Office Of Secretary Of Defense
FY 2000/2001 RDT&E PROGRAM

EXHIBIT R-1

APPROPRIATION: 0400D Research Development Test & Eval, Defwide

Date: FEB 1999

Line No	Program Element Number	Item	Act	Thousands of Dollars FY 1998	FY 1999	FY 2000	FY 2001	SEC
1	0601101D8Z	In-House Laboratory Independent Research	1	1,495	2,167	2,033	2,021	U
3	0601103D8Z	University Research Initiatives	1	214,600	228,415	216,778	210,332	U
4	0601105D8Z	Gulf War Illness	1		23,674	19,185	19,098	U
5	0601111D8Z	Government/Industry Cosponsorship of University Research	1	6,942	4,801	6,351	6,762	U
	Basic Research			**223,037**	**259,057**	**244,347**	**238,213**	
9	0602227D8Z	Medical Free Electron Laser	2	19,137	14,496	9,719	9,698	U
10	0602228D8Z	Historically Black Colleges and Universities (HBCU) Science	2	10,724		14,329	14,338	U
11	0602234D8Z	Lincoln Laboratory Research Program	2	17,197	19,271	20,774	20,739	U
20	0602787D8Z	Medical Technology	2	8,559	9,212	8,903	8,742	U
	Applied Research			**55,617**	**42,979**	**53,725**	**53,517**	
22	0603002D8Z	Medical Advanced Technology	3	2,848	2,130	2,007	2,057	U
23	0603104D8Z	Explosives Demilitarization Technology	3	11,285	14,442	11,183	11,029	U
24	0603120D8Z	Demining	3	15,112				U
25	0603121D8Z	Alternative to Landmines	3	2,760	4,687			U
26	0603122D8Z	Counterterror Technical Support	3	40,826	37,667	52,223	54,791	U
28	0603160D8Z	Counterproliferation Support - Adv Dev	3	74,196				U
30	0603225D8Z	Joint DoD-DoE Munitions Technology Development	3	16,242	13,007	14,786	14,790	U
31	0603232D8Z	Automatic Target Recognition	3	5,904	5,010	7,775	7,588	U
34	0603704D8Z	Special Technical Support	3	11,147	11,176	10,948	10,855	U
37	0603716D8Z	Strategic Environmental Research Program	3	56,716	58,771	53,506	51,729	U

Office Of Secretary Of Defense
FY 2000/2001 RDT&E PROGRAM EXHIBIT R-1

APPROPRIATION: 0400D Research Development Test & Eval, Defwide Date: FEB 1999

Line No	Program Element Number	Item	Act	Thousands of Dollars FY 1998	FY 1999	FY 2000	FY 2001	SEC
38	0603727D8Z	Joint Warfighting Program	3	8,255	18,679	7,872	7,790	U
39	0603728D8Z	Agile Port Demonstration	3	4,617				U
40	0603738D8Z	Cooperative DoD/VA Medical Research	3	18,437	5,915			U
44	0603750D8Z	Advanced Concept Technology Demonstrations	3	74,756	88,598	117,969	119,298	U
45	0603752D8Z	Commercial Technology Insertion Program	3	18,000				U
47	0603755D8Z	High Performance Computing Modernization Program	3	139,023	152,585	159,099	145,140	U
57	0603832D8Z	Joint Wargaming Simulation Management Office	3	60,059	60,518	68,456	68,250	U
58	0605160D8Z	Counterproliferation Support	3			1,495	1,493	U
	Advanced Technology Development			**560,183**	**473,185**	**507,319**	**494,810**	
62	0603228D8Z	Physical Security Equipment	4	17,801	25,465	37,107	36,201	U
63	0603708D8Z	Integrated Diagnostics	4	2,742	3,394			U
64	0603709D8Z	Joint Robotics Program	4	26,806	16,013	12,937	10,492	U
65	0603714D8Z	Advanced Sensor Applications Program	4	14,279	17,918	15,345	15,646	U
66	0603736D8Z	CALS Initiative	4	6,172	7,765	1,652	1,623	U
67	0603790D8Z	NATO Research and Development	4	7,939				U
69	0603851D8Z	Environmental Security Technical Certification Program	4	14,500	16,836	23,260	27,601	U
82	0603892D8Z	ASAT	4	37,500				U
83	0603920D8Z	Humanitarian Demining	4		18,498	15,847	14,819	U
84	0603923D8Z	Coalition Warfare	4			12,781	12,124	U
	Demonstration and Validation			**127,739**	**105,889**	**118,929**	**118,506**	

Office Of Secretary Of Defense
FY 2000/2001 RDT&E PROGRAM

EXHIBIT R-1

APPROPRIATION: 0400D Research Development Test & Eval, Defwide

Date: FEB 1999

Line No	Program Element Number	Item	Act	Thousands of Dollars FY 1998	FY 1999	FY 2000	FY 2001	SEC
88	0604709D8Z	Joint Robotics Program - EMD	5		15,115	12,004	11,742	U
90	0604771D8Z	Joint Tactical Information Distribution System (JTIDS)	5	50,312	30,125	29,382	16,401	U
91	0604805D8Z	Commercial Operations and Support Savings Initiative	5		7,901	16,976	15,129	U
	Engineering and Manufacturing Development			**50,312**	**53,141**	**58,362**	**43,272**	
95	0305889D8Z	Counterdrug Intelligence Support	5	1,835				U
	Engineering and Manufacturing Development			**1,835**				
96	0603858D8Z	Unexploded Ordnance Detection and Clearance	6		1,259	1,226	1,221	U
97	0604942D8Z	Assessments and Evaluations	6		3,868	4,900	5,000	U
98	0605104D8Z	Technical Studies, Support and Analysis	6	30,592	29,641	29,506	30,016	U
101	0605110D8Z	USD(A&T)--Critical Technology Support	6	2,487				U
103	0605116D8Z	General Support to C3I	6			2,000	2,000	U
104	0605117D8Z	Foreign Material Acquisition and Exploitation	6	34,782	34,591	34,937	35,458	U
105	0605122D8Z	Industrial Capabilities Assessments	6			3,299	3,373	U
108	0605128D8Z	Classified Program USD(P)	6	8,397	3,346			U
110	0605160D8Z	Counterproliferation Support	6	6,310				U
113	0605502D8Z	Small Business Innovative Research	6	31,858				U
115	0605710D8Z	Classified Programs - C3I	6	929	6,359	627	645	U
116	0605790D8Z	Small Business Innovation Research Administration	6	1,609	1,799	1,713	1,757	U
	RDT&E Management Support			**116,964**	**80,863**	**78,208**	**79,470**	
142	0305190D8Z	C3I Intelligence Programs	7	8,827	9,551	9,480	10,332	U

Office Of Secretary Of Defense
FY 2000/2001 RDT&E PROGRAM EXHIBIT R-1

APPROPRIATION: 0400D Research Development Test & Eval, Defwide Date: FEB 1999

Line No	Program Element Number	Item	Act	Thousands of Dollars FY 1998	FY 1999	FY 2000	FY 2001	SEC
143	0305204D8Z	Tactical Unmanned Aerial Vehicles	7	53,871				U
144	0305205D8Z	Endurance Unmanned Aerial Vehicles	7	181,165				U
145	0305206D8Z	Airborne Reconnaissance Systems	7	186,090				U
147	0305207D8Z	Manned Reconnaissance Systems	7	26,402				U
150	0305208D8Z	Distributed Common Ground Systems	7	34,879				U
153	0305209D8Z	DARP Integration and Support	7	7,101				U
	Operational Systems Development			**498,335**	**9,551**	**9,480**	**10,332**	
162	1001017D8Z	Partnership for Peace Activities	7		4,896			U
	Operational Systems Development				**4,896**			
	Total Office Of Secretary Of Defense			**1,634,022**	**1,029,561**	**1,070,370**	**1,038,120**	

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)									DATE February 1999	
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 1							R-1 ITEM NOMENCLATURE In-House Laboratory Independent Research (ILIR) PE 0601101D8Z			
COST*(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	1.495	2.167	2.033	2.021	2.102	2.099	2.143	2.188	Continuing	Continuing
ILIR/P503	1.495	2.167	2.033	2.021	2.102	2.099	2.143	2.188	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification

(U) BRIEF DESCRIPTION OF ELEMENT

(U) This program element supports basic medical research at the Uniformed Services University of the Health Sciences (USUHS) and provides the only programmed research funds received by the University. This program facilitates the recruitment and retention of faculty, supports state-of-the-art capabilities for training military medical students, and allows the collection of pilot data by the University's faculty researchers. Pilot data allow the faculty to secure research funds from non-DoD sources (est. $20-$25 million annually). Approximately 80 to 100 intramural research projects (20-25 new starts) are awarded each year, on a peer-reviewed, competitive basis. Results from these studies contribute to the fund of knowledge intended to enable technical approaches and investment strategies within Defense science and technology (S&T) programs.

(U) The ILIR program at USUHS is designed to answer fundamental questions of importance to the military medical mission of the Department of Defense in the areas of Combat Casualty Care (CCC), Infectious Diseases (ID), Military Operational Medicine (MOM), and Nuclear, Biological and Chemical (NBC) Medical Defense. The port folio of research projects will vary annually because this research is investigator-initiated. Examples of typical research efforts are:

- Combat Casualty Care: ischemia and reperfusion injury, traumatic brain and peripheral nerve injury, cryopreservation and substitution of blood components, endotoxic shock, inflammation and wound healing.

- Infectious Diseases: immunology and molecular biology of bacterial, viral and parasitic disease threats to military operations. These threats include *E. coli* and their shiga toxins, gonorrhea, streptococcus, hepatitis A, Venezuelan equine encephalitis (VEE), malaria, and bartonellosis.

- Military Operational Medicine: military and medical training and readiness.

- Nuclear, Biological and Chemical Defense: basic research questions concerning nerve agent intoxication and treatment.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 1	**R-1 ITEM NOMENCLATURE** In-House Laboratory Independent Research (ILIR) PE 0601101D8Z

COST*(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	1.495	2.167	2.033	2.021	2.102	2.099	2.143	2.188	Continuing	Continuing
ILIR/P503	1.495	2.167	2.033	2.021	2.102	2.099	2.143	2.188	Continuing	Continuing

(U) Project Number and Title: P503 ILIR

(U) PROGRAM ACCOMPLISHMENTS AND PLANS

(U) FY1998 Accomplishments:

(U) Combat Casualty Care: This program supported 24 projects in Combat Casualty Care. The following are examples of the objectives of a few highlighted protocols: a) Investigate the vascular effects of biochemicals that cause inflammation related to wounding and wound healing; b) Continue the investigation of the role of endotoxin, the lipopolysaccharide outer membrane component of gram negative bacteria leading to multiorgan failure, shock, and death; c) Study the molecular events underlying muopioid receptor activation to develop better pain relief strategies; d) Examine the effects of neurocytokines, biochemicals that are released upon nerve damage, in peripheral nerve and brain injury; e) Investigate healing mechanisms following ischemia-reperfusion injury; f) develop a blood test for diagnosing malignant hyperthermia susceptibility for use on the battlefield. ($ 0.519 Million)

(U) Infectious Diseases: Twenty-six projects addressing basic research questions in Infectious Diseases were funded for FY1998. Highlights from the plans of these projects include: a) Continue the investigation of Venezuelan equine encephalitis (VEE) by examining the role of macrophages and cytokines in the early immune response and development of inflammation of the central nervous system; b) Continue to investigate how environmental regulation of gonoccocal gene expression plays a critical role in the pathogenesis of the sexually transmitted disease *N. gonorrhoeae*; c) Develop a small animal model to determine the molecular mechanisms and regulation of *Salmonella typhi* invasion of epithelial cells; d) Determine the chronic infection rate, disease burden, risk factors within a population endemic for *B. Bacilliformis* (Batonellosis); e) Study the gene regulation of the shiga-like toxins coming from enterohemorrhagic *Escherichia coli*; f) Continue data collection for the comparison of two inactivated hepatitis A vaccines for their cross-immunogenicity and efficacy.
($ 0.572 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 1	R-1 ITEM NOMENCLATURE In-House Laboratory Independent Research (ILIR) PE 0601101D8Z

(U) **Military Operational Medicine:** FY1998 funds supported 23 projects in Military Operational Medicine. Goals of a few representative proposals are as follows: a) Investigate psychobiological dysfunction (PTSD symptomology) resulting from exposure to combat-like trauma; b) Understand how stress-induced changes in glucocorticoid hormones suppress the immune response; c) Continue to investigate the training practices impacting exertional heat illness in Marine Corps basic training, as well as to study how immune function is affected by exercise; d) Attempt to determine the relationship of health outcomes and job performance to substance use in the military; e) Delineate the gene transcription mechanisms underlying neural enhancement of cognitive function and soldier performance; f) Continue work to understand chronobiotic role of extra-retinal light reception in the control of the physiologic circadian rhythm. ($ 0.264 Million)

(U) **Nuclear, Biological and Chemical Medical Defense:** There were six projects in progress in FY1998 in the NBC area. Representative research efforts in this area are: a) Characterize the breakdown of 1,4-benzodiazepines, such as valium, used as an antidote to central nervous system effects of nerve agent poisoning; b) Study the pattern of sensory input to the frontal cortex for treatment of head injury; c) Study the DNA structure and repair mechanisms of the organism *Deinococcus radiodurans* to understand the mechanism of its extraordinary resistance to radiation; d) Study the functional deficits induced by neocortical cholinergic depletion and the potential restoration of function by administration of nerve growth factor. ($ 0.14 Million)

(U) **FY1999 Plans:**

(U) **Combat Casualty Care:** The objective of this program is to provide support for a significant number of new and continuing projects in Combat Casualty Care from FY1998. The program is continuing to investigate various aspects of wounding and wound healing and the roles that inflammatory mediators play in these processes. Projects to elucidate cellular and molecular mechanisms in endotoxic shock and its treatment continue to be an important area of research. Another major thrust area is peripheral nerve injury and traumatic brain injury with the use of animal models and nerve cells in culture. Included in this program is the investigation of low power laser therapy to decrease programmed cell death when motor nerves are severed. ($ 0.82 Million)

(U) **Infectious Diseases:** This broad area continues to be one of emphasis within the USUHS; approximately 30 protocols are supported in this area. Militarily relevant bacterial threat agents such as *E. coli* and its toxins, gonococcus, and streptococcus garner significant available resources. Mobilization of macrophages and antibody production continues to be studied within the context of Venezuelan equine encephalitis. The initiative to study typhoid fever with the development of an animal model continues. Research continues the study of bartonellosis in Peru by examining the vector and the animal reservoir, and by performing studies of the epidemiology of this parasitic disease. The study of the comparison of two inactivated hepatitis A vaccines should be brought to completion with the final results influencing the decision for vaccination of military personnel. ($ 0.739 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 1	**R-1 ITEM NOMENCLATURE** In-House Laboratory Independent Research (ILIR) PE 0601101D8Z

(U) **Military Operational Medicine:** FY1999 funds are supporting research in training and military readiness as a critical area within Military Operational Medicine. Training practices and their effects on exertional heat illness of Marine Corps basic training recruits continue to be examined, as well as the study of the effects of exercise and exertion on the immune system. Studies to determine the effects of stress and nicotine intake and dysfunctional eating habits also continue. New work to delineate neural mechanisms underlying post-traumatic stress disorder (PTSD) is being initiated. Other studies addressing different aspects of military training and readiness are anticipated. ($ 0.391 Million)

(U) **Nuclear, Biological and Chemical Medical Defense:** Multiple basic research projects in this threat area are being supported. Analysis of the chemical breakdown of different isomers of 1,4 benzodiazepines, such as Valium, and other chiral drugs used as antidote to central nervous system effects of nerve agent poisoning, continue. Study of the pattern of sensory input to the frontal cortex is being supported. The organism that exhibits extraordinary resistance to ionizing radiation, *Deinococcus radiodurans*, is being examined to better understand what gives it this unique ability. A study is being initiated to study the role of mitochondrial membrane proteins in agent-induced cell death.($ 0.217 Million)

(U) **FY2000 Plans:**

(U) Efforts will continue in all the major research areas (CCC, ID, MOM, and NBC) for FY2000. Specific projects compete for funding each year, therefore, detailed description of the research is impossible at this time. ($ 2.033 Million)

(U) **FY2001 Plans:**

(U) Efforts will continue in all the major research areas (CCC, ID, MOM, and NBC) for FY2001. Specific projects compete for funding each year, therefore, detailed description of the research is impossible at this time. ($ 2.021 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 1	**R-1 ITEM NOMENCLATURE** In-House Laboratory Independent Research (ILIR) PE 0601101D8Z

(U) B. Program Change Summary	FY1998	FY1999	FY2000	FY2001	Total Cost
Previous Presidents Budget	1.513	2.173	2.068	2.057	Continuing
Appropriated Value	1.569	0	0	0	Continuing
Adjustments to Appropriated Value					
a. Congressionally Directed Undistributed Reduction	-0.074	-0.006			
b. Rescission/Below-threshold Reprogramming, Inflation Adjustment	0	0	-0.035	-0.036	
c. Other	0	0			
Current Presidents Budget	1.495	2.167	2.033	2.021	Continuing

Change Summary Explanation: Funding changes are due to congressional undistributed reductions and inflation adjustments.

(U) Funding: N/A

(U) Schedule: N/A

(U) Technical: N/A

(U) C. OTHER PROGRAM FUNDING SUMMARY COST: N/A

(U) D. ACQUISITION STRATEGY: N/A

(U) E. SCHEDULE PROFILE: N/A

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 1	R-1 ITEM NOMENCLATURE UNIVERSITY RESEARCH INITIATIVE PE 0601103D8Z

COST *(In Millions)*	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	214.600	228.415	216.778	210.332	214.436	237.414	242.391	247.490	Continuing	Continuing
URI/P103	196.601	209.201	206.778	200.332	204.436	227.414	232.391	237.490	Continuing	Continuing
DEPSCoR/P104	17.999	19.214	10.000	10.000	10.000	10.000	10.000	10.000	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification

(U) BRIEF DESCRIPTION OF ELEMENT:

(U) P103, University Research Initiative (URI). The URI has three primary objectives: (1) to support basic research in a wide range of scientific and engineering disciplines pertinent to maintaining our military technology superiority; (2) to contribute to the education of scientists and engineers in disciplines critical to defense needs; and (3) to help build and maintain the infrastructure needed to improve the quality of defense research performed at universities. Paralleling these objectives, this project, in conjunction with the other project within this program element, competitively supports programs at universities nationwide in three interrelated categories:

- Research. The main thrust of the URI is multidisciplinary research program of the University Research Initiative (MURI). MURI efforts involve teams of researchers investigating high-priority topics that intersect more than one traditional technical discipline; for many complex problems, this multidisciplinary approach serves to accelerate research progress and expedite transition of results to application. In addition, the URI supports the Presidential Early Career Awards for Scientists and Engineers (PECASE), single-investigator research efforts performed by outstanding scientists and engineers early in their independent research careers.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 1	R-1 ITEM NOMENCLATURE UNIVERSITY RESEARCH INITIATIVE PE 0601103D8Z

- Education. The URI promotes graduate education in science and engineering for U.S. citizens through the National Defense Science and Engineering Graduate Fellowship Program. Through FY 1998, the URI also supported the Augmentation Awards for Science and Engineering Research Training (AASERT) program, which awarded research traineeships for graduate students and also supported laboratory experiences for undergraduate students on defense research projects.

- Infrastructure. URI support for the development of research infrastructure responsive to defense needs includes three programs. The Defense University Research Instrumentation Program (DURIP) allows researchers to purchase more costly items of research equipment than typically can be acquired under single-investigator awards. The URI Support Program (URISP) broadens the base of academic institutions participating in defense research by involving institutions that historically have not received much defense funding. The third program is the Defense Experimental Program to Stimulate Competitive Research in project P104.

(U) P 104, Defense Experimental Program to Stimulate Competitive Research (DEPSCoR). The DEPSCoR further helps to build national infrastructure for research and education in defense-critical fields by involving institutions of higher education in states that historically have not received much Federal research funding. It is executed in coordination with state committees formed for the National Science Foundation's Experimental Program to Stimulate Competitive Research.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 1	R-1 ITEM NOMENCLATURE UNIVERSITY RESEARCH INITIATIVE PE 0601103D8Z

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY1998 Accomplishments:

(U) Programmatic accomplishments:

- Research. A MURI competition conducted by the Services resulted in 17 new starts in high-priority areas of multi-Service interest related to four Strategic Research Objectives identified in the DoD's corporate Basic Research Plan: nanoscience, biomimetics, compact power sources, and mobile wireless communications. Fundamental advances in these areas will enable the development of new technologies applicable to a broad range of future military systems. The multidisciplinary nature of these areas, and their multi-Service relevance, make them ideally suited for inclusion under the multidisciplinary element of the URI. In addition to the new MURI efforts, multidisciplinary and PECASE programs begun in prior years continued, with new competitive awards for PECASE programs. ($ 117.660 Million)

- Education. Under the National Defense Science and Engineering Graduate Fellowship program, 96 new graduate fellowships were competitively awarded for study leading to advanced degrees in science and engineering fields of importance to national defense. The FY 1998 competition for the AASERT program led to the award of research traineeships for more than 125 graduate students and support for the involvement of more than 50 undergraduate students in defense research. ($ 29.003 Million)

- Infrastructure. More than 230 new awards were made under the FY 1998 DURIP competition, enabling the purchase of research instrumentation needed to sustain universities' capabilities to perform cutting-edge defense research. Under the URI Support Program, efforts initiated in prior years continued in areas such as electronic and magnetic materials, image analysis, micromanufacturing, and neurodynamics. The FY 1998 competition under the DEPSCoR program resulted in 72 new awards. ($67.937 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 1	R-1 ITEM NOMENCLATURE UNIVERSITY RESEARCH INITIATIVE PE 0601103D8Z

(U) Selected technical accomplishments:

- Researchers at the Georgia Institute of Technology, Northwestern University, and University of Minnesota at Minneapolis used a new method to demonstrate the feasibility of using ultrasonic guided waves to detect the initiation of flaws and other potential failure sites in annular structures, such as those in helicopter rotor hubs. The method includes a theoretical model for the propagation of ultrasonic waves of multiple frequencies traveling at different velocities through a complex structure, and a transfer function to interpret the effects of cracks or other flaws on the acoustic waveform when a structure is subjected to such waves. The new method has multiple advantages over existing x-ray, destructive-testing, and pulse-echo methods for detecting cracks in annular structures: it is less expensive and faster than any of the them; it does not require removing and replacing suspected parts, as do x-ray and destructive-testing methods; and it probes the entire path through the structure, unlike the pulse-echo methods that rely on reflection of transmitted pulses from cracks or other flaws. The use of the new method will increase understanding of deterioration mechanisms in materials and structures, and should enable development of technologies for detecting and predicting microcracks and fractures in real-time. These advances underpin early detection of structural flaws to prevent catastrophic failures in ships, aircraft, and other defense systems (e.g., due to metal fatigue and wearout in rotating machineries, such as high-cycle fatigue in jet aircraft).

- Scientists at Tufts University, Pennsylvania State University, and Columbia developed a biomimetic "nose" to detect volatile organic chemical compounds at vapor-phase concentrations of tens of parts per billion, more than ten times as sensitive as previous man-made "noses" and approaching the sensitivity of canine noses. It also has dramatically improved signal-to-noise ratios of man-made devices. The "nose" is biologically inspired in that it mimics olfactory systems of dogs and other vertebrates in two new and important ways. First, it detects the organic compounds using ensembles of different receptors distributed randomly on a surface, mimicking the olfactory epithelium in an animal's nose. The receptors are polymer microspheres impregnated with various fluorophors that fluoresce in the presence of different, specific compounds. A fiber-optic bundle images the detecting surface on a charged-coupled device; the spatial pattern of the fluorescence and its temporal duration vary with the compound being detected, due to the different spatial distribution and temporal response of the receptors for that compound. The second way in which this "nose" mimics animal olfactory functions is in the data processing for detecting, classifying, and quantifying the compounds; it uses computational neural networks that "learn" the spatial and temporal pattern of the response for each chemical using algorithms that are based on those that animal brains use to process olfactory data. The new "nose" can detect single compounds or mixtures of various compounds. It is a major advance in detection and identification of minute traces of biochemical compounds and has great potential for application in unexploded ordnance detection, chemical and biological warfare defense, and other areas important to protecting warfighters on land and sea.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 1	R-1 ITEM NOMENCLATURE UNIVERSITY RESEARCH INITIATIVE PE 0601103D8Z

- A team at the University of Illinois and the University of Texas at Austin made three significant advances in the area of predicting radar scattering from complex surfaces. First, they extended the new Fast Multipole method to numerically solve equations of electromagnetic wave propagation and compute in a day the scattering of 3-gigaherz radar from the Northrup/McDonnell-Douglas YF-23 (using a computer-assisted design file for the plane); this is a major advance over earlier methods, when solving a complex problem like this one, with two million unknowns, would have taken months and been plagued with errors. Second, they found a quicker way to compute scattering from nearly planar surfaces, which includes important cases such as optical gratings, scattering from very corrugated surfaces with high spatial frequencies (such as vegetation and other ground clutter), and microstrips on ground planes; for this class of scatterers, the researchers discovered a clever way to represent the problem using an integral that can be evaluated by an even faster algorithm than the standard Fast Multipole method. Third, the team devised a new Plane-Wave/Time-Domain (PWTD) algorithm that can quickly compute scattering involving wider frequency ranges, such as scattering of wideband radars. The PWTD calculation in the time and space domains can handle those problems, complementing the Fast Multipole method's Fourier transforms into the frequency domain that cannot do so. Like the Fast Multipole method, the PWTD method uses surface integrals that have major advantages over earlier methods that use volume integrals; it is faster and does not introduce the grid induced dispersion and numerical artifacts produced by the other methods. The team has extensive contacts with industry and government offices that will use the greater power and fidelity of the new methods to design low-observable platforms and target recognition systems for the DoD.

- Researchers at Carnegie Mellon University developed a process to make nanocrystalline phases of iron-cobalt (FeCo) and demonstrated that the materials have excellent soft magnetic properties that persist at higher temperatures needed for military platform applications. Soft magnetic materials are used in alternating-current devices, such as rotors of electric generators, because they can be easily magnetized and demagnetized in the presence of oscillating, applied magnetic fields and have correspondingly lower power losses due to hysteresis effects in those oscillating fields. The military services need soft magnetic materials as they move toward air, land, and sea platforms with more electric systems to replace fluid-cooling and hydraulic systems that require a great deal of maintenance and are a major cause of breakdowns. The new iron-cobalt materials are nanocrystalline, so they have soft magnetic properties that are superior to those of a single crystal or amorphous material; most importantly low power losses. The new materials exhibit those superior properties at higher temperatures than previous nanocrystalline soft magnets; they do so up to a Curie temperature of 970 degrees Celsius, 200 degrees higher than the Curie temperature for previous materials and high enough for applications in aircraft engines operating at 600 degrees Celsius with the needed safety margin. They also exhibit the properties at much higher magnetic fields, up to 2.1 Tesla, than earlier nanocrystalline magnetic materials; with the higher fields, generators made from the materials have higher efficiency. Thus, the new materials have good potential for application in electric systems to help increase efficiency and reduce weight, cost, and need for maintenance in aircraft engines and other subsystems for military platforms. The university researchers' collaborations with industry and national and DoD laboratories will promote transition of the research findings to potential applications.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 1	R-1 ITEM NOMENCLATURE UNIVERSITY RESEARCH INITIATIVE PE 0601103D8Z

- Scientists at Clemson University, North Carolina State University, and the University of Michigan developed unique measuring and modeling capabilities and used them to begin to understand the physical mechanisms affecting quasi-optical power generation by arrays of discrete solid-state sources at frequencies of 10-100 Gigaherz. Vacuum tubes traditionally have been used to get the multiwatt powers at higher frequencies that are required for missile seekers and military communications applications, but there is interest in using solid-state devices because they are cheaper, smaller, and more reliable. The problem is that a single solid-state source produces only 0.1-0.2 watts at the higher frequencies of interest. Using networks with transmission lines to combine outputs of single sources in a brute force way works for 10 sources, but begins to drop off in efficiency for greater numbers of sources due to the complexity of the combining networks. Attempts to get the higher powers by quasi-optically combining the electromagnetic outputs of arrays of 36-100 sources, rather than using metal connections, have yielded total power much lower than the sum of the powers of the single devices. To try to understand the problem with these quasi-optical methods, the researchers developed the first instrument that measures the electromagnetic field amplitude and phase in three dimensions near these solid-state arrays with minimal disturbance of the field. They also developed a unique model to simulate the electromagnetic field inside and outside the array, as well as temperature and nonlinear device effects inside the solid-state material. What they found, which is entirely new and unexpected, is that fields emitted by some sources within an array can be out of phase with those emitted by other sources, causing destructive interference in the electromagnetic field; essentially, power emitted by the former sources is being dissipated by the latter sources due to the phase mismatch. The understanding that the researchers are gaining of the fundamental physics should enable the control and elimination of the interference effects, which will improve output powers of high-frequency, solid-state arrays by factors of ten or more to the multiwatt levels needed for military applications.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 1	R-1 ITEM NOMENCLATURE UNIVERSITY RESEARCH INITIATIVE PE 0601103D8Z

(U) FY1999 Plans:

- Research. Topics for new MURI starts were selected in high-priority research areas such as solid-state electronics (radiation hardening, vacuum electronics, and nanolithography), detection of chemical and biological agents (high selectivity and stochastic sensing mechanisms), computational neuroscience for learning and human/machine interactions, novel materials (tunable electronic polymers, adaptive infrared response materials, computational design), propulsion (pulsed detonation phenomena), ionospheric characterization (global specification and forecasting), and information processing (nonclassical representation and manipulation). The results of that MURI competition should be announced in early 1999. Multidisciplinary and PECASE programs begun in prior years are continuing, with new competitive awards under the PECASE program. ($137.183 Million)

- Education. A FY 1999 competition is being conducted to award approximately 200 graduate fellowships under the National Defense Science and Engineering Graduate Fellowship Program, as the separate AASERT program of graduate research traineeships is discontinued. ($23.412 Million)

- Infrastructure. The FY 1999 competition under the DURIP program resulted in 233 awards for research equipment needed to perform cutting-edge defense research. Sixty-seven new awards were made under the DEPSCoR program. Efforts begun in prior years under the URI Support Program will continue. ($67.820 Million)

(U) FY2000 Plans:

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 1	R-1 ITEM NOMENCLATURE UNIVERSITY RESEARCH INITIATIVE PE 0601103D8Z

- Research. Topics for new MURI starts will be selected in high-priority research areas such as novel materials; devices and structures concepts; information science, including data fusion, distributed computing, quantum computing and quantum memory; biomolecular science and engineering; advanced, ultrawide-bandwidth communications; electronic/electro-optical devices; and compact power systems. Multidisciplinary and PECASE programs begun in prior years will continue, with new competitive awards under the PECASE program. ($133.486 Million)

- Education. A FY 2000 competition will be conducted to award approximately 200 graduate fellowships under the National Defense Science and Engineering Graduate Fellowship Program. ($23.117 Million)

- Infrastructure. FY 2000 competitions will be conducted for new awards under the DEPSCoR and DURIP programs. Efforts begun in prior years under the URI Support Program will continue. ($60.175 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 1	R-1 ITEM NOMENCLATURE UNIVERSITY RESEARCH INITIATIVE PE 0601103D8Z

(U) FY2001 Plans:

- Research. Topics for new MURI starts will be selected in high-priority research areas such as fields underlying the understanding of harsh battlespace environments for military personnel and systems, life extension and life assurance for materials and structures, the physical and mathematical bases of information science, modeling and simulation, and education and training to improve human performance under extreme stress. Multidisciplinary and PECASE programs begun in prior years will continue, with new competitive awards under the PECASE program. ($130.094 Million)

- Education. A FY 2001 competition will be conducted to award approximately 200 graduate fellowships under the National Defense Science and Engineering Graduate Fellowship Program. ($21.449 Million)

- Infrastructure. FY 2001 competitions will be conducted for new awards under the DEPSCoR and DURIP programs. Efforts begun in prior years under the URI Support Program will be completed. ($58.789 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 1	R-1 ITEM NOMENCLATURE UNIVERSITY RESEARCH INITIATIVE PE 0601103D8Z

(U) B. Program Change Summary	FY1998	FY1999	FY2000	FY2001	Total Cost
Previous President's Budget	222.628	216.320	220.522	214.219	Continuing
Appropriated Value	230.788	229.420			Continuing
Adjustments to Appropriated Value					
a. Congressionally Directed undistributed reduction	(13.714)	(1.005)			
b. Rescission/Below-threshold Reprogramming, Inflation Adjustment	(2.474)		(3.744)	(3.887)	
c. Other					Continuing
Current President's Budget	214.600	228.415	216.778	210.332	Continuing

Change Summary Explanation:

(U) **Funding:** Funding changes due to inflation program adjustments.

(U) **Schedule:** Not Applicable

(U) **Technical:** Not Applicable

(U) **C. Other Program Funding Summary Cost** Not Applicable

D. Acquisition Strategy: Not Applicable

(U) **E. Schedule Profile** Not Applicable

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)									DATE February 1999	
APPROPRIATION/BUDGET ACTIVITY RDT&E/Defense Wide/BA 1							R-1 ITEM NOMENCLATURE Gulf War Illnesses Research PE 0601105D8Z			
COST*(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	0	23.674	19.185	19.098	18.988	0	0	0	Continuing	Continuing
Gulf War Illnesses Research/P105	0	23.674	19.185	19.098	18.988	0	0	0	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification

(U) BRIEF DESCRIPTION OF ELEMENT

(U) This program of Gulf War Illnesses (GWI)-related research addresses topics relevant to identifying the etiology and treatment of GWI, increasing our understanding of issues pertinent to Force Health Protection, and enhancing the protection of Service members against deployment-related health threats in future deployments. This program is conducted in coordination with the Research Working Group of the Persian Gulf Veterans' Coordinating Board.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/Defense Wide/BA 1	**R-1 ITEM NOMENCLATURE** Gulf War Illnesses Research PE 0601105D8Z

COST*(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	0	23.674	19.185	19.098	18.988	0	0	0	Continuing	Continuing
Gulf War Illnesses Research/P105	0	23.674	19.185	19.098	18.988	0	0	0	Continuing	Continuing

(U) Project Number and Title: P105 Gulf War Illnesses Research

(U) PROGRAM ACCOMPLISHMENTS AND PLANS

(U) FY1998 Accomplishments:

(U) None reported under this program element. This was a new program element beginning in FY1999. ($ 0 Million)

(U) FY1999 Plans:

(U) Competitively fund projects directed to multidisciplinary research to elucidate neurobiology of stress, connecting psychosocial, psychophysiological, and somatic/physiological outcomes in models of nonspecific and undiagnosed symptoms typical of ill Gulf War veterans.($ 3 Million)

(U) Competitively fund projects which advance deployment toxicology bioassay and biosentinel-based detection and exposure assessment methods, particularly strategies to assess neurotoxic health hazards ($ 3 Million)

(U) Competitively fund projects that explore and establish fundamentally important interactions of medical materiel and operational environments such as stress effects on access to the brain by prophylactic drugs, radiofrequency radiation-enhanced toxicity of drugs, stress effects and interactions of multiple vaccines on vaccine effectiveness
($ 3 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/Defense Wide/BA 1	R-1 ITEM NOMENCLATURE Gulf War Illnesses Research PE 0601105D8Z

(U) Competitively fund epidemiological studies to develop and evaluate effectiveness of health assessment and health care delivery pre-, during, and post-deployment, advancing Force Health Protection surveillance strategies in future deployments. ($ 3 Million)

(U) Conduct 2-year Medical Follow-up Agency (Institute of Medicine) study of prewar healthcare-seeking behaviors of Gulf War veterans and their subsequent health outcomes.
($ 0.5 Million)

(U) Conduct 2-year Medical Follow-up Agency (Institute of Medicine) study of Aberdeen personnel previously exposed to low level chemical agents. ($ 0.5 Million)

(U) Develop Leishmania vaccine and demonstrate feasibility of reliable serological diagnostic tests in a four year program conducted by Army and Navy infectious disease research laboratories Develop Leishmania vaccine and demonstrate feasibility of reliable serological diagnostic tests in a four year program conducted by Army and Navy infectious disease research laboratories.($ 1.5 Million)

(U) Conduct an expanded epidemiological research effort at the Naval Health Research Center involving deployment health assessments. ($ 1.5 Million)

(U) Conduct Congressionally-mandated study of difficult to diagnose conditions such as fibromyalgia, chronic fatigue syndrome, and multiple chemical sensitivities, using advanced neuroscience methods,
($ 3.15 Million)

(U) Study DOD and VA Gulf War registry participants in unique opportunity to address hypothesis-driven epidemiological research on deployment health risk factors. ($ 1 Million)

(U) Program management, contract servicing costs, and supplemental funding to previously funded GWI research studies.
($ 3.524 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/Defense Wide/BA 1	R-1 ITEM NOMENCLATURE Gulf War Illnesses Research PE 0601105D8Z

(U) FY2000 Plans:

(U) Continue projects in neurobiology of stress, deployment toxicology methods, operational interactions of medical materiel, and force health protection epidemiology, and competitively fund new projects to address issues raised by emerging finding from existing research and other discoveries. ($ 12 Million)

(U) Conduct 2-year Medical Follow-up Agency (Institute of Medicine) study of prewar healthcare-seeking behaviors of Gulf War veterans and their subsequent health outcomes. ($ 0.5 Million)

(U) Conduct 2-year Medical Follow-up Agency (Institute of Medicine) study of Aberdeen personnel previously exposed to low level chemical agents. ($ 0.5 Million)

(U) Develop Leishmania vaccine and demonstrate feasibility of reliable serological diagnostic tests in a four year program conducted by Army and Navy infectious disease research laboratories. ($ 1.5 Million)

(U) Conduct an expanded epidemiological research effort at the Naval Health Research Center involving deployment health assessments ($ 1.5 Million)

(U) Program management, contract servicing costs, and supplemental funding to previously funded GWI research studies.($ 3.185 Million)

(U) FY2001 Plans:

(U) Continue projects in neurobiology of stress, deployment toxicology methods, operational interactions of medical materiel, and force health protection epidemiology, and competitively fund new projects to address issues raised by emerging finding from existing research and other discoveries. ($ 12 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/Defense Wide/BA 1	R-1 ITEM NOMENCLATURE Gulf War Illnesses Research PE 0601105D8Z

(U) Conduct 2-year Medical Follow-up Agency (Institute of Medicine) study of prewar healthcare-seeking behaviors of Gulf War veterans and their subsequent health outcomes. ($ 0.5 Million)

(U) Conduct 2-year Medical Follow-up Agency (Institute of Medicine) study of Aberdeen personnel previously exposed to low level chemical agents. ($ 0.5 Million)

(U) Develop Leishmania vaccine and demonstrate feasibility of reliable serological diagnostic tests in a four year program conducted by Army and Navy infectious disease research laboratories. ($ 1.5 Million)

(U) Conduct an expanded epidemiological research effort at the Naval Health Research Center involving deployment health assessments.($ 1.5 Million)

(U) Program management, contract servicing costs, and supplemental funding to previously funded GWI research studies. ($ 3.098 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/Defense Wide/BA 1	**R-1 ITEM NOMENCLATURE** Gulf War Illnesses Research PE 0601105D8Z

(U) B. Program Change Summary	FY1998	FY1999	FY2000	FY2001	Total Cost
Previous Presidents Budget	0	19.646	19.515	19.443	Continuing
Appropriated Value	0	23.796	0	0	Continuing
Adjustments to Appropriated Value					
a. Congressionally Directed Undistributed Reduction	0	-0.122			
b. Rescission/Below-threshold Reprogramming, Inflation Adjustment	0	0	-0.330	-0.345	
c. Other	0	0	0	0	
Current Presidents Budget	0	23.674	19.185	19.098	Continuing

Change Summary Explanation: Funding changes are due to congressional undistributed reductions and inflation adjustments.

(U) Funding: FY 1999 establishes a separate PE for Gulf War Illness Research.

(U) Schedule: N/A

(U) Technical: FY 1999 establishes a separate PE for Gulf War Illness Research.

(U) C. OTHER PROGRAM FUNDING SUMMARY COST: N/A

(U) D. ACQUISITION STRATEGY: N/A

(U) E. SCHEDULE PROFILE: N/A

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)									DATE February 1999	
APPROPRIATION/BUDGET ACTIVITY RDT&E/Defense Wide/BA 1							R-1 ITEM NOMENCLATURE Government/Industry Co-sponsorship of University R PE 0601111D8Z			
COST*(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	6.942	4.801	6.351	6.762	6.891	7.011	7.226	7.345	Continuing	Continuing
GICUR/P111	6.942	4.801	6.351	6.762	6.891	7.011	7.226	7.345	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification

(U) BRIEF DESCRIPTION OF ELEMENT

(U) A shared commitment between industry and Government continues to be created via the Government/Industry Co-sponsorship of University Research (GICUR) program. It will capitalize on university based research, education and training in technologies of strategic importance to national defense and also to industry. It provides an emphasis on ground-breaking research with a long-term horizon, and education and training in selected research areas which are vital to advancement of technologies The commitment is a jointly formed pool of funding and a share d management structure for sponsoring this sort of long term basic research at universities. This will provide the military with leading-edge technologies as well as reducing vulnerabilities of industries involved, increase long-term technical growth in the se areas, infuse new ideas and approaches, all of which are important for national security. Industry and government share responsibility for research focus area selection and overall direction. This program will also employ advances in information technologies and telecommunications to provide extensive connectivity among the partners and research performers from the outset. Thus, strengths of individual investigators can be effectively linked, taking advantage of geographically disbursed nation al re sources. Mechanisms will be established for personnel exchange and interactions to provide for continuing education of highly qualified researchers already working in leading edge and emerging S&T. One program area implemented is on Complex Adaptive Networks. It meets the program criteria and is vital to DoD needs. The high priority thrust in this area is providing powerful mathematical and computer modeling methods to steer technology such that cascading effects and rapid, catastrophic failure of networks (e.g., battlefield communications, electrically powered ships, multisensor surveillance/ integration) are avoided. The results are of extreme importance for the Critical Infrastructures Protection national need. The second area implemented emphasizes basic concepts for DoD needs in high frequency applications such as radars, millimeter/microwave communications and radiometry, with special attention to devices fabricated from compound semiconductors, such as gal liumarsenide. This thrust is unique to DoD. The thrust is by no means limited to silicon-based CMOS (complementary metal oxide silicon) digital topics. Research here is aimed at breakthroughs to enable rapid, correct, verifiable, implementable designs of complex circuits . Interconnect research will include causes of delays and performance limits as features become smaller (for higher speed). Higher conductivity metals and very low dielectric constant materials will be investigated, as will non-conventional, innovative fabrication processes beyond present vision. These areas require truly innovative research.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/Defense Wide/BA 1	**R-1 ITEM NOMENCLATURE** Government/Industry Co-sponsorship of University R PE 0601111D8Z

(U) Within government, DoD has taken the lead in establishing GICUR efforts on these topics. An additional effort will now be directed at another area: Structures and Smart Materials for Reliability Advances This will be co-sponsored by industry in GICUR programs.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/Defense Wide/BA 1	**R-1 ITEM NOMENCLATURE** Government/Industry Co-sponsorship of University R PE 0601111D8Z

COST*(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	6.942	4.801	6.351	6.762	6.891	7.011	7.226	7.345	Continuing	Continuing
GICUR/P111	6.942	4.801	6.351	6.762	6.891	7.011	7.226	7.345	Continuing	Continuing

(U) Project Number and Title: P111 GICUR

(U) PROGRAM ACCOMPLISHMENTS AND PLANS

(U) FY1998 Accomplishments:

(U) Implemented complex adaptive networks program covered under new MOA between electric power industry and DoD, and design/interconnect research program for complex circuits covered under another MOA between industry and DoD. Finalized goals and management structure for both GICUR program, with emphasis on interactions between DoD and industrial consortia sponsors. Jointly chose the first subareas for research and determined selection criteria for proposals. Establish multi-university, multi-investigator programs for the focus topics. ($ 6.942 Million)

(U) FY1999 Plans:

(U) Evaluate operations of first industry-driven consortia, the research programs supported and set further directions. Plan for a new thrust in smart structures and smart materials for reliability advances suitable for university-performed consortium-teamed research. Identify organizations, industry groups, existing consortia, other government agencies, etc. interested in the GICUR concept for further program development. The program in this field will be implemented. Management structure is to be finalized with emphasis on multiservice needs and opportunities being addressed. ($ 4.801 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/Defense Wide/BA 1	R-1 ITEM NOMENCLATURE Government/Industry Co-sponsorship of University R PE 0601111D8Z

(U) FY2000 Plans:

(U) Research in long range aspects of the three areas included in GICUR will continue. For complex adaptive networks, mathematical and computer modeling methods developed will be tested against real world data and situations. For complex circuits, advance design concepts and interconnect schemes will be expressed in prototype devices. For smart structures and smart materials, opportunities will be identified to take concepts and methods achieved and use them in environments which could provide indicators for reliability advances. ($ 6.351 Million)

(U) FY2001 Plans:

(U) Theoretical and experimental achievements will be fully documented to-date. Research will continue along lines both needs and opportunity driven, dependent upon success to date. ($ 6.762 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/Defense Wide/BA 1	**R-1 ITEM NOMENCLATURE** Government/Industry Co-sponsorship of University R PE 0601111D8Z

(U) B. Program Change Summary	FY1998	FY1999	FY2000	FY2001	Total Cost
Previous Presidents Budget	7.393	9.870	9.667	9.691	Continuing
Appropriated Value	7.713	5.674	0	0	Continuing
Adjustments to Appropriated Value					
a. Congressionally Directed Undistributed Reduction	0.32	-0.873	0	0	
b. Rescission/Below-threshold Reprogramming, Inflation Adjustment	0	0	0	0	
c. Other	0	0	-3.316	-2.929	
Current Presidents Budget	6.942	4.801	6.351	6.762	Continuing

Change Summary Explanation: Funding changes are due to congressional undistributed reductions and inflation adjustments.

