activities: 2 0603789F, C3I Advanced evelopment. is project has been ordinated through the Pliance process to harmonize Forts and eliminate	FY 2003 Actual	<u>FY 2004</u> <u>Estimate</u>	FY 2005 Estimate	<u>FY 2006</u> <u>Estimate</u>	FY 2007 Estimate	FY 2008 Estimate	<u>FY 2009</u> <u>Estimate</u>	<u>Cost to</u> <u>Complete</u> <u>Total Cost</u>	
du (U) <u>D</u> . No	plication. <u>Acquisition Strategy</u> ot Applicable.									
Project	4594		F	R-1 Shopping List	- Item No. 13-8 of 1	3-15			Exhibit R-2a (PE 0602702F)	

	Ex	hibit R-2a, F	RDT&E Pro	ject Justif	ication			DATE February 2004		
BUDGE7 <b>02 Ap</b> f	ΓΑCΤΙVITY plied Research			F ( (	<sup>•</sup> E NUMBER AND )602702F Con Communicati	nmand Contr	ol and	PROJECT NUMBER AND TITLE 4917 Collaborative Information Tech		
	Cost (\$ in Millions)	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	Cost to	Total
	Cost (\$ In Winnons)	Actual	Estimate	Estimate	Estimate	Estimate	Estimate	Estimate	Complete	I
4917	Collaborative Information Tech	15.530	7.746	5.637	5.197	5.297	5.456	5.616	, 0.000	0.000
	Quantity of RDT&E Articles	0	0	0	0	0	0	C		1

# (U) <u>A. Mission Description and Budget Item Justification</u>

To implement the Global Strike Task Force and other task force concepts, the Air Force requires a distributed, collaborative command and control (C2) system, allowing the majority of the C2 center to remain in the continental United States, while only a small command element is deployed forward. This project accomplishes the initial exploration of high payoff emerging technologies for the next generation of distributed collaborative C2 systems. This program develops technologies for platform connectivity, distributed collaboration, and embedded information systems. Platform connectivity technologies focus on advanced modulation waveforms for bandwidth efficiency, assured aerospace platform connectivity for C2, and conceptual design approaches for seamless integration of aerospace weapon systems into the information grid. Distributed collaboration technologies advance collaboration science, virtual environments, and predictive simulation tools to facilitate the development and fielding of next generation of distributed information architectures, which will provide cross disciplinary products/capability to a decision maker when, where, and how it is needed. It also provides embedded information system technologies for affordable and adaptable design and development of complex C2 systems, facilitated by an open system architecture approach.

(U)	B. Accomplishments/Planned Program (\$ in Millions)	<u>FY 2003</u>	<u>FY 2004</u>	<u>FY 2005</u>
(U)	MAJOR THRUST: Develop critical information transmission technologies to permit the seamless integration of	1.808	1.989	2.012
	aerospace weapon systems' C2, intelligence, surveillance, and reconnaissance data/information.			
(U)	In FY 2003: Developed assured secure communications technology, leveraging the commercial infrastructure, for			
	positive C2 of aerospace assets in civilian airspace. Developed secure, wide-band wireless information transfer			
	technology for assured communications between munitions and aircraft.			
(U)	In FY 2004: Continue the development of assured communications technology, leveraging commercial infrastructure,			
	for positive C2 of aerospace assets in commercial airspace. Continue the development of secure, wide-band wireless			
	miniaturized transceiver information transfer technology for assured communications between munitions and aircraft.			
(U)	In FY 2005: Continue the development of assured communications technology, leveraging commercial infrastructure,			
	for positive command and control of aerospace assets in commercial airspace. Complete the design and development			
	of secure, wide-band wireless miniaturized transceiver information transfer technology for assured communications			
	between munitions and aircraft. Develop, test, and assess exploratory information transfer technologies.			
(U)				
(U)	MAJOR THRUST: Develop processes, methods, and techniques to provide assured performance, integrity, and	2.533	1.388	1.505
	security of real-time embedded information systems.			
(U)	In FY 2003: Developed dynamically reconfigurable aerospace systems using adaptive computing techniques.			
Pro	oject 4917 R-1 Shopping List - Item No. 13-9 of 13-15		Exhibit R-2a (	(PE 0602702F)
	249			