(U) Funding: FY 1988 and FY 1999 changes are due to Congressional directed reductions. Outyear adjustments are due to programmatic changes.

(U) Schedule: N/A

(U) Technical: FY 1988 and FY 1999 changes are due to Congressional directed reductions. Outyear adjustments are due to programmatic changes.

(U) C. OTHER PROGRAM FUNDING SUMMARY COST: N/A

(U) D. ACQUISITION STRATEGY: N/A

(U) E. SCHEDULE PROFILE: N/A

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)									DATE February 1999	
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/BA2							**R-1 ITEM NOMENCLATURE** Medical Free Electron Laser PE 0602227D8Z			
COST*(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	19.137	14.496	9.719	9.698	4.670	4.651	4.749	4.848	Continuing	Continuing
MFEL/P483	19.137	14.496	9.719	9.698	4.670	4.651	4.749	4.848	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification

(U) BRIEF DESCRIPTION OF ELEMENT

(U) The MFEL program seeks to develop advanced, laser-based applications for military medicine and electronic materials research. Free electron lasers (FELs) provide unique pulse features and tunable wavelength characteristics that are unavailable in other laser devices. Thus, FELs broaden the experimental options for the development of new laser-based applications.

(U) The majority of this program (80%) is focused on developing advanced procedures for the rapid diagnosis and treatment of battlefield - related casualties. Specific applications under investigation include soft tissue repair, hard tissue surgery, therapies for thermal burns and chemical burns, and enhanced medical imaging. Laser applications will be clinically tested in unique MFEL medical centers, leading to Food and Drug Administration (FDA) approval. There is high potential dual use for civilian medicine. Thus far, more than 20 clinical procedures have been developed in several medical specialties, including ophthalmology, orthopedics, thermal and chemical burn repair, and neurosurgery.

(U) A much smaller part of this program (20%) is focused on electronic materials research. In these studies, the high energy FEL beam is being exploited for improved processing applications including more effective dopants, surface cleaning and modification of transport properties of microelectronic substrates

(U) The program is executed extramurally. Performers include 5 major medical centers and approximately 20 applications groups. Awards are made competitively, following solicitation and peer review, for performance periods of 2 to 3 years. The program emphasizes the use of interdisciplinary teams of physicians, physicists, biologists, and engineers and collaborative interactions among the major MFEL centers.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/BA2	**R-1 ITEM NOMENCLATURE** Medical Free Electron Laser PE 0602227D8Z

COST*(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	19.137	14.496	9.719	9.698	4.670	4.651	4.749	4.848	Continuing	Continuing
MFEL/P483	19.137	14.496	9.719	9.698	4.670	4.651	4.749	4.848	Continuing	Continuing

(U) Project Number and Title: P483 MFEL

(U) PROGRAM ACCOMPLISHMENTS AND PLANS

(U) FY1998 Accomplishments:

(U) Research on surgery of the eye and the brain, on monochromatic X -ray imaging, and on improved electronic materials continued at Vanderbilt University. The mid-infrared FEL was compared with a new prototype optical parametric mid-infrared laser for incision quality. ($ 2.221 Million)

(U) Research on surgery of the eye, the brain, the skin, nerves and bone continued at Duke University. Performance of the vacuum ultraviolet (UV) laser was enhanced and the preclinical research facilities was completed. ($ 2.882 Million)

(U) Research on surgical applications of lasers in wound repair, neurosurgery and burn treatment continued at Mass General Hospital. Collaborations were conducted with the Army Institute of Chemical Defense on chemical burn treatment. ($ 3.751 Million)

(U) Research on wound sterilization and bone surgery continued at the Beckman Laser Institute. Development of a new Doppler-imaging device for guiding laser usage by burn surgeons continued. ($ 0.993 Million)

(U) Research on biomolecular and tissue absorption characteristics of FEL radiation continued at Stanford University, as was research into the effects of FEL radiation on microelectronic and energetic materials. ($ 2.155 Million)

(U) Research to develop compact FELs, optical fibers and wave-guides for use in hospitals and battlefield settings continued. ($ 3.283 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/BA2	**R-1 ITEM NOMENCLATURE** Medical Free Electron Laser PE 0602227D8Z

(U) Studies on the interactions of photons with biomolecules, cells, tissues, and materials continued.($ 3.852 Million)

(U) FY1999 Plans:

(U) A competition for medical center awards will be conducted during 1999 for awards beginning in FY2000. It is anticipated that the number of centers supported by the program will be reduced in number from five to three. Increased emphasis will be placed upon transition of research products for combat casualty care and military trauma centers by establishing collaborative projects between military medical sites and research centers funded under the program. ($ 14.496 Million)

(U) FY2000 Plans:

(U) Reduce number of centers funded in the Program from five to three and provide interim funding for close out and transition of promising technologies to industry. Phase out all electronics research and refocus continuing research efforts to address identifiable transition targets relevant to treatment and diagnosis of medical conditions of specific interest in military medicine. Selection of centers and specific projects will depend upon competition held during FY1999. ($ 9.719 Million)

(U) FY2001 Plans:

(U) Begin phase-out of two of the three academic research centers by transition of research efforts to either military medical institutions or industry. Continue development of new procedures for treatment and diagnosis of medical conditions of particular pertinence to military medicine. ($ 9.698 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/BA2	**R-1 ITEM NOMENCLATURE** Medical Free Electron Laser PE 0602227D8Z

(U) B. Program Change Summary	FY1998	FY1999	FY2000	FY2001	Total Cost
Previous Presidents Budget	20.103	9.706	4.800	4.782	Continuing
Appropriated Value	20.841	14.706	0	0	Continuing
Adjustments to Appropriated Value					
a. Congressionally Directed Undistributed Reduction	-1.704	-0.210			
b. Rescission/Below-threshold Reprogramming, Inflation Adjustment	0	0	-0.081	-0.084	
c. Other	0	0	5.000	5.000	
Current Presidents Budget	19.137	14.496	9.719	9.698	Continuing

Change Summary Explanation: Funding changes are due to congressional undistributed reductions and inflation adjustments.

(U) Funding: The budget reflects an increase of $5M in FY00 and FY01 to maintain three medical centers.

(U) Schedule: N/A

(U) Technical: Changes are due to Congressional adjustments in FY 1998 and FY 1999. Outyear programs continue support for three medical centers.

(U) C. OTHER PROGRAM FUNDING SUMMARY COST: N/A

(U) D. ACQUISITION STRATEGY: N/A

(U) E. SCHEDULE PROFILE: N/A

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)									DATE February 1999	
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA2							**R-1 ITEM NOMENCLATURE** Historically Black Colleges and Universities (HBCU) PE 0602228D8Z			
COST*(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	10.724	0	14.329	14.338	14.515	14.960	15.291	15.626	Continuing	Continuing
HBCU/P489	10.724	0	14.329	14.338	14.515	14.960	15.291	15.626	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification

(U) BRIEF DESCRIPTION OF ELEMENT

(U) This PE provides infrastructure support in fields of science and engineering that are important to national defense. This competitive program provides support through grants or contracts for research, collaborative research, education assistance, instrumentation purchases, and technical assistance. The research grants are to further the knowledge in the basic scientific disciplines through theoretical and empirical activities. Collaborative research allows university professors to work directly with military laboratories or other universities. Education assistance funds are used by the selected institutions to strengthen their academic programs in engineering, science and mathematics, thereby increasing the number of under-represented minorities obtaining undergraduate and graduate degrees in these fields. Funds for instrumentation allow institutions to increase their capability to perform research of interest to the Department. Technical assistance funds are used to design programs to enhance the ability of minority institutions to successfully compete for future defense funding.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA2	**R-1 ITEM NOMENCLATURE** Historically Black Colleges and Universities (HBCU) PE 0602228D8Z

COST*(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	10.724	0	14.329	14.338	14.515	14.960	15.291	15.626	Continuing	Continuing
HBCU/P489	10.724	0	14.329	14.338	14.515	14.960	15.291	15.626	Continuing	Continuing

(U) Project Number and Title: P489 HBCU

(U) PROGRAM ACCOMPLISHMENTS AND PLANS

(U) FY1998 Accomplishments:

(U) Awards were made under the DoD Infrastructure Support Program for HBCU/MIs. In one solicitation the Army, Navy and Air Force as a group made a total of forty-three grants to forty-two HBCU/MIs. There were thirty-five Instrumentation awards and eight Education awards. The Instrumentation Program awards made by the Army and Air Force provides for the acquisition of research and educational-use technology equipment and instrumentation. Emphasis is on instrumentation which will enhance the ability of HBCU/MIs to perform research which is of in terest to DoD and to increase the number of underrepresented minority graduates in the fields of science, engineering, and mathematics. The Navy continued funding for eight education centers. The Education Centers Program is designed to (a) enhance pro grams and capabilities at HBCU/MIs in scientific disciplines critical to the national security function of DoD and (b) to increase the number of underrepresented minority in the fields of science, mathematics and engineering. ($ 10.724 Million)

(U) FY1999 Plans:

(U) The FY 1999 program was divided among the Army, Navy, and Air Force to execute based on the Defense Reform Initiative.
($ 0.0 Million)

(U) FY2000 Plans:

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA2	**R-1 ITEM NOMENCLATURE** Historically Black Colleges and Universities (HBCU) PE 0602228D8Z

(U) Continue evaluation of the awards made with the prior year funds. In FY 2000 the HBCU/MI program will make additional awards using the program funds. These awards will be a combination of new starts, and continuations of some grants and other efforts started under previous fiscal years depending on technical progress. The Services will select the competitive awards from proposals submitted under the Infrastructure Support Program for HBCU/Mis. The: FY 2000 broad agency announcement is scheduled to be distributed in August 1999. ($ 14.329 Million)

(U) FY2001 Plans:

(U) Continue evaluation of the awards made with prior year funds. In FY2001, the HBCU/MI program will make additional awards using the program funds. These awards will be a combination of new starts, and continuations of some grants and other efforts started under previous fiscal years depending on technical progress. The Services will select the competitive awards. ($ 14.338 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA2	**R-1 ITEM NOMENCLATURE** Historically Black Colleges and Universities (HBCU) PE 0602228D8Z

(U) B. Program Change Summary	FY1998	FY1999	FY2000	FY2001	Total Cost
Previous Presidents Budget	11.080	0	0	0	Continuing
Appropriated Value	0	0	0	0	Continuing
Adjustments to Appropriated Value					
a. Congressionally Directed Undistributed Reduction	-0.356	0	0	0	
b. Rescission/Below-threshold Reprogramming, Inflation Adjustment	0	0	0	0	
c. Other	0	0	14.329	14.338	
Current Presidents Budget	10.724	0	14.329	14.338	Continuing

Change Summary Explanation:

(U) **Funding:** The Defense Reform Initiative directed that the FY 1999 program be distributed equally to the Services (Army PE 0601102A, Navy PE 0601153N, and Force PE 0601102F). However, for FY2000 and beyond the Defense Reform Initiative PBD 711R directed that program be reverted to OSD.

(U) **Schedule:** N/A

(U) **Technical:** The Defense Reform Initiative directed that the FY 1999 program be distributed equally to the Services (Army PE 0601102A, Navy PE 0601153N, and Force PE 0601102F). However, the Defense Reform Initiative reversed that direction FY 2000 and out year funds.

(U) **C.** **OTHER PROGRAM FUNDING SUMMARY COST:** N/A

(U) **D.** **ACQUISITION STRATEGY:** N/A

(U) **E.** **SCHEDULE PROFILE:** N/A

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1999		
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 2					R-1 ITEM NOMENCLATURE Lincoln Laboratory PE 0602234D8Z					
COST *(In Millions)*	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	17.197	19.271	20.774	20.739	20.994	21.275	21.781	22.590	Continuing	Continuing
Lincoln Laboratory/P534	17.197	19.271	20.774	20.739	20.994	21.275	21.781	22.590	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification

(U) BRIEF DESCRIPTION OF ELEMENT:

(U) The Lincoln Laboratory (LL) program is a high technology research and development effort conducted through a cost reimbursable contract with the Massachusetts Institute of Technology (MIT). LL is operated as a Federally Funded Research and Development Center (FFRDC) administered by the DoD, and is unique among DoD FFRDCs. It has no funding sources other than the Line for its innovative research and development efforts. This is due to the fact that LL is operated by MIT at no fee and may not charge for IR&D (under A-21). Other DoD FFRDCs do charge a fee with which they may support research efforts.

(U) The LL funds research activities that directly lead to the development of new system concepts, new technologies, and new components and materials. Historically, funding supports many development and demonstration programs which have led to such significant DoD systems as JSTARS, MILSTAR, GEODSS, as well as to solid-state devices and processes of major importance to the military industrial base. In addition to being the foundation for many new LL programs, the funding also supports other ongoing Laboratory programs with state-of-the-art technology developments. The program has the following 4 research elements:

- Target surveillance and recognition, with emphasis on (1) revolutionary sensing techniques and algorithms for detecting and recognizing battlefield targets both in the clear and in difficult deployments, (2) supporting data collection and phenomenology, and (3) fundamental target-recognition bounds and their implications for sensor and algorithm design.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 2	R-1 ITEM NOMENCLATURE Lincoln Laboratory PE 0602234D8Z

- High-connectivity, low-cost military global defense network and communications systems, with emphasis on new antennas, RF technology, network protocols (including for mobile users with lightweight transceivers), high-rate fiber and free-space optical communications systems, and the interconnection of these very disparate modalities into a global defense network that can truly realize the vision of a "from sensor to shooter" communications infrastructure which will greatly enhance force effectiveness by providing the right information at the right time anywhere in the world;

- Advanced combat support technologies for hyperspectral sensing systems, Micro Air Vehicles for battlefield surveillance and compact biological agent detection systems. The focus in biological agent detection is in developing technology for compact, lightweight, real-time biological-agent sensors with extremely high sensitivity (> 1 agent containing particle per liter of air) and with strong background clutter rejection for extremely low false-alarm rate (> 1 per week). The primary objective for the active hyperspectral sensing system development is to demonstrate the feasibility and utility of combining active illumination with hyperspectral imaging for a range of military applications including CID.

- Revolutionary, advanced electronic/optical technology, with specific emphasis on optical sampling for direct analog-to-digital conversion on the microwave carrier in digital receivers for radar and electronic intercept, 3-D imaging and high sensitivity IR focal-plane arrays for advanced missile seekers, mid-infrared semiconductor lasers to counter advanced heat-seeking missiles, new miniature fluorescent and microfluidic sensors for rapidly detecting and identifying low concentrations of biowarfare agents, solid state low-light imagers for improved night vision under starlight illumination, and high-speed, radiation hard, ultra-low power analog and digital circuits for ubiquitous DoD applications.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 2	R-1 ITEM NOMENCLATURE Lincoln Laboratory PE 0602234D8Z

COST *(In Millions)*	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	17.197	19.271	20.774	20.739	20.994	21.275	21.781	22.590	Continuing	Continuing
Lincoln Laboratory/P534	17.197	19.271	20.774	20.739	20.994	21.275	21.781	22.590	Continuing	Continuing

(U) Project Number and Title: P534 Lincoln Laboratory

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY1998 Accomplishments:

(U) Target Surveillance and Recognition: ($4.574 Million)

(U) Surface Surveillance

(U) Used the airborne data collection system to image large portions of Ft. Drum, NY over several seasons, creating a unique database of synthetic-aperture-radar (SAR) change phenomenology. Applied fundamental target-recognition bounds to design study of height-sensing SAR. Initiated investigation of "inverse scattering" theory for application to target-recognition in foliage penetrating SAR imagery. These activities have had direct impact on ongoing R&D activities such as Dynamic Data Base (DDB) and Radar Complex Data Exploitation (RCDE) (both DARPA); and have considerable significance for agencies such as NIMA and NRO that must plan next-generation exploitation and sensing systems.

(U) Space Surveillance

(U) Continued the advanced electro-optical technology program in support of the Air Force Space Control Mission. Expanded the technology development effort to include advanced electro-optical seekers for Ballistic Missile Defense. Continued the development of advanced CMOS readout multiplexers for IR focal plane arrays that will enable the improvement of FPA pixel to pixel spatial uniformity for high quantum efficiency detector materials such as InSb and HgCdTe. An FPA CMOS readout multiplexer design has been implemented; fabrication of CMOS integrated circuits for full function FPA readouts have begun. Continued the development of avalanche photo-diode (APD) array for 3-D laser radar imaging to support advanced BMD interceptor seeker concept. Four by four APD sub-arrays have been fabricated and wire bonded to 16-channel CMOS timing electronics. A 3D laser radar brassboard system has been demonstrated. The FPA technology developments will become the basis for improved seekers for the BMD community including the Navy Lower and Upper Tier Theater Ballistic Missile Defense Programs.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 2	R-1 ITEM NOMENCLATURE Lincoln Laboratory PE 0602234D8Z

(U) **Military Communications:** ($3.484 Million)

(U) Continued to investigate globally networked military communications systems that will enable the free flow of information among disparate users and systems at rates from tens of kilobits per second to tens of gigabits per second. The targeted user community for these systems includes DoD (Air Force, Navy & Army) and the intelligence community. Technology is under development for both free-space optical communications and terrestrial fiber communications, as well as for tactical theater communications, particularly to forces on the move, and for the interconnection of satellite communications (SATCOM), terrestrial and wireless systems into a global defense network.

(U) Optical communications: Free-space optical communications technology successfully transitioned to a funded flight demonstration program. Continued work to enhance optical transmitter power and efficiency as well as near-quantum-limited optical receiver technology. Application to world-wide relay of high-rate surveillance data.

(U) Global ultra-high rate networks: Continued development and demonstration of optical technology for ultra-high rate local and metropolitan area networks (LANs and MANs). Demonstration of optical processing functions for high-speed cryptography and for packet routing in a 100 Gbps LAN/MAN. Application to processing and fusion of surveillance data.

(U) Tactical Satellite Terminals: Continued development of electromagnetically-steered phased array antennas utilizing optical fiber and electro-optical technologies that offer light weight, low cost fabrication and integration on tactical platforms. Completed development of architecture and plans for integration of transmit and receive arrays. Continue implementation of an 8 GHz receive array. Application to ground forces communication on the move and to aircraft.

(U) Defensive Information Warfare: Developed and demonstrated a prototype protocol for dynamic reconfiguration in a network conferencing application, to confuse potential network attackers. Developed a network for realistic simulation of actual attacks and anomalous usage, mixed with normal network background traffic, in order to evaluate objectively the performance of existing and developmental intrusion detection systems.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 2	R-1 ITEM NOMENCLATURE Lincoln Laboratory PE 0602234D8Z

(U) **Combat Support Technology**: ($2.903 Million)

(U) Designed and developed a baseline active hyperspectral imaging (HSI) system that incorporates a VIS/NIR white-light "laser" illuminator on a scanning, tripod-mountable platform with a compact imaging spectrometer. The system was successfully tested in a series of laboratory experiments to demonstrate utility in detection and identification of concealed targets in a low-light, highly-cluttered environment. A series of outdoor tests designed to verify performance in concealed target detection and demonstrate range-gating ability are planned. Applications for the baseline system include man or vehicle vision enhancement, mine detection, and optical taggant discrimination.

(U) To improve the performance of UV fluorescence-based biological-agent sensors a large number of agent stimulants and background substances (pollens, mold spores, etc.) were measured in an aerosol chamber. In addition, field measurements of background clutter continued. These lab and field measurements have led to the development of a three-channel sensor for the Army, with considerably enhanced discrimination capability as compared to the previous two-channel sensor. Work was initiated in networking sensors together, both in simulations and for real-time sensing and discrimination. Also, development of a biological identifier accelerated with the addition of DARPA support. Immunological B-cells are being tailored and introduced into microfluidic chambers, which will analyze samples selected by the alarm device. Each cell fluoresces in response to a specific antibody and thereby will provide rapid identification of agents.

(U) Several fixed-wing Micro Air Vehicle (MAV) airframe configurations were tested in a wind tunnel to evaluate electric propulsion performance and the effectiveness of different wing and tail arrangements. Several airframe configurations were also outfitted with radio control for flight testing. A vehicle with 10-in. wingspan flew successfully. Development of more efficient, miniature internal combustion engines continued throughout the year. Optical designs were completed for two high-resolution, visible imaging cameras. The transfer of Lincoln technology will be completed by the end of FY98.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 2	R-1 ITEM NOMENCLATURE Lincoln Laboratory PE 0602234D8Z

(U) **Advanced Electronics Technology:** **(**$6.236 Million)

(U) The general objective of this program is to conceive, demonstrate, and provide advanced electronic devices, circuits and subsystems for Air Force and other DoD systems, and to transfer enabling technologies to industry. Principle efforts are in lasers, electro-optic devices, visible and infrared (IR) sensor arrays, analog and digital silicon integrated circuits, microwave and mm-wave devices, and superconducting electronic devices along with supporting development of materials and processing techniques. These efforts support DoD systems programs elsewhere within Lincoln Laboratory, as well as directly supporting AFRL (IR countermeasures (CM), adaptive optics, focal plane readout circuits, electro-optical space surveillance). Technology from this program is exploited by the Army and Navy ballistic missile defense programs (focal plane readout circuits), by Army EdgeWood Research Development and Engineering Center (ERDEC) (bioaerosol sensors), by DARPA (sub 0.25-µm lithography, low-power/higher-speed CMOS circuits in silicon-on-insulator (SOI) material, high speed optical sampling for analog-to-digital (A/D) conversion, microfluidic bio-agent identifier, multichip modules) by BMDO (avalanche photodiodes for 3-D radar, GaN layers for electronics, superconductive spread spectrum modem) and NSA (superconductive crossbar switch, high-speed cryogenic memory). Technology transfer is being accomplished through direct DoD support (IR countermeasures, CMOS/SOI circuits, imaging arrays and readout circuits, superconductive filters), and through cooperative research development agreements (CRDAs) microchip UV lasers, lithographic technology, and diamond switch technology.

(U) Selected accomplishments: (1) Demonstrated high-power, high brightness lasers at 2- and 4-µm for dual-band IR counter measure subsystem; (2) Demonstrated resonant-tunnel-diode injection-locked oscillator for stable laser driver in optically sampled A/D converter; (3) Fabricated demultiplexers for optical A/D converter; (4) Demonstrated high-accuracy, low-power charge-coupled device (CCD) as A/D converter; (5) Evaluated SOI material and initiated fabrication of merged CMOS/CCD circuit for “smart” focal planes; (6) Demonstrated 1.3-µm-wavelength tapered laser/amplifier with low noise for compact, wide-dynamic- range, analog fiber-optic link; (7) Demonstrated multi-GHz-bandwidth superconductive compressive receiver for electronic intelligence (ELINT); (8) Fabricated > 1-GHz clock-rate SOI/CMOS data-processing circuits for ELINT receiver; (9) Demonstrated geiger-mode avalanche photodiode (APD) array with CMOS per-pixel timing circuits for 3-D radar; (10) Demonstrated antiblooming feature for extended intrascene dynamic range in CCD imager for improved night vision; (11) Continued development of miniature IR, visible and UV lasers for ranging and biodetection; (12) Designed tunable microwave filters using superconductive resonators; (13) First demonstration of avalanche photo gain in GaN.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 2	R-1 ITEM NOMENCLATURE Lincoln Laboratory PE 0602234D8Z

(U) **FY1999 Plans:**

(U) **Target Surveillance and Recognition**: ($4.977 Million)

(U) **Surface Surveillance:**

(U) Initiate development of multichannel airborne data collection capability. Extend fundamental target-recognition bounds to high-range-resolution radar profiling for application to moving-ground-target recognition. Use synthetic foliage-penetrating radar imagery to validate target representation for inverse-scattering-based recognition techniques. Initiative investigation of active seismic characterization of underground facilities – develop computational model and validate with subscale experimentation. In addition to being directly applicable to ongoing R&D efforts such as DARPA's DDB, MTE, FOPEN and Small Unit Operations programs, these activities will have considerable significance for organizations, such as NIMA, NRO and the Services, that are planning and developing next-generation exploitation and sensing systems.

(U) **Space Surveillance**:

(U) Continue advanced focal plane technology work with emphasis on submicron and SOI CMOS device processing technologies applied to silicon monolithic read-out multiplexers for high quantum efficiency FPAs. Continue 3-D laser radar technology development with epoxy bonding of 32 x 32 APD arrays to SOI-CMOS timing electronics arrays for high sensitivity receivers. These advanced focal plane array technologies for both passive and active IR sensors will lead to new BMD interceptors with much-needed improvements in detection, acquisition and discrimination to counter increasingly challenging ballistic missile threats. Both the Army and Navy Theater Ballistic Missile Defense Programs will gain advanced interceptor capabilities form these technologies.

(U) **Military Communications**: ($4.183 Million)

(U) Continue to investigate technology for global high-rate military communications and networking at rates from tens of megabits to tens of gigabits per second, including optical communications and tactical theater communications (particularly to Army forces on the move). Global ultra-high rate networking: Initiate test-bed demonstration of 100 Gps LAN and MAN for processing surveillance data, utilizing soliton optical pulses and optical processing (current state-of-the-art for electronic networks is ~2Gbps); demonstrate networking techniques and protocols for interconnection of disparate military communications systems. Milsatcom: Complete architecture for EHF Milsatcom beyond 2005, including sophisticated, agile and narrow RF beam steering, advanced low-power on-board signal processing, and new networking techniques to enable efficient computer communications over EHF Milsatcom; identify required technology developments. Tactical Satellite Terminals: Continue development of optically-controlled phased array antennas. Evaluate 4-element receive array at 8 GHz; continue development of integrated transmit and receive array (application to communications on-the-move to ground forces and to aircraft).

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 2	R-1 ITEM NOMENCLATURE Lincoln Laboratory PE 0602234D8Z

(U) Defensive Information Warfare: Techniques for dynamic network reconfiguration will be refined, extended and demonstrated in the context of a large scale network, as a step towards developing technology for improved robustness in military C4I systems. The attack/anomalous usage simulation system will be extended beyond the Unix environment to embrace popular commercial operating systems, such as Windows NT, frequently used by the military. The development and refinement of algorithms for improved real time intrusion detection will continue, with preliminary evaluation in military base-protect operating environments.

(U) **Combat Support Technology**: ($3.158 Million)

(U) Hyperspectral Sensing Systems: Extend the operating spectral region of both the white light "laser" and the spectral imaging systems to encompass the 1 to 2 micron and 3 to 5 micron bands. Continue processing algorithm development in order to identify key features for target recognition and visualization using the extended sensing capability. This system will be tested in both laboratory and field environments on a variety of targets and scenarios of military interest. Design of a full-spectral system, spanning the visible through infrared bands will be initiated and the factors affecting fusion with other sensing systems, such as synthetic-aperture radar, will be examined.

(U) Biological Agent Detection Systems: Field measurements and aerosol-chamber measurements will continue. Lab measurements will concentrate on growth media. Field measurements will broaden applications by measuring in and around buildings for counter-terrorism applications. Microfluidics technology work will focus on expanding the capability to design and fabricate complex structures for tissue-based sensors. Advanced laser and optical technology will be pursued to adapt the UV fluorescence sensor to other missions, e.g., release assessment after an attack on an underground structure. Modeling and simulation efforts will be expanded to integrate battlefield communications and biodetection sensor models in a detailed ModSAF simulation. These technology efforts will be flowed into the Army ATD on biological sensing, the Joint Biological Remote Early Warning System (JBREWS) ACTD, and into an expected follow-on Army ATD on a combined chemical, biological, nuclear sensor.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 2	R-1 ITEM NOMENCLATURE Lincoln Laboratory PE 0602234D8Z

(U) **Advanced Electronics Technology**: ($6.836 Million)

(U) In support of digital receivers for advanced DoD sensors, demonstrate direct RF optical sampling (no down conversion) with A/D conversion at greater than 100 MHz bandwidth and 80 dB dynamic range. Transition baseline mid-IR semiconductor laser technology to industry for dual-wavelength IRCM systems. Continue development of tunable superconductive RF filters for frequency-agile receivers. Demonstrate 4-GHz bandwidth ELINT receiver incorporating superconductive chip filters and CMOS/SOI data processor. Explore micromechanical RF tuning structures for electronically reconfigurable microwave communications circuits. Commence development of AlGaN materials for avalanche photodiodes. Demonstrate controlled-impedance multi-chip module (MCM) with high-speed digital circuits. Reduce dark current levels and develop CMOS-based versions of visible, UV and IR focal planes in support of AF, DARPA, and other DoD programs. Continue development of advanced silicon digital and analog integrated circuits to support emerging DoD systems, with an emphasis on low-power/high-speed subsystems in MCMs. Extend SOI/CMOS to sub-200-nm feature size radiation hard process. Demonstrate tunable low-noise tapered lasers in the 1.3-µm region for wavelength division multiplexed RF links. Continue development of bio-detector technology with emphasis on discrimination and identification methodologies. Demonstrate APD arrays for use at eye-safe wavelengths in 3-D ranging/imaging applications. Demonstrate 3-D radar subsystems incorporating a geiger-mode photodiode array, integrated timing electronics, and compact laser illuminator.

(U) **FY2000 Plans:**

(U) **Target Surveillance and Recognition**: ($5.621 Million)

(U) **Surface Surveillance:**

(U) Complete development of multichannel airborne data collection capability. Formulate new sensor designs incorporating insights gained from development of fundamental ATR performance bounds and high-definition vector imaging (HDVI). Use synthetic foliage-penetrating radar imagery for initial validation of inverse-scattering-based target recognition Develop algorithms for exploiting active seismic signatures of underground facilities and validate with subscale experimentation. In addition to being directly applicable to ongoing R&D efforts such as DARPA's DDB, MTE, FOPEN and Small Unit Operations programs, these activities will have considerable significance for organizations, such as NIMA, NRO and the Services, that are planning and developing next-generation exploitation and sensing systems.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 2	R-1 ITEM NOMENCLATURE Lincoln Laboratory PE 0602234D8Z

(U) **Space Surveillance**:

(U) Continue the development of advanced focal plane arrays in both visible and IR wavebands and in-pixel focal plane signal processing. Continue the development of 3-D laser radar for advanced seeker applications with the capability to scale the array size to greater than 32X32 pixels. The on-FPA processing technologies for both passive and active (LADAR) sensors promise significant improvements in performance and reductions in development and life cycles costs for future BMD interceptor systems for Navy Theater Area Defense and Theater Wide Defense.

(U) **Military Communications**: ($4.724 Million)

(U) Continue to develop technology for global high-rate military communications and networking, including optical communications in space and fiber, future EHF Milsatcom architecture and technology, and tactical theater communications (particularly to Army forces on the move). Continue extension and demonstration of networking techniques and protocols for interworking among disparate networks including Milsatcom. Complete 100 Gbps optical LAN/MAN testbed (application to surveillance data processing). Continue demonstration of integrated transmit/receive phased array antenna system, and begin design of prototype system for future Milsatcom applications. Continue development of Milsatcom signal processing technology; continue laboratory demonstration of integrated on-board demodulation, switching, and routing techniques for next-generation EHF Milsatcom.

(U) Defensive Information Warfare: Prototype protocols for improved security and robustness to network attack in Internet environments will be developed and demonstrated in the context of a distributed collaborative planning application, as a further step towards more netware attack-resilient military C4I systems. The development and evaluation of advanced techniques for network intrusion detection will be continued, with emphasis on the fusion of complementary data from an ensemble of cooperating intrusion detection systems, for improved aggregate performance.

(U) **Combat Support Technology**: ($3.566 Million)

(U) Hyperspectral Sensing: Develop a full-spectral active HSI system, using select, discrete-frequency laser wavelengths throughout the visible through mid-wave IR spectral regions, broadband illumination in discreet segments of those regions, and passive long-wave IR imaging. The system will be adaptable, where both the sensing wavebands and target-recognition algorithms will be specified by the applications. For some applications, visible APD arrays will be incorporated that permit range-resolved imaging as well as the standard spatial and spectral imaging that the active HSI system affords. Effort will also be expended in developing real-time processing and visualization schemes for either direct relay to user or transmission to a control station for fusion of multiple sensing assets.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 2	R-1 ITEM NOMENCLATURE Lincoln Laboratory PE 0602234D8Z

(U) Biological Agent Detection Systems: Perform lab tests to explore integrating a UV fluorescence trigger sensor with a microfluidic biofilter and with a B-cell identifying sensor. Extend the modeling and simulation to develop advanced sensor-fusion algorithms and to look at simulation of combined Nuclear Biological Chemical (NBC) sensor. Explore how to adapt biological sensing processes (e.g., B-cell sensing) to non-living systems. This work will feed into the Army ATD and also into the Joint Biological Universal Detection (JBUD) system to be developed by the Joint Program Office for Biological Defense.

(U) **Advanced Electronics Technology**: ($7.863 Million)

(U) Extend direct RF optical sampling to higher bandwidths by demonstrating scalable methods for parallelizing quantizers. Improve materials and spectral combining techniques enabling higher-brightness and higher- operating-temperature optically pumped mid-IR semiconductor lasers for IRCM applications. Continue development of advanced silicon process technology with extensions of CMOS to sub-100-nm feature sizes, with emphasis on development of technologies for on-focal processing, radiation hard technologies, and integrated sensors. Explore applications of visible and IR "expendable" imagers for unmanned observation post. Demonstrate micromechanically reconfigurable microwave ICs for frequency-agile receivers. Continue development of bio-detector technology with emphasis on compact, long duration sensors capable of rapid agent identification. Develop AlGaN UV detectors for solar blind applications

(U) **FY 2001:**

(U) **Target Surveillance and Recognition: ($5.355 Million)**

(U) **Surface Surveillance:**

(U) Use multichannel airborne data collection system to demonstrate wide-area, high-resolution, rapid-revisit GMTI with ECCM. Develop and apply absolute (vs. relative, between two sensor designs) fundamental ATR performance bounds. Use real foliage-penetrating radar imagery to validate inverse-scattering-based target recognition. Test exploitation of active-seismic underground-facility signatures with full-scale experimentation. In addition to being directly applicable to ongoing R&D efforts such as DARPA's DDB, MTE, FOPEN and Small Unit Operations programs, and to planning and development activities of NIMA, NRO and the Services, this activity will help develop and prove concepts crucial to creation of a true joint integrated air/ground picture

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 2	R-1 ITEM NOMENCLATURE Lincoln Laboratory PE 0602234D8Z

(U) Space Surveillance

(U) Continue the development of 3-D laser radar technologies for advanced seeker applications. These include compact, high efficiency lasers, receiver FPA's and high sensitivity passive sensor FPA's for acquisition and handover to the LADAR. These advanced technology sensors will allow future ballistic missile defense interceptors to address very advanced missile threats which will include intentional countermeasures applied to both defense tracking radars as well as the IR interceptor seekers. The evolving Ballistic Missile Defense Organization (BMDO) Technology Readiness Roadmap specifically identifies these technology developments as high priority for future BMD systems by both Air Force, Army and Navy BMD Programs.

(U) Military Communications: ($4.500 Million)

(U) Continue to develop technology for global high-rate military communications and networking, including optical communications in space and fiber, future Milsatcom architecture and technology, and tactical theater communications (particularly to Army forces on the move). Continue Laboratory demonstrations of technology for DoD-specific applications (particularly in EHF Milsatcom signal and antenna processing), refine networking architecture and protocols, complete integrated transmit/receive phased array antenna, and aid DoD in defining its development and procurement strategy for the future global defense network that will provide C3 and ISR product transport. Application is to the emerging integration of DoD command elements, information centers, and execution forces into a unified Global Information Grid.

(U) Defensive Information Warfare: Dynamic reconfiguration and improved security protocols will be integrated with state-of-the-art intrusion detection technology for adaptive real time reaction to network attacks. Intrusion detection strategies will be extended to focus on anomalous user behavior, with the objective of countering computer/network attacks mounted from inside the protected bastion perimeter. Transition of proven technology to military operating environments will be initiated.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 2	R-1 ITEM NOMENCLATURE Lincoln Laboratory PE 0602234D8Z

(U) Combat Support Technology: ($3.398 Million)

(U) Hyperspectral Sensing Systems: Operational concepts will be developed during this phase of the 4-D hyperspectral sensor program for surface surveillance and reconnaissance to be operated on various platforms such as ground vehicles (including unattended ground sensors), UAVs and aircraft. The effort will focus on selected specific applications which will lead to the design and development of compact and/or miniaturized sensing systems, adaptive and automated real-time (or near real-time) processing algorithms, as well as protocols for communication and product dissemination.

(U) Biological Agent Detection Systems: Develop and test a fully integrated detection/identification system, including the required communications and data-fusion architectures. Explore how to integrate biological sensors with chemical and nuclear sensors. Begin to test sensors based on non-living systems.

(U) Advanced Electronics Technology: ($7.486 Million)

(U) Investigate highly scaled CMOS/SOI digital circuits using mixed electron-beam and optical lithography at 25-nm feature sizes for ultradense circuits. Demonstrate compact and power efficient version of optically sampled A/D with multi-GHz bandwidth for radar and electronic intelligence use. Demonstrate highly integrated imager with digital output in optimized low-power-consumption configuration suitable for tactical image web and/or micro-air vehicle use. Continue development of UV, visible, IR and hyperspectral imaging devices with on-focal-plane processing for "smart" multimode sensors. Explore analog optical processing techniques to extend performance of compressive receivers to 10-GHz bandwidth for signal intercept. Extend micromechanically reconfigurable microwave circuits to high power for transmitter applications. Transfer advanced mid-IR semiconductor laser technology to industry for dual-wavelength IRCM. Continue development of solid-state devices, materials and processing subsystems in support of DoD programs.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 2	R-1 ITEM NOMENCLATURE Lincoln Laboratory PE 0602234D8Z

(U) B. Program Change Summary	FY1998	FY1999	FY2000	FY2001	Total Cost
Previous President's Budget	17.708	19.641	19.574	19.252	Continuing
Appropriated Value	18.474				Continuing
Adjustments to Appropriated Value					
a. Congressionally Directed undistributed reduction	(0.766)				
b. Rescission/Below-threshold Reprogramming, Inflation Adjustment					
c. Other			1.500	1.800	Continuing
Current President's Budget	17.708	19.641	21.074	21.052	Continuing

Change Summary Explanation:

(U) **Funding:** Changes in 1998 are based on Congressionally directed reduction. FY2000 and FY2001 was increased to extend the technology developed for chemical agent detection to include biological agent detection technology.

(U) **Schedule:** Not Applicable

(U) **Technical:** Not Applicable

(U) **C. OTHER PROGRAM FUNDING SUMMARY COST:** Not Applicable

(U) **D. ACQUISITION STRATEGY** Not Applicable

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 2	R-1 ITEM NOMENCLATURE Lincoln Laboratory PE 0602234D8Z

(U) **E. SCHEDULE PROFILE:** Not Applicable

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)									DATE February 1999	
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 2							R-1 ITEM NOMENCLATURE Medical Technology PE 0602787D8Z			
COST*(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	8.559	9.212	8.903	8.742	8.990	9.210	9.380	9.526	Continuing	Continuing
Radiation Injury Assessment and Therapeutic Approa/P505	8.559	9.212	8.903	8.742	8.990	9.210	9.380	9.526	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification

(U) BRIEF DESCRIPTION OF ELEMENT

(U) This program supports applied research to investigate new approaches that will lead to advancements in biomedical strategies for preventing, treating, assessing and predicting the health effects of ionizing radiation, either alone or in combination with other biological warfare (BW)/chemical warfare (CW) toxicants. The premise is that DoD must be ready to conduct tactical, humanitarian or counterterrorism missions within radiation environments. Development of protective and therapeutic strategies will enable military forces to operate, when required, in nuclear or radioactive combat environments, while minimizing both short- and long-term risks of adverse health consequences. Advancements in tools to measure radiation exposure to military personnel will be us ed in triage, treatment decisions and risk assessment. Accurate models to predict casualties, particularly in combined nuclear-biological-chemical NBC environments, will promote effective command decisions and force structure plannin g to ensure mission success.

(U) The program has three primary goals: (1) to understand the pathological consequences of radiation injury and radiological hazards in order to provide a rational basis for prophylactic and therapeutic drug development; (2) to develop novel biological markers and delivery platforms for rapid, field-based individual dose assessment; (3) to define any interactions between radiation and BW or CW agents that cause more severe injury and the drugs used to protect against them -- with the goal of developing new models to predict casualties.