Exhibit R-2a, RDT&E Proje	ect Justification	DAT	<sup>™</sup> February :	2004
BUDGET ACTIVITY 02 Applied Research	PE NUMBER AND TITLE 0602702F Command Control and Communications	PROJECT NU 4917 Colla	MBER AND TITLE borative Inform	ation Tech
Developed concepts, designs, and models for the next generation C2 global affordable design and development of highly complex aerospace systems. determining the suitability of Java and Real-Time Java to support open sys information systems.	l information systems, which will allow Developed methods and processes for tem architectures for real-time, embedded			
(U) In FY 2004: Continue to develop dynamically reconfigurable aerospace sy techniques. Define and develop algorithms, methods, and processes to sup management of system resources across multiple tactical platforms.	stems using adaptive computing port real-time, adaptive resource			
(U) In FY 2005: Continue development of dynamically reconfigurable aerospatchechniques. Continue to develop algorithms, methods, and processes to supmanagement of system resources across multiple tactical platforms. Devel implementation of Java and Real-Time Java Virtual Machines using adapti	ace systems using adaptive computing oport real-time, adaptive resource op methods and processes for ve computing techniques.			
<ul> <li>(U)</li> <li>(U) MAJOR THRUST/CONGRESSIONAL ADD: Develop advanced information support, knowledge management, and rapid adaptation/re-allocation of associated environment. Note: This effort includes \$3.5 million in FY 2003 Contract and \$2.4 million in FY 2004 Concernational Additional Statement and \$2.4 million in FY 2004 Concernational Additional Statement and \$2.4 million in FY 2004 Concernational Additional Statement and \$2.4 million in FY 2004 Concernational Additional Statement and \$2.4 million in FY 2004 Concernational Additional Statement and \$2.4 million in FY 2004 Concernational Additional Statement and \$2.4 million in FY 2004 Concernational Additional Statement and \$2.4 million in FY 2004 Concernational Additional Statement and \$2.4 million in FY 2004 Concernational Additional Statement and \$2.4 million in FY 2004 Concernational Additional Statement and \$2.4 million in FY 2004 Concernational Additional Statement and \$2.4 million in FY 2004 Concernational Additional Statement and \$2.4 million in FY 2004 Concernational Additional Statement and \$2.4 million in FY 2004 Concernational Additional Statement and \$2.4 million in FY 2004 Concernational Additional Statement and \$2.4 million in FY 2004 Concernational Additional Statement and \$2.4 million in FY 2004 Concernational Additional Statement and \$2.4 million in FY 2004 Concernational Additional Statement and \$2.4 million in FY 2004 Concernational Additional Statement and \$2.4 million in FY 2004 Concernational Additional Statement and \$2.4 million in FY 2004 Concernational Statement and \$2.4 million in FY 2004 Concernation</li></ul>	ation technologies for collaborative decision ets in response to the continually changing ongressional Add funding for Secure	7.728	4.369	2.120
<ul> <li>(U) In FY 2003: Investigated techniques to perform the collaborative planning Operations (AF CONOPS). Developed distributed decision-making technology to support a sensor-to-shooter scenario moviment. Developed technology to support a sensor-to-shooter scenario moviment.</li> </ul>	for the seven Air Force Concepts of ology for joint battlespace information to stressing the time-critical target			
<ul> <li>(U) In FY 2004: Develop techniques to assist in performing the collaborative p Initiate development of distributed collaborative environment technology f battlespace awareness. Continue to develop technology to support a sensor target requirement, which will deny the enemy sanctuary of time.</li> </ul>	blanning for the seven AF CONOPS. or effects-based operations and predictive r-to-shooter scenario stressing time-critical			
(U) In FY 2005: Continue development of techniques to perform collaborative seven AF CONOPS. Continue development of distributed collaborative en operations and predictive battlespace awareness. Complete work to develo scenario stressing time-critical target requirement, which will deny the energy of the seven and the seven as a seven a	e, capability based planning required by the avironment technology for effects based op technology to support a sensor-to-shooter my sanctuary of time.			
(U) (U) CONCRESSIONAL ADD: A tile Bereard and Development/Science and	Tashuslasa Castar of Engellance	2 461	0.000	0.000
<ul> <li>(U) In FY 2003: Developed simulation-based acquisition (SBA) technologies is systems design and analysis. Developed an enhanced collaborative technologies.</li> <li>SBA. Demonstrated the enhanced architecture in an experiment for collaborative technologies.</li> </ul>	for application to integrated aerospace logy architecture supporting the tenets of orative spiral requirements and capability	3.401	0.000	0.000
Project 4917 R-1 Shop	ping List - Item No. 13-10 of 13-15		Exhibit R-2a (F	PE 0602702F)