(U) This program is executed by the Armed Forces Radiobiology Research Institute (AFRRI) which, because of its multidisciplinary staff and facility resources, is uniquely qualified to carry out this mission. AFRRI's radiation sources allow the simulation of any radiological environment that might be encountered. Because national laboratories operated by the Department of Energy no longer support research efforts relevant to military medical radiobiology, the AFRRI is currently the sole laboratory with the combined capabilities needed to conduct this research.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 2	**R-1 ITEM NOMENCLATURE** Medical Technology PE 0602787D8Z

COST*(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	8.559	9.212	8.903	8.742	8.990	9.210	9.380	9.526	Continuing	Continuing
Radiation Injury Assessment and Therapeutic Approa/P505	8.559	9.212	8.903	8.742	8.990	9.210	9.380	9.526	Continuing	Continuing

(U) Project Number and Title: P505 Radiation Injury Assessment and Therapeutic Approach

(U) PROGRAM ACCOMPLISHMENTS AND PLANS

(U) FY1998 Accomplishments:

(U) Developed new strategies for preventive treatments of both acute and chronic radiation injuries based on (a) fundamental mechanisms of cellular and molecular injury, (b) selecting less toxic drug alternatives, (c) pharmacologic quenching to reduce drug toxicity, and (d) new drug delivery alternatives. ($ 2.114 Million)

(U) Developed enhanced treatments for radiation-associated infections using immune system stimulators. ($ 2.045 Million)

(U) Evaluated newly developed delivery platform for cytogenetic-based radiation dose assessments in individuals. The system will provide standardized operational simplicity needed to carry out dose assessments in clinical and reference laboratories, enabling better medical management of large numbers of casualties .($ 0.664 Million)

(U) Identified and initiated development of two classes of novel molecular markers potentially useful as diagnostic determinants of radiation doses received by individuals. Observed that ionizing radiation induces a specific deletion in the genomes of mitochondrial DNA and alterations in oncogene expression, both of which are quantifiable in a dose-dependent fashion. Both classes of markers can be easily and quickly measured using newly developed polymerase chain reaction (PCR) methods for nucleic acid sequence analysis. ($ 0.658 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 2	**R-1 ITEM NOMENCLATURE** Medical Technology PE 0602787D8Z

(U) Quantified the increased mortality rates seen in irradiated mice infected via the pulmonary route with *Bacillus anthracis* (Sterne) spores. Initiated studies to assess effects of radiation on the immune status of individuals vaccinated with the anthrax vaccine. Established *in vitro* model systems to assess radiation/viral interactions. Data will be used to build casualty prediction models and develop treatment protocols for combined injuries. ($ 1.054 Million)

(U) Identified a synergistic consequence that causes redistribution of blood flow within the body resulting from the interaction of sub-lethal radiation and therapeutic levels of the nerve agent prophylactic pyridostigmine. These data will be used to assess treatment of combined injuries. ($ 0.961 Million)

(U) Initiated studies to assess the cancer-ca using potential of depleted uranium (DU) in laboratory animals. Initiated a pilot study to assess the effects on the immune system of tissue-embedded DU fragments. Initiated development of a potentially fieldable method to measure uranium in the urine of military personnel. ($ 0.792 Million)

(U) Planned study and initiated pilot experim ents to determine the toxicity associated with tungsten, which is a proposed replacement metal for DU in munitions manufacturing . ($ 0.271 Million)

(U) FY1999 Plans:

(U) Initiate studies to assess efficacy of conventional or slow-released radioprotectants to prevent or reduce late-arising health consequences of radiation, including cancer and chronic immune system suppression. ($ 2.222 Million)

(U) Develop and test second-generation radioprotective modalities that improve efficacy through sustained effectiveness. Assess newly available drug prototypes for protective efficacy against acute radiation injury. ($ 2.009 Million)

(U) Continue development of clinical bioassays that provide a rapid dose assessment capability for radiation exposures involving a broad spectrum of radiation qualities (gamma, neutron, etc.). Develop an automated analytical capability that allows high sample-number throughput and operability by generalist laboratory technicians. ($ 0.748 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 2	**R-1 ITEM NOMENCLATURE** Medical Technology PE 0602787D8Z

(U) Continue identification and development of new biological markers and compact, portable instrumentation for radiation dose assessments that provide a simple and easy-to-use forward-fielded screening system. Measure effects of incremental doses and time-course of exposures to evaluate the practical utility of candidate assays. ($ 0.779 Million)

(U) Extend radiation/BW agent interaction studies to assess incapacitation resulting from combined exposures to a variety of doses, and add this endpoint to casualty prediction models. Continue studies to determine the effect of radiation on the immune status of individuals vaccinated against anthrax. Extend *in vitro* models for viral/radiation interactions to *in vivo* model systems. ($ 1.222 Million)

(U) Initiate studies to determine how radiation and nerve agents interact to adversely affect military personnel upon combined exposure. Continue assessments of the physiologic consequences of combined exposure to radiation and the nerve agent prophylactic pyridostigmine. ($ 1.219 Million)

(U) Continue laboratory animal studies on the cancer risk of DU to refine recommendations for treatment of military personnel wounded by DU. Initiate full study on the toxicity of tungsten. Initiate pilot studies to determine the long-term effects on the immune, nervous, and male reproductive systems from exposure to DU. ($ 1.013 Million)

(U) FY2000 Plans:

(U) Continue to develop and test second generation of radioprotective treatments with sustained effectiveness. Assess efficacy of newly synthesized drug prototypes for protection from acute radiation injury. ($ 2.043 Million)

(U) Design, synthesize, and provide initial testing of drug prototypes to treat immune system deficiencies after radiation exposure. ($ 2.043 Million)

(U) Continue development of clinical bioassays for assessment of radiation exposures. Optimize protocol to permit assessment of prior radiation exposure. Develop a rapid sample processing procedure involving the use of a portable incubator to minimize cell culture delays for the analysis of samples using the clinical bioassays. ($ 0.721 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 2	R-1 ITEM NOMENCLATURE Medical Technology PE 0602787D8Z

(U) Continue evaluation of new assays to detect radiation exposure to provide simple and easy-to-use forward-field screening exposure-assessment tools. Develop automated analysis systems to efficiently evaluate promising candidate bioassays. ($ 0.757 Million)

(U) Continue assessment of immunization strategies for B. anthracis in combination with radiation. Quantify the interactions of radiation with incapacitating bacterial agents for non-lethal endpoints to provide prediction models of casualties from combined injuries. Extend radiation/BW agent interaction studies to the viral threat agent Venezuelan Equine Encephalitis (VEE) virus, assessing increased mortality of the combined exposure in order to expand the capability of casualty prediction models and to provide appropriate care for casualties. ($ 1.441 Million)

(U) Assess the changes in sensitivity to nerve agent induced seizures with prior exposure toionizing radiation. Initiate studies on effectiveness of therapeutic regimens to mitigate these seizures. Quantify the interactions of nerve agent and radiation in order to expand the capability of casualty prediction models. ($ 0.918 Million)

(U) Continue studies on the cancer risk of DU in laboratory animals, tungsten toxicity, and the long-term effects of exposure to DU on immune, nervous, and male reproductive systems. ($ 0.980 Million)

(U) FY2001 Plans:

(U) Continue development of simple, self-administered drug delivery systems for radiation protection and treatment. Evaluate transdermal skin patches, oral administration, and autoinjector systems. ($ 4.012 Million)

(U) Continue development of clinical bioassays to provide rapid assessment of radiation exposure from a low dose and low dose-rate exposures. Establish protocols to process high number of samples simulating a mass-casualty incident. ($ 0.708 Million)

(U) Continue identification and development of new assays to detect radiation exposure. Complete in vitro evaluation studies to permit identification of suitable cytological and molecular biomarker to transition to in vivo validation studies. ($ 0.743 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 2	**R-1 ITEM NOMENCLATURE** Medical Technology PE 0602787D8Z

(U) Complete assessment of effectiveness of t he vaccine for anthrax to provide protection from infection with a combined radiation/B. anthracis exposure. Continue studies with other vaccines (e.g. for VEE). Assess therapeutic strategies for combined exposures to radiation and B. anthracis in order to evaluate current therapeutic strategies and to recommend the best treatments for combined injuries. ($ 1.424 Million)

(U) Continue assessment of interactions of radiation with nerve agent and nerve agent therapeutics in order to provide recommendations for appropriate treatment protocols for combined injuries. Interactions will be determined for various nerve agents, various time intervals between radiation /agent exposures and various doses of radiation and of nerve agent to fully characterize the interactions for both therapeutic strategies and casualty prediction models. ($ 0.893 Million)

(U) Continue studies on the cancer risk of DU in laboratory animals. Complete tungsten toxicity study. Complete pilot studies on long-term effects of exposure to DU on immune and nervous systems. Continue male reproductive study. ($ 0.962 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 2	**R-1 ITEM NOMENCLATURE** Medical Technology PE 0602787D8Z

(U) B. Program Change Summary	FY1998	FY1999	FY2000	FY2001	Total Cost
Previous Presidents Budget	8.669	9.239	9.056	8.900	Continuing
Appropriated Value	8.407	9.239	0	0	Continuing
Adjustments to Appropriated Value					
a. Congressionally Directed Undistributed Reduction	0	-0.027			
b. Rescission/Below-threshold Reprogramming, Inflation Adjustment	0	0			
c. Other	0.152	0	-0.153	-0.158	
Current Presidents Budget	8.559	9.212	8.903	8.742	Continuing

Change Summary Explanation: Funding changes are due to congressional undistributed reductions and inflation adjustments.

(U) Funding: Changes in FY99 are a result of undistributed reductions. FY2000 and FY 2001 are a result of budget adjustments.

(U) Schedule: N/A

(U) Technical:

(U) C. OTHER PROGRAM FUNDING SUMMARY COST: N/A

(U) D. ACQUISITION STRATEGY: N/A

(U) E. SCHEDULE PROFILE: N/A

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)									DATE February 1999	
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3							R-1 ITEM NOMENCLATURE Medical Advanced Technology Program PE 0603002D8Z			
COST*(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	2.848	2.130	2.007	2.057	2.091	2.133	2.175	2.224	Continuing	Continuing
Risk Assessment and Biamedical Applications/P506	2.848	2.130	2.007	2.057	2.091	2.133	2.175	2.224	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification

(U) BRIEF DESCRIPTION OF ELEMENT

(U) This program supports efforts in advanced technology development to provide biomedical strategies for preventing, treating, assessing and predicting casualties from ionizing radiation, either alone or in combination with biological warfare (BW)/chemical warfare (CW) agents. It is directed at the need for the Department of Defense (DoD) to be prepared to execute military missions within radiation environments, to manage radiation crises associated with terrorist activities, and for consequence management in the event of nuclear weapons detonation. The DoD is ethically committed to protection of Service members from the adverse health effects of ionizing radiation to the fullest extent consistent with operational requirements. The program incorporates findings from basic and applied research into highly integrated and focused advanced technology development studies to produce: (1) protective and therapeutic strategies, (2) tools to measure radiation exposure to military personnel, and (3) accurate models to predict casualties, particularly in combined nuclear-biological-chemical (NBC) environments. This program is executed by the Armed Forces Radiobiology Research Institute (AFRRI) which, due to its multidisciplinary staff and exceptional laboratory and radiation facilities, is uniquely qualified to carry out this mission. Because national laboratories operated by the Department of Energy no longer support advanced research relevant to military medical radiobiology, AFRRI is currently the sole laboratory in existence with the combined capabilities needed to conduct this research.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Medical Advanced Technology Program PE 0603002D8Z

COST*(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	2.848	2.130	2.007	2.057	2.091	2.133	2.175	2.224	Continuing	Continuing
Risk Assessment and Biomedical Applications/P506	2.848	2.130	2.007	2.057	2.091	2.133	2.175	2.224	Continuing	Continuing

(U) Project Number and Title: P506 Risk Assessment and Biomedical Applications

(U) PROGRAM ACCOMPLISHMENTS AND PLANS

(U) FY1998 Accomplishments:

(U) Completed a pilot demonstration of an improved clinical support protocol for acute, potentially fatal radiation injury. Continued assessment and optimization of a combined (prophylaxis/therapeutic) treatment modality for enhancing survival following acute, lethal irradiation. ($ 0.718 Million)

(U) Demonstrated the feasibility of using implanted capsules to provide sustained and effective delivery of radioprotective drugs. Improved efficacy of implanted 'slow-release' drug capsules by instituting use of therapeutic drug assays for monitoring blood levels of radioprotective drugs during protocol optimization studies. ($ 0.402 Million)

(U) Developed simplified sample preparation procedure used with chromosome aberration assays for radiation dose assessment. The procedure will facilitate fielding of chromosomal aberration assays to advanced medical treatment facilities. Completed initial studies extending the application of radiation dose measuring protocols to incremental doses of gamma and fission neutrons. ($ 0.524 Million)

(U) Developed protocols to enable measurement molecular markers (oncogene expression, mitochondria DNA deletions) by means of a compact, portable field-deployable platform. This effort exploits a dual-use potential for a delivery platform under development elsewhere for military use that can rapidly measure nucleic acid changes by the polymerase chain reaction (PCR). ($ 0.619 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Medical Advanced Technology Program PE 0603002D8Z

(U) Established the capability to integrate the health con sequences of radiation/ BW agent interactions into the Consequence Assessment Tool Set (CATS). Initiated computer-modeling efforts to incorporate combined injury data into CATS. ($ 0.293 Million)

(U) Continued development of simple method to measure uranium i n urine of military personnel to provide a rapid, field-based clinical assay for depleted uranium (DU) exposure, and submitted the procedure for patent application. ($ 0.292 Million)

(U) FY1999 Plans:

(U) Assess efficacy of a modified, nontoxic radioprotective dru g combination together with an improved clinical regimen for maximizing the prevention of acute and potentially fatal radiation injury. ($ 0.168 Million)

(U) Initiate development of preventive treatments for the long -term health consequences associated with radiation exposure. Design and assess implanted, slow-release drug capsules. ($ 0.169 Million)

(U) Initiate combined treatment protocol studies aimed at combating radiation-associated nausea and tissue injury following acute exposures. ($ 0.168 Million)

(U) Complete development of initial *in vitro* radiation calibration curves for a simplified chromosome aberration measurement procedure. Further optimize sample preparation protocols for automated analysis in deployed medical treatment facilities. Develop automated cytological platforms for rapid analysis of blood samples from mass casualties. ($ 0.369 Million)

(U) Develop software tools to manage biodosimetric data for field use and provide an integrated system for measurement of radiation exposures. Test rapid, forward-fieldable screening assays for estimating radiation exposure. Validate newly developed biodosimetry methods under collaborative agreements and human-use protocols at clinical radiotherapy centers for testing radiation therapy patients. ($ 0.504 Million)

(U) Develop initial computer program for CATS to predict casualty rates in operational forces using experimental data from animal studies that reveal enhanced mortality from combined exposures to radiation and bacteria. The program will have the capability to superimpose and analyze the two footprints in a single output. ($ 0.321 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Medical Advanced Technology Program PE 0603002D8Z

(U) Provide recommendations to physicians for treatment of exposure to DU based on continuing studies of DU toxicity and tissue distribution. Continue development of simple method to measure uranium in urine of military personnel. ($ 0.431 Million)

(U) FY2000 Plans:

(U) Assess safety and efficacy of implanted, slow-release, radioprotective treatment devices. Perform standard toxicology assessments on treatments relative to specific blood or tissue levels of radioprotectants. ($ 0.476 Million)

(U) Continue *in vivo* studies validating chromosome aberration assay over a broad dose range and partial-body exposure situation. Test improved cytological analysis platforms using simple and easy to perform sample protocols. ($ 0.347 Million)

(U) Complete initial-phase optimization of PCR-based assays for measuring multiple molecular biomarkers using field deployable platform. Continue studies to validate screening assays for measuring radiation exposure. ($ 0.474 Million)

(U) Provide recommendations for addressing any changes in efficacy of *B. anthracis* vaccine upon exposure to ionizing radiation. Initiate efforts to incorporate performance-degrading consequences from combined radiation/bacterial and radiation/pyridostigmine exposures into casualty prediction models. ($ 0.303 Million)

(U) Complete development of method to measure uranium in urine of military personnel; provide protocol to application centers for assessment as a fieldable methodology. ($ 0.407 Million)

(U) FY2001 Plans:

(U) Design and test easy-to-use autoinjector devices for delivery and implantation of the slow-release drug capsules for treatment of injuries associated with radiation exposure. ($ 0.487 Million)

(U) Further validate biological marker assays for radiation exposure by determining their performance characteristics in measuring (1) exposure to gamma rays at low-dose rates and (2) prior radiation exposures. The availability of a prior-exposure assessment capability is essential to permit dose assessment when analysis is delayed or when exposures are protracted. ($ 0.356 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Medical Advanced Technology Program PE 0603002D8Z

(U) Conducted validation analysis of the automated imaging platform for radiation dose assessment. Continue to develop and validate multiple molecular biomarker approach for diagnostic biodosimetric applications. ($ 0.486 Million)

(U) Provide computer module for Consequence Assessment Tool Set (CATS) to predict mortality from interactions of radiation and *B. anthracis*. Initiate efforts to incorporate interactions of radiation with viral agents into casualty prediction models. ($ 0.310 Million)

(U) Provide recommendations to physicians for treatment of exposure to Depleted Uranium (DU) based on findings from AFRRI immunotoxicity and neurotoxicity studies. ($ 0.418 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Medical Advanced Technology Program PE 0603002D8Z

(U) B. Program Change Summary	FY1998	FY1999	FY2000	FY2001	Total Cost
Previous Presidents Budget	2.672	2.136	2.041	2.094	Continuing
Appropriated Value	2.778	2.136	0	0	Continuing
Adjustments to Appropriated Value					
a. Congressionally Directed Undistributed Reduction	-0.106	-0.006	0	0	
b. Rescission/Below-threshold Reprogramming, Inflation Adjustment	0	0	-0.034	-0.037	
c. Other	0	0			
Current Presidents Budget	2.848	2.130	2.007	2.057	Continuing

Change Summary Explanation: Funding changes are due to congressional undistributed reductions and inflation adjustments.

(U) Funding: Changes are due to congressional undistributed reductions and inflation adjustments.

(U) Schedule: N/A

(U) Technical: Changes are due to congressional undistributed reductions and inflation adjustments.

(U) C. OTHER PROGRAM FUNDING SUMMARY COST: N/A

(U) D. ACQUISITION STRATEGY: N/A

(U) E. SCHEDULE PROFILE: N/A

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)									DATE February 1999	
APPROPRIATION/BUDGET ACTIVITY RDT&E/Defense Wide/BA 3							R-1 ITEM NOMENCLATURE Explosives Demilitarization Technology PE 0603104D8Z			
COST*(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	11.285	14.442	11.183	11.029	11.337	11.693	11.919	12.116	Continuing	Continuing
JDTP/P486	11.285	14.442	11.183	11.029	11.337	11.693	11.919	12.116	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification

(U) BRIEF DESCRIPTION OF ELEMENT

(U) The Explosive Demilitarization Technology Program is a cooperative interservice, interagency effort focused as the sole Department of Defense (DoD) program dedicated to the development of safe, efficient and environmentally acceptable processes for the resource recovery and recycling (R3) or disposition of strategic, tactical, and conventional munitions including explosives, and rocket motors. Efforts in this program emphasize environmentally compliant technologies to enhance existing methods for munitions R3 and treatment, such as, open burning/open detonation (OB/OD). There are currently over 500,000 tons of these materials requiring disposition with a forecast of over 1,450,000 tons to flow through the stockpile by 2004. This is funded under Advanced Technology Development based upon its supports to the development and exploration of new munitions concepts and technology preceding system engineering development.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Explosives Demilitarization Technology PE 0603104D8Z

(U) The effort employs the highly developed technology base in the DoD Service Laboratories/Technical Centers, DOE National Laboratories, industry, and academia. The joint program is integrated through the Joint Ordnance Commanders Demilitarization Subgroup and leverages support from the Environmental Security Technology Certification Program (ESTCP), the Strategic Environmental Research and Development Program (SERDP), the Joint DoD/DOE Munitions Program, and the Services. A specific federal laboratory sponsors each of the projects with peer review by the Joint Working Group. The Demilitarization Users Group provide assessment and review of demilitarization requirements for use in planning new investments for this program. Supporting an annual Global Demilitarization Symposium, which focuses on technical review and data evaluation from current projects enhances technology transfer opportunities, and ongoing advanced demonstrations. This program was established pursuant to Section 226 of the National Defense Authorization Act Fiscal Year 1996 (Public Law 104-106) and Section 227 of the National Defense Authorization Act for Fiscal Year 1997 (Public Law 104-201). The program provides an annual report to the Congress, which provides a detailed plan update on technology investments, accomplishments, and future planned investment areas. Recent annual reports; FY 1997-Department of Defense Joint Demilitarization Technology Program (February 1998) and the FY 1998-Department of Defense Joint Demilitarization Technology Program (February 1999).

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Explosives Demilitarization Technology PE 0603104D8Z

COST*(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	11.285	14.442	11.183	11.029	11.337	11.693	11.919	12.116	Continuing	Continuing
JDTP/P486	11.285	14.442	11.183	11.029	11.337	11.693	11.919	12.116	Continuing	Continuing

(U) Project Number and Title: P486 JDTP

(U) PROGRAM ACCOMPLISHMENTS AND PLANS

(U) FY1998 Accomplishments:

(U) Analysis of seven initial demonstrations continues. X-Tunnel complex at the Nevada Test Site has been repaired and improved to accommodate more efficient future demonstrations. Data was gathered from EPA Standard Methods, off-line analysis of bulk gases, volatile organic chemicals, semi-volatile organic chemicals, metals and particulates as well as the demonstrations of a tunable diode laser for measuring bulk gases and a real time particle analysis instrument. The Contained Burn Chamber for tactical rocket motors was developed and placed at NTS. Tri-Service Molten Salt Technology effort explored improved feed systems and optimized equipment design. ($ 7.285 Million)

(U) Four Hydrothermal Oxidation propellant treatability demonstrations accomplished. Hazard Class 1.1 propellant behavior studies furthered thermal cycling criteria for removal completion. ($ 2.000 Million)

(U) Completed ingredient recovery demonstration for 1.1 propellant. Improved design of washout fixture for the removal system to accommodate Multiple Launch Rocket System (MLRS). Feasibility study of dry removal completed. ($ 0.500 Million)

(U) The waterjet and resource recovery and recycling (R3) system completed the static testing of the abrasive slurry jet system on 40-mm projectiles. In addition, a demonstration of the washout of PBXN-106 loaded projectiles was conducted. Hydrogenation of high explosive material feasibility study indicated acceptable risk for further development. ($ 0.500 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Explosives Demilitarization Technology PE 0603104D8Z

(U) The Portable Propellant/Explosive Analyzer Program completed design and fabrication of ruggedized miniature field near infrared (IR), thin layer chromatography (TLC) and gas chromatography/mass spectrometry (GC/MS) units for field screening stability tests of recovered propellants. This program is developing uncomplicated analytical procedures for field stability testing. The propellant to fertilizer program successfully completed conversion validation tests consisting of 2 phases totaling 21 batch reactions. The first phase processed up to 100 pounds of propellant per batch, and the second phase scaled up to 1,800 pounds per batch. Independent analysis of the conversion results verified complete conversion of propellant to fertilizer. Design criteria for a mobile conversion unit was initiated. ($ 1.000 Million)

(U) FY1999 Plans:

(U) The Tunnel Demonstration Program will continue to optimize detonations and burns that replicate depot-type field operations. The data collected from these events will be used to develop less intrusive methods for munition demilitarization, such as improved loading configurations, containment chamber, and noise limitations. Capability at Dugway Proving Ground (DPG) will be used to develop emissions profiles. Testing of the Contained Burn Chamber will be initiated and proved out of the complete destruction of Shillelagh and TOW missile rocket motors accomplished. Molten Salt Technology will test effectiveness of the improved unit with transition to the base for destruction of demilitarization waste streams. Joint integration will continue. ($ 7.792 Million)

(U) The Propellant Removal and Treatment Process will be modified to examine effectiveness on tactical and conventional systems. Further feasibility studies on hydrolytic reactions in treatment vessels will be accomplished. Hydrothermal Oxidation optimization for specific formulations will be supported. ($ 2.75 Million)

(U) Multiple Launch Rocket System will be processed at advanced rates to optimize efficiency and to improve recovered material reformulation processes. ($ 1.6 Million)

(U) The waterjet and resource recovery and recycling program will continue with applying the high-pressure water washout system to Composition A3 and transitioning the system to Crane Army Ammunition Activity. In addition, improvements will be incorporated into the abrasive slurry jet system to include cutting at 20,000 psi. Flexible workcell applications will be enhanced. ($ 1 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Explosives Demilitarization Technology PE 0603104D8Z

(U) The Portable Propellant/Explosive Analyzer program will accomplish field-testing of the developed unit. In addition, a compete technical data package will be developed. Initial explosive feasibility studies and planning will be completed. ($ 1 Million)

(U) Catalytic Hydrotreating uses a liquid stream containing the energetic material, which is combined with hydrogen, heated, and contacted with a catalyst. This catalytic reduction with hydrogen provides the flexibility of recovering valuable chemical or fuel resources. Primary focus will be on the reaction chemistry and product separation operations. This work will build on the Explosive D work performed for the Navy to determine viability of the process for energetics. ($ 0.3 Million)

(U) FY2000 Plans:

(U) The Tunnel Demonstration Program will continue in FY 2000. Additional tunnel detonations and burns will be conducted to allow benchmarking events to be compared with improved procedures that will reduce both safety and environmental concerns. Design criteria will be develo0ped for facility fragment and noise containment as well as reduced EPA regulated emissions. Additionally, the Contained Burn Chamber will be modified to accommodate a variety of tactical systems, and joint integration will continue. ($ 7.283 Million)

(U) Cryogenic technologies resulting from Propellant Removal and Treatment Process will be further studied for effectiveness on conventional and tactical systems. Hydrothermal Treatment of small quantity gun propellants and high explosive fillers will be conducted. ($ 0.700 Million)

(U) Critical Fluid optimization for system specific application will be accomplished for Multiple Launch Rocket System variants and standard missiles. ($ 0.700 Million)

(U) Resource recovery development for waterjet and advanced cutting techniques, such as, femtosecond lasers will be pursued for conventional systems demilitarization. The flexible workcell will be enhanced for use by items and families. ($ 1.350 Million)

(U) Portable Propellant Analyzers will be transitioned to field trials and explosive work for AEDA and recovered materials will be initiated. ($ 0.900 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Explosives Demilitarization Technology PE 0603104D8Z

(U) Hydrotreating of high explosive fill will be fully characterized and process shifts to higher value products will be supported. ($ 0.250 Million)

(U) FY2001 Plans:

(U) The Focus on the Tunnel Demonstration Program will continue to be proving out of improved field detonation and burn operations. Detonation and Burn events will be designed and implemented based on data gathered from previous experiments. Facility fragment and noise containment designs will be tested and measured against EP?A standards. Testing and modification of the Contained Burn Chamber will continue along with joint integration. ($ 6.879 Million)

(U) Advanced removal/conversion efforts will continue. Conventional systems treatability demonstration with cryogenic technology and optimization of hydrothermal oxidation will be completed with field demonstrations of second-generation design. ($ 1.000 Million)

(U) Critical fluid size reduction process application will be furthered with transportable/portable field unit demonstrations. ($ 0.500 Million)

(U) Advanced cutting and removal program will include flexible/agile process demonstrations for efficient processing of small quantity munitions items to prove out recovery values. ($ 0.800 Million)

(U) Analytical tools for explosive and propellant evaluation will continue to be optimized for recovered items. ($ 0.800 Million)

(U) Hydrogenation of energetic and other innovative processes to support conversion to higher value products will be accomplished. ($ 0.300 Million)

(U) Microwave energetic applications will move from bench scale to study of the selective decomposition of high explosives in the presence of other constituents and for anti-personnel land mine applications. ($ 0.750 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Explosives Demilitarization Technology PE 0603104D8Z

(U) B. Program Change Summary	FY1998	FY1999	FY2000	FY2001	Total Cost
Previous Presidents Budget	11.711	11.65	11.375	11.228	Continuing
Appropriated Value	12.259	14.650	0	0	Continuing
Adjustments to Appropriated Value					
a. Congressionally Directed Undistributed Reduction	-0.974	-.208	0	0	
b. Rescission/Below-threshold Reprogramming, Inflation Adjustment	0	0	-0.192	-0.199	
c. Other	0	0	0	0	
Current Presidents Budget	11.285	14.442	11.183	11.029	Continuing

Change Summary Explanation: Funding changes are due to congressional undistributed reductions and inflation adjustments.

(U) Funding: FY 1999 funding changes are due to congressional increases.

(U) Schedule: N/A

(U) Technical: FY 1999 funding changes are due to congressional increases.

(U) C. OTHER PROGRAM FUNDING SUMMARY COST: N/A

(U) D. ACQUISITION STRATEGY: N/A

(U) E. SCHEDULE PROFILE: N/A

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)									DATE February 1999	
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3							R-1 ITEM NOMENCLATURE Demining PE 0603120D8Z			
COST*(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	15.112	0	0	0	0	0	0	0	0.000	15.112
Demining/P547	15.112	0	0	0	0	0	0	0	0.000	15.112

(U) A. Mission Description and Budget Item Justification

(U) BRIEF DESCRIPTION OF ELEMENT

(U) This humanitarian demining R&D program focuses on development, testing, and evaluation of equipment to reduce the time and costs associated with demining while improving operational safety of deminers. This program adapts commercial-off-the-shelf equipment and mature technologies to rapidly demonstrate and transition equipment for landmine detection, landmine clearance, protection of deminers, and mine awareness training to the international demining community. The program seeks to leverage past and current R&D project activity in related areas including tactical countermine, unexploded ordnance clearance, and foreign development programs. There are four areas of emphasis currently being addressed by this technology development program: equipment to locate mined and mine-free terrain; clearers specialized for demining agricultural areas and neutralization devices to destroy individual mines without moving them; tools for the deminer to enhance safety; and various media to facilitate mine awareness and deminer training. Humanitarian demining needs and sustainment issues originate with the regional Commanders-In-Chief during the annual demining action officers' workshop. These needs and issues are refined with data from the United Nations, international groups, Non-Government Organizations (NGOs), and contractors experienced in demining operations.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Demining PE 0603120D8Z

COST*(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	15.112	0	0	0	0	0	0	0	0.000	15.112
Demining/P547	15.108	0	0	0	0	0	0	0	0.000	15.112

(U) Project Number and Title: P547 Demining

(U) PROGRAM ACCOMPLISHMENTS AND PLANS

(U) FY1998 Accomplishments:

(U) Developed and successfully demonstrated mechanical cleare rs specialized for demining agricultural areas and QA of areas previously cleared. Developed and successfully demonstrated small remote controlled clearance devices that use commercial mowers for vegetation removal and flails for mine clearance. Initiated development of an improved mechanical flail to correct deficiencies identified from prior deployments. Developed and demonstrated various alternative technologies used for in-situ neutralization of landmines, some of which do not permit high order detonation. Initiated improvements for a hand held liquid explosive foam (LEXFOAM) application. Developed and successfully demonstrated improved Blast & Fragment Containers that contain fragments during mine detonation and a simple alternative power source used with various detection equipment to reduce the logistics burden caused by the constant requirement of batteries in the field. Developed and successfully demonstrated a wide area detection system capable of mine detection, mine/minefield mapping and recording and various mission planning operations. Continued the development of a hand held detection device that capitalizes on commercial mining equipment and is capable of mine detection and discrimination. Initiated improvements to the hand held detection devices and integrated mine marking devices. Initiated development and demonstration of commercially available explosive detection equipment for mine detection applications. Continued the development of individual tools used to enhance deminer safety and improve efficiency of the operation. Continued the development of various media to facilitate mine awareness and deminer training.($ 15.112 Million)

(U) FY1999 Plans:

(U) FY1998 concluded advanced technology development.
($ 0 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Demining PE 0603120D8Z

(U) B. Program Change Summary	FY1998	FY1999	FY2000	FY2001	Total Cost
Previous Presidents Budget	15.918	0	0	0	0.000
Appropriated Value	15.918	0	0	0	Continuing
Adjustments to Appropriated Value					
a. Congressionally Directed Undistributed Reduction	-.0806	0	0	0	
b. Rescission/Below-threshold Reprogramming, Inflation Adjustment	0	0	0	0	
c. Other	0	0	0	0	
Current Presidents Budget	15.112	0	0	0	15.112

Change Summary Explanation: Funding changes are due to congressional undistributed reductions and inflation adjustments.

(U) **Funding:** : Funding for FY 1999 through FY 2005 was realigned to PE 0603920D8Z because the program is more properly classified as Demonstration and Validation.

(U) **Schedule:** N/A

(U) **Technical:** : Funding for FY 1999 through FY 2005 was realigned to PE 0603920D8Z because the program is more properly classified as Demonstration and Validation.

(U) **C.** **OTHER PROGRAM FUNDING SUMMARY COST:** N/A

(U) **D.** **ACQUISITION STRATEGY:** N/A

(U) **E.** **SCHEDULE PROFILE:** N/A

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)									DATE February 1999	
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3							R-1 ITEM NOMENCLATURE Alternatives to Antipersonnel Landmines PE 0603121D8Z			
COST*(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	2.760	4.687	0	0	0	0	0	0	0.000	7.609
Alternatives to Antipersonnel Landmines/P121	2.760	4.687	0	0	0	0	0	0	0.000	7.609

(U) A. Mission Description and Budget Item Justification

(U) BRIEF DESCRIPTION OF ELEMENT

(U) P121, Alternatives to Anti-personnel Landmines (APL). This program element develops, tests, and evaluates area denial systems to replace anti-personnel landmines (APL). APL alternatives include surveillance systems, command and control systems, and overwatch fires which will be evaluated and developed in parallel. Nonlethal technologies will also be evaluated for applicability. During the first phase, various concepts will be defined in detail and examined with emphasis placed on leveraging existing programs. A process to select viable alternatives for further development will be conducted using modeling and simulation along with advanced warfighting experiments. The selected approaches will then enter prototype development, further selection of viable concepts will then enter the engineering and manufacturing development phase. This program currently supports the non-self-destructing APL alternative program, which is being funded (PE 0604808A) and executed by the US Army. Funding for this program ends in 1999.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Alternatives to Antipersonnel Landmines PE 0603121D8Z

COST*(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	2.760	4.687	0	0	0	0	0	0	0.000	7.609
Alternatives to Antipersonnel Landmines/P121	2.760	4.687	0	0	0	0	0	0	0.000	7.609

(U) Project Number and Title: P121 Alternatives to Antipersonnel Landmines

(U) PROGRAM ACCOMPLISHMENTS AND PLANS

(U) FY1998 Accomplishments:

(U) During FY 1998 the Department conducted a study to quantify the military utility of APL and assess potential alternatives. The APL alternatives considered included: force structure; tactical techniques, and procedures; and technology options. Industry was given the results of the study and solicited for proposals. The top industry candidates were awarded purchase orders in order to develop formal proposals of their alternatives. The Department then completed the evaluation of 52 white papers, 12 of which were chosen for proposal development and submission. Proposal evaluation for contract award has been completed. ($ 2.760 Million)

(U) FY1999 Plans:

(U) During FY 1999 development contracts will be awarded, hardware for the prototype assessment test (PAT) phase will be purchased and the PAT plan and operations order will be finalized. ($ 4.687 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Alternatives to Antipersonnel Landmines PE 0603121D8Z

(U) B. Program Change Summary	FY1998	FY1999	FY2000	FY2001	Total Cost
Previous Presidents Budget	2.856	4.753	0	0	7.609
Appropriated Value	2.990	4.753	0	0	Continuing
Adjustments to Appropriated Value					
a. Congressionally Directed Undistributed Reduction	-0.230	-0.066	0	0	
b. Rescission/Below-threshold Reprogramming, Inflation Adjustment	0	0	0	0	
c. Other	0	0	0	0	
Current Presidents Budget	2.760	4.687	0	0	7.447

Change Summary Explanation: Funding changes are due to congressional undistributed reductions and inflation adjustments.

(U) Funding: N/A

(U) Schedule: N/A

(U) Technical: N/A

(U) C. OTHER PROGRAM FUNDING SUMMARY COST: N/A

(U) D. ACQUISITION STRATEGY: N/A

(U) E. SCHEDULE PROFILE: N/A

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)									DATE February 1999	
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3							R-1 ITEM NOMENCLATURE Counterterror Technical Support PE 0603122D8Z			
COST*(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	40.826	37.667	52.223	54.791	56.510	52.758	54.021	55.306	Continuing	Continuing
Counterterror Technical Support (CTTS)/P484	35.675	32.349	43.054	45.330	46.768	42.713	43.626	44.595	Continuing	Continuing
Explosive Ordinance Disposal/Low Intensity Conflict/P206	3.717	3.983	7.831	8.095	8.350	8.626	8.847	9.131	Continuing	Continuing
Special Operations/Low Intensity Conflict (SO/LIC)/P205	1.434	1.335	1.338	1.366	1.392	1.419	1.548	1.580	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification

(U) BRIEF DESCRIPTION OF ELEMENT

(U) P484, Counterterror Technical Support (CTTS). This program develops technology and prototype equipment that address needs and requirements that have direct operational application in the national effort to combat terrorism. It integrates defense advanced development efforts with government-wide and international efforts to combat terrorism. Projects support antiterrorism and counterterrorism activities to: conduct tactical operations; protect military forces, civilian personnel, installations, infrastructure elements and the general populace from terrorist attack; detect, neutralize, and mitigate the effects of conventional and unconventional (chemical, biological, nuclear, and radiological) devices; conduct surveillance and tracking of terrorist; conduct threat and event assessments; and process and disseminate information. The Assistant Secretary of Defense for Special Operations and Low-Intensity Conflict directs the CTTS Program which addresses combating terrorism requirements identified by the interagency Technical Support Working Group (TSWG).

(U) The TSWG is a multi-agency R&D working group under the aegis of the National Security Council's Interagency Working Group on Counterterrorism. As such, the CTTS program supports, and is integrated into, the national interagency response to terrorism. Also, it conducts a cooperative international R&D program, and is executing projects with three countries.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Counterterror Technical Support PE 0603122D8Z

(U) The CTTS program develops technologies and state-of-the-art prototype equipment that have direct operation al application in the national effort to combat terrorism. Projects address the highest priority needs as dictated by current threat assessments. Documented activities and capabilities show that terrorists continue to be technologically and tactically sophisticated, which poses new challenges to our capability to respond. The CTTS program supports measures against chemical and biological terrorism and is fully coordinated with the Chemical/Biological Defense Program and the Counterproliferation Support Program. Current priorities are the detection and neutralization of terrorist-built explosive devices, countermeasures for chemical and biological terrorism, and t he detection and surveillance of terrorists.

(U) Projects are structure d to address numerous technical focus areas. Capabilities to be pursued include: equipment used to prevent and respond effectively to a chemical/biological agent release in an urban area; building a national capability to detect and disable large-vehicle bombs; methods and systems used to detect improvised terrorist devices from stand-off distances; a national infrastructure assurance and protection; systems for improved audio and video surveillance of terrorists; effective detection of ammonium nitrate-based explosives; more effective post-blast forensic analysis; and equipment and systems assisting DoD units and other response agencies i n dealing with consequence management following a terrorist attack. These areas address deficiencies cited in response to questions about the adequacy of counterterrorism R&D posed in Presidential Decision Directive 39 (PDD-39).

(U) All national and international projects are distributed among eight counterterrorism mission categories: Tactical Operations Support; Explosives Detection and Disposal; Weapons of Mass Destruction Countermeasures; Personnel Protection; Surveillance, Collection, an d Operations Support; Physical Security; Infrastructure Protection; and Investigative Support and Forensics. This program is a non-system advanced technology development project used to demonstrate the utility or cost reduction potential of technology when applied to different types of defense equipment or techniques. It includes technology development and proof-of-principle demonstrations in field applications for new and improved systems. Coordination and planning efforts with the participating agencies facilitate technology transition from development to operational use. The demonstrations strive to evaluate integrated technologies in a realistic operating environment to assess the performance in actual mission scenarios an d the cost reduction potential of advanced technology.

(U) P206, Explosive Ordnance Disposal/Low-Intensity Conflict (EOD/LIC). The EOD/LIC project is a rapid prototyping effort to provide technology and equipment to military operators who are confronted with explosive threats. Tasks focus on detection, countermeasures, and neutralization of explosive threats. Requirements submitted by the Joint Service EOD community and other LIC-oriented military users are prioritized by the OS D EOD/LIC Coordination Group.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Counterterror Technical Support PE 0603122D8Z

(U) P205, Special Operations/Low-Intensity Conflict (SO/LIC) Analytical Support. The S O/LIC Analytical Support project provides specialized research and analytical support for the Assistant Secretary of Defense for Special Operations and Low- Intensity Conflict, (ASD (SO/LIC)). Projects address a broad spectrum of technical, acquisition, and policy issues relating to special operations, counter- and anti-terrorism, peacekeeping, psychological operations, counterinsurgency, unconventional warfare, and contingency operations. The project supports and is integrated into overall DoD efforts to develop options for dealing effectively with a wide range of military responsibilities in military operations other that war. This project provides a vehicle to initiate analysis required to support acquisition documentation and conceptual policy issues regarding roles and missions of SOF in the changing world environment. Analysis may also be used to improve OASD(SO/LIC) 's congressionally mandated oversight function of special operations and low-intensity conflict.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Counterterror Technical Support PE 0603122D8Z

COST*(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	40.826	37.667	52.223	54.791	56.510	52.758	54.021	55.306	Continuing	Continuing
Counterterror Technical Support (CTTS)/P484	35.675	32.349	43.054	45.330	46.768	42.713	43.626	44.595	Continuing	Continuing

(U) Project Number and Title: P484 Counterterror Technical Support (CTTS)

(U) PROGRAM ACCOMPLISHMENTS AND PLANS

(U) FY1998 Accomplishments:

(U) **TACTICAL OPERATIONS SUPPORT.** Completed development of specialized access tools that provides for installing anchors for supporting assault forces. Continued development of a high-speed, personnel delivery boat. Continued development of a rifle-fired 40mm grenade with a controlled fragmentation pattern for use in close quarters battle scenarios. Continued development of night vision goggles that substantially reduces the effects of halo and blooming when bright lights are encountered, greatly improving the effectiveness of the devices. Started development of the design for a miniature laser range finder for use by snipers and other tactical forces. ($ 1.635 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Counterterror Technical Support PE 0603122D8Z

(U) **EXPLOSIVES DETECTION & DEFEAT.** Completed development of the High Energy Access and Disablement system (HEAD) for the disruption of large vehicle bombs; procedures and hardware delivered to US Air Force EOD teams. Completed development of the 90-mm water cannon disrupter for mid-sized improvised explosives devices (IEDs); procedures written and 6 systems deployed over seas to EOD teams. Completed test and evaluation of a COTS water disrupter, the "Boot Banger", for disruption of improvised explosive devices contained within the truck of a passenger car; procedures written for EOD. Completed development of a base-line, prototype of the All-purpose Remotely controlled Teleoperated System (ARTS) for use against large vehicle bombs. Completed development of the Universal Training Device for training against IEDs; 20 systems delivered for DOD testing. Continued development of a system for the detection of terrorist bombs from standoff distances under a variety of conditions. Continued to develop the full spectrum of response requirements for large vehicle bombs, including detection, analysis, access, and disablement. Continued to develop an interactive, computer-based improvised explosive device neutralization training system. Continued to develop a safer initiating system for various explosive disruption robots. Continued development of a single-sided antenna for use with nuclear quadrupole resonance explosive detection methods. Continued researching factors that affect the capabilities of improvised explosive device detection through biological schemes. Continued development of a field-portable x-ray system for imaging the contents of suspect baggage/containers when access to only one side is possible. Started development of a flat-panel imager for a digital x-ray system. Started development of a Canine based, remote collection, screening system for large vehicle bombs. Started the development of a single-sided neutron interrogation unit for the detection of vehicle bombs. Started modeling of non-ideal, terrorist explosives. Started development of a database for identification of large vehicle threats, disruption tools and procedures. Started development of the ARTS platform to include on-board diagnostics and access tools for EOD. ($ 7.06 Million)

(U) Continued development of the Pulsed Fast Neutron Analysis (PFNA) Container Inspection System (CIS) to non-intrusively determine materials present in large shipping containers. ($ 2.707 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Counterterror Technical Support PE 0603122D8Z

(U) **CHEMICAL, BIOLOGICAL, RADIOLOGICAL, AND NUCLEAR COUNTERMEASURES.** Completed the development of a low-cost, throw-away protective mask to provide sufficient levels of protection from a chemical/biological threat while egressing a contaminated area. Completed development of a handheld reader for immunochromatographic assays for the detection of biological agents. Completed the development of a ruggedized, downsized capability for operators to determine the contents of closed containers. Completed development of chemical/biological masks for first responders. Completed the development of an improved, in-field capability to identify nuclear materials. Continued development of a standoff system for detection and characterization of chemical and biological agents using a non-nuclear source. Continued development of a non-hazardous, non-corrosive, environmentally-safe decontamination systems for chemical and biological agents. Started the modification of a ion mobility spectroscopy chemical agent detector to perform separation of chemical agents in contaminated environments with a reduction in false alarms. Started the development of a real-time, highly selective and sensitive, portable chemical and biological warfare agent detection systems. Started the development of a rapid detection system for pathogenic chemical and biological agents in food. Started development of a personal chemical and biological agent dosimeter. Started development of a inexpensive disposable chemical and biological protective system. ($ 6.398 Million)

(U) Started development of an Anti-Biological Device (ABD) to non-intrusively destroy biological agents in situ. ($ 3.539 Million)

(U) **PERSONNEL PROTECTION.** Completed the design enhancements to allow fully armoring of a unibody vehicle. Continued development of a design for flexible body armor that resists penetration and slashes from knives and other sharp edged instruments. Started development of lightweight body armor using advanced materials to make the armor lighter and more flexible. Started modeling explosive effects on fully armored vehicles, including effects on occupants. Started a study to evaluate technologies to support the detection and interception/deflection of sniper bullets directed at speakers. Started evaluation of alternative, lightweight, transparent armor for use in vehicles. ($ 2.845 Million)

(U) **SURVEILLANCE, COLLECTIONS, & OPERATIONS SUPPORT.** Started development of advanced tagging systems. Started development of hostage barricade surveillance systems. ($ 1.500 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	R-1 ITEM NOMENCLATURE Counterterror Technical Support PE 0603122D8Z

(U) **PHYSICAL SECURITY.** Completed and distributed guides to DoD field activities for Security Glazing Applications and Protection Against Terrorist Vehicle Bombs. Developed and distributed Terrorist Bomb Threat Stand-Off reference to security forces and EOD activities. Completed development of prototype non-intrusive, multi-sensor, inspection system for the detection of bulk explosives in large vehicles. Conducted demonstration of inspection technologies in SWA, success of demonstration has resulted in request to conduct additional OCONUS follow-on technology demonstrations. Completed Personal Injury Study of the Oklahoma City Bombing detailing location of injuries and fatalities from the bombing. Continued the development of an interagency Structural Blast Mitigation Program. Started field tests of specialized structures that address pre and post construction technologies to mitigate blast effects. Started follow-on study at Air Force request to address the Khobar Tower bombing. Started data computation effort to verify various interagency computer blast models. Started development of a modular, open architecture computer based system able to address vulnerability assessments and consequence or risk management to assist security personnel, facility engineers, installation managers and Commanders in making effective and cost-sensitive force protection and facility security decisions. ($ 8.126 Million)

(U) **INFRASTRUCTURE PROTECTION.** Continued development of an automated infrastructure analysis tool for the electric power grid. Started development of a means of modeling the effects of economic and information warfare terrorism. Started development of an radio frequency weapon characterization and effects database. Started development of a common encryption standard for use by the "commodity transport" infrastructure systems (i.e., natural gas, petroleum, electricity, etc.) on their Supervisory Control and Data Aquisition (SCADA) systems and Remote Terminal Units (RTU). ($ 0.695 Million)

(U) **INVESTIGATIVE SUPPORT & FORENSICS.** Continued development of an enhanced version of the CarBomb CAD analysis tool, which is a system that aides post-blast analysis of vehicle bombs. Started development of an enhanced handwriting analysis system. Started development of a personal attribute determination by fingerprints capability. Started the development of a system to detect and recover fingerprints on water soaked surfaces. Started development of a document copier tagging system. Started development of chemicals to tag devices and documents with micro-tracer particles. ($ 1.170 Million)

(U) FY1999 Plans:

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Counterterror Technical Support PE 0603122D8Z

(U) **TACTICAL OPERATIONS SUPPORT.** Complete development and field evaluation of night vision goggles that mitigate the effects of halo effects and blooming when bright lights are encountered, and which is rugged enough to withstand the physical shock from tactical operations. Complete development of a robust, miniature laser range finder. Transition the advanced high speed personnel delivery boat. Continue development of a rifle-fired 40mm grenade that provides a controlled pattern for use by tactical forces in close combat situations. Start evaluation and development of technologies that provide through-wall-imaging capability for use by tactical forces. Start identification and development of non-explosive breaching capabilities. Start evaluation and development of improved non-pyrotechnic diversionary device. ($ 1.470 Million)

(U) **EXPLOSIVES DETECTION & DEFEAT.** Complete technology transition of the 90-mm water canon to industry. Complete technology transition of the Universal Training Device to industry. Complete development of a safer initiating system for various explosive disruption robots. Continue development of a system for the detection of terrorist bombs from standoff distances under a variety of conditions. Continue to develop the full spectrum of response requirements for large vehicle bombs, including detection, analysis, access, and disablement. Continue to develop an interactive, computer-based improvised explosive device neutralization training system. Continue development of a single-sided antenna for use with nuclear quadrupole resonance explosive detection methods. Continue researching factors that affect the capabilities of improvised explosive device detection through biological schemes. Continue development of a field-portable x-ray system for imaging the contents of suspect baggage/containers when access to only one side is possible. Continue development of the ARTS platform to include on-board diagnostics and access tools for EOD. Continue development of the flat-panel imager for a digital x-ray system. Continue development of a Canine based, remote collection explosives screening system for Large Vehicle Bombs. Continue development of a single-sided neutron interrogation unit for identification of vehicle bombs. Continue modeling of non-ideal, terrorist explosives. Continue development of a database for identification of large vehicle threats, disruption tools and procedures. Start development of an x-ray database on components used in IEDs. Start development of software codes for integrating robotic chassis and various tools used (arms/disrupters/sensors) for modular PC based control architecture. Start development of small, capable, low cost robots for EOD use. Start development of new high speed shape charge technology. Start development of new, portable, light-weight explosive total containment systems. ($ 5.179 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	R-1 ITEM NOMENCLATURE Counterterror Technical Support PE 0603122D8Z

(U) **CHEMICAL, BIOLOGICAL, RADIOLOGICAL, AND NUCLEAR COUNTERMEASURES.** Complete the development of an improved, in-field capability to identify nuclear materials. Complete the modification of a ion mobility spectroscopy chemical agent detector to perform separation of chemical agents in contaminated environments with a reduction in false alarms. Complete the development of a rapid detection system for pathogenic chemical and biological agents in food. Complete development of a inexpensive disposable chemical and biological protective system. Continue development of a standoff system for detection and characterization of chemical and biological agents using a non-nuclear source. Continue development of a non-hazardous, non-corrosive, environmentally-safe decontamination systems for chemical and biological agents. Continue the development of a real-time, highly selective and sensitive, portable chemical and biological warfare agent detection systems. Continue development of a personal chemical and biological agent dosimeter. Start the development of enhanced non-intrusive screening and diagnostic capabilities for operators to determine the contents of closed containers. Start expert review of existing urban modeling capabilities to include domestic and foreign.($ 7.294 Million)

(U) **PERSONNEL PROTECTION.** Complete design for flexible body armor that resists penetration and slashes from knives and other sharp edged instruments. Complete development and characterization of advanced lightweight body armor. Continue modeling explosive effects on fully armored vehicles, including effects on occupants. Continue development of a design for a system that will provide protection to VIP speakers from snipers. Continue evaluation and characterization of advanced transparent armor for use in fully armored vehicles. Start evaluation and development of multilayered, lightweight, energy-absorbing, composite armor for vehicles. ($ 1.515 Million)

(U) **SURVEILLANCE, COLLECTIONS, & OPERATIONS SUPPORT.** Continue development of advanced tagging systems. Continue development of hostage barricade surveillance systems. Start development of CT analyst support tool. Start development of long-range, LPI/D communications system. Start development of special cellular communications protocol intercept and geolocation system. Start development of GPS cellular tracking device. Start development of portable, remote antenna array. ($ 1.988 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	R-1 ITEM NOMENCLATURE Counterterror Technical Support PE 0603122D8Z

(U) **PHYSICAL SECURITY.** Complete Personal Injury Study of the Khobar Towers Bombing and identify techniques that will reduce personnel injuries from blast effects. Continue development of a non-intrusive, multi-sensor, inspection system for the detection of bulk explosives in large vehicles. Continue the development of the modular, open architecture computer based system able to address the full range of vulnerability assessments and consequence or risk management tools to assist security personnel, facility engineers, installation managers and commanders in making effective and cost-sensitive force protection and facility security decisions. Continue the development of interagency Structural Blast Mitigation Program. Pace of large scale blast test against specialized structures increases; focus will be to evaluate new and existing seismic construction techniques for protection against blast loads. Start development of a multi-sensor, non-intrusive Undervehicle Inspection System for detection of bulk explosives and contraband. Start development of non-intrusive, rapid personnel screening system to detect explosive residue on individual passing through an inspection point. Start development of a advanced technology, rapid, mobile cargo inspection system. Start development of technology to stop internal combustion engine powered vehicles from exiting a vehicle inspection point. Start development of a self contained, easily deployable, immediately operable, access control point for deployed security forces. ($ 9.008 Million)

(U) **INFRASTRUCTURE PROTECTION.** Complete development of an automated infrastructure analysis tool for the electric power grid. Complete development of a common encryption standard for use by the “commodity transport ” infrastructure systems (i.e., natural gas, petroleum, electricity, etc.) on their Supervisory Control and Data Aquistion (SCADA) systems and Remote Terminal Units (RTU). Continue development of a means of modeling the effects of economic and information warfare terrorism. Continue the development of an radio frequency weapon characterization and effects database. Start development of computer/ software security and network intrusion detection tools. Start development of computer security training aides. Start development of water pipeline database. Start development of a hacker publication, tools, and methodology database. ($ 1.440 Million)

(U) **INVESTIGATIVE SUPPORT & FORENSICS.** Complete the development of a system to detect and recover fingerprints on water soaked surfaces. Complete development of a document copier tagging system. Complete development of an enhanced version of the CarBomb CAD design tool, which is a system that aides post-blast analysis of vehicle bombs. Complete development of a first responder’s tool set for emergency response and management. Continue development of an enhanced handwriting analysis system. Continue development of a personal attribute determination by fingerprints capability. Continue development of chemicals to tag devices and documents with micro-tracer particles. Start development of novel optical tagging systems for law enforcement. Start development of compendium of explosive properties. Start development of characterization of materials that are transparent to x-rays. Start development of computer forensics tools. ($ 1.955 Million)

(U) Start development of a real-time facial recognition system.($ 2.500 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Counterterror Technical Support PE 0603122D8Z

(U) FY2000 Plans:

(U) **TACTICAL OPERATIONS SUPPORT.** Complete development of non-pyrotechnic diversionary devices. Complete safety certification and transition rifle-fired 40mm grenade that provides a controlled pattern for use by tactical forces in close combat situations. Continue development of through wall imaging systems that provide capability to image wall construction as well as to identify presence of personnel in adjacent spaces. Continue development of portable non-explosive breaching devices. Start development of small, covert optical tags for tactical forces. Start development of advanced tactical sensors to identify and locate anti-personnel surveillance systems. ($ 1.660 Million)

(U) **EXPLOSIVES DETECTION & DEFEAT.** Complete development of the flat-panel imager for a digital x-ray system. Complete development of a Canine based, remote collection explosives screening system for Large Vehicle Bombs. Complete to develop an interactive, computer-based improvised explosive device neutralization training system. Complete development of the ARTS platform for diagnostic and access for EOD; transition to US Air Force for procurement. Complete development of a single-sided neutron interrogation unit for the detection of vehicle bombs. Complete development of the x-ray database for identification of IED components. Complete development of a database for identification of large vehicle threats, tools and procedures. Complete modeling of non-ideal, terrorist explosives. Complete development of new, portable, light-weight explosive total containment systems. Continue development of a system for the detection of terrorist bombs from standoff distances under a variety of conditions. Continue development of a single-sided antenna for use with nuclear quadrupole resonance explosive detection methods. Continue researching factors that affect the capabilities of improvised explosive device detection through biological schemes. Continue to develop the full spectrum of response requirements for large vehicle bombs, including detection, analysis, access, and disablement. Continue development of software codes for integrating robotic chassis and various tools used (arms/disrupters/sensors) for modular PC based control architecture. Continue development of a field-portable x-ray system for imaging the contents of suspect baggage/containers when access to only one side is possible. Continue development of small, capable, low cost robots for EOD use. Continue development of high speed shape charge technology. Start development of detection technology to be used against advanced sensor based threats; thermal, acoustics, etc. Start development of technologies to image and identify components of IEDs for precision disruption. Start development of EOD tools (arms/disrupters) and sensors for small robotic platforms. Start development of enhanced Canine substance detection. Start development of detection technology for use against non-nitrogen based explosives. Start development for non-intrusive analysis. Start development of background contaminant profiling. ($ 12.188 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	R-1 ITEM NOMENCLATURE Counterterror Technical Support PE 0603122D8Z

(U) **CHEMICAL, BIOLOGICAL, RADIOLOGICAL, AND NUCLEAR COUNTERMEASURES.** Complete development of a non-hazardous, non-corrosive, environmentally-safe decontamination systems for chemical and biological agents. Complete the development of a rapid detection system for pathogenic chemical and biological agents in food. Continue development of a standoff system for detection and characterization of chemical and biological agents using a non-nuclear source. Continue development of a real-time, highly selective and sensitive, portable chemical and biological warfare agent detection systems. Continue development of a personal chemical and biological agent dosimeter. Continue review of urban modeling capability, perform verification studies. Start the development of enhanced non -intrusive screening and diagnostic capabilities for operators to determine the contents of closed containers. Start the development of testing procedures for next generation NBC responder equipment. ($ 10.291 Million)

(U) PERSONNEL PROTECTION. Complete evaluation of advanced transparent armor for potential use in fully armored vehicles. Complete development of multilayered, lightweight, energy-absorbing, composite armor for vehicles. Complete modeling explosive effects on fully armor ed vehicles, including effects on occupants. Continue development of a design for a system that will provide protection to VIP speakers from snipers. Start development of system(s) capable of locating and identifying sniper optics. Start development a personnel tag system that provides identification of friendly personnel in an environment of multiple agency participation. ($ 1.687 Million)

(U) **SURVEILLANCE, COLLECTION & OPERATIONS SUPPORT.** Complete development of hostage barricade surveillance systems. Complete development of CT analyst support tool. Complete development of long-range, LPI/D communications system. Complete development of GPS cellular tracking device. Continue development of advanced tagging systems. Continue development of special cellular communications protocol intercept and geolocation system. Continue development of portable, remote antenna array. Start development of long-range, clan destine microphone system. Start development of an automated profiling capability program to define the type and source of information indicative of terrorist activity. ($ 3.179 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	R-1 ITEM NOMENCLATURE Counterterror Technical Support PE 0603122D8Z

(U) **PHYSICAL SECURITY.** Complete development of system that can stop internal combustion engine powered vehicles from exiting a inspection point. Complete development of advanced multi-sensor, non-intrusive Undervehicle Inspection System for the detection of bulk explosives and contraband. Complete development of a non-intrusive, rapid personnel screening system to detect explosive residue on individual passing through an inspection point. Continue the development of a rapid, multi-sensor inspection system for the detect ion of bulk explosives at a entry point. Continue the interagency blast mitigation program; evaluation of the effectiveness of new blast wall designs for reducing over pressure and debris impacts on personnel and structures. Demonstrate new methods and establish criteria for reducing injuries and causalities due to progressive structural collapse. Continued development of a modular, open architecture system to provide intelligent vulnerability assessment, consequence and risk management tools to assist security personnel, facility engineers, installation managers and commanders in making effective and cost-sensitive force protection decisions. Conduct demonstration of enhanced capability mobile cargo inspection system. Start development of a virtual reality training system for inspection and entry points where security force personnel will participate in real time consequence management and interaction with virtual indigenous population. ($ 10.218 Million)

(U) **INFRASTRUCTURE PROTECTION.** Complete development of an radio frequency weapon characterization and effects database. Complete development of computer security training aides. Complete development of a hacker publication, tools, an d methodology database. Continue development of a means of modeling the effects of economic and information warfare terrorism. Continue development of computer/software security and network intrusion detection tools. Continue development of water pipe line database. ($ 1.660 Million)

(U) **INVESTIGATIVE SUPPORT & FORENSICS.** Complete development of chemicals to tag devices and documents with micro-tracer particles. Complete development of a first responder's tool set for emergency response and management. Complete development of compendium of explosive properties. Complete development of characterization of materials that are transparent to x-rays. Continue development of an enhanced handwriting analysis system. Continue development of a personal attribute determination by fingerprints capability. Continue development of novel optical tagging systems for law enforcement. Continue development of computer forensics tools. ($ 2.171 Million)

(U) FY2001 Plans:

(U) **TACTICAL OPERATIONS SUPPORT.** Complete development of through wall imaging systems that provide capability to image wall construction as well as to identify presence of personnel in adjacent spaces. Complete development of non-explosive breaching devices. Complete development of small, covert optical tags for tactical forces. Continue development of advanced tactical sensors to identify and locate anti-personnel surveillance systems. ($ 1.792 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Counterterror Technical Support PE 0603122D8Z

(U) **EXPLOSIVES DETECTION & DEFEAT.** Complete development of a single-sided antenna for use with nuclear quadrupole resonance explosive detection methods. Complete development of software codes for integrating robotic chassis and various tools used (arms/disrupters/sensors) for modular PC based control architecture. Complete development of small, capable, low cost robots for EOD use. Complete researching factors that affect the capabilities of improvised explosive device detection through biological schemes. Complete development of high speed shape charge technology. Complete development of a field-portable x-ray system for imaging the contents of suspect baggage/containers when access to only one side is possible. Continue development of a system for the detection of terrorist bombs from standoff distances under a variety of conditions. Continue development of detection technology to be used against advanced sensor based threats; thermal, acoustics, etc. Continue development of technologies to image and identify components of IEDs for precision disruption. Continue development of EOD tools (arms/disrupters) and sensors for small robotic platforms. Continue development of enhanced Canine substance detection. Continue development of detection technology for use against non-nitrogen based explosives. Continue development for non-intrusive analysis. Continue to develop the full spectrum of response requirements for large vehicle bombs, including detection, analysis, access, and disablement. Continue development of background contaminant profiling. Start development of system to provide moving vehicle screening for explosives. Start development of materials for enhanced suppression/mitigation. ($ 11.785 Million)

(U) **PERSONNEL PROTECTION.** Complete and demonstrate a system that will provide protection to VIP speakers from snipers. Complete development of system(s) capable of locating and identifying sniper optics. Complete the development of a personnel tag system that provides identification of friendly personnel in an environment of multiple agency participation. ($ 1.795 Million)

(U) **PHYSICAL SECURITY.** Complete technology survey and field test phase of the interagency blast mitigation program. Complete recommended architectural guidelines for facility site planning and pre- and post-construction technologies that will mitigate damage and personal injury effects large blasts. Complete development of a modular, open architecture system to provide intelligent vulnerability, consequence management, risk, and assessment tool to assist security personnel, facilities engineers, installation managers an d commanders in making effective and cost-sensitive force protection and facility security decisions. Continue development of a virtual reality training system for inspection and entry points where security force personnel will participate in real time consequence management and interaction with a virtual indigenous population. Continue the development of a rapid, multi-sensor inspection system for the detection of bulk explosives at a entry point. Start development of a integrated multi-sensor, non- intrusive, stand-off vehicle and operator inspection system able to address all facets of vehicle inspection and rapidly integrate the results to the security force. Start development of a easily deployable, quick erect protective barrier system capable of mitigating the effects of a large vehicle bomb. Start development of non-intrusive vehicle tagging and tracking system able to monitor unlimited number of vehicles located within a installation. ($ 11.112 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	R-1 ITEM NOMENCLATURE Counterterror Technical Support PE 0603122D8Z

(U) **INFRASTRUCTURE PROTECTION.** Complete development of water pipeline database. Continue development of a means of modeling the effects of economic and information warfare terrorism. Continue development of computer/softw are security and network intrusion detection tools. ($ 1.791 Million)

(U) **INVESTIGATIVE SUPPORT & FORENSICS.** Complete development of an enhanced handwriting analysis system. Complete development of a personal attribute determination by fingerprints capability. Complete development of novel optical tagging systems for law enforcement. Continue development of computer forensics tools. ($ 1.793 Million)

(U) **SURVEILLANCE, COLLECTION & OPERATIONS SUPPORT.** Complete development of special cellular communications protocol intercept and geolocation system. Cote developmt of portable, remote antenna array. Complete development of advanced tagging systems. Continue development of long range, clandestine microphone system. Continue development of an automated profiling capability program to define the te a sourcof information indicative of terrorist activity. ($ 3.509 Million)

(U) **CHEMICAL, BIOLOGICAL, RADIOLOGICAL, AND NUCLEAR COUNTERMEASURES.** Complete the development of a rapid detection system for pathogenic chemical and biological ages in food. Complete development of a inexpensive disposable chemical and biological protective system. Continue development of a standoff system for detection and characterization of chemical and biological agents using a non-nuclear source. Contin development of a non-hazardous, non-corrosive, environmentally-safe decontamination systems for chemical and biological agents. Continue the development of a real-time, highly selective and sensitive, portable chemical and biological warfare agent dection systems. Continue development of a personal chemical and biological agent sampler. Continue review of urban modeling capability, perform validation studies. Continue the development of enhanced non-intrusive screening and diagnostic capabilities for operators to determine the contents of closed containers. Start the development of testing procedures for next generation NBC responder equipment. ($ 11.753 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Counterterror Technical Support PE 0603122D8Z

COST*(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	40.826	37.667	52.223	54.791	56.510	52.758	54.021	55.306	Continuing	Continuing
Explosive Ordnance Disposal/Low Intensity Conflict/P206	3.717	3.983	7.831	8.095	8.350	8.626	8.847	9.131	Continuing	Continuing

(U) Project Number and Title: P206 Explosive Ordnance Disposal/Low Intensity Conflict

(U) PROGRAM ACCOMPLISHMENTS AND PLANS

(U) FY1998 Accomplishments:

(U) Completed development of an autonomous search vehicle. Completed development of an imaging ordnance locator. Completed development of a high resolution diver sonar. Completed development of a standoff dearmer with laser sight. Completed development of a clandestine underwater transponder. Completed development of an improvised explosive device visualization capability. Completed development of EOD ballistic/fragmentation protection. ($ 0.403 Million)

(U) Continued development of special operations forces vehicle ballistic protection. Continued development of non-explosive cartridges. Continued development of a remote field disassembly system. Continued development of a limpet mine detection system. ($ 0.69 Million)

(U) Started development of a support craft command and control system. Started development of an integrated mission planning and evaluation system. Started development of an integrated diver's display mask. Started development of an improved underwater demolition charge. Started development of a limpet mine neutralization tool. Started development of a hull acoustic navigation system for diver's search. Started development of an EOD incident site command, control and communications system. Started development of an advanced EOD tactical information system. Started development of a small munitions/boobytrap disrupter. Started evaluation of long range disrupters. Started evaluation of a miniature mine detector. Started development of a non-magnetic dive light. ($ 2.624 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Counterterror Technical Support PE 0603122D8Z

(U) FY1999 Plans:

(U) Complete development of special operations forces vehicle ballistic protection. Complete development of non-explosive cartridges. Complete development of a remote field disassembly system. Complete development of a limpet mine detection system. ($ 1.000 Million)

(U) Continue development of a support craft command and control system. Continue development of an integrated mission planning and evaluation system. Continue development of an integrated diver's display mask. Continue development of an improved underwater demolition charge. Continue development of a limp et mine neutralization tool. Continue development of a hull acoustic navigation system for diver's search. Continue development of an EOD incident site command, control and communications system. Continue development of an advanced EOD tactical information system. Continue development of a small munitions/boobytrap disrupter. Continue evaluation of long range disrupters. Continue evaluation of a miniature mine detector. Continue development of a non-magnetic dive light. ($ 1.575 Million)

(U) Start development of an HMMWV-based laser ordnance neutralization system. Start development of special operations target information system with a multifunction equation/calculator system. Start development of an EOD explosive transport and storage kit container. Start development of a portable/hand held thermal imaging device. Start development of a ground penetrating object detector. Start development of remote activation munitions systems (underwater adapter kit). Start development of electronic countermeasures for electronic fuses. Start development of an improved vehicle access/disruption device. ($ 1.408 Million)

(U) FY2000 Plans:

(U) Complete development of a support craft command and control system. Complete development of an integrated mission planning and evaluation system. Complete development of an integrated diver's display mask. Complete development of an improved underwater demolition charge. Complete development of a limp et mine neutralization tool. Complete development of a hull acoustic navigation system for diver's search. Complete development of an EOD incident site command, control and communications system. Complete development of an advanced EOD tactical information system. Complete development of a small munitions/boobytrap disrupter. Complete evaluation of long range disrupters. Complete evaluation of a miniature mine detector. Complete development of a non-magnetic dive light. ($ 0.300 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Counterterror Technical Support PE 0603122D8Z

(U) Continue development of an HMMWV-based laser ordnance neutralization system. Continue development of special operations target information system with a multifunction equation/calculator system. Continue development of an EOD explosive transport and storage kit container. Continue development of a portable/hand held thermal imaging device. Continue development of a ground penetrating object detector. Continue development of remote activation munitions systems (underwater adapter kit). Continue development of electronic countermeasures for electronic fuses. Continue development of an improved vehicle access/disruption device. ($ 1.605 Million)

(U) Start development of an integrated improvised explosive devices training system. Start development of a rapid underwater ordnance neutralizer. Start development of an advanced remotely controlled, EOD mini-reconnaissance vehicle. Start development of a special operations global remote initiator device. Start development of a miniature CD-ROM reader for EOD applications. Start development of a remote controlled transporter x-ray. Start development of a portable thermite grenade thermal insulator. Start development of a polarized ground disturbance lens. Start development of focused acoustic waves for special operations landmine detection. Start development of an ultrahigh pressure waterjet mine neutralization system. Start development of a SOF special energetic material (SOFSEM). Start development of an underwater breathing apparatus advanced CO2 scrubber. Start development of an advanced tactical personnel protection system. Start development of an integrated C4I low intensity conflict digital reconnaissance system. Start development of an under water digital reconnaissance system. Start development of an EOD low cost remote underwater search system. Start development of a long range remote control system. Start development of an advanced device for standoff identification of explosive hazard s. Start development of a tactical lightweight filmless x-ray receiver/imager. Start development of an advanced demolition timer. Start development of a portable underwater laser line scanner. Start development of a miniaturized, multi-sensor surface reconnaissance system. ($ 5.926 Million)

(U) FY2001 Plans:

(U) Complete development of an HMMWV-based laser ordnance neutralization system. Complete development of special operations target information system with a multifunction equation/calculator system. Complete development of an EOD explosive transport and storage kit container. Complete development of a portable/hand held thermal imaging device. Complete development of a ground penetrating object detector. Complete development of remote activation munitions systems (underwater adapter kit). Complete development of electronic countermeasures for electronic fuses. Complete development of an improved vehicle access/disruption device. ($ 0.550 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Counterterror Technical Support PE 0603122D8Z

(U) Continue development of an integrated improvised explosive devices training system. Continue development of a rapid underwater ordnance neutralizer. Continue development of an advanced remotely controlled, EOD mini-reconnaissance vehicle. Continue development of a special operations global remote initiator device. Continue development of a miniature CD-ROM reader for EOD applications. Continue development of a remote controlled transporter x-ray. Continue development of a portable thermite grenade thermal insulator. Continue development of a polarized ground disturbance lens. Continue development of focused acoustic waves for special operations landmine detection. Continue development of an ultrahigh pressure waterjet mine neutralization system. Continue development of a SOF special energetic material (SOFSEM). Continue development of an underwater breathing apparatus advanced CO2 scrubber. Continue development of an advanced tactical personnel protection system. Continue development of an integrated C4I-low intensity conflict digital reconnaissance system. Continue development of an underwater digital reconnaissance system. Continue development of an EOD low cost remote underwater search vehicle. Continue development of a long range remote control system. Continue development of an advanced standoff system for identification of explosive hazards. Continue development of a tactical lightweight filmless x-ray receiver/imager. Continue development of an advanced demolition timer. Continue development of a portable underwater laser line scanner. Continue development of a miniaturized, multi-sensor surface reconnaissance system. ($ 6.363 Million)

(U) Start development of an active infrared (AIR) detection system. Start development of an advanced limpet mine neutralization tool. Start development of an underwater excavation system. Start development of an area survey imaging sonar (ASIS). ($ 1.182 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Counterterror Technical Support PE 0603122D8Z

COST*(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	40.826	37.667	52.223	54.791	56.510	52.758	54.021	55.306	Continuing	Continuing
Special Operations/Low Intensity Conflict (SO/LIC)/P205	1.434	1.335	1.338	1.366	1.392	1.419	1.548	1.580	Continuing	Continuing

(U) Project Number and Title: P205 Special Operations/Low Intensity Conflict (SO/LIC)

(U) PROGRAM ACCOMPLISHMENTS AND PLANS

(U) FY1998 Accomplishments:

(U) Projects included: Analysis of SOF Information Warfare Requirements and Capabilities, The Future of Intra-State Conflict, Development of Analytical Tools for Operations Other Than War, Enhanced PYSOP, Readiness of Joint Service Explosive Or dnance Disposal Units for the 21th Century, Effectiveness of PYSOP in Bosnia and Potential for Increased Utility of PYSOP on Support of Future Peace-Type Operations, and AC-130 Force Structure. ($ 1.434 Million)

(U) FY1999 Plans:

The FY 1999 program was approved in August 1998. Approved projects/study include: Non-lethal Weapons Interagency study; Optempo/Perstempo versus Deployment of NSW Forces; Sof Operations in a Sensor Rich Environment; Joint Architecture Requirements for MPARE; Compliance with DoD Information Operations Master Plan; SECDEF Report on the Military's Role in Countering Terrorism; and the Effectiveness of DoD Medical Humanitarian Projects. ($ 1.335 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	R-1 ITEM NOMENCLATURE Counterterror Technical Support PE 0603122D8Z

(U) FY2000 Plans:

(U) The FY 2000 program will be finalized in August 1999, ensuring that study projects are timely and responsive to the requirements of DoD policy makers. ($ 1.338 Million)

(U) FY2001 Plans:

(U) The FY 2001 program will be finalized in August 2000, ensuring that study projects are timely and responsive to the requirements of DoD policy makers. ($ 1.366 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	R-1 ITEM NOMENCLATURE Counterterror Technical Support PE 0603122D8Z

(U) B. Program Change Summary	FY1998	FY1999	FY2000	FY2001	Total Cost
Previous Presidents Budget	39.036	35.813	39.223	41.381	Continuing
Appropriated Value	0	38.3130	0	0	Continuing
Adjustments to Appropriated Value					
a. Congressionally Directed Undistributed Reduction	0	-.646	0	0	
b. Rescission/Below-threshold Reprogramming, Inflation Adjustment	1.7900	0	-0.900	-0.900	
c. Other	0		13.0000	013.410	
Current Presidents Budget	40.826	37.667	52.223	54.791	Continuing

Change Summary Explanation:

(U) **Funding:** FY 1999 funding changes are due to congressional undistributed reductions. Congress added $2.5 million in FY 1999 for the Facial Recognition Technology (FRT) project. Increase in FY 2000 and FY 2001 focus on Anti-Terrorism and Force Protection development.

(U) **Schedule:** N/A

(U) **Technical:** N/A

(U) **C. OTHER PROGRAM FUNDING SUMMARY COST:** Other Appropriation Funds: Department of State

(U) **D. ACQUISITION STRATEGY:** N/A

(U) **E. SCHEDULE PROFILE:** N/A

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

DATE: February 1999

BUDGET ACTIVITY: 3 - Advanced Technology Development

PE NUMBER AND TITLE: 0603160D8Z Counterproliferation Advanced Technology Development

COST (*In Thousands*)	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	74196	0	0	0	0	0	0	0	0	74196
P535 SOF Counterproliferation Support	16189	0	0	0	0	0	0	0	0	16189
P539 Counterforce	58007	0	0	0	0	0	0	0	0	58007

Mission Description and Budget Item Justification:

In August 1994, DoD established the Counterproliferation Support Program specifically to address the DoD shortfalls in counterproliferation operational capabilities documented in the May 1994 Report to Congress titled *Report on Nonproliferation and Counterproliferation Activities and Programs*. Counterproliferation Support Program funds are used to leverage DoD acquisition programs to meet the counterproliferation priorities of the Commanders-in-Chief (CINCs) of the Combatant Commands and accelerate the deployment of enhanced capabilities to the field. Specifically, the goal of the Counterproliferation Support Program is to improve specific military counterproliferation capabilities by (1) building on ongoing programs in the Services, DoD agencies, Department of Energy and US Intelligence; (2) focusing on the most critical counterproliferation shortfalls to address major gaps in deployed capabilities (as reflected in the CINCs' priorities and the Counterproliferation Review Committee's (CPRC) prioritized list of counterproliferation Areas for Capability Enhancements); (3) leveraging existing program funding to more rapidly field capabilities by accelerating the deliverables of DoD programs; (4) identifying and enhancing the development of high payoff technologies to accelerate capabilities to the warfighter; (5) identifying and promoting key non-materiel initiatives that complement technological advances; and (6) transitioning Counterproliferation Support Program projects to the Services as soon as practicable.

The FY 1998 Defense Reform Initiative (DRI) directed the establishment of the Defense Threat Reduction Agency (DTRA) effective 1 October 1998. The DTRA will be formed through the consolidation of three existing agencies: the Defense Special Weapons Agency (DSWA), the On-Site Inspection Agency (OSIA), and the Defense Technology Security Administration (DTSA). In addition, several functions from the Office of the Secretary of Defense (OSD) and Washington Headquarters Services (WHS) currently involved in the management of associated programs will transfer to DTRA as well. The DTRA will also carry out programs to counter proliferation and reduce threats posed by weapons of mass destruction and provide nuclear weapon stockpile and related support.

As part of this budget submission, Counterproliferation Support Program funding and manpower resources programmed for FY 1999 and out are transferred to the DTRA. A five-percent military and civilian personnel savings associated with the DTRA consolidation has already been applied and is reflected in the funding and personnel transfers to DTRA.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE: February 1999
BUDGET ACTIVITY: 3 - Advanced Technology Development	PE NUMBER AND TITLE: 0603160D8Z Counterproliferation Advanced Technology Development / PROJECT: P535

COST (*In Thousands*)	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
P535 SOF Counterproliferation Support	16189	0	0	0	0	0	0	0	0	16189

A. Mission Description and Budget Item Justification

Project P535 - SOF Counterproliferation Support: In 1995, the Secretary of Defense (SECDEF) assigned the core task of countering the proliferation of weapons of mass destruction (WMD) to Special Operations Forces (SOF). The SOF Projects will develop and demonstrate SOF unique devices that enable SOF and special mission units to detect, disable and neutralize WMD and their associated facilities under the direction of a geographic combatant commander-in-chief (CINC) in support of Concept Plan (CONPLAN) 0400. These projects are to be employed by SOF units with direct application to the nation's effort to counter the spread of WMD (CP-WMD). These include efforts to defeat hard and deeply buried targets (HDBT), explosive ordinance disposal (EOD) and maritime efforts to prevent the spread of WMD technology or systems using the sea-lanes. HDBT is focused on breaching tools, improved communications, life support equipment, detection and defeat sensors, underground navigation systems, and target defeat. The EOD focus is on detection, characterization, extraction, and emergency destruction of nuclear, biological and chemical (NBC) agents and devices. Efforts to seek to improve these capabilities by providing greater standoff and utilizing non-intrusive technologies. Maritime counterproliferation (CP) operations concentrate on defeating and neutralizing WMD or WMD material being transported or concealed on maritime platforms. Also included are efforts to enhance our existing capability in support of the domestic response to the WMD threat on U.S. soil. The CP-WMD effort also includes support requirements that apply to all three efforts.

Under Project 535, First Responder Projects quickly leverage DoD biological and chemical response, detection and mitigation technologies to crisis and consequence management response teams such as the US Army Technical Escort Unit (USA TEU), the Navy Defense Technical Response Group (DTRG), the Federal Emergency Management Agency (FEMA), the US Secret Service (USSS) and the Department of Public Health and Safety (PHS). These projects are executed in conjunction with the Joint Chiefs of Staff CONPLAN 0300, the Office of the Assistant Secretary of Defense (Special Operations and Low Intensity Conflicts) and the Technical Support Working Group of the National Security Council's Interagency Working Group on Counterterrorism to ensure full interagency coordination of requirements.

Acquisition Strategy:

FY 1998 Accomplishments:

- 1828 FIRST RESPONDER PROJECTS
- Chemical/ Biological Sentry System (CBSS)--Finalized field testing; delivered prototype unit to user (600)
- Biological Detection Kit--Field tested system; delivered prototype units to user (329)
- Chemical Agent Recognition Training Aid—Developed a training aid that reproduces the visual and auditory signatures associated with chemical agent alarm functioning, thereby increasing individual and user confidence in detector operability (150))

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE: February 1999
BUDGET ACTIVITY: 3 - Advanced Technology Development	PE NUMBER AND TITLE: 0603160D8Z Counterproliferation Advanced Technology Development
	PROJECT: P535

- Detection/ Electronic Diagnostics—Initiated development of modified x-ray system to minimize risk of explosive device functioning during x-ray operations (400)
- Access -- Conducted development of Sloth Technology equipment designed to operate/move at speeds below sensing threshold of volumetric sensors (275)
- Neutralize -- Assessed capability of explosively driven magneto-hydrodynamic generators as a means of defeating very fast firing circuits on explosive devices (50)
- SBIR/STTR (24)

•	14361	SOF PROJECTS
•		Efforts in support of SOF. Specific details are classified (14232)
•		SBIR/STTR (129)
Total	16189	

FY 1999 Planned Program:

Total	0	Funds and activities transferred to PE 0603160BR. P535

FY 2000 Planned Program:

Total	0	Funds and activities transferred to PE 0603160BR. P535

FY 2001 Planned Program:

Total	0	Funds and activities transferred to PE 0603160BR. P535

B. Project Change Summary

	FY 1998	FY 1999	FY 2000	FY2001	Total Cost
Previous President's Budget	11885	0	0	0	Continuing
Appropriated Value	11885	N/A	N/A	N/A	N/A
Adjustments to Appropriated Value	4304	N/A	N/A	N/A	N/A
Current Budget Submit/President's Budget	16189	0	0	0	Continuing

C. Other Program Funding Summary

	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Compl	Total Cost
Not Applicable										

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

DATE: February 1999

BUDGET ACTIVITY: 3 - Advanced Technology Development

PE NUMBER AND TITLE: 0603160D8Z Counterproliferation Advanced Technology Development

PROJECT: P539

COST (*In Thousands*)	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
P539 Counterforce	58007	0	0	0	0	0	0	0	0	58007

A. Mission Description and Budget Item Justification

Project P539 - Counterforce: The purpose of this project is to develop technologies, demonstrate prototype systems in an operationally realistic environment and provide the warfighter with enhanced capabilities in response to current threat projections for potential adversaries who have the capability to develop and/or employ nuclear, biological and chemical (NBC) weapons in future regional conflicts involving the U.S. or its allies. The U.S. requires the capability to identify and characterize NBC research, production, storage and operational support facilities and be prepared to attack and neutralize them while mitigating collateral effects resulting from expulsion and release of NBC agents. The potential target set includes fixed, aboveground and underground hardened and unhardened facilities. The project started in FY95 and was structured to exploit ongoing technology programs wherever possible. Early project emphasis was applied to efforts to predict and measure target response and dispersion of agents associated with attacks against NBC facilities using existing conventional weapons. Current emphasis is to mitigate collateral effects through advanced weapon development and greatly enhanced deliberate target planning leading to optimized weapon employment. The near-term focus is the demonstration of target planning tools, weapons and sensors supporting direct attacks on an expanded set of NBC targets. In the longer-term, the project emphasis will change to standoff penetrating weapons, collateral effects assessment and the supporting planning tools. Prototype or modified systems integrating these technologies will then be evaluated in an Advanced Concept Technology Demonstration (ACTD), and a residual operational capability provided to the warfighters.

A second counterforce CP ACTD is approved by DUSD(AT) and is awaiting signature of the management plan. The original CP ACTD has been retitled CP1 ACTD for the first CP ACTD. The second CP ACTD is called the Second Counterproliferation Counterforce Advanced Concept Technology Demonstration (CP2 ACTD). FY98 is the transition year with CP1 ACTD concluding and CP2 ACTD starting.

This project builds on previous Defense Special Weapons Agency (DSWA) projects to develop and mature sensor systems to provide additional capabilities for pre-, trans- and post-attack target characterization, and damage and collateral effects assessments. The project further develops and accelerates capabilities in collateral effects prediction, target/weapon interaction prediction, and funds the integration of these capabilities into Service/CINC target planning systems. The project also builds on Service programs in advanced weapon guidance, penetration and fuze enhancements. Service weapon development expertise will be used to integrate complementary, demonstrated technologies into prototype weapons that can improve prompt response, enhance lethality and control collateral effects. The project milestones are broken into four major product areas or subprojects, sensors, collateral effects, target planning and weapons, plus the operational demonstrations.

1. Sensors. This effort will provide improved warfighting residual capabilities for facility characterization, battle damage assessment (BDA) and collateral effects assessment against the spectrum of NBC facilities. Research and development is currently in progress at DSWA to characterize signatures from shallow underground facilities for exploitation by tactical unattended ground sensors (TUGS). Objectives of the current program include development of techniques for source identification,

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603160D8Z Counterproliferation Advanced Technology Development
	PROJECT P539

localization, and performing change detection in trans-attack signatures for weapon effectiveness analysis. Current intelligence community (IC) and Department of Energy (DOE) programs involve research and development to assess sensor performance and approaches for optimum sensor application for surface target detection and underground facility detection and characterization. Other project activities include enhancing the performance of existing forward looking infrared (FLIR) sensors and a weapon based sensor to provide high confidence BDA. This sub-project will leverage existing programs to (1) define concept of operations and sensor system (ground, air, and weapon based) architectures for BDA, collateral effects assessment and facility characterization; (2) develop and demonstrate sensor technologies and prototype sensor systems for BDA and facility characterization; (3) produce a data fusion and processing module for BDA and facility characterization to meet user requirements on existing platforms; (4) produce an integrated BDA module to support airborne sensors; (5) develop and demonstrate a man-emplaced TUGS system that includes multi-sensor arrays; (6) integrate stand-off and point chemical sensors onto an unmanned air vehicle (UAV) and an expendable mini-UAV, respectively, and demonstrate the ability to confirm, identify, and assess the release of chemical agents in support of attacks on NBC facilities. CP2 ACTD sensors and data fusion will address confirming the presence of chemical agents post attack and assist in predicting transport patterns by updating pre-strike predictions of the potentially hazardous plume with real-time data. The CP2 ACTD sensor program will leverage on-going chemical sensor efforts within the chemical and biological defense community to minimize program risk in developing chemical sensors for counterforce missions. This program will also monitor the progress of remote biological agent detectors for potential incorporation into the collateral effects assessment system.