	Exhibit R-	2a, RDT&E	Project Ju	stification			DATE	February 2	2004
BUDGET ACTIVITY 02 Applied Research				PE NUMBER A 0602702F C Communica	ND TITLE ommand Con ations	trol and	PROJECT NUM 4917 Collabo	BER AND TITLE Drative Information	ation Tech
<ul><li>based planning.</li><li>(U) In FY 2004: Not Applicable.</li><li>(U) In FY 2005: Not Applicable.</li><li>(U) Total Cost</li></ul>							15.530	7.746	5.637
(U) <u>C. Other Program Funding Sum</u>	<mark>mary (\$ in Milli</mark> <u>FY 2003</u> Actual	<u>ons)</u> <u>FY 2004</u> Estimate	<u>FY 2005</u> Estimate	<u>FY 2006</u> Estimate	<u>FY 2007</u> Estimate	<u>FY 2008</u> Estimate	<u>FY 2009</u> Estimate	<u>Cost to</u> Complete	<u>Total Cost</u>
<ul> <li>(U) Related Activities:</li> <li>(U) PE 0603789F, C3I Advanced Development. This project has been coordinated through the</li> <li>(U) Reliance process to harmonize efforts and eliminate duplication.</li> </ul>									
(U) <u>D. Acquisition Strategy</u> Not Applicable.									
Project 4917		R-	1 Shopping List -	Item No. 13-11 of 2	13-15			Exhibit R-2a (P	PE 0602702F)

Exhibit R-2a, RDT&E Project Justification								DATE	DATE February 2004	
BUDGET ACTIVITY 02 Applied Research				P 0 0	PE NUMBER AND TITLE 0602702F Command Control and Communications			PROJECT NUMBER AND TITLE 5581 Command and Control (C2) Technology		
	Cost (\$ in Millions)	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	Cost to	Total
		Actual	Estimate	Estimate	Estimate	Estimate	Estimate	Estimate	Complete	
5581	Command and Control (C2) Technology	24.730	26.716	33.764	34.970	39.741	36.599	37.953	0.000	0.000
	Quantity of RDT&E Articles	0	0	0	0	0	0	0		
(U) ]	information for real-time, distributed bat systems and infrastructure. Technology information management and distribution systems. Advances in the ability to detect development of various courses of action create new knowledge are needed by the reconfiguration of C2 centers to respond distribution technologies will ensure the <b>B. Accomplishments/Planned Program</b>	tle management. development in t n services. Adva ct, classify, ident n to counter their Expeditionary A to varying crisis delivery of high- ( <b>\$ in Millions</b> )	Technologies his project foc inces in plannin ify, and track of intentions. Ac terospace Forc levels, as require quality, timely	being develop uses on plannin ng and assessmo objects and eve dvances in the of e. Advances ir hired, by the Ex y, secure inform	ed in this projecting and assessing ment technologies nts will improved evelopment of a distributed interpeditionary Ae- nation to the wa	ct will increase g techniques, k es will vastly in e the understan very large con elligent inform rospace Force. urfighter.	capability and nowledge base approve the mil ding and pred aprehensive kr ation systems Advances in F	d quality, while n es, distributed in litary decision m iction of enemy nowledge bases w will allow autom robust informati	reducing the co formation syste aking process intentions, allo to rapidly form natic rapid on managemen FY 2004	st of C2 ems, and within C2 wing the ulate and t and FY 2005
(U) 1 (U) 1 (U) 1 i (U) 1	MAJOR THRUST: Investigate and devel generation knowledge bases for aerospace In FY 2003: Developed tools that will au for discovering relevant linkages between inferencing and performance of C2 system In FY 2004: Continue to develop tools the link patterns for discovering relevant linka	lop technologies e C2 systems. tomate intelligen entities. Develo ns. at will automate ages between ent	for the rapid d t extraction, co ped enhanced the intelligent ities. Investig	evelopment and prrelation, and reasoning tech extraction, corr ate and develop	d application of classification of niques for comp relation, and cla o ultra-large, all	r next f link patterns plex assification of l-source		4.930	6.576	7.393
i (U) ] (0	<ul> <li>information repositories and associated privacy protection technologies. Complete development of enhanced reasoning techniques for complex inferencing and performance of C2 systems.</li> <li>In FY 2005: Investigate and develop technologies for the rapid development and application of next generation knowledge bases for aerospace C2 systems. Continue to develop tools that will automate the intelligent extraction, correlation and classification of link patterns for discovering relevant linkages between entities. Continue development of ultra-large all-source information repositories and associated privacy protection technologies.</li> </ul>									
(U) (U) ] i	MAJOR THRUST: Investigate, analyze, intelligent information systems to varying	and develop tech crisis levels face	nologies for an ed by the Expe	utomatic rapid ditionary Aero	reconfiguration space Force.	of distributed		7.031	7.385	8.228
Proje	ect 5581		R-1 Sho	opping List - Item	No. 13-12 of 13-	15			Exhibit R-2a (I	PE 0602702F)
				252	2					