2. Collateral Effects. The Collateral Effects program provides predictive tools for NBC expulsion and dispersion resulting from attacks on WMD facilities as well as acts of terrorism and hostile use of WMD for a variety of applications supporting NBC target attack planning. Requirements include high resolution weather models, weather measurement systems, and population databases. A key element in developing these collateral effects codes is chemical/biological expulsion tests and modeling. Modeling of chemical/biological expulsion sources will be based on theoretical model and empirical data. Codes will be validated from existing data, other predictive models and special collateral effects experiments. The collateral effects tools will provide pre-attack prediction and post-attack assessment. The Hazard Prediction and Assessment Capability (HPAC) is a major product that predicts the release and transport of NBC materials and the subsequent collateral effects. The high resolution weather prediction capability, another area of emphasis in the subproject, will provide timely wind, cloud, and precipitation data necessary for NBC collateral effects predictions. Weather data currently does not have the resolution or quality necessary. This weather data will also be available to other users in the theater such as Joint Warning Network (JWARN). These tools will also be integrated into the target attack planning tools to assess the consequences of attacks on WMD facilities.

3. Target Planning. This effort will provide a new deliberate planning combat assessment capability and a major upgrade for existing theater level planning capabilities for defeating or denying NBC facilities and capabilities. This effort builds upon the Integrated Mission Effects Assessment (IMEA) planning tool developed for CP1. IMEA provides a forward deployable target planning capability for NBC targets. IMEA is an integration of the Munitions Effects Assessment (MEA) tool providing targeting solutions using conventional weapons for a variety of structures and equipment and the HPAC developed under the Collateral Effects subproject. The current effort will produce the Integrated Target Planning Tool Set (ITPTS) that will provide a spectrum of planning capabilities from deliberate to crisis. ITPTS includes IMEA II and high resolution weather prediction. IMEA II will import target data and import attack assessment data from prior planned strikes. ITPTS will also predict weapons performance and associated NBC collateral effects, develop targeting solutions that minimize collateral effects, and provide the results through the appropriate interfaces for a variety of targets including functionally and structurally complex facilities. The major differences between IMEA and IMEA II is a greatly enhanced interface to the

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603160D8Z Counterproliferation Advanced Technology Development PROJECT P539

Intelligence community and upgrades to handle additional target types including complex facilities, to handle additional weapons and platforms, to provide more operator friendly displays, to import attack assessment data, and to efficiently interface with Service planning systems. The ITPTS interfaces include but are not limited to Global Command and Control System, the Service targeting and strike execution control systems, strategic and tactical intelligence and sensor systems, the weather community, and the NBC warning system. A key interface for CP applications is with the Tactical Multi-Sensor Fusion (TMSF), providing critical pre- and post-strike target characterization information. The "plug and play" architecture is required to accommodate differing CONOPS, theaters, and performers in several geographic locations. The deliberate planning capability requires significant input from the intelligence community including data regarding NBC facilities, processes, and surrounding populations. This effort will support the intelligence community in developing the necessary interfaces to provide for the efficient transfer of intelligence data. ITPTS will include IMEA II, IMEA II Prime, an advanced wind and weather prediction capability, and a "plug and play" architecture. This effort will execute a full verification and validation program for all delivered capabilities including extensive field testing at all functional levels.

4. Weapons. Conventional explosive-filled weapons are often relatively ineffective in destroying large underground reinforced concrete facilities. Even if the weapon detonates inside the facility, substantial interior walls and/or floors often confine the blast and fragmentation thus causing significant overpressure and venting through the penetration hole. Likewise conventional explosive-filled weapons often result in complete and uncontrolled destruction of soft buried and aboveground facilities. When these facilities protect NBC, the random use of conventional weapons greatly increases the risk of agent dispersal that may result in extensive civilian or force casualties. This sub-project will develop, integrate and demonstrate advanced conventional weapons technologies to improve mission effectiveness against NBC facilities while mitigating collateral effects. For CP1 ACTD, these technologies include improvements in adverse-weather/precision guidance, enhanced penetrating capabilities, and advanced fuzing options. Technologies that have been successfully demonstrated will be weaponized into prototype systems. Advanced fuzes will enable weapons employment options to maximize lethality and/or control collateral effects. The focus for CP2 ACTD is to provide the warfighter with a demonstrated option to attack NBC facilities in a standoff mode. CP2 ACTD will improve on existing stand-off weapon platforms to provide enhanced penetration, advanced fuzing, and enhanced payloads that can reduce collateral effects by neutralizing agents before they are released or reducing the amount released. Standoff weapons to be enhanced include the conventional Tomahawk Land Attack Missile (TLAM-C) and the Conventional Air Launched Cruise Missile (CALCM). Enhanced payloads will explore alternate warhead options to conventional blast/fragmentation with the objectives of mitigating collateral effects associated with dispersal of NBC materials while also minimizing the number of weapons required to functionally defeat WMD facilities.

5. Operational Demonstrations. The Counterproliferation ACTD will improve the operational capability for holding NBC targets at risk with minimum collateral effects. The objective is to integrate available or near-term technologies for sensors, weapons, collateral effects prediction and target planning tools, evaluate the technologies in an operational context, and transition improved capabilities rapidly to warfighters. Specifically, this project will enhance and accelerate existing programs to provide integrated target planning to include collateral effects prediction codes and sensors for facility characterization and BDA, and advanced weapons development programs to meet NBC target defeat requirements. This project will also support demonstration operations to include system operational concept, demonstration planning, scenario development, execution of the ACTD and post-demonstration analysis. Planning and execution of the ACTDs uses a time phased approach to screen candidate technologies for maturity, develop prototype systems and demonstrate enhancements in military capability against a warfighter prioritized subset of all potential NBC target types. This approach results in a cycle of prototype development and testing followed by periods of operational demonstration.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE: February 1999
BUDGET ACTIVITY: 3 - Advanced Technology Development	PE NUMBER AND TITLE: 0603160D8Z Counterproliferation Advanced Technology Development
	PROJECT: P539

Two operational demonstration series were defined for the CP1 ACTD. The first demonstration, named Dipole Orbit (DO), was successfully completed in February 1997. This first demonstration used new target planning tools to determine the "best" employment of current weapons with a smart fuze against simulated biological agents housed in soft above-ground bermed structures. The second and final demonstration series, named Dipole Jewel (DJ), is scheduled for completion in July 1998. This demonstration will assess improved capabilities in weapons, sensors, and enhanced planning tools against a simulated, hardened chemical weapons production facility in a shallow-buried, cut-and-cover structure. After the start of CP1 ACTD, the sponsoring command identified a need to understand their ability to conduct counterforce operations against soft above-ground simulated chemical production facilities using the TLAM-C. The Dipole Tiger (DT) demonstration series was added as a quick response to the users' request. DT started in April 1997 and will end in FY98.

Four operational demonstration series are planned during CP2 ACTD over the period of FY1999-2002 to provide the sponsor and participating commands with the opportunity to assess the utility of the selected technologies. The objective of the first demonstration series in CP2 ACTD, called Dipole Xeric (DX), is to employ current technology products in weapons and improved target planning tools, using new weapon delivery tactics, and operationally demonstrate their enhanced penetration capabilities against a simulated chemical agent production and storage facility considerably harder than the structure used during CP1 ACTD Dipole Jewel series. The objective of the second demonstration series, called Dipole Yukon (DY), is to exploit near-term technology by demonstrating the baseline capabilities of the Joint Air-to-Surface Stand-off Missile (JASSM) to conduct chemical/biological (C/B) counterforce missions through operationally realistic attacks against a simulated biological weapons storage facility. The objective of the third demonstration, called Dipole Zodiac (DZ), is to assess the suitability of the CALCM with a penetrating warhead and a Predator UAV-based standoff sensor providing collateral effects assessment. The objective of the fourth demonstration series, called Divine Canberra (DC), is to evaluate the end-to-end set of products of the CP2 ACTD including the target planning tool, in its final operational context, a TLAM stand-off attack penetrating weapon capability, and remote combat assessment using a small expendable mini - UAV with a chemical point sensor on-board (and deployed from the Predator UAV demonstrated in DZ) against a relatively hard chemical production and storage facility. DC also includes demonstration of a weaponized enhanced payload.

The High Frequency Active Auroral Research Program (HAARP) is to develop an ionospheric research facility to study and exploit emerging ionospheric technology for DoD surveillance and communications applications. The specific application of this project is imaging of underground counterproliferation related facilities.

Acquisition Strategy:

FY 1998 Accomplishments:

- 11440 SENSORS
- Delivered TMSF for validation, support ACTD fielding and provide operational user manuals. (600)
- Provided test support and fielding for TFPM. (1400)
- Delivered TUGS demonstration units, supply communications and interfaces, support validation tests and supply operational user manuals. (2700)
- Baselined performance of existing remote or standoff chemical agent detectors for the counterforce role and down-select to an appropriate candidate. (200)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603160D8Z Counterproliferation Advanced Technology Development
	PROJECT P539

- Initiated testing of existing chemical point sensors for counterforce role. (1400)
- Initiated design modifications of a mini-UAV chemical point sensor. (900)
- Initiated design modifications of the Predator UAV platform for remote sensing and delivery of a mini-UAV. (540)
- Initiated Predator UAV sensor system integration and subsystem test and evaluation. (1000)
- Upgraded HAARP transmitter. Evaluate "Blind" test data. Validation analysis of ground global tomography (2700)

- 6900 COLLATERAL EFFECTS
- Developed high resolution weather prediction capability and weather data server. (2500)
- Collected weather data for tools validation. (1800)
- Developed a chemical precursor source term model. (800)
- Enhanced population effects model. (600)
- Initiated development of HPAC 4.0 software. (1200)

- 10600 TARGET PLANNING
- Delivered IMEA 3.1 to reflect lessons learned from the CP I ACTD. (500)
- Generated component level weapon-target validation data. (800)
- Initiated design and development of IMEA 4.0 for Dipole Xeric. (1800)
- Defined interface standards and initiate software development for the Integrated Target Planning Tool Set (ITPTS). (1200)
- CP Analysis and Planning System (CAPS) - advanced planning initiative (6300)

- 18004 WEAPONS
- Completed ITAG flight test and fabrication of ACTD demonstration units. (2880)
- Completed Ground Setting Unit (GSU) design and certification for HTSF. (2650)
- Procured AUPs and conduct flight tests for DX demonstration readiness. (1092)
- Designed and ground tested a CALCM unitary penetrator. (2500)
- Conducted TLAM penetrator systems integration. (982)
- Initiated TLAM penetrator warhead design, fabrication, and test. (3850)
- Initiated smart fuze design to meet Navy certification requirements. (1800)
- Conducted initial down-selection and lab tests of payloads to mitigate collateral effects. (950)
- Began scale tests of selected high temperature incendiaries (HTI) and chemical neutralization agents against simulated chemical and biological agents. (550)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE: February 1999
BUDGET ACTIVITY: 3 - Advanced Technology Development	PE NUMBER AND TITLE: 0603160D8Z Counterproliferation Advanced Technology Development
	PROJECT: P539

- Conducted modeling and simulation to support concept screening and down-select. (600)
- Developed enhanced weapon lethality models to support predictions of agent response. (150)

- 10205 OPERATIONAL DEMONSTRATIONS
- Executed the CP ACTD Phase II (Dipole Jewel). (5098)
- Completed Dipole Jewel post demonstration analysis. (1100)
- Initiate target construction for Dipole Xeric demonstration. (807)
- Conducted Dipole Xeric demonstration planning. (1200)
- CP Capabilities Working Group - advanced planning initiative (2000)

- 858 SBIR/STTR

Total 58007

FY 1999 Planned Program:

Total 0 Funds and activities transferred to PE 0603160BR. P539

FY 2000 Planned Program:

Total 0 Funds and activities transferred to PE 0603160BR. P539

FY 2001 Planned Program:

Total 0 Funds and activities transferred to PE 0603160BR. P539

B. Project Change Summary	FY 1998	FY 1999	FY 2000	FY 2001	Total Cost
Previous President's Budget	46376	0	0	0	Continuing
Appropriated Value	56376	N/A	N/A	N/A	N/A
Adjustments to Appropriated Value	1631	N/A	N/A	N/A	N/A
Current Budget Submit/President's Budget	58007	0	0	0	Continuing

C. Other Program Funding Summary	FY 1998	FY1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Compl	Total Cost
Not applicable										

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	R-1 ITEM NOMENCLATURE JOINT DoD/DOE MUNITIONS PE 0603225D8Z

COST *(In Millions)*	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	16.242	13.007	14.786	14.790	14.916	15.233	15.553	15.880	Continuing	Continuing
DoD/DOE Munitions/P225	16.242	13.007	14.786	14.790	14.916	15.233	15.553	15.880	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification

(U) BRIEF DESCRIPTION OF ELEMENT:

(U) This R&D program is a cooperative, jointly funded effort between DoD and DOE to pursue new and innovative warhead, explosive, and fuze technologies in order to bring about major improvements in non-nuclear munitions. This program supports the development and exploration of new munitions concepts and technology preceding system engineering development. Through our funding arrangement with DOE, DoD resources are matched. More importantly, this relatively small DoD contribution effectively taps the annual billion-dollar DOE RDT&E investment by accessing the specialized skills, scientific equipment, facilities and computational tools not available in DoD.

(U) The effort exploits the extensive and highly developed technology base resident in the National Laboratories relevant to achieving the goal of developing capable, cost-effective conventional munitions, and leverages DoD investments with matching DOE investments. The current program supports 43 projects in warhead technology, energetic materials, advanced initiation and fuze development, munitions lifecycle technology and demilitarization, and computer simulation. A specific Service laboratory sponsors each of these active projects. The program is administered and reviewed by a Joint Technical Advisory Committee composed of members from the Army, Navy, Air Force, OSD, and DOE. Projects are peer-reviewed semi-annually by DoD Service Laboratory/Technical Center personnel in order to monitor technical excellence and insure that the technologies under development address priority DoD needs. The program is integrated with Service efforts through the Project Reliance Weapons Panel and participation in the Defense Technology Area Plan for Conventional Weapons. The program is reviewed under the Technology Area Review and Assessment process.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	R-1 ITEM NOMENCLATURE JOINT DoD/DOE MUNITIONS PE 0603225D8Z

COST *(In Millions)*	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	16.242	13.007	14.786	14.790	14.916	15.233	15.553	15.880	Continuing	Continuing
DoD/DOE Munitions/P225	16.242	13.007	14.786	14.790	14.916	15.233	15.553	15.880	Continuing	Continuing

(U) Project Number and Title: P225/DoD/DOE Munitions

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY1998 Accomplishments:

(U) This development effort continues to provide improved component options for use in robust, low-cost, miniature electronic safing, arming and firing systems. The objective is to provide a set of characterized, qualified, generic components (and suppliers) and to demonstrate their use in prototype designs. The primary challenge is to significantly reduce system size and cost while increasing the operational capability and survivability and maintaining safety and reliability. A further challenge is to extend the technology to high velocity penetrating weapons and to artillery and mortar rounds. The functionality and reliability of a new semiconductor switch was demonstrated that is a factor of 5 lower in cost and a factor of 10 smaller than the vacuum switch used in current systems. The firing voltage for chip-slapper detonators was decreased 30% by using composite flyers and aluminum bridges. Lower detonator voltage allows the use of smaller, lower-cost energy storage devices and other components. The functionality of redesigned 1 kV ceramic capacitors was demonstrated for fire set application to replace custom mylar units. Capacitor costs decreased from $100 to $2-$10; size decreased by a factor of 10. These new components have been demonstrated in a working prototype electronic safing and arming device (ESAD) that is 1.25 cubic inches in size with parts cost of $120. This represents a factor of 5 reduction in size and a factor of 4 reduction in cost over current state-of-the-art technology. Multi-point detonators are the enabling technology for advanced aimable and multi-mode warheads. A 20-point design utilizing new lower energy and lower voltage Safe, Low-Input, Microslappers (SLIM) is being transferred to the Air Force contractor working on the multi-mode warhead for LOCAAS. Fast charge coupled devices (CCD) are being used to build a high-speed imaging (4000 frames/s) camera with a 512x512 pixel array for use in range-gated sensors and experiment diagnostics. Fabrication and testing of the imager at full pixel clock rate was completed. ($3.380 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	R-1 ITEM NOMENCLATURE JOINT DoD/DOE MUNITIONS PE 0603225D8Z

(U) DoD and DOE have very similar requirements for energetic materials. Both agencies desire high explosives with increased or tailored performance and decreased sensitivity. Recent accomplishments have benefited both agencies. LLM-105, a new energetic molecule that combines moderate energy with excellent insensitivity properties, was scaled up using a batch process to a 0.4-kg quantity. Instrumented shock loading tests showed a prototype formulation to be extremely insensitive, thereby increasing the likelihood of it becoming a practical material for munitions. A R&D 100 Award, given to the top 100 inventions in the US each year thought to have the greatest impact, was won for a new explosive compound that produces no smoke yet generates large quantities of gas. It is an excellent candidate material for low-signature rocket propellants. A hard target penetrator explosive, RX-35-EK, which combines nearly 50% increase in energetic performance with improved survivability, was transferred to Eglin AFB for testing. The CHEETAH 2.0 thermochemical code, used by over 250 DoD organization and contractors for prediction of the performance of high explosives (HE) as well as gun and rocket propellants, was released to users. This update tripled the database of HEs and enables CHEETAH to be used over a very comprehensive range of energetic materials problems. An initial code suite for use in multidimensional cookoff studies was completed and transitioned to the NAVY. This first-ever truly predictive capability for cookoff is composed of coupled thermal/mechanical/chemical codes for predicting when and where initiation occurs, along with shock physics tools for predicting the resulting violence of reaction. ($3.480 Million)

(U) Polymeric carbon monoxide, the first of a new and potentially very interesting class of metastable High Energy Density Materials (HEDM) was synthesized under very high pressure and temperature in the laboratory and recovered for characterization at ambient conditions. Energy content of this class of materials is predicted to exceed that of known high explosives by a factor of 2 to 4. Scale-up activities and performance evaluations continued on another new class of energetic materials, Metastable Intermolecular Composites (MIC), where 500 prototype MIC-based, green (lead-free) percussion primers for small-arms ammunition were produced and evaluated by the Army; all performance specs were met. Work on a carbon/hydrogen HEDM continued. The energy storage mechanism was established and preliminary experiments showing feasibility of production scale-up were completed. ($1.060 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	R-1 ITEM NOMENCLATURE JOINT DoD/DOE MUNITIONS PE 0603225D8Z

(U) Lagrangian and Eulerian hydrocodes, coupled code systems, arbitrary Lagrangian-Eulerian (ALE) codes, and supporting materials models and constitutive relations developed at the nuclear weapons laboratories, have been improved and adapted to DoD problems and transitioned to the DoD user community for use in warhead design and evaluation. This program provides prompt and direct access to the substantial investments in computational mechanics and materials modeling by the DOE and acts as the conduit for transition. Specific activities supporting the technology transition include distribution of computational tools to the DoD community, support of DOE codes on centralized DoD computing systems, training of the user community, and consulting as needed. The smooth particle hydrocode SPHINX, used for detailed endgame analyses of high-speed missile intercepts, was improved and adapted to parallel computer architectures. New materials and failure models required for this application were implemented. Material constitutive models for composites and explosives were developed using experimental data from a new Hopkinson bar made of magnesium, which allows dynamic strain rates of low-density materials to be determined. ($2.822 Million)

(U) A new concept for hard target weapons, the monolithic ballasted penetrator, has been developed that significantly increases velocity limits, penetration depth into concrete, and volume for energetic materials. The first prototype penetrator was fabricated demonstrating casting of ultra high strength alloy steel, net-shape processing and cost-effective manufacture. Preparations for testing are underway. Completed successful instrumented test of mid-scale conventional penetrator at high velocity (3500 fps) into concrete providing first detailed environmental data for components and payload at these conditions. These tests directly support the challenging problem of designing a fuze and payload that will survive high velocity impact into rock and concrete. A new level of shaped charge performance (classified), resulting from hydrocode design tools, was demonstrated. Two separate designs were developed; one of which originated from using the Global Local Optimizer (GLO) code coupled with the hydrocode CALE. GLO enhances the effectiveness of the designer approximately 10-fold. This was the first attempted use of GLO to accomplish a completely new warhead design. Both of the designs were successfully tested and achieved the predicted levels of performance. A new understanding of the influence of material properties on warhead liner performance provided the first correlation and explanation of the combined influence of material grain size and impurity concentration of liner ductility. ($3.250 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	R-1 ITEM NOMENCLATURE JOINT DoD/DOE MUNITIONS PE 0603225D8Z

(U) DoD and DOE efforts toward munitions lifecycle technologies including stockpile aging, surveillance, demilitarization and disposal are coordinated under the auspices of this program. Work was completed on molten salt and base-hydrolysis, two competing technologies for the destruction of explosives and other organic materials. Prototype units have been constructed and delivered for pilot plant use and evaluation. The molten salt destruction of energetic materials project was completed with transition of pilot plant reactors to the Bluegrass Ammunition Depot and to Air Force Research Laboratory at Eglin AFB. A portable base-hydrolysis unit and hydrothermal unit was designed, fabricated, tested and delivered to a DOE facility for evaluation. Initial tests were performed using a femtosecond laser, demonstrating the capability to cut through HE samples, both bare and inside of a case, without any evidence of chemical reaction in the HE. These test results served to initiate a major effort to exploit the technology for demilitarization and precision machining of HE. In collaboration with a DoD contractor a process was developed for cofiring rocket motor propellant washout waste streams contaminated with asbestos fibers. The presence of asbestos is a result of the washout process. Combustion conditions and control strategies were demonstrated that burns the residual propellant and transform the asbestos fibers into amorphous, harmless magnesium silicates. A prototype robotic workcell for disassembling 40-mm projectiles was developed and delivered to McAlester Army Ammunition Plant for testing and evaluation. Age-related degradation of materials within high value weapon systems was studied in order to understand and predict changes in munitions safety, performance and reliability during long term storage. Development of predictive models for materials and system aging was begun based on evaluation of stockpile materials and components. The focus is on solder interconnect reliability, corrosion of electronics with an emphasis on plastic encapsulated microcircuits, and the aging of propellants. ($2.250 Million)

(U) FY1999 Plans:

(U) Continue the improvement of electronic safing, arming and firing systems with a focus on reducing size and cost for application to artillery and mortar rounds and increasing shock survivability for application to high-velocity hard target penetrators. Continue to work with industry to establish commercial sources for qualified components and continue the transition of technology to developmental and fielded weapon systems. Complete the characterization of low-energy semiconductor bridge (SCB) slapper detonators and continue work on the producability, packaging and long-term reliability of chip and SCB slapper detonators. Complete development and testing of HNS-IV explosive formulations with binders for use in detonator pellets in high shock environments. Establish an alternate commercial source for the new semiconductor switch; the current supplier has decided to quit the defense business. Evaluate electron-bombarded CCD intensifier to improve sensitivity and resolution of high-speed imaging camera. Evaluate non-linear optical materials as imaging detector in near IR and initiate field tests. ($2.310 Million)

(U) Continue the development of HE with increased or tailored performance and decreased sensitivity. Initiate work on a more energetic hard target explosive with significantly improved survivability to meet the HE needs of the Navy and Air Force for a hypervelocity munition. Complete characterization

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	R-1 ITEM NOMENCLATURE JOINT DoD/DOE MUNITIONS PE 0603225D8Z

work on promising new energetic, insensitive molecule, LLM-105. Produce increased quantities and evaluate new high-nitrogen tetrazine-based explosives that promise decreased sensitivity while maintaining performance. Evaluate energetic elastomers based on dinitropropylacrylate for use as explosive binders having tailored glass transition temperature to reduce the embrittlement of explosives at low operational temperatures. Continue characterization of new, smokeless compounds for application in explosives and propellants. Continue work to predict the response of energetic materials in weapon systems subjected to thermal and mechanical insult. Fully characterize bulk and constituent properties of explosives PBX-9502 and PBXN-9, build constitutive models, and implement in 3D hydrocodes. Use these tools to predict HE response to hard target penetration environments. Experimentally assess and validate tools for predicting the violence of reaction in cookoff accidents. Continue the equation of state measurements on unreacted and off-Hugoniot states of HEs as a physical basis for developing the CHEETAH kinetics modeling capability. ($2.800 Million)

(U) Complete the characterization of polymeric carbon monoxide, the first metastable HEDM sample, in terms of its structure and energy content. Explore energy release mechanisms, continue the creation of new HEDM materials, and proceed with plans to scale up the high pressure and high temperature workcell. Scale up MIC fabrication capability to 1 kg/day operation and assist Army and Navy in evaluating alternatives for establishing fabrication capability at DoD facilities. Establish parameters for production of carbon/hydrogen in powder form and generate adequate powder to characterize its nature and properties. ($0.720 Million)

(U) Ongoing code and material model development will continue to focus on greater accuracy, improved physics, and extension to a broader class of real-world problems. Release new version of ALE3D in parallel architecture. Experimentally validate SPHINX simulations of high-speed missile intercept endgames. Implement improved and validated reactive and dynamic burn models into hydrocodes. Continue the development, implementation, and validation of material constitutive and failure models for incorporation into simulation tools. ($2.317 Million)

(U) Build four additional monolithic ballasted penetrator prototypes and test at mid-scale. Work supports Navy development of penetrating warhead for Standard Missile. Establish velocity limits and transition behavior for oblique and yawed impacts into limestone and weathered rock. Support the development of advanced reactive warhead concepts by evaluating how thin-film composition and structure affect the performance, deformation and failure of brittle films on ductile metal substrates. Continue the application of the optimizer code GLO to complex warhead design problems, as a powerful extension of design efficiency and capability. Use GLO to design warheads for increased penetration capability against concrete structures, for the integration of LX-19 into a tantalum explosively formed projectile (EFP) warhead, and for continuation of the high speed jet design. Continue the study of impurity effects on

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	R-1 ITEM NOMENCLATURE JOINT DoD/DOE MUNITIONS PE 0603225D8Z

the dynamic behavior of warhead liner materials. Continue the exploration and demonstration of the highest speed shaped charge jets attainable. Continue the dynamic study and analysis of liner formation and behavior, using infrared thermometry and fluorescence techniques, as well as high-speed, high-resolution optical techniques. Perform EFP tests to evaluate powder metallurgy tantalum vs. wrought material and determine the effects of specific textures and powder processes on warhead formation and performance. ($2.870 Million)

(U) Establish a testbed facility for the evaluation and exploitation of femtosecond laser cutting and machining of HE for use in munitions manufacturing and demilitarization processes. Initiate a parallel modeling effort to fully understand the femtosecond time-scale kinetics of the interaction of a laser pulse with energetic material. Improve vision and force control algorithms for the robotic workcell to increase operation rate of the disassembly of 40-mm Navy projectiles. Begin design and fabrication of tools and fixtures for automated disassembly of Improved Conventional Munitions (ICM) and safing of individual submunitions. In the study of materials aging characterize age-related physiochemical changes taking place in propellants to identify the cause of observed bulk property changes in composite rocket motors. The objective is to develop a constitutive propellant failure model to improve service-life predictive codes. ($1.990 Million)

(U) FY2000 Plans:

(U) Continue the development and demonstration of improved component options for use in robust, low-cost, miniature safing, arming and firing systems. Complete the characterization of detonators, capacitors, switches, etc. in shock environments for application to hard target munitions. Continue work on prototype ESAD sized for artillery and mortar rounds. Initiate work on an ESAD for hard target penetrators. The goal is to complete the design, fabrication and testing of a working prototype in FY2003. Complete high-speed imaging camera with electron-bombarded CCD and high-resolution frame grabber technology. ($2.430 Million)

(U) Continue the development of a low-sensitivity HE for application to hypervelocity hard target penetrators. The goal is to provide the Air Force and Navy with a high performance explosive formulation that will survive the impact of a hypervelocity penetrator into concrete. Complete characterization of new tetrazine-based explosives and select most promising candidate material for explosive and propellant formulations. Initiate formulation studies to optimize their performance in munitions systems. Evaluate the potential of sol-gel energetic materials for possible applications in high energy and high power explosives, precision detonator materials and detonation wave shapers, and pyrotechnics. Transition TATB-based technology developed for the nuclear weapons community to the DoD to meet IHE material requirements in a cost-effective manner. Continue pursuit and evaluation of highly energetic molecules with improved thermal stability. Continue development of equation of state for unreacted, partially reacted and fully reacted HEs, including non-ideal HEs,

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	R-1 ITEM NOMENCLATURE JOINT DoD/DOE MUNITIONS PE 0603225D8Z

through modeling and carefully diagnosed experiments. Information generated will be input into CHEETAH and transitioned throughout the DoD community. ($3.570 Million)

(U) Continue ongoing pursuit of new HEDM candidate materials having energy capacities 2-4 times that of HMX. Scale up production capabilities to provide gram-size material samples for characterization and study of energy release mechanisms. Transition fabrication technology for MIC materials to Army and Navy and complete economic assessments for establishing DoD production facilities. Complete study of carbon/hydrogen HEDM in terms of sensitivity, energy release potential, shelf-life stability and suitability for exploitation. ($1.010 Million)

(U) Continue development of Eulerian, Lagrangian, coupled and ALE codes relevant to the design and evaluation of munitions. Continue to incorporate improved materials models emerging from the DOE Advanced Strategic Computing Initiative to provide high resolution, accurate predictions of materials behavior and failure during warhead formation and warhead/target interactions. Support the transition of these tools to the DoD community. ($2.536 Million)

(U) Complete testing of ballasted penetrator concept for use against hard target. Develop and improve constitutive modeling of rock and soil and continue extensive benchmarking of codes and design tools against mid-scale and lab-scale tests. Provide fuze and payload developers with accurate predictions and measurements of penetration environments to support survivability testing. Produce and demonstrate prototype explosive projectile warheads using liners processed according to specifications developed from ongoing impurity and microstructural studies. Pursue hybrid EFP/jet and tandem concepts of defeat of specified hard targets. Evaluate utility of GLO-designed warhead concept for defeat of concrete targets. Transition high-speed jet designs to DoD to meet performance requirements well beyond the current state-of-the-art. ($3.340 Million)

(U) Begin tests in the femtosecond laser facility of cutting potential against large-scale HE samples and live munitions. Continue study of HE/ultra-short-pulse laser beam interactions through integration of modeling and well-diagnosed experiments. Delimit regions of utility for demilitarization and machining operations. Transition the process for synthesis of TATB, a high value explosive, by the direct conversion of waste Explosive D available from demilitarization operations. Demonstrate progress toward remote disassembly of 155-mm ICM artillery shells by remotely exposing submunition layers for handling and safing. The program goal is to implement integrated vision capabilities with force control and compliant tooling to demonstrate completely automated disassembly of ICMs with safing of individual submunitions by FY2002. Complete the predictive model for solder interconnect reliability based on mechanistic models of thermomechanical fatigue and fatigue crack propagation. Validate model using laboratory test samples and fielded test hardware. Continue the development of other materials and system aging models. ($1.900 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	R-1 ITEM NOMENCLATURE JOINT DoD/DOE MUNITIONS PE 0603225D8Z

(U) FY2001 Plans:

(U) Continue the development of advanced electronic safing, arming, and firing systems with a focus on small size, low cost and improved survivability. Demonstrate a working prototype of a generic ESAD sized for artillery and mortar rounds (less than 0.75 cubic inches) and with a further factor of two reduction in cost ($50 in parts). Continue work on the prototype hard target ESAD toward the planned demonstration in FY2003. ($2.430 Million)

(U) Transition HE and propellant formulations based on new tetrazine explosives to Services for safety qualification and application to munitions systems. Exercise the new hazards codes to evaluate the risk to munitions systems from a broad range of accident scenarios. Develop materials models that can predict new explosives molecules and their properties. Formulate explosives and propellants with enhanced properties such as lower sensitivity and smoke-free burning. ($3.600 Million)

(U) Complete characterization of metastable polymeric carbon monoxide and continue synthesis effort of other extended solid HEDM. Study the nature of phase transitions in solid nitrogen; pursue high hydrogen content material (BH3). Evaluate large volume press to scale up production. ($0.590 Million)

(U) Continue to develop, extend and apply the hydrocodes and associated materials models for warhead design and evaluation. Continue to support the transition of these tools, the training and consulting for the DoD user community. ($3.170 Million)

(U) Continue study of advanced hard target penetrator concepts and adapt designs to state-of-the-art materials and manufacturing methods. Continue development and validation of computational design tools and material models to extend penetrating weapon reliability and capability. Produce power metallurgy molybdenum and tungsten liners for enhanced warhead applications. Apply advanced modeling and simulation based design techniques to new warhead materials with energetic properties which couple to targets in order to increase efficiency and lethality. ($3.180 Million)

(U) Complete testing of the femtosecond laser cutting on live munitions and transition the technology to Services and DoD contractors for application to munitions manufacturing and demilitarization operations. Conduct full-scale demonstration of the direct chemical oxidation process for destruction of organic waste. This technique addresses the need for low-cost processing of empty shell cases to certify removal of trace quantities of explosives or toxic materials. Demonstrate integrated disassembly hardware and software algorithms in the robotic workcell for automated, remote disassembly of ADAM mine projectiles. Complete the predictive model for the reliability of plastic encapsulated microcircuits in dormant storage. This is important because commercial

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	R-1 ITEM NOMENCLATURE JOINT DoD/DOE MUNITIONS PE 0603225D8Z

specifications and test protocols do not accurately represent storage times and conditions for DoD munitions. Continue the development of other materials and system aging models. ($1.820 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	R-1 ITEM NOMENCLATURE JOINT DoD/DOE MUNITIONS PE 0603225D8Z

(U) B. Program Change Summary	FY1998	FY1999	FY2000	FY2001	Total Cost
Previous President's Budget	16.141	16.354	15.290	15.306	Continuing
Appropriated Value	17.700				Continuing
Adjustments to Appropriated Value					
a. Congressionally Directed undistributed reduction	(0.733)	(.440)			
b. Rescission/Below-threshold Reprogramming, Inflation Adjustment	(0.058)				
c. Other		(2.907)	(.504)	(.516)	Continuing
Current President's Budget	16.242	13.007	14.786	14.790	Continuing

Change Summary Explanation:

(U) **Funding:** Funding changes in 1999, 2000, and 2001 are due to congressionally directed undistributed reductions and below threshold program adjustments.

(U) **Schedule:** Not Applicable

(U) **Technical:** Not Applicable

(U) **C. Other Program Funding Summary Cost** Not Applicable

(U) **D Acquisition Strategy :** Not Applicable

(U) **E. Schedule Profile** Not Applicable

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)									DATE February 1999	
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/BA 3				R-1 ITEM NOMENCLATURE Automatic Target Recognition PE 0603232D8Z						
COST *(In Millions)*	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	5.904	5.010	7.775	7.588	4.709	4.795	4.896	4.999	Continuing	Continuing
ATR/P232	5.904	5.010	7.775	7.588	4.709	4.795	4.896	4.999	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification

(U) BRIEF DESCRIPTION OF ELEMENT:

(U) Automatic Target Recognition (ATR) systems improve the capabilities of our armed forces by enabling them to make better use of the information provided by such military sensor systems as radar, laser, infrared (IR), hyperspectral, identification friend or foe (IFF), and electronic signal measurement (ESM). ATR enhances the combat capabilities of our forces by increasing the lethality and survivability of our weapon systems and decreasing the time required to acquire and identify potential adversaries. ATR technology reduces our risk of fratricide by augmenting combat identification systems to improve our ability to distinguish between friend, foe, or neutral forces under high stress conditions. When coupled to appropriate sensor suites, ATR allows rapid detection of individual surface and buried mines and unexploded ordinance (UXO). ATR technology provides significant workload reduction for the intelligence forces by aiding the image analyst to exploit imagery rapidly and accurately. In an era of decreasing military manpower, improved ATR will enable our forces to handle an ever increasing load of sensory information in the complex situations to be encountered in the military missions of the future.

(U) Increasing ATR operational effectiveness requires research and development to enhance sensors and algorithm processing. Additionally, improved, standardized procedures and metrics for measuring and demonstrating ATR effectiveness must be developed. The utility of ATR is highly dependent on the quality of the information provided by the sensor system(s) and the ability to process that information effectively to provide reliable decisions with operationally acceptable false alarm rates. Service and Agency ATR efforts have concentrated on algorithm development for conducting post-processing comparison and decision making which exploit improved digital computational capability. This program will focus on determining effectiveness of ATR, establishing benchmark metrics, and conducting and collecting single and multi-sensor data for potential reuse in Service and Agency algorithm development and objective evaluation. Consistent with the 1997 report of the Defense Science Board Task Force on ATR, this program will establish standard tests and procedures to provide an “honest broker” assessment of current leading candidate ATR’s, as well as emerging ATR technology for the next generation of ATR systems.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/BA 3	R-1 ITEM NOMENCLATURE Automatic Target Recognition PE 0603232D8Z

(U) The ATR program funds the integration and demonstration of advanced technology for field experimentation and assessment. The result of the ATR program efforts is the integration of the demonstrated technological capabilities and the capability to assess algorithms and various technologies. This leads to greatly improved understanding of the Joint Warfighting utility when assessed in realistic operational contexts. The Military Services provide air, land, and naval technological superiority, respectively, and ACTDs rapidly prototype and transition technological solutions to specific threat scenarios. This program provides timely resources and flexibility to horizontally integrate technology solutions across Services and Agencies and identify new and emerging “best-in-class” ATR systems with confidence so that this critical technology can be fielded sooner.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/BA 3	R-1 ITEM NOMENCLATURE Automatic Target Recognition PE 0603232D8Z

COST *(In Millions)*	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	5.904	5.010	7.775	7.588	4.709	4.795	4.896	4.999	Continuing	Continuing
ATR/P232	5.904	5.010	7.775	7.588	4.709	4.795	4.896	4.999	Continuing	Continuing

(U) Project Number and Title: P232 ATR

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1998 Accomplishments:

(U) Work continued to assess key ATR metrics to find the "best in class" and spur fielding for critical needs identified by the Defense Science Board (DSB) and Joint Requirements Oversight Council. An ATR Transition Conference was held to address a DSB recommendation to bring developers and operators together to better understand each other's perspectives and expectations for ATR. The Virtual Distributed Laboratory (VDL) was brought on-line with the central site at Air Force Research Laboratory, Wright Patterson AFB, OH. The VDL is a high-speed network to Service sites to host test procedures, data sets, and ATR results to reduce the cycle time for ATR development and evaluation. A cooperative multi-sensor data collection, referred to as the Mother-of-All Data Collections-1 (MAD-1), was conducted at Eglin AFB, FL in conjunction with the Air Force, Army, and DARPA. The imagery of operationally deployed target sets was used to assess Laser Radar ATR performance and is being hosted on the VDL to mature surveillance and attack ATR algorithms. The longer-term approach to provide imagery to ATR's for evaluation is to use multi-sensor synthetic imagery. For the first time, synthetic infrared imagery was input to an ATR for evaluation and its results were compared to those obtained with the corresponding real imagery as an initial step for validation. The recommendation of the OSD Hyperspectral Imaging (HSI) Integrated Product Team (IPT) to establish a Hyperspectral Technology Assessment Program was implemented. The Hyperspectral Technology Assessment Program (HTAP) will lay out the framework needed to characterize the potential value of HSI systems to DoD operations, and will apply this framework to identify opportunities for near-term technology development and demonstration. ($5.904 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/BA 3	R-1 ITEM NOMENCLATURE Automatic Target Recognition PE 0603232D8Z

(U) FY 1999 Plans:

(U) The focus of the ATR assessment technology program will be directed toward Synthetic Aperture Radar (SAR) ATR for the reconnaissance and surveillance scenario. A comparative assessment of ATR's for SAR will be conducted and the results used to both establish the state-of-the-art performance and to assess concepts for performance benchmark metrics. Techniques and metrics to quantitatively describe input image difficulty, or clutter, will be developed. The program will cooperate with a service Program Manager to facilitate transition of an ATR application through enhanced evaluation techniques directed toward mission specific problem sets. "Best Practices" for standardized ATR evaluation and assessment will be established and promulgated through the Automatic Target Recognition Working Group (ATRWG). ATR evaluation techniques will be applied to hyperspectral imaging systems. The use of synthetic imagery for forward-looking infrared (FLIR) ATR evaluation will be validated. Humanitarian Demining Operations will be addressed through evaluation of ATR technologies developed to detect mines and UXO. More extensive multi-sensor algorithms will be evaluated. For HTAP, the two most promising application domains to pursue are 1.) tactical target detection and classification; and 2.) battlespace environment characterization, from both airborne and spaceborne sensors. Hyperspectral algorithm assessment and performance modeling will be undertaken for these two domains. ($5.010Million)

(U) FY 2000 Plans:

(U) Standard metrics to describe ATR performance and associated problem sets will be adopted which cover surveillance, weapon, and attack applications of ATR's. The evaluation effort to determine "best in class" will be expanded to include more complex ATR functions such as scene analysis, and new sensor types to include hyperspectral and multi-mode sensors. Quantitative performance for hyperspectral algorithms will be established and used to refine a system level performance model. The Services' synthetic image generation capabilities will be applied to multi-spectral ATR's as a means to assess ATR performance over a wider range of operating conditions. During this time period more extensive subsystem technology effectiveness demonstrations will be conducted which support a broader range of system/platform applications. Modeling and simulation tasks will be conducted to provide software and hardware in the loop effectiveness analyses refine design requirements and manufacturing approaches. These models and simulations will be used to expand the range of tests and provide greater confidence in ATR field tests, which are limited in scope and duration, to facilitate transition to production programs. A quantitative understanding of HSI performance and operational utility will be established as a basis for future investment decisions. This timing is consistent with the current schedules for ASRP flight demos and launches of Warfighter –1 and the Navy Earth Map Observer. ($7.775 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/BA 3	R-1 ITEM NOMENCLATURE Automatic Target Recognition PE 0603232D8Z

(U) FY 2001 Plans:

(U) Robustness of selected ATR's will be assessed over a wider range of challenging operating conditions using innovative applications of real, hybrid and synthetic imagery. This effort will support the validation of using multi-spectral synthetic imagery generated "on-demand" for the selected ATR in its operational scenario. The application of such multi-sensor synthetic imagery in High Level Architecture (HLA) simulations will be assessed as a technique to determine dynamically ATR effectiveness. In the hyperspectral area, an end-to-end performance model, incorporating sensor and processor models, will be validated. The end-to-end model will be used to conduct performance and subsystem trade off analyses between hyperspectral sensors and their ATR's. Service models developed to predict ATR performance will be refined to include evolving high fidelity multi-mode sensors. ($7.588 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/BA 3	R-1 ITEM NOMENCLATURE Automatic Target Recognition PE 0603232D8Z

(U) B. Program Change Summary	FY 1998	FY 1999	FY 2000	FY 2001	Total Cost
Previous President's Budget	6.487	5.081	4.909	4.725	Continuing
Appropriated Value	6.789				Continuing
Adjustments to Appropriated Value					
a. Congressionally Directed undistributed reduction	(0.302)	(.071)			
b. Rescission/Below-threshold Reprogramming, Inflation Adjustment					
c. Other			3.000	3.000	Continuing
Current President's Budget	5.904	5.010	7.775	7.588	Continuing

Change Summary Explanation:

(U) **Funding:** FY 1999 changes are due to congressionally directed undistributed reductions. FY2000 and FY2001 changes are due to addition of Hyperspectral Imaging and systems applications to the ATR Program.