	Exhibit R-2a, RDT&E Project Jus	DATE February 2004				
BUDGET ACTIVITY       PE NUMBER AND TITLE         02 Applied Research       0602702F Command Control and Communications		PE NUMBER AND TITLE 0602702F Command Control and Communications	PROJECT NUMBER AND TITLE 5581 Command and Control (C2) Technology			
(U)	In FY 2003: Developed a dynamic and adaptable interface technology that allows comission-tailored view of the configuration and status of the currently executing Air C command and control (C2) process. Developed advanced interactive displays suitable applications and command centers. Developed techniques and applications for inform conjunction with multiple, heterogeneous data sets.	ommanders to create a Operation Center (AOC) le for deployment with C2 mation visualization for use in				
(U)	In FY 2004: Continue to develop a dynamic and adaptable interface technology that mission-tailored view of the configuration and status of the currently executing AOC develop advanced interactive displays suitable for deployment with C2 applications a the development of techniques and applications for visualization of multiple, heterog technologies to improve the fidelity, accuracy, and interconnection of computer-base contingency plans and response strategies.	allows commanders to create a C2 process. Continue to and command centers. Complete eneous data sets. Develop d wargames used to prepare				
(U)	In FY 2005: Continue to develop dynamic and adaptable interface technology that a mission-tailored view of the configuration and status of the currently executing AOC develop advanced interactive displays suitable for deployment with C2 applications a development of advanced techniques and AOC-based applications for information view th multiple, heterogeneous data sets. Continue to develop technologies to improve interconnection of computer-based wargames used to prepare contingency plans and	llows commanders to create a C2 process. Continue to and command centers. Initiate sualization for use in conjunction the fidelity, accuracy, and response strategies.				
(U)						
(U)	MAJOR THRUST: Investigate and develop technologies to securely share information query within a coalition environment. Note: Broken out from the next major thrust be emphasis on C2 in a coalition environment.	on via publish, subscribe, and below due to the increased	0.000	0.000	5.276	
(U)	In FY 2003: Not Applicable.					
(U) (U)	In FY 2004: Not Applicable. In FY 2005: Initiate investigation and development of technologies to dynamically f produce customized coalition information products. Start development of techniques availability, integrity, and survivability of information within a coalition Joint Battles development of technology approaches that will rapidly incorporate coalition force so infosphere.	ilter and fuse information and s and tools that will ensure space Infosphere (JBI). Initiate tructure units into an operational				
(U)						
(U) (U)	MAJOR THRUST/CONGRESSIONAL ADD: Investigate and develop technologies and survivable information management and distribution services to enable a JBI. N million in FY 2003 Congressional Add funding for Information Management for Cri In FY 2003: Developed techniques for integrating legacy client-server C2 systems in web-enabled information management environments. Investigated approaches to environments	s to implement flexible, secure, ote: This effort includes \$3.0 sis Response. nto the next generation of agile, while a IBL to service thousands of	6.238	2.671	2.904	
Pr	niect 5581	rem No. 13-13 of 13-15		Exhibit R-22 (F	PE ()6()27()2E)	
				LANDIL IN-20 (F	L 00021021 )	