(U) **Schedule:** Not Applicable

(U) **Technical:** Not Applicable

(U) **C. OTHER PROGRAM FUNDING SUMMARY COST:** Not Applicable

(U) **D. ACQUISITION STRATEGY:** Not Applicable

(U) **E. SCHEDULE PROFILE:** Not Applicable

Exhibit R-2, RDT&E Budget Item Justification									DATE: FEBRUARY 1999	
APPROPRIATION/BUDGET ACTIVITY RDT&E,DW/BA 3					R-1 ITEM NOMENCLATURE Program Element (PE) Name and No. **Special Technical Support** **PE 0603704D8Z**					
COST*($In Millions)*	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	Cost to Complete	Total Cost
Total PE Cost	11.147	11.176	10.948	10.855	11.043	11.279	11.514	11.757	Continuing	Continuing
Project Name/No. and Subtotal Cost STS/P704	11.147	11.176	10.948	10.855	11.043	11.279	11.514	11.757	Continuing	Continuing

A. Mission Description and Budget Item Justification

Brief Description of Element: Special Technology Support to Intelligence and Light Forces provides quick reaction capability to satisfy CINC Intelligence and Light Forces requirements. It emphasizes the rapid prototyping of equipment and systems under initiatives that are ordinarily completed within a 12 to 24 month period, and cost less than a million dollars. By Congressional direction for FY 1990 and beyond, this program element contains two projects previously funded under other program elements: 1) the Counter Insurgency Special Technology Program (which was part of the Force Enhancements – Active Program/PE1110011D), and 2) a portion of the Equipment Upgrade Program/PE0203745A). Both projects are intelligence related.

The PE is under Budget Activity 3, Advanced Development, since these initiatives result in proof of technology feasibility and technical and operational evaluations.

Program Accomplishments and Plans:

Exhibit R2, RDT&E Budget Item Justification	DATE FEBRUARY 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,DW/BA 3	R-1 ITEM NOMENCLATURE Program Element (PE) PE 0603704D8Z SPECIAL TECHNICAL SUPPORT

FY 1998 Accomplishments
- Rapid fielding of specialized surveillance systems
- Continued support to the Demand Driven Direct Digital Dissemination (5D) system
- Special Access Program for HUMINT mission support
- Development and fielding of unique secure data reporting systems
- Developed and fielded network reporting and visualization systems
- Developed and demonstrated Tactical and Strategic events visualization system
- Fielded Technical Intelligence systems and components

FY 1999 Plans
- Mission Support

FY 2000 Plans
- Mission Support

FY 2001 Plans
- Mission Support

B. **Program Change Summary**	FY1998	FY1999	FY2000	FY2001	Total Cost

Exhibit R2, RDT&E Budget Item Justification	DATE FEBRUARY 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,DW/BA 3	R-1 ITEM NOMENCLATURE Program Element (PE) PE 0603704D8Z SPECIAL TECHNICAL SUPPORT

Previous President's Budget	11.224	11.337	11.320	11.234	Continuing
Appropriated Value					
Adjustments to Appropriated Value					
a. Below threshold program adjustments	-.077		-.184	-.183	
b. Inflation Adjustment		-.161	-.188	-.196	
Amended Budget Estimate Submission	11.147	11.176	10.948	10.855	Continuing

Change Summary Explanation: N/A

C. Other Program Funding Summary: None

D. Acquisition Strategy: N/A

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)									DATE February 1999	
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/BA 3							R-1 ITEM NOMENCLATURE Strategic Environmental Research and Development program PE 0603716D8Z			
COST *(In Millions)*	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	56.716	58.771	53.506	51.729	53.764	53.423	54.468	55.569	Continuing	Continuing
SERDP/P470	56.716	58.771	53.506	51.729	53.764	53.423	54.468	55.569	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification

(U) BRIEF DESCRIPTION OF ELEMENT:

(U) The Strategic Environmental Research and Development Program (SERDP) was established by Congress in 1990 (10 U.S.C. Section 2901-2904) to address Department of Defense (DoD) and Department of Energy (DOE) environmental concerns. It is conducted as a DoD program, jointly planned and executed by the DoD, DOE, and the Environmental Protection Agency (EPA), with strong participation by other Federal agencies, industry, and academia. SERDP's objective is to improve DoD mission readiness by providing new knowledge, cost-effective technologies, and demonstrations in the areas of environmental cleanup, compliance, conservation, and pollution prevention. SERDP does this by (1) addressing high priority, mission- relevant, defense environmental technology needs necessary to enhance military operations, improve military systems' effectiveness, enhance military training/readiness, and help ensure the safety and welfare of military personnel and their dependents; and (2) enhancing pollution prevention capabilities to reduce operational and life-cycle costs, as well as reducing the cost of necessary cleanup actions and compliance with laws and regulations. As a secondary benefit, SERDP helps solve significant national and international environmental problems. The keys to a growing list of SERDP technological successes are the ability to respond aggressively to these priority defense needs; the pursuit of universal, world-class technical excellence; emphasis on constant technology transfer to field use; and sound fiscal management.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/BA 3	R-1 ITEM NOMENCLATURE Strategic Environmental Research and Development Program PE 0603716D8Z

COST *(In Millions)*	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	56.716	58.771	53.506	51.729	53.764	53.423	54.468	55.569	Continuing	Continuing
SERDP	56.716	58.771	53.506	51.729	53.764	53.423	54.468	55.569	Continuing	Continuing

(U) Project Number and Title: SERDP/P470

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY1998 Accomplishments:

(U) Pollution Prevention:

(U) Next Generation Fire Suppression Technology Program (NGFSTP): This umbrella project which began in FY 1997 is part of the NGFSTP for the replacement of Halon 1301 in DoD weapon systems, the production of which was banned by the Montreal Protocol. It is divided into the following six fully integrated technical focus areas each with sequential and synergistic research elements (a total of 32 research elements). Research and development activities began in the following sub-thrust areas: Mechanisms of Ultra-High Efficiency Chemical Suppressants, Suppression Dynamics of Fine Droplets and Particles, Stabilization of Flames, Suppression System Effectiveness Screening, and Advanced Propellants/Additive Development for Gas Generators. In FY 1998, data on fires in military platforms and the outcome of these fires were received from military safety centers and a draft report summarizing these was completed. A number of compounds containing such atoms as phosphorus, iron, nitrogen, and bromine have been demonstrated to be at least as effective as Halon 1301 with little potential environmental impact. Additionally, characterization of the particle behavior in flames as a function of the individual size groupings and position in the flames of various strain is underway and fabrication of wind tunnel for flame spread experiments is completed. A successful workshop on screening methods for agent compatibility with people, materials, and the environment was held. A detailed summary of the discussions and conclusions from the workshop is available online at http://flame.cfr.nist.gov/ngp/. Also, sixteen new research elements were initiated. ($ 3.407 Million)

(U) Elimination of Toxic Materials and Solvents from Solid Propellant Components: Continuing project, to eliminate (minimize) the use of lead compounds as ballistic catalysts in reduced-smoke propellants, and eliminate HCl as a combustion product of tactical and strategic boosters. In FY 1998 lead-free formulations were developed and formulation downselection was completed. ($ 1.420 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/BA 3	R-1 ITEM NOMENCLATURE Strategic Environmental Research and Development Program PE 0603716D8Z

(U) Elimination of Toxic Heavy Metals from Small Caliber Ammunitions: Continuing project to eliminate hazardous materials in the bullet core and primer of small caliber ammunition while meeting U.S. and NATO performance requirements. The project evaluates tungsten as a possible replacement for lead-antimony. A draft report on environmental safety and health aspects of tungsten is being prepared. Preliminary recycle and bio-uptake studies for tungsten as replacement material for lead antimony are completed. A sensitivity study of Metastable Interstitial Composites primer to water was completed. Primers have been assembled into cartridges and tested. Long term storage tests and primer/propellant ignition interface tests are ongoing. ($ 0.900 Million)

(U) Eliminate Volatile Organic Compounds (VOCs) in CARC Paint Formulation, Applications, and Removal: Continuing project to reduce the regulated VOC content of chemical agent resistant coating (CARC) system for use on military equipment by all services. Established basic low VOC formulation. Army Research Laboratory awarded patent (#5,691,410) for the water reducible low VOC CARC formulation. Validated all properties of Army Green camouflage color. ($ 0.900 Million)

(U) Trapped Vortex Combuster for Jet Engines: Continuing project will develop design rules for and demonstrate the feasibility of a trapped vortex combustor for reducing the NOx (oxides of nitrogen) VOC, and CO (carbon oxide) emissions from aircraft, land and marine gas turbine engines by 60%. This combustor has been chosen for inclusion in the Integrated High Performance Turbine Engine Technology (IHPTET) engine. Fabrication of high pressure facility for testing trapped vortex combustor at up to 45 atm has been completed. ($ 0.640 Million)

(U) Additional efforts in 17 other projects were undertaken in Pollution Prevention. ($ 11.363 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/BA 3	R-1 ITEM NOMENCLATURE Strategic Environmental Research and Development Program PE 0603716D8Z

(U) Cleanup:

(U) Unexploded Ordnance (UXO) Detection: Continuing umbrella effort to integrate and automate UXO detection, identification, and discrimination sensor technologies to include wide-area, rapid coverage over a variety of terrain of UXO-contaminated areas. In FY1998, completed in-depth analysis of UXO sensor data from Phase II studies. Developed GIS for incorporating sensor, ground truth, and environmental/geophysical data. Assembled database of magnetic and acoustic resonance signatures of UXO. Developed prototype multisensor fusion algorithm. Also, in a related parallel approach using enhanced harmonic radar for UXO detection, levels of UXO harmonic responses were measured and included narrowband (CW) and impulse waveforms. Also, system integration and field demonstration of the multi-sensor MUDSS (Mobile Underwater Debris Survey System) system for underwater UXO detection was completed. Use of MUDSS as compared to manual survey can reduce survey time by a factor of five and reduce costs by 50-70%, a savings of up to $400K per square nautical mile. MUDSS was also successfully demonstrated in the search for the SWISSAIR plane off Nova Scotia in September 1998. ($ 2.695 Million)

(U) Integrated Biotreatment Research Program: From Flask to Field: Continuing umbrella project to be completed in FY 2001. Project represents a collective research initiative by several key government and academic organizations supporting the development of bioremediation treatment technologies. The research objective is to develop and field several biotreatment processes for remediation of predominant DoD contaminants. Project is evaluating: (1) biocell reactor and cascading bioslurry reactors for PAHs (polycyclic aromatic hydrocarbons); (2) aerobic degradation of PCBs (polychlorinated biphenyls) with new strains; (3) engineering of reductive dechlorination of PCBs; and (4) combining solvent extraction with residual in situ biotreatment for PCE (perchloroethylene) and TCE (trichloroethylene). The fluidized-bed reactor study at Volunteer Army Ammunition Plant and the engineering and installation of an electrolytic degradation system for PCE were completed successfully. ($ 2.600 Million)

(U) Aquifer Restoration by Enhanced Source Removal: Continuing project to demonstrate processes for enhancing removal of light and dense non-aqueous phase liquids (LNAPLs and DNAPLs) in a variety of geologic settings. In FY 1998 with leveraged funding from other DoD and EPA sources, completed 9 side by side tests at Hill Air Force Base for LNAPL removal using surfactants and co-solvents. Field tests for DNAPL removal from contaminated ground water using co-solvents, sparging, and surfactants began at Dover Air Force Base test cells. The results from these tests will be used to develop guidelines that will address the entire remediation effort, including site characterization and support to achieve maximum benefit. ($ 2.180 Million)

(U) Additional efforts in 13 other projects were undertaken in Cleanup. ($ 10.040 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/BA 3	R-1 ITEM NOMENCLATURE Strategic Environmental Research and Development Program PE 0603716D8Z

(U) Conservation:

(U) Marine Mammal Monitoring for DoD Compliance: Two projects completed in FY 1998. These projects demonstrated a near real-time communication link for data distribution to automate detection and classification processes for marine mammals. Completed at-sea tests to assess the impacts of low-frequency sound sources on mammals and determined long-term monitoring capability. Monitoring databases have been developed for NAVFAC and will be transitioned to the Navy and the National Oceanic and Atmospheric Agency (NOAA) in FY 1999. Results will provide DoD with first order effects of the impact of Naval operations on marine mammals and the tools and analytical capability to comply with the Marine Mammals Act. ($2.065 Million)

(U) Emerging and Contemporary Technologies in Remote Sensing for Ecosystem Assessment and Change Detection on Military Reservations: Continuing project will develop remotely sensed change detection protocols necessary to stimulate natural dynamics (temporal and spatial) of the military installation ecosystems. The project will also develop models and/or techniques for military trainers and land managers to assess training impact on land use. Initiated the retrospective analysis and developed classifications of ecological sites. Survey points for ecotone identification / analysis were established. ($1.000 Million)

(U) Additional efforts in 13 other projects were undertaken in Conservation. ($6.046 Million)

(U) Compliance:

(U) Compact Shipboard Incinerator: Project completed in FY 1998. Developed new concept for waste incinerator based on pulsed combustor actuator. Successfully developed and demonstrated pilot-scale actively controlled vortex combustion (afterburner) and transitioned to simplified design and realistic operational conditions. Evaluations are underway for full, real-time testing of this afterburner. ($1.240 Million)

(U) Lead-Based Paint Hazard Mitigation: Project completed in FY 1998. Project has transitioned to demonstration/validation field tests of vitrification technologies for immobilizing heavy metals during lead removal activities are underway at DoD installations (Rock Island Arsenal, IL, Marine Corps Base Hawaii, and Puget Sound Naval Shipyard, WA). Other removal technologies including microwave assisted removal of paint from wood, were evaluated to minimize worker and public exposure. ($ 0.750 Million)

(U) Additional efforts in 16 other projects in were undertaken Compliance. ($ 9.470 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/BA 3	R-1 ITEM NOMENCLATURE Strategic Environmental Research and Development Program PE 0603716D8Z

(U) **FY1999 Plans:**

(U) **Pollution Prevention:** There are five major focus areas within pollution prevention.

(U) **(1) Next Generation Fire Suppression Technology Program:** This umbrella project seeks to replace Halon 1301 in DoD weapon systems. In FY 1999, this project will finalize data on in-flight ullage conditions and complete the development of test methodologies on the toxicity, environmental impact, materials compatibility, and principal degradation products. ($ 4.146 Million)

(U) **(2) Reduction of Air Emissions:** There are eight projects focused on reducing or eliminating hazardous air emissions in the form of Volatile Organic Compounds (VOC), oxides of nitrogen (NOx) and particulates. These projects range from reformulations of sealants, primers and coatings to improved, non-hazardous solvents to improved turbine engine design. ($ 5.251 Million)

(U) **(3) "Green Energetics":** Five projects are designed to reduce the environmental impact of explosives and propellants. They span from the reformulation of bullets in small caliber ammunition to eliminate the lead in them, to elimination of hazardous material from propellants, to the "Green Gun Barrel" program. ($ 3.953 Million)

(U) **(4) Elimination of Chromium:** Chromium is used extensively in both coatings and sealants due to its corrosion protection and durability. However, hexavalent chromium is a carcinogen and creates an environmental hazard. There are four projects dedicated to the elimination of chromium in a variety of applications from hard chrome plating to sealants, adhesives and coatings. Research spans from elucidating basic mechanisms to reformulations of products to eliminate the chromium. ($ 2.891 Million)

(U) **(5) Elimination or Reduction of Hazardous Materials:** The handling and disposal of hazardous materials is a costly and time consuming process. These six projects are designed to eliminate or reduce the production of hazardous materials in the operation and maintenance of weapons systems. Technologies such as new depainting and stripping processes can radically reduce the volume of hazardous materials. Development of non-hazardous substitute materials which perform equal to or better than the original is another focus of these projects. ($ 2.699 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/BA 3	R-1 ITEM NOMENCLATURE Strategic Environmental Research and Development Program PE 0603716D8Z

(U) Cleanup: There are four high priority areas within cleanup that comprise the bulk of the cleanup effort. In addition, there are four National Environmental Technology Test Sites (NETTS) which are maintained in order to facilitate the demonstration and validation of technologies for more rapid transfer to the field.

(U) (1) Unexploded Ordnance (UXO) Detection: A total of 8 projects including 5 continuing efforts to improve UXO detection capability, which is the highest priority within the SERDP Cleanup Technology Thrust Area. Represents a collective research initiative for the development and integration of multi-sensors and data fusion software for the location, identification, discrimination, and delineation of UXOs. In FY 1999, three new efforts will be initiated to address innovative UXO discrimination techniques ($ 4.024 Million)

(U) (2) Dense Non-Aqueous Phase Liquid (DNAPL) Detection and Remediation: DNAPLs are among the most difficult materials to detect in the subsurface and remediate. They are a common contaminant at almost every DoD site due to their widespread use as cleaning solvents. Twelve projects, including five new starts, are focused on all phases of the problem starting with detection of the contamination in the subsurface. Included within these projects are several technologies for remediating DNAPLs with an emphasis on in-situ technologies. ($ 6.135 Million)

(U) (3) Risk Assessment: One of the most pressing issues in cleanup is “how clean is clean”. To determine this, five projects are focusing on the risks to humans, animals, plants and ecosystems associated with military compounds. Included in this is a $2.7M earmark for environmental toxicological risk assessment. ($ 5.921Million)

(U) (4) Integrated Biotreatment Research Program: From Flask to Field: Continuing umbrella project that represents a collective research initiative by several key government and academic organizations supporting the development of bioremediation treatment technologies. The research objective is to develop field implementable, cost effective biotreatment processes for remediation of predominant DoD contaminants. ($ 2.635 Million)

(U) (5) DoD National Environmental Technology Test Sites (NETTS) Program: Continuing project facilitates transfer to field use of new, innovative, cost savings cleanup technologies. Four operational test sites (Dover AFB, McClellan AFB, NCB Port Hueneme, and former Wurtsmith AFB) plan to host 15-20 field tests and demonstrations of innovative remedial and site characterization technologies. ($ 2.575 Million)

(U) Compliance: The Compliance Thrust Area develops “end-of-pipe” control technologies which treat waste streams to prevent the introduction of contaminants into the environment. There are three major foci within the Compliance thrust area. This thrust area includes an earmark for the National Environmental Education and Training Center (NEETC).

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/BA 3	R-1 ITEM NOMENCLATURE Strategic Environmental Research and Development Program PE 0603716D8Z

(U) **(1) Air Emissions:** This is the largest of the foci of the thrust area. There are eleven projects dealing with the control of the emission of Volatile Organic Compounds (VOC), the oxides of nitrogen (NOx) and particulate matter with an emphasis on applications to detect contaminants and control them in jet engine test cells and tactical vehicle paint booths. ($ 6.345 Million)

(U) **(2) Demilitarization of Conventional Weapons:** There are two continuing projects to develop environmentally benign processes for the destruction of explosives in conventional weapons. With the establishment of the DoD Demilitarization Program, these are the last projects for demilitarization that will be funded by SERDP. ($ 0.926 Million)

(U) **(3) Oil/Water Separator Sludge:** There are two new start projects to deal with the difficult problem of Oil/Water separator sludges. The goal is a small, compact unit for on-site or shipboard processing that can render these sludges environmentally benign. ($ 1.417 Million)

(U) **Conservation:** There are four central themes to the Conservation thrust area.

(U) **(1) Impacts of Military Operations:** The seven projects in this sub-thrust examine the impacts of military operations on military lands, threatened and endangered species and marine mammals. Through sound scientific knowledge, we can sustain military training and testing operations while simultaneously protecting the environment. ($ 4.427 Million)

(U) **(2) Restoration:** These two projects develop techniques and technologies which are designed to restore degraded military lands. This is necessary not only to ensure the long term sustainability of the land, but also to provide a realistic training environment. These projects include new planting techniques as well as the development of new cultivars that can withstand a significant level of use and abuse. ($ 1.071 Million)

(U) **(3) Modeling and Simulation:** Modeling and simulation play a key role in the development of natural resources management plans. Three efforts in ecological modeling and simulation and an analysis of the errors inherent in the models are included in this segment. ($ 1.254 Million)

(U) **(4) Ecosystem Management:** This represents a major new initiative beginning in FY 1999 to develop the scientific understanding of ecosystem processes on military lands that will permit the sustainable use of these lands. Centered at Ft. Benning, GA, this initiative will first focus on the development of indicators of ecosystem health and thresholds of ecosystem damage. ($ 3.101 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/BA 3	R-1 ITEM NOMENCLATURE Strategic Environmental Research and Development Program PE 0603716D8Z

(U) **FY2000 Plans:**

(U) **Pollution Prevention:** There are five major focus areas within pollution prevention.

(U) **(1) Next Generation Fire Suppression Technology Program:** This umbrella project seeks to replace Halon 1301 in DoD weapon systems. In FY 2000, this project will finalize data on the toxicity, environmental impact, materials compatibility, and principal degradation products of candidate replacements. ($ 3.888 Million)

(U) **(2) Reduction of Air Emissions:** There are six continuing projects focused on reducing or eliminating hazardous air emissions in the form of Volatile Organic Compounds (VOC), oxides of nitrogen (NOx) and particulates. These projects include reformulations of sealants and coatings to improved, non-hazardous solvents. The initial development of the improved combuster for turbine engines will be completed. ($ 3.954 Million)

(U) **(3) "Green Energetics":** Three continuing projects are designed to render the manufacture of explosives and propellants environmentally benign. They span from the reformulation of propellants to elimination of solvents from the manufacturing process. Work on a solventless binder for energetic materials and recycling of propellants will be completed. ($ 3.570 Million)

(U) **(4) Elimination of Chromium:** There are four continuing projects dedicated to the elimination of chromium in a variety of applications. Research spans from elucidating basic mechanisms of chromium protection to development of new application processes. A new start for developing a replacement for the non-line-of-sight hard chrome plating process is projected. ($ 3.592 Million)

(U) **(5) Elimination or Reduction of Hazardous Materials:** Five continuing projects are designed to eliminate or reduce the production of hazardous materials. Development of technologies which permit inspection of aircraft structures without removing the coating will significantly reduce the volume of waste material. One new start is anticipated in reducing the hazardous materials associated with the application and stripping of specialty coatings. ($ 3.064 Million)

(U) **Cleanup:** There are four high priority areas within cleanup that comprise the bulk of the cleanup effort. In addition, there are four National Environmental Technology Test Sites (NETTS) which are maintained in order to facilitate the demonstration and validation of cleanup technologies for more rapid transfer the to field.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/BA 3	R-1 ITEM NOMENCLATURE Strategic Environmental Research and Development Program PE 0603716D8Z

(U) **(1) Unexploded Ordnance (UXO) Detection:** There are 6 continuing efforts to improve UXO detection capability. Efforts in exploiting third harmonic radars and data fusion will be completed. ($ 2.431 Million)

(U) **(2) Dense Non-Aqueous Phase Liquid (DNAPL) Detection and Remediation:** DNAPLs are among the most difficult materials to detect in the subsurface and remediate. Ten continuing projects are focused on all phases of the problem starting with detection of the contamination in the subsurface. Included within these projects are several technologies for remediating DNAPLs with an emphasis on in-situ technologies. Work on In-well vapor stripping of TCE will be completed and one new start in anticipated. ($ 5.363 Million)

(U) **(3) Risk Assessment:** One of the most pressing issues in cleanup is "how clean is clean". To determine this, four continuing projects are focusing on the risks to humans, animals, plants and ecosystems associated with military compounds. ($ 3.516 Million).

(U) **(4) Integrated Bio-treatment Research Program: From Flask to Field:** Continuing umbrella project that represents a collective research initiative by several key government and academic organizations supporting the development of bioremediation treatment technologies. The research objective is to develop field implementable, cost effective biotreatment processes for remediation of predominant DoD contaminants. The demonstration of a bioreactor to treat PAHs and the in situ biotreatment of PCE/TCE will be completed. ($ 4.143 Million)

(U) **DoD National Environmental Technology Test Sites (NETTS) Program:** Continuing project facilitates transfer to field use of new, innovative, cost savings cleanup technologies. Four operational test sites (Dover AFB, McClellan AFB, NCB Port Hueneme, and former Wurtsmith AFB) plan to host 15-20 field tests and demonstrations of innovative remedial and site characterization technologies. ($ 1.683 Million)

(U) **Compliance:** The Compliance Thrust Area develops "end-of-pipe" control technologies which treat waste streams to prevent the introduction of contaminants into the environment. There are three major foci within the Compliance thrust area. Two new starts in FY00 are planned in the areas of fate and impact of energetics on training and testing ranges and fate and impact of copper and zinc in harbors and estuaries. ($ 1.000 Milion)

(U) **(1) Air Emissions:** There are eight continuing projects develop detection and control technologies for the emission of contaminants. Work on non-thermal plasma destruction and membrane mediated extraction of VOCs will be completed. ($ 4.244 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/BA 3	R-1 ITEM NOMENCLATURE Strategic Environmental Research and Development Program PE 0603716D8Z

(U) **(2) Demilitarization of Conventional Weapons:** There are two completing projects to develop environmentally benign processes for the destruction of explosives in conventional weapons. These are the last projects dealing with demilitarization that will be funded by SERDP. ($ 1.421 Million)

(U) **(3) Oil/Water Separator Sludge:** There are two continuing projects to deal with the difficult problem of Oil/Water separator sludges and rendering them environmentally benign. Work continues towards developing a small, compact unit for on-site or shipboard processing. ($ 2.187 Million)

(U) **Conservation:** There are four central themes to the Conservation thrust area.

(U) **(1) Impacts of Military Operations:** The six continuing projects in this sub-thrust examine the impacts of military operations on military lands, and threatened and endangered species. One new start in the impact of riparian zones is anticipated. ($ 3.864 Million)

(U) **(2) Restoration:** The two continuing projects develop techniques and technologies which are designed to ensure the long term sustainability of the land, and to provide a realistic training environment. A new start in the control of invasive species is planned. ($ 1.661 Million)

(U) **(3) Modeling and Simulation:** Modeling and simulation play a key role in the development of natural resources management plans. Three continuing efforts in ecological modeling and simulation and an analysis of the errors inherent in the models are included in this segment. ($ 1.106 Million)

(U) **(4) Ecosystem Management:** This major initiative continues to develop the scientific understanding of ecosystem processes on military lands that will permit the sustainable use of these lands. Centered at Ft. Benning, GA, this initiative will first focus on the development of indicators of ecosystem health and thresholds of ecosystem damage. One new start to examine the role of disturbance is planned. ($ 2.818 Million)

(U) **FY2001 Plans:**

(U) **Pollution Prevention:** There are five major focus areas within pollution prevention. Five new starts to address high priority DoD needs are planned.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/BA 3	R-1 ITEM NOMENCLATURE Strategic Environmental Research and Development Program PE 0603716D8Z

($ 3.001 Million)

(U) **(1) Next Generation Fire Suppression Technology Program:** This continuing umbrella project seeks to develop a replacement for Halon 1301. ($ 4.182 Million)

(U) **(2) Reduction of Air Emissions:** There are six continuing projects, five of which will complete in FY 2001, focused on reducing or eliminating hazardous air emissions in the form of Volatile Organic Compounds (VOC), oxides of nitrogen (NOx) and particulates. ($ 3.873 Million)

(U) **(3) "Green Energetics":** One continuing project, the "Green Gun Barrel" program will be completed in FY 2001. ($ 1.092 Million)

(U) **(4) Elimination of Chromium:** There are four continuing projects dedicated to the elimination of chromium in FY 2001. The development of Sol-Gel technology to replace chromated sealant and primers will be completed. ($ 3.716 Million)

(U) **(5) Elimination or Reduction of Hazardous Materials:** Three continuing projects are designed to eliminate or reduce the production of hazardous materials. Technologies to replace current toxic aircraft deicing fluids will be completed. ($ 1.130 Million)

(U) **Cleanup:** There are four high priority areas within cleanup that comprise the bulk of the cleanup effort. Eight new starts, including an increased emphasis on UXO, are planned. ($5.773 Million)

(U) **(1) Unexploded Ordnance (UXO) Detection:** There are 5 continuing efforts to improve UXO detection capability, all of which will be completed. A large portion of the new start funds cited above will be dedicated to UXO detection. ($ 3.185 Million)

(U) **(2) Dense Non-Aqueous Phase Liquid (DNAPL) Detection and Remediation:** Six continuing projects are focused on all phases of the problem Five of the six continuing projects will be completed. ($ 3.185 Million)

(U) **(3) Risk Assessment:** One continuing project, which will be completed this year addresses the risk of DoD related environmental contaminants to individuals and populations. ($ 1.131 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/BA 3	R-1 ITEM NOMENCLATURE Strategic Environmental Research and Development Program PE 0603716D8Z

(U) **(4) Integrated Bio-treatment Research Program: From Flask to Field:** This continuing umbrella project will be completed this year. ($ 0.331 Million)

(U) **DoD National Environmental Technology Test Sites (NETTS) Program:** Continuing project facilitates transfer to field use of new, innovative, cost savings cleanup technologies. ($ 1.668 Million)

(U) **Compliance:** The work in Demilitarization has ended and work on fate and impact of contaminants started in FY 00 is continuing. Three new starts are planned for FY 01. ($ 2.302 Million)

(U) **(1) Air Emissions:** There are four continuing projects dealing with the control of the emission of Volatile Organic Compounds (VOC) and particulate matter, all of which will be completed. ($ 2.528 Million)

(U) **(2) Fate and Impact of Contaminants:** Continuing work on energetics on military ranges and zinc and copper in harbors and estuaries. ($ 2.714 Million)

(U) **(3) Oil/Water Separator Sludge**: There are two completing projects to deal with the difficult problem of Oil/Water separator sludges. ($ 2.166 Million)

(U) **Conservation:** There are four central themes to the Conservation thrust area. There are 5 new starts planned in FY 01. ($2.606 Million)

(U) **(1) Impacts of Military Operations:** The three completing projects in this sub-thrust examine the impacts of military operations on military lands, and threatened and endangered species. ($ 1.695 Million)

(U) **(2) Restoration:** The two continuing projects develop techniques and technologies which are designed to restore degraded military lands. ($ 1.782 Million)

(U) **(3) Modeling and Simulation**: Three completing efforts in ecological modeling and simulation and an analysis of the errors inherent in the models are included in this segment. ($ 1.172 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/BA 3	R-1 ITEM NOMENCLATURE Strategic Environmental Research and Development Program PE 0603716D8Z

(U) **(4) Ecosystem Management:** This major long-term initiative continues to develop the scientific understanding of ecosystem processes on military lands that will permit the sustainable use of these lands. Centered at Ft. Benning, GA, this initiative will first focus on the development of indicators of ecosystem health and thresholds of ecosystem damage. ($ 2.498 Million)

(U) B. Program Change Summary	**FY1998**	**FY1999**	**FY2000**	**FY2001**	**Total Cost**
Previous President's Budget	57.115	0	54.429	52.664	Continuing
Appropriated Value	61.874	58.771			Continuing
Adjustments to Appropriated Value					
a. Congressionally Directed undistributed reduction	(5.158)				
b. Rescission/Below-threshold Reprogramming, Inflation Adjustment					
c. Other					Continuing
Current President's Budget	56.716	58.771	53.506	51.729	Continuing

Change Summary Explanation:

(U) **Funding:** Funding changes in outyears reflect below threshold program adjustments and revisions to inflation adjustments.
(U) **Schedule:** Not Applicable
(U) **Technical:** Not Applicable

(U) **C. Other Program Funding Summary Cost** Not Applicable

(U) **D. Acquisition Strategy**: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/BA 3	R-1 ITEM NOMENCLATURE Strategic Environmental Research and Development Program PE 0603716D8Z

(U) **E. Schedule Profile** Not Applicable

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)									DATE February 1999	
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3				R-1 ITEM NOMENCLATURE Joint Warfighting PE 0603727D8Z						
COST *(In Millions)*	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	8.255	18.679	7.872	7.790	7.751	7.706	7.624	7.615	Continuing	Continuing
Joint Warfighting/P727	8.255	18.679	7.872	7.790	7.751	7.706	7.624	7.615	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification

(U) BRIEF DESCRIPTION OF ELEMENT:

In May 1998 the Secretary of Defense appointed Commander-in-Chief, United States Atlantic Command (CINCUSACOM) as the Defense Department's Executive Agent for Joint Experimentation. Subsequently, the Department realigned resources to support ACOM's new role. FY 99 funding from this Program Element was redirected to support the initial stand-up of ACOM's Joint Experimentation Directorate. Funding for joint experiments was transferred to ACOM. Funding to support the Joint Advanced Warfighting Program concept development, the digital network infrastructure, and technology feeder support for joint experimentation was retained in this PE. Program Element 0603727N has been established to provide ACOM with their own funding source in FY 00. Consequently, the FY 98 accomplishments and FY 99 plans in this exhibit include ACOM's activities. Detailed funding changes are in section B.

The Joint Warfighting PE supports three related activities: the Joint Advanced Warfighting Program (JAWP), the Information Technology Backbone (ITB), and technology feeder support for joint experimentation. While these activities strongly support ACOM's joint experimentation efforts, a separate program element has been retained since the activities support other organizations in addition to ACOM, and they require a degree of independence from ACOM to function as envisioned.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	R-1 ITEM NOMENCLATURE Joint Warfighting PE 0603727D8Z

The JAWP was established by OSD, with the support of the Vice Chairman of the Joint Chiefs, to serve as a catalyst for innovation and change. This program's focus is on assisting in the formulation and assessment of advanced concepts and capabilities, plus identifying enabling technologies and integration options for the Department. These concepts drive changes in the doctrine, organization, training and education, materiel and leadership (DOTML) of the Services. The JAWP serves a key role in identifying, exploring and evaluating breakthrough warfighting capabilities. It builds on the lessons learned from earlier Service experiments that have underscored the importance of having a firm conceptual basis upon which to build experiments. The JAWP concentrates on joint vice Service unique revolutionary concepts. In identifying and elaborating innovative Joint concepts and capabilities, and associated enabling technologies, the JAWP will not only take into account Service efforts but those of CINCs and Defense Agencies as well. The JAWP promotes integration and assists implementation. The JAWP's work complements and supports the activities of the Atlantic Command (ACOM), the Joint Staff, and the Office of the Secretary of Defense. It provides an independent source for formulating advanced concept candidates for joint experimentation. The JAWP is composed of both civilian analysts and technologists, and military operators. The civilians provide a level and quality of expertise not generally available in the Department of Defense. The active duty military provide current operational perspective to concepts under investigation and serve as a vital link to ongoing relevant activities in the Services.

(U)

The Information Technology Backplane provides an advanced network infrastructure that extends commercial capabilities to provide capabilities needed to meet JV2010 needs. Information Superiority is a key JV2010 building block and the ITB provides the means to experiment with the digital transmission capabilities that will be available in five years. The ITB is not a new physical network. It is a virtual network that capitalizes on existing physical networks such as the Defense Information Systems Network (DISN), the Defense Information Systems Agency (DISA)-Defense Advanced Research Projects Agency (DARPA) Leading Edge Services Network, the Defense Research and Engineering Network (DREN), and the experimental Advance Technology Demonstration (ATD) net. The ITB has many users from sites served by existing networks but the funding included in this PE is the incremental funding needed to support joint experimentation. For example, this PE provides the circuit costs to extend the ITB from the experimentation site to the nearest point on the backplane (where no other network exists), and only the "extra" backplane costs generated by the Joint Warfighting Experiments. Since joint experiments are very dependent on advanced distributed simulation, or on limited live command post exercises that are being driven by simulations, a robust network is needed to interconnect the various sites. Often times, these simulations press the state of the art in networking capability, including that of requiring Type-I encryption for protected communications. The ITB also supports new bandwidth intensive applications such as video teleconferencing and high definition television.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	R-1 ITEM NOMENCLATURE Joint Warfighting PE 0603727D8Z

The third effort supported by this PE is technology feeder support for joint experiments. There are many technology demonstrations, advanced technology demonstrations, and advanced concept and technology demonstrations that can provide advanced technologies to support joint experiments. For example, the Joint Staff has prepared 72 desired operational capabilities based on JV2010 concepts and 21st Century Challenges. For each Challenge, the Joint Staff has prepared roadmaps that provide opportunities to assess each Challenge. The roadmap for the battlefield awareness challenge shows 42 Advanced Concept Technology Demonstrations (ACTDs) that have the potential to demonstrate some aspect of a desired operational capability supporting battlefield awareness. This effort provides technology managers the resources to expand the scope of a test or demonstration to collect data for the joint staff or ACOM, thereby leveraging the OSD and Service ACTD investment.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY1998 Accomplishments:

(V) USACOM was officially designated Executive Agent for Joint Experimentation on October l, 1998. However in FY 98 an extensive effort was focused on four objectives: the stand-up of USACOM J-9 organization, the development of the Joint Expcrimentation process, concept development and selection, and development of the experimentation program for FY 99-01. Additionally, USACOM sponsored thc live fly portion of Information Superiority Experiment 1.1 in 4th quarter FY 1998. Leveraging thc United States Air Force's Expeditionary Forces Experiment (EFX) 98, USACOM investigated and tested new concepts and organizations to enhance Joint Suppression of Enemy Air Defenses (JSEAD) against mobile targets. Data assessment is ongoing and is included in ACOM's FY 1999 Joint Experimentation program. ($4.055 Million)

(U) The Joint Advanced Warfighting Program (JAWP) was established in April 1998. Working for the Office of the Secretary of Defense, the Joint Staff, the Atlantic Command (ACOM) and their subordinate activities in support of Joint Warfighting Experimentation, it has: (1) identified key elements of a joint experimentation process; (2) began development of candidate advanced concepts for joint experimentation; (3) began development of an exemplar joint experiment; (4) developed prototype experimentation plans; (5) conducted research and seminars to classify works on future operational concepts and future security environments that are relevant to joint experimentation; and (5) planned for seminars and workshops with other government organizations to identify complimentary and supporting technology programs and activities. ($1.500 million)

(U) An Information Technology Backplane (ITB) compliant with the Joint Technical Architecture, and Advanced Battlespace Information System (ABIS) was integrated and put in place, thereby providing an environment of existing information technology components into which prototype

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	R-1 ITEM NOMENCLATURE Joint Warfighting PE 0603727D8Z

and other emerging products can be inserted, exercised and evaluated with respect to interoperability and joint warfighting potential. The ITB builds upon existing networks and complements, not duplicates, other networking efforts by Defense Information Systems Agency (DISA), Defense Advanced Research Projects Agency (DARPA), Director Defense Research and Engineering/ High Performance Computing Management Office (DDR&E/HPCMO) and Naval Research Lab (NRL). The ITB was extended into ACOM (Joint Training, Analysis and Simulation Center) and Institute for Defense Analyses.

(U) In the commercial environment, Asynchronous Transfer Mode (ATM) is the protocol of choice for simultaneously processing multiple applications that have huge amounts of data with low latency. ATM provides an economical method to dynamically combine large, low latency data streams like video and voice over a single transmission resource. The 98 accomplishments all relate to our efforts to evolve ATM services to meet JV2010 requirements, while still using commercial of the shelf equipment. In the network management area we provided the means to separate hundreds of switches into logical groups that can be administered by different organizations/services. Work also began on a Java-based network management tool that automatically discovers these logical groups of switches and simplifies their interconnection. In the network security area work began to strengthen the authentication needed to access ATM switch management features using Kerberos security. In the area of Quality of Service (QoS), drivers were implemented to map the Internet Protocol flows to ATM Quality of Service. We also deployed Multiple Protocol Over ATM (MPOA), which eliminates traditional router bottlenecks by creating ATM virtual circuit shortcuts. In the area of ATM applications we implemented Voice-Telephone-Over-ATM, which enables a site to carry both voice from standard handsets and data over a single network connection. In the area of test tools work began on tools that will exercise network devices to assist in lab bench testing, live network testing and network monitoring. Finally, network equipment will be acquired to support ACOM's end node, field two deployable network suites, and upgrade test beds. ($2.700 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	R-1 ITEM NOMENCLATURE Joint Warfighting PE 0603727D8Z

(U) FY1999 Plans:

(U) USACOM's experimentation activities arc broken into three categories: (l) USACOM Generated Events - Events developed "in-house' by USACOM J-9 specifically to support assessment of one or more concepts; (2) Major Leveraged Events - Events that are planned, developed and executed by CINC, Service, or Agency in which USACOM plays a major role in modifying the event to support assessment of one or more concepts; and (3) Minor Leveraged Events - Events intended to provide relatively small amounts of information in a more narrowly focused area for further development. Capitalizing on existing resources end work accomplished by the Joint Staff and Services, USACOM's FY 99 experimentation focus is to provide "Proof of Concept" of the Experimentation Process by conducting Joint Experiment Number I (JE-1). In addition, USACOM will leverage ongoing Service sponsored Experiments to test various warfighting concepts. In total USACOM will be involved in the execution and assessment of one USACOM Generated Event (JE-1), two Major Leveraged Events, and ten Minor Leveraged Events. USACOM will sponsor other concept development studies and Red Team vulnerability assessments. Experiment support technologies including prototypes, advanced technologies, surrogates, and integration materials will be used to support experimentation efforts. Concurrently, USACOM will host a series of Futures Seminars and Warfighter Reviews as a part of the baseline analysis on mid-term and future concepts. Analysis, modeling and simulation and wargames are an integral part of the FY 99 plan. Advanced planning for FY 00 and 01 experiments will be conducted in parallel of ongoing FY 99 experiments. ($ 10.562 M)

The Joint Advanced Warfighting Program (JAWP) will support JV2010 implementation and the Joint Experimentation work in the Office of the Secretary of Defense, the Joint Staff, and the Atlantic Command (ACOM) and subordinate elements. Efforts will be both on front-end identification and elaboration of concepts and capabilities, plus support for the conduct of experiments. It will continue to develop and refine candidate advanced warfighting concepts and capabilities using wargames, and modeling and simulation. It will identify promising and enabling technologies. It will collect and analyze data to support the formulation of the Department’s overall Joint Experimentation efforts. The JAWP will begin to evaluate these concepts and systems through simulation, wargaming and analysis. The JAWP will help in the construct, design and conduct of joint warfighting experiments. The JAWP will have a major role in executing the simulation portion of ACOM’s Joint Experiment-1. It will also participate in other experiments during the year that support advanced joint warfighting. The JAWP will look specifically at the Revolution in Military Affairs to analyze the impact of revolutionary technological concepts on doctrine and investment strategies. Workshops, seminars and conferences will be held to inform the discussions and shape the debate on future concepts and exercises. It will begin to conduct vulnerability assessments using “Red Teaming” techniques to identify weaknesses and avoid surprises. Transformation will also be a key focus. The JAWP will begin to identify programs, systems and methods to improve and expedite the process of executing and implementing the recommended changes, which result from the joint

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	R-1 ITEM NOMENCLATURE Joint Warfighting PE 0603727D8Z

experimentation process and the development of new technological capabilities. Included in these latter activities, the JAWP will evaluate the systems and products developed during the Synthetic Theater of War (STOW) Advanced Concept Technology Demonstration (ACTD) for use in support a robust modeling and simulation capability which can provide near and mid term support to ACOM's experimentation activities. The Defense Modeling and Simulation Office will oversee the JAWP M&S activities to insure that they are consistent with department policy and the DOD High Level Architecture for simulations. $4.3 Million)

The Information Technology Backplane will be expanded and network services and equipment will be provided to ACOM. In the network security area work will continue on the authentication system for web servers and ATM switch management. The ITB will also serve as a NSA alpha and beta test site for cryptographic testing (specifically the KG-75 Release 3 FASTLANE and the KG-175 TACLANE). In the area of ATM applications workstation voice-over-data capability will be converted to a standards based system which will allow users at workstations to conduct voice calls using the microphone and speakers attached to the computer. Work will also be continued on tools to exercise network devices, to assist in lab bench testing, live network testing, and network monitoring.