Exhibit R-2a, RDT&E Project Ju	DA	DATE February 2004			
BUDGET ACTIVITY 02 Applied Research	PE NUMBER AND TITLE 0602702F Command Control and Communications	PROJECT NU 5581 Com Technolog	T NUMBER AND TITLE ommand and Control (C2) blogy		
participating C2 and intelligence, surveillance, and reconnaissance clients exchang Investigated and developed technologies that will ensure availability, integrity, and a Joint Battlespace Infosphere.	ing millions of information objects. I survivability of information within				
(U) In FY 2004: Continue to develop techniques and tools for integrating legacy clien systems into a publish, subscribe, and query infosphere.	t-server command and control (C2)				
<ul> <li>(U) In FY 2005: Complete development of techniques and tools for integrating legacy publish-subscribe and query infosphere. Continue to investigate and develop publ technologies enabling a secure infosphere that can support thousands of C2 and in reconnaissance clients, and can operate within a coalition warfighting environmen</li> </ul>	r client-server C2 systems into a ish, subscribe, and query telligence, surveillance, and t. Investigate techniques to				
optimize publish, subscribe, and query mechanisms within bandwidth limited envi	ronments.				
<ul> <li>(U) MAJOR THRUST/CONGRESSIONAL ADD: Develop next generation monitoric assessment technologies and tools enabling distributed aerospace commanders to e develop effects based campaigns. Note: This effort includes \$1.0 million of FY 2 Effects-Based Planning Execution Assessment.</li> </ul>	6.531	10.084	9.963		
(U) In FY 2003: Developed the next generation of planning and assessment technolog commanders to determine and create the desired operational effects at the right pla Developed technologies to dynamically assess the battlespace, determine measures provide near-real-time command of forces to execute those measures. Developed success of qualitatively different courses of action. Developed intelligent agent te- joint/coalition C2 systems for various missions. Developed and assessed active te dynamic mobile C2 applications. Developed tools to increase situational awarene puch and pull in dynamic environments.	ties and tools enabling aerospace ace and at the right time. Is to create the desired effects, and tools to visualize the probability of chnologies capable of supporting mplate technologies for use in ass through intelligent information				
<ul> <li>(U) In FY 2004: Develop the next generation of monitoring, planning, execution, and enabling aerospace commanders to efficiently and collaboratively develop effects-develop technologies to dynamically and rapidly assess the battlespace, and provid manned and unmanned forces to execute the required missions. Investigate develor for incorporation into command and control (C2) tools. Continue to develop tools success of qualitatively different courses of action. Continue to develop intelligen supporting joint/coalition C2 for various missions. Develop and assess active tem technologies for use in mobile C2 applications. Continue to develop tools to incre intelligent information push and pull in dynamic environments.</li> </ul>	assessment technologies and tools based campaigns. Continue to le near-real-time command of opments in decision support science to visualize the probability of t information systems capable of plate and semantic ontology ase situational awareness through				
(U) In FY 2005: Continue to develop technologies to dynamically and rapidly assess to	he battlespace, and provide				
Project 5581 R-1 Shopping List		Exhibit R-2a (PE 0602702F)			

Exhibit R-2a, RDT&E Project Justification							DATE	DATE February 2004		
BUDGET ACTIVITY 02 Applied Research				PE NUMBER AND TITLE 0602702F Command Control and Communications			PROJECT NUMBER AND TITLE 5581 Command and Control (C2) Technology			
(U)	developments in decision support se qualitatively different courses of act joint/coalition command and contro semantic ontology technologies for awareness through intelligent inform information processing techniques to Total Cost	cience. Complete tion. Continue to ol (C2) for various use in C2 applica nation push and p to enhance the C2	e development o o develop intelli s missions. Cor ations. Continu- pull in dynamic 2 decision makin	of tools to visual gent information atinue to develop e to develop tool environments. I ng process.	ize the probabili a systems capabl and assess actives and assess actives as to increase situ finitiate investiga	ty of success of e of supporting ve template and uational ation of intelligen	nt	24.730	26.716	33.764
(U)	C. Other Program Funding Sum	<u>mary (\$ in Millio</u>	ons)							
(U) (U) (U) (U)	Related Activities: PE 0603617F, C3 Applications. PE 0303401F, Communications-Computer Systems (C-CS) Security RDT&E. PE 0603789F, C3I Advanced Development. This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.	<u>FY 2003</u> <u>Actual</u>	<u>FY 2004</u> <u>Estimate</u>	<u>FY 2005</u> <u>Estimate</u>	<u>FY 2006</u> <u>Estimate</u>	<u>FY 2007</u> <u>Estimate</u>	<u>FY 2008</u> <u>Estimate</u>	<u>FY 2009</u> <u>Estimate</u>	<u>Cost to</u> <u>Complete</u>	<u>Total Cost</u>
(U)	<b>D. Acquisition Strategy</b> Not Applicable.		D	1 Shopping List	tem No. 13-15 of 1	13-15			Eyhihit P-20	