A significant part of the ITB effort will provide direct support to ACOM. Circuits will be upgraded to 155Mbs and network management provided between ACOM, IDA, the Joint Advanced Warfighting Program, and Naval Research Lab (NRL). Since NRL is a physical hub, network access to other Defense Research and Engineering Network sites such as Space and Naval Warfare Center, Army Research Lab, etc, will be leveraged without cost to this program. ACOM will also be provided a distributed file system node capable of accessing high-end computing resources and sharing files across the High Performance Computing Office of the DDR&E. Coordination will begin with appropriate OSD ACTD managers and service activities such as USA-CECOM and USAF-Rome Labs to define the network architecture for ACOM's Joint Contingency Force experiment in FY 00. ($1.817 Million)

(U) Experimentation Feeder Support: ACOM's Campaign Plan, dated 1 December 1998, provides the list of ACOM generated events, major leveraged events and minor leveraged events for FY 99-01. The next step is to develop detailed concept papers for each of the eight concept areas that ACOM is pursuing. The Deputy Under Secretary of Defense (Advanced Systems and Concepts) in coordination with ACOM and the Joint Staff will assist in determining which ACTDs, ATDs, and/or Technology Demonstrations best support ACOM's experimentation events. This funding will be provided to the selected technology managers to support a joint experiment. Funding will be provided for efforts such as system integration, and logistics and test support. ($2.00 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	R-1 ITEM NOMENCLATURE Joint Warfighting PE 0603727D8Z

(U) FY2000 Plans:

(U) The JAWP will continue to build on its FY99 efforts to support the Department's Joint Experimentation efforts. The focus will be on increased involvement in additional Service/joint exercises and the Atlantic Command's (ACOM) Joint Experimentation activities, with emphasis on advancing the understanding of specific concepts and in conducting experimentation. Opportunities will be identified to leverage and integrate Service and other agency programs, as well as activities such as Advanced Technology Demonstrations and Advanced Concept Technology Demonstrations. Data collection and independent analysis will be conducted and used to produce reports and papers intended to inform the OSD, Joint Staff and ACOM leadership of experimentation results and to make recommendations for future activities. In addition, the JAWP will identify breakthrough concepts and technologies that could produce revolutionary future warfighting capabilities. Vulnerability assessments and "Red Teaming" will be conducted to improve the validity and robustness of experimentation. A major effort during the FY will be a focus on the transformation process. The JAWP will work on the identification of vehicles and opportunities that can be used in the early transition of new concepts and technologies in to actual operational military capabilities. ($4.300 Million)

(U) The ITB will continue to be upgraded to reflect emerging protocols that show promise from advanced research network testbeds. In the area of network management Kerberos authentication will be extended into Simple Network Management Protocol Version 3 (SNMPv3). In the area of applications, the capability for a workstation voice user to communicate with a standard handset voice user will be provided. Efforts in support of ACOM will continue. Selected circuits will be upgraded from 155Mbs to 622Mbs. This will enable experimentation with "killer applications" such as High Definition Television (HDTV), which produces data at gigabit per second rates. Lower bandwidth, high quality HDTV will be purchased and installed at key sites. HDTV provides mission planners and commanders the ability to observe real-time or near-real-time temporally meaningful data. ACOM will be provided with the network infrastructure that supports their Joint Contingency Force experiment. ($1.572 Million)

(U) Experimentation Feeder Support for Joint Experimentation will continue. ACOM's Campaign Plan 00, which will be published in April 99, will provide additional experimentation detail and refinements to the current plan. Integrated concept teams will have had the opportunity to prepare more detailed experimentation and assessment plans. Once the concepts and experimentation plans are more clearly articulated, technologies supporting the experiments will be identified. It is anticipated that plans for the Joint Olympic event in the FY 04 timeframe will become clearer and work will be begin to align the technologies supporting this major integrating exercise. Once again, this funding is only intended to leverage ongoing developments to support joint experiments, and not to fund the development itself.($2.000 Million)

(U) FY 2001 Plans:

(U) The Joint Advanced Warfighting Program (JAWP) will continue support of the Department's Joint Experimentation activities. It will mature those promising concepts developed and demonstrated during the previous two years. It will exploit successes and continue to serve as a catalyst for change and transformation. ($4.300 Million) The IT Backplane will be upgraded to reflect emerging protocols that show promise from

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	R-1 ITEM NOMENCLATURE Joint Warfighting PE 0603727D8Z

advanced research network testbeds. Support will continue for ACOM and other joint experimentation sites. ATM enabled applications and experiments will permit ACOM to conduct experiments using emerging technologies that will be commercially available in the 2000-2003 timeframe. ($1.490 Million)

(U) Experimentation Feeder Support will continue to support Joint Experimentation and the FY 04 Olympic event. ($2.000 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	R-1 ITEM NOMENCLATURE Joint Warfighting PE 0603727D8Z

(U) B. Program Change Summary	FY1998	FY1999	FY2000	FY2001	Total Cost
Previous President's Budget	8.761	23.700	27. 332	30.212	Continuing
Appropriated Value		18.700			Continuing
Adjustments to Appropriated Value					
a. Congressionally Directed undistributed reduction	-0.506	-0.021			
b. Rescission/Below-threshold Reprogramming, Inflation Adjustment					
c. Other			-19.460	-22.422	Continuing
Current President's Budget	8.255	18.679	7.872	7.790	Continuing

Change Summary Explanation:

(U) **Funding:** Reductions based on planning adjustments. FY00-05 funding was transferred to the Navy's Joint Experimentation Progam PE 0603727N.

(U) **Schedule:** Not Applicable

(U) **Technical:** Not Applicable

(U) **C. Other Program Funding Summary Cost** Not Applicable
(U) **D. Acquisition Strategy:** Not Applicable
(U) **E. Schedule Profile** Not Applicable

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)									DATE February 1999	
APPROPRIATION/BUDGET ACTIVITY RDT&E/Defense Wide/BA 3							R-1 ITEM NOMENCLATURE Agile Port Demonstration PE 0603728D8Z			
COST*(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	4.617	0	0	0	0	0	0	0	Continuing	Continuing
ADP/P728	4.617	0	0	0	0	0	0	0	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification

(U) BRIEF DESCRIPTION OF ELEMENT

The goal of the program is to support the development and deployment of advanced concepts and technologies leading to an automated, fully-integrated, multi-modal Defense Transportation System (DTS) able to meet the needs of the 21st century. The Center for Commercial Development of Transportation Technologies (CCDoTT) is a DoD funded consortium of public, private, and academic activities brought together to identify and deploy advanced technologies that can be systematically integrated into ports and other transportation systems supporting both commercial and DoD transportation requirements. The purpose of the program is to compare traditional transportation methodologies with next generation technologies, identify the potential for these new technologies to support DoD mobility requirements, and determine the scenarios and criteria for their economic use.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Agile Port Demonstration PE 0603728D8Z

COST*(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	4.617	0	0	0	0	0	0	0	Continuing	Continuing
ADP/P728	4.617	0	0	0	0	0	0	0	Continuing	Continuing

(U) Project Number and Title: P728 ADP

(U) PROGRAM ACCOMPLISHMENTS AND PLANS

(U) FY1998 Accomplishments:

(U) Advanced Sealift Technologies. Planned to conduct a military Sealift Emergency Deployment Readinesss Exercise (SEDRE) using a commercial high speed sealift vessel to transport troops and materiel from a military deployment port to a selected destination. Perform detailed design, analysis and evaluation of features identified in FY97 as necessary to make commercial vessels compatible with DoD Strategic & Tactical requirements and current DoD cargo handling systems. Focus included research and development, testing, evaluation and commercialization on top candidate enabling technologies for high speed marine applications as identified in FY97 assessments. Evaluated additional commercial ship designs and planned initiatives that can be effectively used for military support or adapted for use by the DoD. Performed more in-depth research on high speed sealift propulsion systems, cargo transfer equipment, and related systems. ($ 1.250 Million)

(U) Agile Port Technologies. Conducted R&D scale demonstrations of selected state-of-the-art cargo handling technologies and port systems to quantitatively assess the improvements in deployment efficiency, reduced times, decrease in port congestion and increase in p ort-mobilization capabilities. Planned to demonstrate selected terminal management and information technologies to interface Agile Ports with the DTS. Increased sophistication of models & simulations and conducted optimization, design and cost analysis assessments of Agile Ports. Continued to develop, evaluate, and optimize Agile Port concepts and associated Intermodal Transfer (IT) in order to provide flexibility to future DoD mobility operations while serving both commercial and military needs. ($ 2.170 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/Defense Wide/BA 3	R-1 ITEM NOMENCLATURE Agile Port Demonstration PE 0603728D8Z

(U) **Rapid Deployment Technologies.** Demonstrated R&D scale models of technologies which leveraged advanced commercial Marine-Rail Interfaces in support of DoD intermodal deployments. Expanded modeling and simulation to include the hinterland region between the seaport and the Inland Port; integrated advanced Weigh In Motion (WIM) technology into an improved TrAMS; and expanded analysis and evaluations of advanced technologies offering maximum benefits to DoD mobility activities. ($ 1.197 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Agile Port Demonstration PE 0603728D8Z

(U) B. Program Change Summary	FY1998	FY1999	FY2000	FY2001	Total Cost
Previous Presidents Budget	4.778	0	0	0	Continuing
Appropriated Value		0	0	0	Continuing
Adjustments to Appropriated Value					
a. Congressionally Directed Undistributed Reduction	.-161	0	0	0	
b. Rescission/Below-threshold Reprogramming, Inflation Adjustment		0	0	0	
c. Other	0	0	0	0	
Current Presidents Budget	4.617	0	0	0	Continuing

Change Summary Explanation:

(U) **Funding:** FY 1998 reductions are based on inflation adjustments and other minor below threshold reprogramming.

(U) **Schedule:** N/A

(U) **Technical:**

(U) **C.** **OTHER PROGRAM FUNDING SUMMARY COST:** N/A

(U) **D.** **ACQUISITION STRATEGY:** N/A

(U) **E.** **SCHEDULE PROFILE:** N/A

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)									DATE February 1999	
APPROPRIATION/BUDGET ACTIVITY RDT&E/Defense-Wide/BA 3							R-1 ITEM NOMENCLATURE Cooperative DoD/VA Medical Research Program PE 0603738D8Z			
COST*(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	18.437	5.915	0	0	0	0	0	0	24.349	24.349
Coop DoD/VA Medical/P464	18.437	5.915	0	0	0	0	0	0	24.349	24.349

(U) A. Mission Description and Budget Item Justification

(U) BRIEF DESCRIPTION OF ELEMENT

(U) Congress has added funding in this program element to the Department of Defense (DoD) budget request each year since 1987. Funds support a "core (general research)" program of cooperative medical research funded by DoD and managed by the Department of Veterans Affairs (VA). Core projects ad dress medical research topics potentially of benefit to both Departments, such as emerging infectious diseases, trauma, stress, and exercise physiology. The DoD and VA jointly identify focus areas. Projects are selected through a independent peer review process, and are conducted by intramural VA and DoD physicians and scientists. Funds also support studies on emerging medical issues of importance to DoD and VA, for example, Gulf War veterans illnesses (GWVI) and hepatitis C research.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/Defense-Wide/BA 3	**R-1 ITEM NOMENCLATURE** Cooperative DoD/VA Medical Research Program PE 0603738D8Z

COST*(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	18.437	5.915	0	0	0	0	0	0	24.349	24.349
Coop DoD/VA Medical/P464	18.437	5.915	0	0	0	0	0	0	24.349	24.349

(U) Project Number and Title: P464 Coop DoD/VA Medical

(U) PROGRAM ACCOMPLISHMENTS AND PLANS

(U) FY1998 Accomplishments:

(U) Established a focus areas for core projects in exercise physiology; a solicitation was prepared jointly by DoD and VA technical advisors and the process of independent merit review and project selection is in process. Additional focus areas in nervous system injury and host defenses to emerging pathogens are being planned. For all focus areas, research proposals are solicited from in-house DoD and VA investigators, and projects are selected for funding based on technical merit and relevance to the solicitation. Technical merit is determined through peer review by non-DoD, non-VA experts. ($ 9.992 Million)

(U) Continued intramural, core research efforts on the health effects of combat stress and post-traumatic stress disorder, and GWVI-related conditions such fibromyalgia. ($ 0.846 Million)

(U) Initiated intramural research to determine the prevalence o f hepatitis C virus infection among U.S. military populations. This research, conducted by the Naval Medical Research Institute, was established in response to Congressional concern that the number of VA patients with hepatitis C antibodies has apparently increased during recent years, indicating an elevated risk of service-connected infections. ($ 0.445 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/Defense-Wide/BA 3	**R-1 ITEM NOMENCLATURE** Cooperative DoD/VA Medical Research Program PE 0603738D8Z

(U) Continued intramural, epidemiological studies efforts concerning Gulf War Illnesses. These seven large studies, conducted by the Naval Health Research Center, are comparing symptoms, hospitalizations and reproductive outcomes between Gulf War veterans and non-deployed veterans of the same era. Efforts included a study to determine the feasibility of establishing an active-surveillance birth defects registry for DoD. Epidemiological studies demonstrated that Gulf War veterans who remained on active duty were not at increased postwar risk of unusual hospitalizations or of having children with birth defects. These studies are inter-Agency collaborations among DoD, Centers for Disease Control and Prevention, Environmental Protection Agency, Department of Veterans Affairs, and University of California at San Diego. Studies have been endorsed by the Institute of Medicine, presented to the Presidential Advisory Committee for Gulf War Veterans' Illnesses, presented to the GAO, and published in the leading peer-reviewed medical journals. ($ 2.654 Million)

(U) Initiated the establishment of a program of multi-site, cooperative clinical trials to assess the effectiveness of protocols for treating veterans of the Persian Gulf War who suffer from ill-defined or undiagnosed conditions, such as chronic fatigue syndrome and fibromyalgia. Treatment protocols will include, but not be limited to, a multi-disciplinary treatment model, or which cognitive behavioral therapy is a component. ($ 4.5 Million)

(U) FY1999 Plans:

(U) In accordance with the FY99 Defense Authorization Bill (H.R. 3616, Sec. 244), management of this program will be revised for FY99. The Department of Defense will guide the investment of these funds as executive agent for the program, acting through the U.S. Army Medical Research and Materiel Command and the Naval Operational Medicine Institute. Details of the FY99 management and investment strategies currently are being developed. ($ 5.915 Million)

(U) FY2000 Plans:

($ 0 Million)

(U) FY2001 Plans:

($ 0 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/Defense-Wide/BA 3	R-1 ITEM NOMENCLATURE Cooperative DoD/VA Medical Research Program PE 0603738D8Z

(U) B. Program Change Summary	FY1998	FY1999	FY2000	FY2001	Total Cost
Previous Presidents Budget	14.421	0	0	0	14.421
Appropriated Value	19.500	6.000	0	0	Continuing
Adjustments to Appropriated Value					
a. Congressionally Directed Undistributed Reduction	-1.063	-0.085	0	0	
b. Rescission/Below-threshold Reprogramming, Inflation Adjustment	0	0	0	0	
c. Other	0	0	0	0	
Current Presidents Budget	18.437	5.915	0	0	24.352

Change Summary Explanation: Funding changes are due to congressional undistributed reductions and inflation adjustments.

(U) Funding: Funding changes are due to program budget and congressional adjustments. The FY1998 program of $15 Millions was a congressional plus up.

(U) Schedule: N/A

(U) Technical: Funding changes are due to program budget and congressional adjustments. The FY1998 program of $15 Millions was a congressional plus up.

(U) C. OTHER PROGRAM FUNDING SUMMARY COST: N/A

(U) D. ACQUISITION STRATEGY: N/A

(U) E. SCHEDULE PROFILE: N/A

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)									DATE February 1999	
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide/BA 3					**R-1 ITEM NOMENCLATURE** Advanced Concept Technology Demonstrations PE 0603750D8Z					
COST *(In Millions)*	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	74.756	88.598	117.969	119.298	121.149	123.497	126.080	128.725	Continuing	Continuing
ACTDs/P523	74.756	88.598	117.969	119.298	121.149	123.497	126.080	128.725	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification

(U) BRIEF DESCRIPTION OF ELEMENT: The Department of Defense recognizes the need to rapidly develop and field new technological capabilities, and to explore new and innovative operational and organizational concepts associated with those capabilities. Such advances are critical to the objective of achieving a "revolution in military affairs" to support the Chairman's *Joint Vision 2010*. Advanced Concept Technology Demonstrations (ACTDs) are low risk vehicles for pursuing that objective. ACTDs are capability demonstration and evaluation programs in which the development and employment of technology and innovative, operational concepts by the military user are the primary focus. The demonstrations involve a material development organization that develops the technology, and a warfighting organization responsible for assessing the military utility. In addition to stimulating innovation, ACTDs offer three other significant opportunities. They provide experienced combat commanders with an opportunity to develop operational concepts and operational requirements to fully exploit the capabilities being evaluated. They allow the users an opportunity to assess the military utility of the proposed capability prior to a major acquisition decision. They also provide the Services with a mechanism for compressing acquisition cycle time, thus significantly improving their response to priority operational needs. As such, ACTDs are at the foundation of the DoD acquisition reform process. In FY 1999, ACTDs also became an integral part of the Joint Warfighter Experimentation process. U.S. Atlantic Command's (ACOM) Joint Experimentation Plan 99 identified twelve ACTDs in its near-term experimentation matrix. The Deputy Under Secretary of Defense (Advance Systems and Concepts) (DUSD/ASC) is working closely with ACOM in preparing Campaign
Plan 00 to insure ACTD work to integrate technology and develop new concepts of operation is fully leveraged and integrated into future joint experiments.

(U) Other sources provide most of the funding for ACTDs. Funding from this program element, typically 10 to 20%, is used: 1) to support actual demonstrations and exercises, 2) to provide hardware to demonstrate military utility, and 3) to fund interim capability operations and support for two years after the "operational demonstration phase" of the ACTD. This two-year phase provides the operators with adequate time to continue to address the issues of supportability, maintainability and training identified by the ACTD.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide/BA 3	R-1 ITEM NOMENCLATURE ADVANCED CONCEPT TECHNOLOGY DEMONSTRATIONS PE 0603750D

(U) Both the Science and Technology (S&T) and the warfighter communities submit candidate ACTDs in January of each year. The candidates proposed by the S&T community reflect technological opportunities that have been enabled by recently demonstrated technology. The candidates proposed by the warfighter community (Joint Chiefs of Staff (JCS), Unified Commanders in Chief (CINCs), Service operational organizations) respond to a deficiency in military capability or to an emerging military need. For each candidate, it is necessary to confirm that the proposed concept is based on technology that is sufficiently mature, and that the capability addresses a priority military need.

(U) The maturity of the technology associated with the proposed capability is assessed by the Deputy Under Secretary of Defense (Advanced Systems and Concepts (DUSD (ASC)), with assistance of senior members of the science and technology community (known as the Breakfast Club). The Joint Requirements Oversight Council (JROC) determines the military need by prioritizing the ACTD candidates. The principal management tool for the ACTD is the ACTD Management Plan. Each approved ACTD will be described in a top-level document that provides details of the demonstration/evaluation, the main objectives, approach, critical events, measures of success, transition options, participants, schedule, and funding.

(U) The typical timeline of two-to-four years for the operational demonstration phase of an ACTD is compressed compared to normal timelines for fielding an operational capability. These shorter schedules are made possible by the fact that the ACTDs incorporate mature or nearly mature technology and, therefore, forgo time consuming technology development and technical risk reduction activities. At the end of the ACTD, the user sponsor is able to determine if the capability provided by current technology has sufficient utility to warrant procurement; if there are significant shortcomings, either to pursue an advanced technology demonstration to improve performance, or not to pursue the technology any further at this time. In cases where the operational user is satisfied the prototype has significant utility, the prototype can be used as an interim capability and then move quickly to enter the formal acquisition process and to acquire quantities to fully satisfy the need.

(U) The request for Fiscal Year 2000 candidate ACTDs was issued October 1998. Proposals were received from the CINCs, Services, other Department of Defense Agencies, and industry in January 1999. Candidates are organized into the *Joint Vision 2010* focus areas of Dominant Maneuver, Precision Engagement, Full Dimensional Protection and Focused Logistics. Plans are being finalized with the Joint Staff to begin the process of identifying and reviewing the candidates for FY 2000 ACTDs in February/March 1999. Funding for FY 2000 ACTDs is approximately $10 million.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) **FY 1998 Accomplishments**: All ACTDs initiated in FYs 1995, 1996 and 1997 have been reviewed for objectives, content and management. This includes in-depth review by some of the ACTD operational sponsors such as United States Atlantic Command (ACOM). Fourteen new ACTDs were started in FY 1998: Adaptive Course of Action, Command, Control, Communications and Intelligence (C4I) for Coalition Warfare, High Power

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide/BA 3	R-1 ITEM NOMENCLATURE ADVANCED CONCEPT TECHNOLOGY DEMONSTRATIONS PE 0603750D

Microwave, Information Assurance: Automated Intrusion Detection Environment, Joint Biological Remote Early Warning System, Joint Continuous Strike Environment, Joint Modular Lighter System, Line of Sight Anti-Tank System, Link-16, Migration Defense Intelligence Threat Data System, Precision Target Identification, Space Based Space Surveillance Operations, Theater Precision Strike Operations and Unattended Ground Sensors. The selection process for FY 1999 ACTDs began in October 1997. Thirteen final ACTD candidates, of the 37 received from the Unified Commands, the Services and Defense agencies, were considered for final selection. Candidates covered a broad range of technologies and needs, including logistics, intelligence, medical protection and telemedicine, information technology, mission planning, battle damage assessment, automated maintenance, personnel recovery and air defense. These candidates were evaluated for technical maturity by the Breakfast Club and for operational need and utility by the Joint Staff Joint Warfare Capability Assessment (JWCA) process. The JROC then prioritized these thirteen candidates and eleven were finally selected based upon funding availablity. In order to validate technical maturity, program planning and program management, each final candidate underwent a one-day comprehensive review (termed a 'final scrub') prior to final selection and ACTD start in early FY 1999. FY 1998 funds were transferred to the executing services/agencies in the amount of $74.756 million.

(U) 1998 accomplishments include:

FY 1995 Starts:

- Advanced Joint Planning (AJP): Developed software tools that provide the insight into readiness of component forces and the ability to manage Time Phased Force Deployment Data (TPFDD) demonstration on a daily basis at U.S. Atlantic Command (ACOM). Utility of these tools (Time-Phase Force Deployment Data Editor (TPEdit), Force Modual Editor (FMEdit), Force Module Editor (FMEdit), Course of Action Selection Tool (COAST), Target, Automated Joint Monthly Readiness Review (AJMRR), and the Joint Readiness Assessment Management System (JRAMS)) has been successfully completed. TPEdit, FMEdit, COAST,and Target have been delivered to Defense Information Systems Agency (DISA) D6 for final testing and fielding. JRAMS has been distributed to several CINCs for demonstration of improved responsiveness and accuracy of the CINC readiness assessment. Both JRAMS and AJMRR were delivered to DISA D6 in November 1998.
- High Altitude Endurance Unmanned Aerial Vehicles (HAE-UAV): Successful first flights for both Global Hawk and DarkStar air vehicles were conducted. Global Hawk Air Vehicles #1 and #2 have flown a total of ten air worthiness and payload test flights at Edwards AFB CA for a total of 50.4 hours. Eight of the ten flights have reached altitudes in excess of 50,000 feet. The latest flight was the first payload mission on 22 Jan 99; the Global Hawk Integrated Sensor Suite (which includes three different types of sensors) successfully used these sensors to gather 'spot' and 'swath' imagery, and also transmitted the imagery via satellite communications to a ground station in San Diego CA. DarkStar has completed five successful airworthiness test flights to date totalling 6.1 hours. Four of the flights went to 5000 feet in altitude; the latest flight on 9 Jan 99 flew for 2.7 hours and 25,000 feet in altitude
- Joint Countermine (JCM): Completed Phase II and the second demonstration during MARCOT/Unified Spirit 98 on 6-26 June 1998 in Stephenville, Newfoundland, Canada. Demonstrated ten novel systems, C4I integration, and legacy systems during the operational exercise. A

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide/BA 3	R-1 ITEM NOMENCLATURE ADVANCED CONCEPT TECHNOLOGY DEMONSTRATIONS PE 0603750D

"quick look" analysis report and operational assessment has been prepared. In addition in August 1998, ACOM sponsored Warfighter Analysis Laboratory Experiment to allow warfighters to apply lessons learned during a simulated exercise. Several land based countermine systems were also demonstrated in JTFEX 98-1 at Fort Bragg, North Carolina in February 1998. ACOM published its military utility assessment in October 1998.

- Precision Signals Intelligence (SIGINT) Targeting System (PSTS): Completed a final demonstration phase in Korea in September 1998. The PSTS integrated airborne and National SIGINT to achieve accurate geolocation of emitters. The demonstration included upgraded capabilities for the U.S. Army GUARDRAIL system, processing software and communications links. The ACTD leaves a limited operator capability and transitions into a long-term program to upgrade all airborne and National SIGINT systems to provide precision geolocation of Electronics Intelligence (ELINT) and Communications Intelligence (COMINT) emitters.
- Rapid Force Projection Initiative (RFPI): Completed the full scale demonstration phase in August 1998. This demonstration incorporated new sensor, shooter and command and control technologies into the nation's light, first-to-fight forces. The demonstration concluded with a large free-play engagement between a brigade of the 101st Air Assault Division and a combination of real and virtual opposing forces. The new capabilities that were demonstrated included the Hunter Sensor Suite, Remote Sensory, Integrated Acoustic System, High Mobility Artillery Rocket System (HIMARS), Automated 155 Howitzer and digital command and control in the form of a Light Digital Tactical Operations Center (LDTOC). These components will be entering an interim capability and transition phase.
- Synthetic Theater of War (STOW): Participated in a major operational exercise in support of ACOM and began transition of STOW technologies to the Joint Simulation System (JSIMS) and the Services. In all supported events to date, STOW has been distributed among many sites that interface to it via operational command, control, communications, computers and intelligence (C4I) systems. This integration allows realistic interaction between real-world planning and simulated combat implementation. STOW has achieved new milestones in the number and fidelity of entity-level simulations.

FY 1996 Starts:

- Air Base/Port Biological Detection: Conducted Aerosol Background Environmental Sampling at four U.S. installations in Central Command (CENTCOM)/Pacific Command (PACOM) areas of responsibility. At CENTCOM request, the ACTD prototype network was deployed for Operation Desert Thunder. It was operational for 24 hours a day, ran for over 3000 hours with zero network false alarms, and less than one half of a percent of false positives. In addition, the Mark-III sensors have been reduced 25% in size and 35% in weight.
- Battlefield Awareness and Data Dissemination (BADD): Installed a software package at multiple sites providing an integrated environment of broadcast management, information dissemination management, and battlefield awareness service that provide near-real-time imagery, geographic and video products at transfer rates ranging from hundreds-to-thousands of times faster than current capability. Secured user involvement via a series of jointly designed, operationally realistic assessments. Continued efforts to transition BADD products to selected national, joint and service infrastructure programs.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide/BA 3	R-1 ITEM NOMENCLATURE ADVANCED CONCEPT TECHNOLOGY DEMONSTRATIONS PE 0603750D

- Combat Identification (CID): Conducted Virtual Integration Exercise (VIE) using the distributed interactive simulation systems at Fort Knox (ground components and forward air controllers), Fort Rucker (helicopters), and Armstrong Laboratories (fixed wing aircraft) all executing operations at the same time over a National Training Center (NTC) terrain data base. Conducted Combat ID Exercise (CIDEX) at Fort Hood with the Digitized Brigade for the military utility assessment of Battlefield Combat Identification System (BCIS) Ground and BCIS Helicopter. Conducted Combat ID Interoperability Demonstration (CIDID) at Fort Huachuca to assess interoperability of combat ID architecture. De-installed BCIS from the 4th Infantry Division at Fort Hood. Provided data in support of the decision to transition BCIS and Situational Awareness Data Link (SADL) to production.
- Combat Vehicle Survivability (CVS): Completed technical and operational field tests. Analyzed field test data, which indicated that the technology has significant military utility. Performed CASTFORM modeling to extrapolate technology's utility to larger engagements. Designed and tested improved critical technology subsystem. Conducted extended user tests of subsystem on an operational platform. Redesigned critical technology subsystem to allow for *'use as needed'* capability, instead of being permanently installed.
- Counterproliferation I (CP I): Conducted several demonstrations and tests against a hardened surrogate chemical weapons production facility. These included successful demonstrations of the Hard Target Smart Fuze (HTSF) and Advanced Unitary Penetrator (AUP), sensors, targeting and hazard prediction tools, with live ordinance dropped from F-15Es and F/A-18s. The Inertial Terrain Aided Guidance (ITAG), which provides a launch and leave, adverse weather precision guidance system, had its first successful test. The Integrated Munitions Effectiveness Assessment (IMEA) is being used to support European Command (EUCOM) targeting activities. Standoff capability is an integral component of CP II (see FY97 starts) which is focusing on Tactical Land Attack Missile and Conventional Air Launched Cruise Missile. The Tactical Unattended Ground Sensor (TUGS) system and the Tactical Forward Looking Infrared (FLIR) Pod Modification (TFPM) capabilities were successfully included in the demonstrations and showed enhanced capabilities for target characterization and battle damage assessments (BDA).
- Joint Logistics (JL): Phase II constructed web-based Joint Logistics decision support tools. Focus was placed on connectivity into emerging data bases, operations planning systems and communications networks. These advanced logistics planning capabilities were demonstrated in exercises, then transitioned to the CINCs for true field use.
- Miniature Air Launched Decoy (MALD): Completed tooling development for air vehicle fabrication, assembly, ground integration and testing.
- Navigation Warfare (NavWar): Exercises used prevention and protection equipment developed by the Navigation Warfare ACTD. Squad-sized exercises were carried out at White Sands Missile Range, New Mexico, Fallon Naval Air Station, Nevada and Camp Lejeune, North Carolina. Large-scale exercises were carried out at Fort Bragg, North Carolina (Purple Dragon) and Fallon Naval Air Station, Nevada. These large-scale exercises have begun the process of training and CONOPs development necessary to deal with Advanced Navigation Systems on a stressed battlefield in the fog of war.
- Semi-Automated Imagery Processing (SAIP): Deployed the enhanced SAIP system, which added several new capabilities. The first formal military utility assessment was held in June 1998. This two-week field exercise included Army and Air Force participation, with SAIP processing live real-time imagery from the U-2 aircraft. This exercise clearly demonstrated the advantages of SAIP-aided imagery analysis over unaided

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide/BA 3	R-1 ITEM NOMENCLATURE ADVANCED CONCEPT TECHNOLOGY DEMONSTRATIONS PE 0603750D

analysts. Results showed SAIP is critical to handling ever-increasing volumes of imagery products.

- Tactical Unmanned Aerial Vehicle (TUAV): Military utility assessment for joint land force components, which included the Army and Marine Corps, concluded in July 1998. Conducted 184 flights without a Class A or B mishap. Conducted 31 fights with autolandings. Conducted seven flights with an endurance of greater than three hours. Maximum range demonstrated was 205 kilometers. Commenced the interim capability period.
- Theater High Energy Laser (THEL): Currently undergoing testing of the laser system at the Capistrano Test Site in California. End-to-end testing of the pointer/tracker system alignment was completed. Initial command, control, communications and intelligence (C3I) and radar testing was completed at White Sands Missile Range. THEL site construction at the site was initiated. This is a joint ACTD with Israel.

FY 1997 Starts:

- Chemical Add-On to Air Base/Port Bio Detection: The chemical sensor hardware interface was successfully demonstrated and evaluated at Dugway Proving Grounds and was deployed with the prototype Airbase/Port Biological Detection ACTD to Kuwait at CENTCOM request to support Operation Desert Thunder.
- Consequence Management (CM): In December 1997, the Army Technical Escort Unit (TEU) and USMC Chemical Biological Incident Response Force (CBIRF) responded to a simulated domestic terrorist scenario involving release of various biological simulants in a large U.S. city. This was the final and very successful demonstration for this ACTD. The TEU and CBIRF were equipped with existing and emerging bio-detection technologies. These technologies were evaluated for their usefulness and ability to be operated by both units. The final technical review and report were completed this year.
- Counterproliferation II (CP II): The design was completed with elements including: stand-off penetrators (enhanced warhead penetration performance and fuzing options); enhanced payloads (reduce collateral effects by either neutralizing the agent or mitigating release and dispersion); combat assessment (assess collateral effects generated by attack on a chemical related facility); and enhanced planning tools (institutionalize end-to-end nuclear, chemical or biological related target planning support for warfighting commands).
- Extending the Littoral Battlespace (ELB): A Systems Integration Lab (SIL) at the Space Warfare (SPAWAR) Systems Center, was established, along with a hardware and systems integration testbed aboard USS Coronado. These two testbeds will support integration, testing and demonstration for the command and control elements, as well as rapid transition/acquisition support. An industry team was awarded a competitive contract to be the Systems Engineer and Integrator. Detailed analysis and evaluation of candidate-enabling technologies was conducted. The first Major Systems Demonstration (MSD I) was definitized and detailed planning and coordination were executed. Initial integration tests were successfully conducted with a commercial off-the-shelf wireless network, sensors, fires and targeting, and command and control applications.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide/BA 3	R-1 ITEM NOMENCLATURE ADVANCED CONCEPT TECHNOLOGY DEMONSTRATIONS PE 0603750D

- Information Operations Planning Tools (IOPT): Due to cancellation of CENTCOM's Internal Look exercise in FY 1998, a series of mini evaluations were held. The first exercise, AVENGING SURF 98, was held in July 1998 for CENTCOM, and its components, to evaluate in-garrison and initial crisis planning. It provided a positive feedback environment for CENTCOM, Central Air Forces (CENTAF), Navy and Army participants. This first demonstration in an operational oriented scenario allowed the ACTD to obtain critical data on how the tool would be used by geographically separated units. The second assessment was the USAF's EFX in September 1998. Transition discussions for the ACTD are on going with Air Combat Command (ACC) and Air Force Materiel Command (AFMC), as well as representatives from the other service information warfare (IW) centers of excellence. In August 1998, the initial operational capability of the IOPT was installed at CENTCOM, Central Air Forces (CENTAF), Joint Command and Control Warfighting Center (JC2WC), and the Air Force Information Warfare Center (AFIWC).
- Integrated Collection Management (ICM): The first system demonstration was completed. Completed Phase I prototype design and development.
- Joint Advanced Health and Usage Monitoring System (JAHUMS): Awarded and completed nine contracts for Phase I concept definition studies for twelve technology modules. Conducted critical design review of baseline system.
- Military Operations in Urban Terrain (MOUT): Completed technology assessment process that enables the rapid identification of technology candidates and evaluates them against the user-developed criteria to enable a rank ordering of each candidate's ability to meet the requirements. Conducted product and user qualification testing and experimentation for three Army and two U.S. Marine Corps experiments. Conducted a complete technology risk assessment for all 32 user requirements and developed courses of action to mitigate or eliminate the risks. Conducted an excursion of MOUT technology products with RFPI. Instrumented MOUT sites at Fort Benning (Army) and Camp Lejeune (USMC) to facilitate non-intrusive data collection and to assist in generating data for modeling and simulation assessments of military utility.
- Rapid Terrain Visualization (RTV): Conducted detailed technical and operational study to select optimum radar and platform for collection of high-resolution digital elevation data. Merged linear and spatial feature data into a fully integrated data set using prototype battlefield visualization database generation software and generated tailored databases for terrain analysis workstations. Demonstrated baseline semi-automated feature extraction capability using commercial satellite imagery. Demonstrated prototype RTV systems in the Joint Precision Strike Demonstration (JPSD) Integration and Evaluation Center (IEC) and obtained data to evaluate measures of effectiveness. Participated in Division XXI advanced warfighting experiments (AWE) in support of III Corps and 101st warfighting experiments (WFX) in support of the XVIII Airborne Corps. Installed and demonstrated version 2.0 of semi-automated topographic data generation software at XVIII Airborne Corps testbed and III Corps topographic units.

FY 1998 Starts:

- Adaptive Course of Action (ACOA): Completed knowledge acquisition and initial base lining of PACOM planning operations. Started CINC-level software integration. Produced a World Wide Web-based Visual Demonstration of the ACOA vision and concept of operations to include descriptions of technologies and applications to be used to achieve the goals set forth in the ACOA Management Plan.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide/BA 3	R-1 ITEM NOMENCLATURE ADVANCED CONCEPT TECHNOLOGY DEMONSTRATIONS PE 0603750D

- C4I for Coalition Warfare (C4ICW): The objective is enhanced interoperability of US Army command and control (C2**)** systems with the United Kingdom, France, Germany, Italy and Canada. This is being accomplished through two multilateral formats with the listed countries. The process uses both NATO standardized message formats and database replications. A series of coalition demonstrations/AWEs are in the early planning stage. This ACTD has developed the process for passing coalition ground force data to other Service's systems. The capability will be integrated into and supported in the Army Battle Command System (initially Maneuver Control System (MCS)) as part of the planned fielding of Army Command Battle System (ABCS) software upgrades. DISA accepted the ACTD data elements and definitions for the next GCCS build to enhance both the land element of the common operational picture and potential for interoperability with coalition partners.
- High Power Microwave (HPM): Demonstrated an operational information warfare attack capability, packaged for tactical operations. Contract for construction of demonstration modules was awarded in September 1998.
- Information Assurance: Automated Intrusion Detection Environment (IA:AIDE): Conducted first demonstration in September at seven sites, with two-level reporting to DISA's Global Operations System Center.
- Joint Biological Remote Early Warning System (JBREWS): Completed system and critical design reviews. Commenced fabrication of systems.
- Joint Continuous Strike Environment (JCSE): Completed design and integration of technology models. Commenced design integration into the Global Command and Control System (GCCS) and relevant service systems. Conducted first in a series of user demonstrations. Began refinement of CONOPS.
- Joint Modular Lighter System (JMLS): Provides operational capability to move warfighting materiel from ship-to-shore in Sea State 3. Will significantly increase system life and reduce required maintenance. Proposals for design of a lightweight, affordable, Sea State 3-capable system were evaluated and multiple contracts for most promising designs were awarded in March 1998.
- Line-of-Sight Anti-Tank (LOSAT): Contract was awarded in April 1998. Completed missile guidance electronics design updated in preparation for incorporation of the inertial measurement unit (IMU). Fabricated hardware and updated operational and test software for missile guidance electronics verification tests. Initiated update of weapon system, fire unit and missile hardware and software requirements. Initiated design concepts for fire unit electronics and missile aft-looking receiver (ALR).
- Link - 16: Demonstrated a joint, integrated capability to pass tactical information seamlessly among Link-16 and variable message format-based tactical data link networks, which are currently separated both in message format and physical wavelength. Software has been developed to exchange tactical information between the networks and their physical devices, as well as the specific message sets required for this exchange. Capability was demonstrated in a controlled environment.
- Migration Defense Intelligence Threat Data System (MDITDS): Operational planning with EUCOM, Defense Special Weapons Agency (DSWA), J34, and the Defense Intelligence Agency (DIA) is ongoing. Cross-network data transitioning to support warning, threat, and vulnerability assessment is underway. Threat assessment/summary software was delivered in September 1998. The operational management team is currently planning a fall 1998 force protection exercise to help determine functional requirements of future MDITDS modules. The

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide/BA 3	R-1 ITEM NOMENCLATURE ADVANCED CONCEPT TECHNOLOGY DEMONSTRATIONS PE 0603750D

EUCOM Special Assistant for Security Matters recently put a theater-specific vulnerabilities database on-line. The ACTD will incorporate this as the core to the 'blue' information/decision support interface and proliferate it globally.

- Precision Targeting Identification (PTI): Conducted preliminary demonstration of the potential of laser radar (LADAR) and 3rd generation forward-looking infrared (FLIR) technologies to increase search area and obtain low-probability of intercept, precise target location and identification. Prepared for demonstrations of capability in the counter-drug mission area aboard a modified U.S. Navy P-3 Orion. Capability is applicable to other platforms and missions requiring precise target identification.
- Space Based Space Surveillance Operations (SBSSO): Integration of the MSX sensor into the Space Surveillance System was achieved with dramatic improvement in system performance for high altitude surveillance.
- Theater Precision Strike Operations (TPSO): Commenced system integration and evaluation. Began United States Forces - Korea exercise support.
- Unattended Ground Sensors (UGS): A series of demonstrations were conducted using hand-employed sensors.

(U) FY 1999 Plans: Transition those ACTDs that have successfully demonstrated military utility and been determined to warrant acquisition. Continue development and operational demonstration of the remaining FY 95/96/97/98 ACTDs, and start new FY 1999 ACTDs in accordance with planned schedules. Continue the annual process of developing and structuring new candidate ACTDs to rapidly address user needs and address issues identified in *Joint Vision 2010*. DUSD(ASC) is coordinating with the Joint Staff's Joint Warfighting Center to identify candidate ACTDs that will become an integral part of the Joint Warfighter Experimentation process and help implementation of the Chairman's *Joint Vision 2010*. Support the respective services and agencies to complete the Year 2000 assessment and necessary remediation of each ACTD to insure that the ACTD products are Year 2000 compliant. Funding will continue for all active previous ACTDs, including the new FY 1999 ACTDs, for a total of $88.598 million.

(U) Other significant plans for FY 1999 are:

FY 1995 Starts:

- Advanced Joint Planning : The Automated Joint Monthly Readiness Review (AJMRR), and the Joint Readiness Assessment Management System (JRAMS) will complete transition into the Global Command and Control System (GCCS) common operating environment (COE). Final TPEdit, FMEdit, COAST and target enhancements will be delivered to DISA D6. Conclude interim capability period.
- High Altitude Endurance UAVs: Global Hawk and DarkStar unmanned air vehicles will complete their air worthiness and sensor payload test flights, and then commence operational field demonstrations, exercises, and possible contingency deployments, enabling early user involvement to evaluate military utility. A total of four Global Hawks and three DarkStars are planned to take part in the operational demonstrations, along with two complete sets of the associated Common Ground Segment equipment.
- Joint Countermine: Provide those technologies that demonstrated utility to ACOM for continued operations and evaluation during the residual

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide/BA 3	R-1 ITEM NOMENCLATURE ADVANCED CONCEPT TECHNOLOGY DEMONSTRATIONS PE 0603750D

phase. Joint Countermine Operational Simulation (JCOS) will transition to STOW, and the Countermine C4I will begin transition to GCCS. Several of the novel systems will transition into acquisition and other ongoing PM programs. Transition efforts for the remaining novel systems will be evaluated and coordinated with user and service agencies.

- Precision SIGINT Targeting System: Commence interim capability period.
- Rapid Force Projection Initiative: Conclude simulation activities and testing. Continue follow-on training and commence interim capability period.
- Synthetic Theater of War: Conduct additional mission rehearsal and training exercises in support of ACOM and continue technology transition to Joint Simulation System (JSIMS) and the Services simulation system. Conclude interim capability period.

FY 1996 Starts

- Airbase/Port Biological Detection System: Residuals will be incrementally fielded to sites in two theaters in this year and FY2000. Residuals consist of : detection network, C4I connectivity and downwind hazard prediction, unmasking procedures, commercial half-mask test, decontamination equipment, and contamination detection kit.
- Battlefield Awareness and Data Dissemination: Complete the assessment of operational utility. Transition of BADD products to operational users as part of the collaborative assessments carried out using distributed service (Army, Navy, Air Force and Joint) sites. Effort will continue to allow products to be integrated into the Defense Information Infrastructure (DII) Common Operating Environment (COE) and GCCS. Service interaction to refine and extend BADD capabilities will also continue.
- Combat Identification: Complete military utility assessment report. Conduct Single Channel Ground and Airborne Radio System (SINCGARS) System Improvement Program (SIP)+ and SINCGARS SIP+ Forward Operating Forward Air Controller (FOFAC) operational tests. Install Battlefield Combat Identification System (BCIS) trainers as leave-behind assets at Ft Hood's Command and Control Technical Training (CCTT) facilities. Continue leave-behind assessments for BCIS, SINCGARS SIP+, SINCGARS SIP+ FOFAC, Situational Awareness Data Link (SADL) and SADL Forward Air Controller (FAC). Conclude interim capability period and end the ACTD.
- Counterproliferation I: With the delivery of the residuals (HTSF, AUP, IMEA, TUGS, and TFPM), CP I moves into residual support mode to EUCOM. HTSF will begin EMD, and transition activities for other CP I elements will continue. This ACTD will continue to support exercises and CONOPS development for EUCOM.
- Joint Logistics: Phase II will continue building additional capability into the web-based Joint Logistics decision support tools. The focus will be on force capability assessment, logistics course of action planning analysis, connectivity into emerging data bases, operations planning systems and execution monitoring. These advanced logistics capabilities will be demonstrated in exercises and then transitioned to the CINCs for field use.
- Miniature Air Launched Decoy: First flight is scheduled for late 1998. Completion of flight demonstrations will follow, where operational users will evaluate military utility in preparation for the user assessment and recommendation. Complete operational demonstration of the decoy with a

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide/BA 3	R-1 ITEM NOMENCLATURE ADVANCED CONCEPT TECHNOLOGY DEMONSTRATIONS PE 0603750D

user assessment of military utility. Interim capability period will commence.

- Navigation Warfare: Revise CONOPS. Commence interim capability period.
- Semi-Automated IMINT Processing: Integration and field testing will continue to achieve transition system objectives and to support the U-2 Advanced Synthetic Aperture Radar System (ASARS-2), and the ASARS-2 Improvement Program. The second SAIP military utility assessment will be held in January 1999. SAIP will process SAR imagery from both the U2 and Global Hawk aircraft in an operational scenario. Transition planning with the Air Force and Army will continue, and residual capabilities will be delivered to both services.
- Tactical UAV: Continue interim capability period.
- Theater High Energy Laser: System will begin laser set-up and assembly, followed by system integration and functional testing at the HELSTAF facility at White Sands Missile Range in October 1998. System testing with single and salvo engagements of Katyusha rockets will be conducted during January-March 1999. At the conclusion of the testing at HELSTAF in mid-FY 1999, the THEL system will be shipped to Israel for development of operational concepts, training and deployment along the northern border.

FY 1997 Starts

- Chemical Add-On to Air Base/Port Biological Detection: Residuals will be incrementally fielded to sites in two theaters in this year and FY2000. Residuals consist of the chemical sensors fully integrated into the Airbase/Port reporting, display and command and control network.
- Consequence Management: Integration into operations of user selected technologies will continue, as will CONOPS refinement. This is the concluding year for the ACTD's demonstration and residual period and ends the ACTD.
- Counterproliferation II: Selection will occur between the United Kingdom (UK) Broach and the ACTD Advanced Unitary Penetrator (AUP) for Conventional Air-Launched Cruise Missile. Continue Tactical Land Attack Missile (TLAM) penetrator integration and standoff platform designs. Test and evaluate a dual-drop tactic with AUP from an F-117. Evaluate chemical point detector. New CONOPS development will start for standoff counter force operations.
- Extending the Littoral Battlespace: Conduct MSD I in the third quarter FY 1999. MSD I will stress the ability to operate after deeply penetrating the littoral while leaving all heavy support and infrastructure afloat, literally expanding the littoral battlespace by tens of thousands of square miles. MSD I will be conducted during Operation Kernel Blitz 99 using the Third Fleet and First Marine Expeditionary Force as operational forces supported by other U.S. Pacific Command component forces. Post-MSD I activities will include initial military utility assessment and determination of interim residual and/or transition opportunities.
- High Power Microwave: Conduct user assessment of the HPM capability.
- Information Operations Planning Tool: Participate in EFX 99 and another joint exercise so that Air Intelligence Agency (AIA)/AFIWC and CENTCOM can further refine operational requirements and enhance the capability of the tool. CENTCOM will use the IOPT to allow real time update of Information Operations Plans by CENTAF and JC2WC. Naval Information Warfare Agency (NIWA) plans to install an IOPT and start computer-based training and familiarization for their Navy Central (NAVCENT) support elements. Based on inputs from M, space information

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide/BA 3	R-1 ITEM NOMENCLATURE ADVANCED CONCEPT TECHNOLOGY DEMONSTRATIONS PE 0603750D

operations (IO) concepts and requirements for IO planning will be rolled into the tool. Work to provide segmentation into DII/COE will take place. Further investigation and implementation of a new mapping tool, collaboration capability and interface to MIDB 2.0 will take place.

- Integrated Collection Management: Complete Phase II process re-engineering and prototype design. Commence first military utility assessment.
- Joint Advanced Helicopter Usage and Monitoring System: Phase II design, fabrication and testing of technology module board level designs. Acquire, install and test baseline system on the aircraft.
- Military Operations in Urban Terrain: Complete four-to-six Army and three-to-four Marine experiments. Assess MOUT operational concepts, tactics, techniques and procedures. Conduct down-selection for best-in-class prototype hardware and software based on operational performance, user acceptance, technical risks and affordability. Implement systems integration, interoperability assessments, and diagnoses of advanced technology candidate products. Conduct joint company-level integrating experiments for interoperability assessments and refinement. Develop plans for MOUT Advanced Concepts Excursion to demonstrate and evaluate more advanced science and technology (S&T)-based technologies for application in a MOUT environment. Conduct modeling and simulation to quantify military utility of advanced technology candidate products.
- Rapid Terrain Visualization: Acquire and process high-resolution digital elevation data set and commercial satellite imagery in direct support of XVIII Airborne Corps WFXs. Exploit multi-spectral and radar imagery to accelerate the terrain feature extraction process using the prototype RTV database generation system. Continue iterative upgrade of workstations and software at XVIII Airborne Corps and III Corps. Demonstrate RTV process in the Integration and Evaluation Center (IEC), including capabilities for rapid elevation data collection and semi-automated extraction of feature data. Continue demonstration of selected RTV capabilities from XVIII Airborne Corps to III Corps elements for further user evaluation. Complete modifications to DeHavilland DHC-7 aircraft, including installation and integration of RTV Infrared Synthetic Aperture Radar (IFSAR) sensor and onboard processing capability. Develop an RTV Transition Plan to address transition of the ACTD products into the acquisition process.

FY 1998 Starts:

- Adaptive Course of Action: Continue CINC-level software integration. Demonstrate the ACOA concept of collaborative planning operations at PACOM and three remote sites in December 1998. This demonstration will also test the military utility of the Web Based Planner, ODYSSEY, and LEIF. If military utility is proven, these applications will progress toward acquisition and delivery to the Global Command and Control System in the April 1999 time frame.
- C4I for Coalition Warfare: The basic message gateway and the data replication mechanism will be tested. The basic message gateway will be integrated into the Maneuver Control System, V12.1, as part of the initial ACTD residual. The developed international data structure will be embedded in the common database for the Army Battle Command System upgrade for the First Digitized Division.
- Joint Biological Remote Early Warning System: Fabrication of ACTD systems and test design plan will be completed. A series of military utility assessments and tests will be held at Dugway Proving Grounds in the 3rd and 4th quarters.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide/BA 3	R-1 ITEM NOMENCLATURE ADVANCED CONCEPT TECHNOLOGY DEMONSTRATIONS PE 0603750D

- Information Assurance: Automated Intrusion Detection Environment: Continue sensor bridge development. Install additional sensors at 15 sites and implement database and design changes for new sensors. Instrument nine additional sites for an end-of-year demonstration.
- Joint Continuous Strike Environment: Participate in joint theater exercise and continue concept of operations refinement. Incrementally develop four modules (target prioritization, weapons availability monitoring, weapons-target pairing and airspace deconfliction), test, and begin integration into Global Command and Control System and Service fire support systems.
- Joint Modular Lighter System: Conduct system critical design review and begin hardware fabrication. Conduct unit-level training and demonstrations in the Norfolk/Virginia Beach area.
- Line-of-Sight Anti-Tank System: Integrate IMU with missile guidance electronics and conduct verification tests. Complete update of weapon system, fire unit and missile hardware and software requirements. Complete fire unit electronics and missile ALR preliminary designs and initiate breadboard testing. Complete missile structural design. Conduct initial program design review and initiate fire unit and missile long lead time procurement. Initiate fire unit operational and test software development effort.
- Link-16: Conduct system tests at the Joint Battle Center and a demonstration test and warfighter assessment/operational demonstration. Begin interim capability period.
- Migration Defense Intelligence Threat Data System: The vulnerability assessment module will be completed, MDITDS will be installed with the Joint Guard Tactical Operations Authority (TOA), and the threat summary capability will be incrementally integrated into the system for evaluation. EUCOM will conduct an exercise to gather user functional requirements for future software deliveries and modifications to existing modules. Delivery and testing of the cross-network and deployable information transitioning will occur.
- Precision Targeting Identification: Conduct crew training and user utility operations.
- Space Based Space Surveillance Operations (SBSSO): Conduct additional user demonstration.
- Theater Precision Strike Operations (TPSO): Commence three-year series of annual user demonstrations. Conduct Continental United States (CONUS)/ Outside Continental United States (OCONUS) baseline demonstration.
- Unattended Ground Sensors (UGS): Conduct air-dropped sensor emplacement demonstrations and tests are planned.

FY 1999 Starts:

- Battle Damage Assessment (BDA) in Joint Targeting Toolbox (BDA in JTT): Integrate and demonstrate an advanced technology-based BDA capability to provide functional damage assessments measured against stated objectives, related objectives and the desired end state. The ACTD will address current problems in the BDA process: labor intensive/mainly manual; lacks timeliness and accuracy; focus on physical damage limits depth of analysis; BDA collection outstrips analysis capability.
- Coherent Analytical Computing Environment (CACE): The objective is to significantly reduce Joint Strike Force Program total cost of ownership (TOC) by: developing and evaluating a proof of concept analytical computing environment for decision support purposes and providing a marked improvement in the quantity, quality, timeliness, and utility of mission-critical logistics information available to the chain of

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide/BA 3	R-1 ITEM NOMENCLATURE ADVANCED CONCEPT TECHNOLOGY DEMONSTRATIONS PE 0603750D

command and supporting agencies and authorities. This fiscal year, the CACE system will be developed and integrated in two Fleet Harrier II squadrons, creating a shared data/information environment.

- Common Spectral MASINT Exploitation Capability (COSMEC): Use COSMEC to test data from a sensor, e.g., LASH or SYERS, in conjunction with a domestic exercise, such as ASCIET or RED FLAG, to determine the utility of spectral capabilities and products for the warfighter.
- Compact Environmental Anomaly Sensor II (CEASE II): The objective is to develop a three pound, four-inch cube of miniaturized environmental sensors and integrate it with a critical satellite for launch into a geosynchronous orbit prior to Solar Max. Provide the capability of warnings of dangerous space environment conditions to allow for spacecraft safing. Provide environmental data to speed anomaly resolution and to reduce downtime. The system will be built and tested during this fiscal year.
- Force Medical Protection Chemical/Biological Dosimeter: Conduct field evaluation of Phase I prototype passive chemical sampler and develop concept of employment, using simulated Phase II samplers. Conduct technical evaluation of Phase II candidate technologies and select technologies for integration into Phase II sampler.
- HUMINT and Counterintelligence Support Tools: The objectives are to: 1) demonstrate, integrate and assess tools to enhance national-to-tactical HUMINT and CI targeting, dissemination and collection; and 2) improve strategic-to-tactical concepts of operation and architecture.
- Joint Medical Operations - Telemedicine (JMO-T): Demonstrate interoperability of joint telemedicine teams. Determine requirements for standard tactics , techniques and procedures for JMO-T employment forward of the theater hospital using modeling and simulation. Demonstrate feasibility of a tactical communication network (TCN) to provide cost effective data transport far forward .
- Joint Theater Logistics (JTL): The objective is to initiate the migration from Federated Combat Support Joint Decision Support Tools, and CINC, Service and agency applications, to integrated information displays in support of the joint warfighter.; to enhance command and control of combat support at the joint task force level; and, to develop and support a transition strategy for ongoing operations and maintenance. Complete initial integration and migration planning this fiscal year.
- Personnel Recovery (PR) Mission Software System Integration and Fielding: The objective is to transition from a paper-based PR response to an integrated GCCS software suite with point-and-click mission interface. Provide Joint Search and Rescue Centers with PR mission software and hardware. Participate this year in the PACOM Cobra Gold exercise.
- Small Unit Logistics (SUL): Small Unit Logistics: Tactical deployment of decision support tools and a logistics information system via web-based technologies, reducing the logistics response time. Commence a two-year software integration and an incremental lead-service exercise evaluation. First year emphasis on supply and maintenance software systems.
- Theater Air Missile Defense Interoperability (TAMDI): Demonstrate the capability to interface Patriot radar measurements data with the Cooperative Engagement Capability (CEC) composite air picture. Demonstrate real-time target track data exchange between AEGIS and PATRIOT weapons systems.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide/BA 3	R-1 ITEM NOMENCLATURE ADVANCED CONCEPT TECHNOLOGY DEMONSTRATIONS PE 0603750D

(U) **FY 2000 Plans:** Continue the process of transitioning and initiating ACTDs. Numerous demonstrations will be conducted for those ACTDs initiated in previous years. All FY 1995 and 1996 ACTD demonstrations should be completed during this period, along with most of the FY 1997 and some FY 1998 ACTD demonstrations. Funding will continue for active ACTDs initiated in FY 1995, 1996, 1997,1998 and 1999 ($107.740 million total for all prior year ACTDs) that have not been completed or transitioned to acquisition programs. Funding available for initiating new FY 2000 ACTDs, after subtracting for previous years ACTDs, will be approximately $10.229 million. ($117.969 million).

(U) Other significant plans for FY 2000 are:

FY 1995 Starts:

- High Altitude Endurance UAVs: Commence interim capability period.
- Joint Countermine: Continue to support user assessments to obtain additional feedback on military utility and maintainability and continue to coordinate transition plans. Conclude the interim capability period and end the ACTD.
- Rapid Force Projection Initiative: Conclude interim capability period and end the ACTD.
- Precision SIGINT Targeting System: Conclude interim capability period and end the ACTD.
- Synthetic Theater of War: Conclude interim capability period and end the ACTD.

FY 1996 Starts:

- Air Base/Port Biological Detection: Continue residual maintenance, training and field support at sites in two theaters.
- Battlefield Awareness and Data Dissemination: Continue enhancements as high payoff capabilities emerge from the technology base. Refine development based on operational warfighter input. Prepare capability for final transition.
- Combat Identification: Interim capability assets will be supported for a last year of continued operation and to obtain additional user feedback on military utility and maintainability. Continued operational support provides a mechanism which critical features for the continued development of Combat Identification identify technologies.
- Counterproliferation I: Support residuals for further operational feedback to assist system engineering, integration and production activities. Continue to support exercises and concept of operations (CONOPS) development for EUCOM. Complete interim capability period and end the ACTD.
- Information Operations Planning Tool: Continue to integrate tools and conduct an operational demonstration. Refinement of the CONOPs based on the field demonstration in FY98 will occur, and an assessment of the INTERNAL LOOK 98 demonstration will be made.
- Joint Logistics: Continue joint demonstrations and military utility assessments. Commence interim capability period.
- Miniature Air-Launched Decoy: Continue interim capability period.
- Navigation Warfare: Continue interim capability period.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide/BA 3	R-1 ITEM NOMENCLATURE ADVANCED CONCEPT TECHNOLOGY DEMONSTRATIONS PE 0603750D

- Semi-Automated Imagery Processing: The Army vehicle version and the Air Force rack version of the SAIP residuals will be supported, CONOPS revised and transition plans finalized. This is the final year of SAIP demonstration and interim capability period and ends the ACTD.
- Tactical UAV: Conclude interim capability period.
- Theater High Energy Laser: Maintain operational use in Israel.

FY 1997 Starts

- Chemical Add-On: Residual maintenance, training and field support will continue at sites in two theaters.
- Counterproliferation II: Continue stand-off platform, penetrator and fuze tests against a surrogate soft biological facility. Continue mini-UAV and dispenser pods integration for collateral effect assessment. Demonstrate new weapon delivery tactics to achieve penetration into hard facilities containing NBC materials. Fabricate EMD prototypes and begin test program for the TLAM penetrator.
- Extending the Littoral Battlespace: Assessment of MSD I, lessons learned, continued technology search and evaluation and preparation for MSD II will be conducted.
- Information Operations Planning Tool: User evaluation will continue, in part via demonstration, during BLUE FLAG 00-1. AFIWC will consider integration of other IO tools developed under their concept exploration/development initiative. Sustainment and support of the IOPT will be provided to CENTCOM and CENTAF.
- Integrated Collection Management: Complete Phase II prototype development, operational development tests and the second military utility assessment.
- Joint Advanced Health and Usage Monitoring System: Complete system installations, conduct training for operational and maintenance crews and begin operational demonstration.
- Military Operations in Urban Terrain: Conduct MOUT Advanced Concepts Excursion. Complete systems integration assessments and refinements. Acquire products and prototypes for the culminating demonstration (CD) and for interim operational capability. Complete New Equipment Training (NET) for CD. Conduct the Advanced Concept Excursion. Conduct the MOUT Culminating Demonstration.
- Rapid Terrain Visualization: Complete integration and testing of high-resolution elevation data collection capability on DeHavilland DHC-7 aircraft. Demonstrate integrated end-to-end RTV process. Acquire and process digital terrain data using DHC-7 collection platform and commercial satellite sources in direct support of XVIII Airborne Corps WFXs. Complete upgrade of workstations and software to objective capability in the IEC and XVIII Airborne Corps and evaluate in a WFX. Extend upgrades and capabilities to topographic units within III Corps.

FY 1998 Starts

- Adaptive Course of Action: Continue CINC-level software integration. Conduct a multi-CINC user demonstration. Continue to evaluate applications within ACOA for early transition to the Global Command and Control System on a 12-to-18 month cycle.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide/BA 3	R-1 ITEM NOMENCLATURE ADVANCED CONCEPT TECHNOLOGY DEMONSTRATIONS PE 0603750D

- C4I for Coalition Warfare: Conduct a demonstration, in the context of a coalition command post exercise, of the integrated message gateway. Data replication mechanism development and testing will be completed. Message formats will be fielded in the maneuver control system (MCS).
- Information Assurance: Automated Intrusion Detection Environment: Integrate an additional 15 sensors into the G-2 environment and an additional nine sites. Sensors and data correlation will be fine tuned to reduce false alarm rates. Hardware and software upgrades for all the ACTD sites will be purchased and installed. All additional installation and training will be completed. Final reports documenting the entire ACTD will be written and formalized. A final demonstration of the entire system will be conducted.
- Joint Biological Remote Early Warning System: Residual assets (Sentry Units (SU), Sample Identification Units (SIU), and Sensor Network Command Post (SNCP) Units) will provide remote detection and warning of biological agents for a Brigade-size assembly area and will be installed and supported in theater. CONOPS development will continue.
- Joint Continuous Strike Environment: Participate in joint and combined theater exercises and continue concept of operations refinement. Complete four modules (target prioritization, weapons availability monitoring, weapons-target pairing and airspace deconfliction), testing, and integration into Global Command and Control System and Service fire support systems. Hold final military utility assessment.
- Joint Modular Lighter System: Conduct joint and unit demonstrations. Commence interim capability period.
- Line-of-Site Anti-Tank: Complete fire unit and missile detail level design and analysis. Hardware tooling and fabrication will begin. Complete fire unit operational and test software design; initiate code development and test. Complete update of missile operational software requirements and initiate software update. Complete update of existing Virtual Prototype Simulator (VPS) and initiate fabrication of second unit. Complete hardware-in-the-loop and closed loop simulation software upgrades and initiate hardware integration.
- Link-16: Continue interim capability period.
- Migration Defense Intelligence Threat Data System: The threat summary and debriefer's associate components will be completed, integrated and tested. The collection interface elements will be developed and tested. Military utility assessment will be conducted.
- Precision Target Identification: Upgrades are planned to the baseline Over-the-Horizon Airborne Sensor Information System (OASIS), which will have been flown operationally in FY99. This C4I upgrade will provide Fleet connectivity to permit processing of external target track information to generate pointing directions for the AVX-1(x) PTI subsystem in addition to providing the compatible data link formats such as OTH-T Gold and TRAP. Delivery and integration support with the United Kingdom¹s Tornado testbed is also planned for completion.
- Space Based Space Surveillance Operations (SBSSO): Conduct final user demonstration and commence interim capability period.
- Theater Precision Strike Operations (TPSO): Complete second of three user demonstrations in conjunction with Ulchi Focus Lens Exercise.
- Unattended Ground Sensor (UGS): Commence interim capability period.

FY 1999 Starts

- Battle Damage Assessment (BDA) in Joint Targeting Toolbox: A subset of the components of the functional assessment approach will be integrated. These components include: data retrieval, filtering and indexing; target and target system models; and their functional aggregation.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide/BA 3	R-1 ITEM NOMENCLATURE ADVANCED CONCEPT TECHNOLOGY DEMONSTRATIONS PE 0603750D

Review and validation will be done by J2-T, 497IG, and the Joint Targeting Tools Users' Group Beta test.

- Coherent Analytical Computing Environment: Incorporation of reasoners/intelligent agents in proof-of-concept squadrons, creating a CACE. Provide residual, shared data/information environment architecture/software to entire USMC Harrier community. Provide JSF Program Office impact assessment.
- Common Spectral MASINT Exploitation: Demonstrate the utility of spectral data with operational assets, such as SYERS/CARS or LANDSAT/EAGLE VISION, during a theater-level exercise, such as FOAL EAGLE, UNION FLASH or TRAIL BLAZER.
- Compact Environmental Anomaly Sensor II: Complete system integration on critical satellite systems and conduct system launch.
- Force Medical Protection Chemical/Biological Dosimeter: Technical evaluation of Phase II sampler. Demonstrate real-time chemical sampler with biological agent collection capabilities. Conduct utility assessment at the CINC level.
- Human Intelligence (HUMINT) and Counterintelligence (CI) Support Tools: Model and evaluate collection tools. Procure and evaluate dissemination tools. Conduct single echelon user tests.
- Joint Medical Operations – Telemedicine: Demonstrate effectiveness of integrated JMO-T capability to satisfy user measures of effectiveness in a joint, capstone utility assessment.
- Joint Theater Logistics: Migrate federated applications to integrated information software capability.
- Personnel Recovery Mission Software: Conduct CENTCOM integration.
- Small Unit Logistics: Continue system integration to include tactical distribution and health services. Deploy the web-based system in a joint exercise showing the inter-operable material readiness information system, maintenance application, and the tactical intermediary logistics operations center. Assess performance for replacing tactical footprint and inventory with speed and information.
- Theater Air Missile Defense Interoperability: Demonstrate the ability to pass target track information to a PATRIOT weapons system to initiate an intercept (launch weapon) in advance of the PATRIOT radar detecting and tracking the target.

(U) **FY 2001 Plans:** Continue the process of transitioning and initiating ACTDs. Numerous demonstrations will be conducted for those ACTDs initiated in previous years. Most FY 1995 and 1996 ACTDs will be fully completed (end of interim capability period) during this year. All FY 1997 ACTD demonstrations should be completed , along with most of the FY 1998 and some FY 1999 ACTDs. Funding will continue for active ACTDs initiated from FY 1996 through FY 2000 ($89.170 million total for all 96-99 ACTDs and an estimated $20 million for FY 00) that have not been completed or transitioned to acquisition programs. Funding available for initiating new FY 2001 ACTDs, after subtracting for previous year ACTDs, will be approximately $10.128 million. ($119.298 million).

(U) Other significant plans for FY 2001 are:

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide/BA 3	R-1 ITEM NOMENCLATURE ADVANCED CONCEPT TECHNOLOGY DEMONSTRATIONS PE 0603750D

FY 1995 Starts

- High Altitude Endurance UAVs: Conclude the interim capability period and end the ACTD.

FY 1996 Starts

- Airbase/Port Bio Detection: Continue residual maintenance, training and field support at four sites in two theaters. Conclude the demonstration and interim capability period and end the ACTD.
- Battlefield Awareness Data Dissemination: Conclude interim capability period and end the ACTD. Handoff capability to DISA for potential fielding to operational users.
- Joint Logistics: Continue joint demonstrations and interim capability period.
- Miniature Air-Launched Decoy: Conclude the interim capability period and end the ACTD.
- Navigation Warfare: Conclude interim capability period and end the ACTD.

FY 1997 Starts

- Chemical Add-On to Airbase/Port Bio Detection: The ACTD demonstration and interim capability period conclude this year and end the ACTD.
- Counterproliferation II: Evaluate Conventional Air-Launched Cruise Missile (CALCM) with AUP against surrogate hard chemical facility. Complete integrated munitions effectiveness assessment tools and perform end-to-end validation for the CP II demonstrations. Complete weaponization and qualification.
- Extending the Littoral Battlespace: Conduct MSD II in second quarter FY 2001 followed by a rapid military utility assessment and potential transition to acquisition of accepted residual systems.
- Information Operations Planning Tools: Residual support will continue and transition plans finalized. The IOPT will support CENTCOM in INTERNAL LOOK 01, CENTAF in Blue Flag 01-1, and EFX 01. Provide IOPT capability to other IO related programs in various services. This is the last year for the ACTDs demonstration and interim capability period and ends the ACTD.
- Integrated Collection Management: Complete Phase III prototype design and development. Conclude third military utility assessment.
- Joint Advanced Helicopter Usage and Monitoring System: Complete operational demonstration. Conduct health and usage monitoring system (HUMS) technology assessment and cost/benefit analysis.
- Military Operations in Urban Terrain: Commence interim capability period.
- Rapid Terrain Visualization: Conclude interim capability support period and end the ACTD.

FY 1998 Starts

- Adaptive Course of Action: Complete integration, hardening and transition into the GCCS/Leading Edge Services (LES). Begin interim capability maintenance and sustainment phase.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide/BA 3	R-1 ITEM NOMENCLATURE ADVANCED CONCEPT TECHNOLOGY DEMONSTRATIONS PE 0603750D

- C4I for Coalition Warfare: A major United States, United Kingdom, France, Germany, Italy and Canada demonstration of the coalition interoperability gained with ACTD message formatting and database replication will be held. This will be in the form of a Command Post Exercise. The developed capability will be fully integrated into the Maneuver Control System (MCS) for fielding during FYs 2001/2002. A decision will be made on the wider integration of capability into other ABCS systems. An initial test of passing coalition ground force data to other service's systems is also projected.
- Information Assurance: Automated Intrusion Detection Environment: Commence interim capability period.
- Joint Biological Remote Early Warning System: In this final year of the residual phase, support will continue for the brigade-size capability.
- Joint Continuous Strike Environment: Install and support residual software with Service fire support systems and GCCS. Provide capabilities to other programs, e.g., Extending the Littoral Battlespace and Theater Precision Strike Operations ACTDs.
- Joint Modular Lighter System: Continue interim capability period.
- Line-of-Site Anti-Tank: Complete fire unit and missile assembly designs and conduct final program design review. Begin integration of fire unit, including the integration of weapon system software. Missile software integration will be completed and hardware integration will be initiated. Complete update of digital and hardware-in-the-loop simulations. Operational procedures and training guides will be completed. Training device development and preparations for first Battle Lab Warfighting Experiment will also be completed.
- Link-16: Conclude interim capability period and end the ACTD.
- Migration Defense Intelligence Threat Data Systems: The vulnerability assessment, threat summary and auto data tagging will be installed for the residual period. The collection interface will have a field demonstration and evaluation.
- Precision Target Identification: The full PTI system will be deployed in the Fleet after final modifications to the laser radar (LADAR) in this budget year. Specifically, final repackaging of the LADAR and integration on the AVX-1(x) optical station are planned. The full sensor system will be tested initially at contractor facilities to ensure successful LADAR operation prior to installation on a brass board optical station at the Naval Air Warfare Center – Annapolis Division (NAWCAD) facility. Next, the system will be integrated on a testbed aircraft Following a successful triumvirate, PTI will be integrated as an AVX-1(x) configuration co-aligned with the mid-wavelength infrared (MWIR) camera in the acquisition turret for operational deployment.
- Space Based Space Surveillance Operations: Conclude interim capability period and end the ACTD
- Theater Precision Strike Operations: Complete third in series of user demonstrations/evaluations.
- Unattended Ground Sensors: Conclude interim capability period and end the ACTD.

FY 1999 Starts

- Battle Damage Assessment in Joint Targeting Toolbox: Additional components will be integrated. These include: comparison of combat objectives with actual results and BDA report generation. A military utility assessment will be conducted in a CENTCOM joint exercise.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide/BA 3	R-1 ITEM NOMENCLATURE ADVANCED CONCEPT TECHNOLOGY DEMONSTRATIONS PE 0603750D

- Coherent Analytical Computing Environment: Extend reasoners/intelligent agents to group, wing and Headquarters USMC. Provide CACE architecture to USMC aviation community. Update JSF Program Office impact assessment.
- Common Spectral MASINT Exploitation: Commence maintenance and sustainment of a COSMEC interim capability
- Compact Environmental Anomaly Sensor II: Demonstrate mission support.
- Force Medical Protection Biological/Chemical Dosimeter: Transition system to the CINC level.
- Human Intelligence (HUMINT) and Counterintelligence (CI) Support Tools (HCIST): Assess CONOPS, equipment and architecture in Joint Warfighting exercise. Conduct OCONUS real-world military utility assessment and operational evaluation.
- Joint Medical Operations – Telemedicine: Transition an interim capability for the CINC or designated component surgeon.
- Joint Theater Logistics: Complete integrated operations and combat service support operations center capability.
- Theater Air Missile Defense Interoperability: Conduct user assessment of the AEGIS/PATRIOT integrated air picture capability.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide/BA 3	R-1 ITEM NOMENCLATURE ADVANCED CONCEPT TECHNOLOGY DEMONSTRATIONS PE 0603750D

(U) ACQUISITION STRATEGY: Not Applicable

(U) B. Program Change Summary	FY1998	FY1999	FY2000	FY2001	Total Cost
Previous President's Budget	77.455	116.330	133.768	122.209	Continuing
Appropriated Value		89.830			Continuing
Adjustments to Appropriated Value					
a. Congressionally Directed undistributed reduction	(2.699)	(1.232)			
b. Rescission/Below-threshold Reprogramming, Inflation Adjustment					
c. Other			(15.799)	(2.911)	Continuing
Current President's Budget	74.756	88.598	117.969	119.298	Continuing

Change Summary Explanation:

(U) Funding: Changes in FY 1999 were due to congressionally directed undistributed reductions. FY2000 and FY20001 adjustments were based on programmatic revisions.

(U) Schedule:

(U) Technical:

(U) C. Other Program Funding Summary Cost : Not Applicable

(U) D. Acquisition strategy Not Applicable

(U) E: Schedule Profile: Not Applicable

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide/BA 3	R-1 ITEM NOMENCLATURE ADVANCED CONCEPT TECHNOLOGY DEMONSTRATIONS PE 0603750D

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide/BA 3	R-1 ITEM NOMENCLATURE ADVANCED CONCEPT TECHNOLOGY DEMONSTRATIONS PE 0603750D

(U) E. PE Funding for FY 1995 ACTDs:

ACTD	FY 1998	FY1999	FY 2000	FY 2001
Advanced Joint Planning**	1.390	1.200	.300	0
Cruise Missile Defense Phase I*	0	0	0	0
Joint Countermine**	6.530	1.440	.390	0
High Altitude Endurance Unmanned Aerial Vehicle	0	0	0	0
Kinetic Energy Boost Phase Intercept*	0	0	0	0
Medium Altitude Endurance Unmanned Aerial Vehicle*	0	0	0	0
Precision SIGINT Targeting System**	.960		0	0
Rapid/Counter Multiple Launcher*	0	0	0	0
Rapid Force Projection Initiative**	0	0		0
Synthetic Theater of War**	2.140	.600	0	0

*Completed

** Completed the demonstration phase of the ACTD

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide/BA 3	R-1 ITEM NOMENCLATURE ADVANCED CONCEPT TECHNOLOGY DEMONSTRATIONS PE 0603750D

(U) E. PE Funding for FY 1996 ACTDs

ACTD	FY 1998	FY 1999	FY 2000	FY 2001
Airbase/Port Biological Detection	1.070	1.200	1.300	2.800
Battlefield Awareness and Data Dissemination	4.280	2.400	2.600	0
Combat Identification**	4.280	2.400	1.280	0
Combat Vehicle Survivability**	1.200	0	0	0
Counterproliferation I	1.080	5.280	6.500	2.000
Counter Sniper*	0	0	0	0
Joint Logistics	1.600	.0	0	0
Joint Readiness Extension to Advanced Joint Planning ***	0.320	.0	0	0
Low Life Cycle Cost, Medium Lift Helicopter*	0	0	0	0
Miniature Air Launched Decoy	0.750	.600	1.600	2.450
Navigation Warfare	4.170	.360	0	0
Semi-Automated IMINT Processing	2.140	2.400	0	0
Tactical UAV**	0	0	0	0
Theater High Energy Laser	0	0	0	0

*Completed

** Completed the demonstration phase of the ACTD

*** Completed the demonstration phase of the ACTD and incorporated into the Advanced Joint Planning ACTD

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide/BA 3	R-1 ITEM NOMENCLATURE ADVANCED CONCEPT TECHNOLOGY DEMONSTRATIONS PE 0603750D

(U) E. PE Funding for FY 1997 ACTDs

ACTD	FY 1998	FY 1999	FY 2000	FY 2001
Chemical Add-On to Biological Detection	1.070	0	.700	1.000
Consequence Management*	0	0	0	0
Counterproliferation II	0	5.400	10.300	7.400
Extending the Littoral Battlespace	2.200	6.000	6.400	9.000
Information Operations Planning Tool	2.140	2.728	1.300	1.800
Integrated Collection Management	1.070	1.200	1.300	1.800
Joint Advanced Health and Usage Monitoring System	4.280	4.800	5.300	1.800
Military Operations in Urban Terrain	5.400	0	0	0
Rapid Terrain Visualization	1.600	2.400	3.900	5.400

* Completed

**Completed the demonstration phase of the ACTD

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide/BA 3	R-1 ITEM NOMENCLATURE ADVANCED CONCEPT TECHNOLOGY DEMONSTRATIONS PE 0603750D

(U) E. PE Funding for FY 1998 ACTDs

ACTD	FY 1998	FY1999	FY 2000	FY 2001
Adaptive Course of Action	2.900	4.800	5.200	2.200
C4I for Coalition Warfare	.430	1.920	3.000	2.600
High Powered Microwave	.750	.600	1.500	.500
Information Assurance: AIDE	3.210	3.600	5.200	3.600
Joint Bio Remote Early Warning System	0	0	2.600	5.400
Joint Continuous Strike Environment	.960	1.560	2.600	2.000
Joint Modular Lighterage System	3.800	4.260	.070	0
Line-of-Sight Anti-Tank	5.276	8.400	6.400	1.800
Link 16	1.230	.600	1.300	2.000
Migration Defense Intelligence Threat Data System	.430	.960	1.100	.540
Precision Targeting Identification	2.300	2.700	3.500	1.080
Space Based Space Surveillance Operations	.750	.840	.900	0
Theater Precision Strike Operations	1.070	4.900	7.050	9.000
Unattended Ground Sensors	1.980	2.160	3.200	4.600

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide/BA 3	R-1 ITEM NOMENCLATURE ADVANCED CONCEPT TECHNOLOGY DEMONSTRATIONS PE 0603750D

(U) E. PE Funding for FY 1999 ACTDs

ACTD	FY1999	FY 2000	FY 2001
Battle Damage Assessment in the Joint Targeting Toolbox	.480	.600	.400
Coherent Analytical Computing Environment	0	.640	.900
Common Spectral MASINT Exploitation Capability	1.200	2.300	1.200
Compact Environment Anomaly Sensor	0	0	.100
Force Medical Protection	.420	1.500	2.200
Human Intelligence and Counterintelligence Support Tools	.600	2.000	1.600
Joint Medical Operations Telemedicine	2.040	3.070	1.000
Joint Theater Logistics	1.800	2.000	1.000
Personnel Recovery Mission Software	.750	1.800	2.100
Small Unit Logistics	1.200	1.640	1.000
Theater Air and Missile Defense Interoperability	2.400	5.400	6.900

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)									DATE February 1999	
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3							**R-1 ITEM NOMENCLATURE** Commercial Technology Insertion Program PE 0603752D8Z			
COST*(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	18.000	0	0	0	0	0	0	0	Continuing	Continuing
Commercial technology Insertion for First Use Mili/P795	8.905	0	0	0	0	0	0	0	Continuing	Continuing
Open Systems Demonstrations to Expand Commercial I/P796	9.095	0	0	0	0	0	0	0	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification

(U) BRIEF DESCRIPTION OF ELEMENT

(U) The purpose of the Commercial Technology Insertion Program (CTIP) is to reduce risks and increase opportunities for the insertion of commercial technologies into defense systems. By supporting the required nonrecurring engineering, test and qualification, CTIP enables commercial components to be used confidently in weapon system applications. By demonstrating open system architectures that take advantage of the latest commercial technologies, CTIP increases the ability of defense systems to avoid parts obsolescence and keep pace with commercial technology advancement. Commercial technologies selected for insertion through this Program apply to more than one weapon system and will reduce life cycle costs and improve performance, reliability and maintainability. This Program implements the Department's strategy for using more commercial technologies in military equipment.

(U) The Program is managed by the Office of the Secretary of Defense and executed by Service program offices. Proposed projects for the insertion of commercial technologies and demonstration of open architectures in defense systems are selected by the Services and approved for funding by the OSD. The systems selected as initial applications are planned/ongoing development and modification programs. CTIP has defined two major thrust areas for the FY 97-99 program: P795 - Commercial Technology Insertion for First Use Military Applications and P796 - Open Systems Demonstrations to Expand Commercial Insertion Opportunities.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Commercial Technology Insertion Program PE 0603752D8Z

(U) P795. The first thrust eliminates barriers to the insertion of a commercial components in a military system. DoD program managers are often reluctant to take the risk of using parts whose characteristics in a military operating environment have not been tested and validated. The business case often does not exist for a single program to make the required investment in adapting and testing commercial items. As a result, military unique items continue to be selected by designers of defense systems, leading to higher costs, lower reliability, increased parts obsolescence, and often lower performance than commercial alternatives. CTIP addresses this problem by providing the engineering and qualification testing needed for the "first user" program, thereby reducing the risk and expense to an acceptable level for follow-on programs. CTIP also provides information to users on test and operational experience with commercial parts in military applications. Two projects were initiated in the first year of the program: (1) commercial microelectromechanical sensors for fuze, safe, and arm devices, with initial applications for undersea weaponry and missiles, and (2) commercial analog to digital signal processing architecture for the F-15 radar.

(U) P796. The second thrust focuses on the system engineering of open system architectures (OSA). OSA are based on commercial market developments and standards. This thrust demonstrates the effectiveness and suitability of these open architectures for use in weapon systems. The purpose is to increase the opportunity for insertion of commercial subsystems and components from sources other than the original equipment manufacturer, and to facilitate upgrades over the life cycle to keep pace with commercial technology advancement. Defense system architectures are often proprietary system solutions that make parts substitution and future upgrades difficult. By contrast, the best practice in the commercial sector is to rely on open system standard interfaces that make upgrading faster, easier and less expensive. Commercial interfaces apply to computer hardware and software and to other electronic, electrical and mechanical attributes.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Commercial Technology Insertion Program PE 0603752D8Z

COST*(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	18.000	0	0	0	0	0	0	0	Continuing	Continuing
Commercial technology Insertion for First Use Mili/P795	8.905	0	0	0	0	0	0	0	Continuing	Continuing

(U) Project Number and Title: P795 Commercial technology Insertion for First Use Mili

(U) PROGRAM ACCOMPLISHMENTS AND PLANS

(U) FY1998 Accomplishments:

(U) Expanded testing and qualification of commercial MEMS sensors for application to Extended Range Guided Munition (ERGM) and Low Cost Competent Munitions. ($ 4 Million)

(U) Completed system engineering to integrate a commercially based analog to digital signal processing architecture into the F15 radar. Design, prototype, and test the video processor board, integrate it with the digital signal processor board, and conduct bench testing to verify performance. ($ 4.905 Million)

(U) FY1999 Plans:

(U) Beginning with FY 1999, CTIP funding will transfer t o PE 604805D. ($ 0 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Commercial Technology Insertion Program PE 0603752D8Z

COST*(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	18.000	0	0	0	0	0	0	0	Continuing	Continuing
Open Systems Demonstrations to Expand Commercial I/P796	9.095	0	0	0	0	0	0	0	Continuing	Continuing

(U) Project Number and Title: P796 Open Systems Demonstrations to Expand Commercial I

(U) PROGRAM ACCOMPLISHMENTS AND PLANS

(U) FY1998 Accomplishments:

(U) Demonstrated the feasibility of using commercial software and standard commercial interfaces in the avionics suite, mission computer, and warfare management computer of the AV-8B. ($ 9.095 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Commercial Technology Insertion Program PE 0603752D8Z

(U) B. Program Change Summary	FY1998	FY1999	FY2000	FY2001	Total Cost
Previous Presidents Budget	19.105	0	0	0	Continuing
Appropriated Value	20.000	0	0	0	Continuing
Adjustments to Appropriated Value					
a. Congressionally Directed Undistributed Reduction	-0.895	0	0	0	
b. Rescission/Below-threshold Reprogramming, Inflation Adjustment	0	0	0	0	
c. Other	1.105	0	0	0	
Current Presidents Budget	18	0	0	0	Continuing

Change Summary Explanation: Funding changes are due to congressional undistributed reductions and inflation adjustments.

(U) Funding: Reductions are due to Congressional adjustments. The President's Budget submit for FY 1999 transfers the funding to PE 064805D and to the Services.

(U) Schedule: N/A

(U) Technical: Reductions are due to Congressional adjustments. The President's Budget submit for FY 1999 transfers the funding to PE 064805D and to the Services.

(U) C. OTHER PROGRAM FUNDING SUMMARY COST: N/A

(U) D. ACQUISITION STRATEGY: N/A

(U) E. SCHEDULE PROFILE: N/A

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE January 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide / BA 3	R-1 ITEM NOMENCLATURE HIGH PERFORMANCE COMPUTING MODERNIZATION PE 0603755D8Z

COST *(In Millions)*	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	139.023	152.585	159.099	145.140	139.109	144.297	147.248	150.275	Continuing	Continuing
HPCM/P476	139.023	152.585	159.099	145.140	139.109	144.297	147.248	150.275	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification

(U) BRIEF DESCRIPTION OF ELEMENT:

(U) The Department of Defense (DoD) High Performance Computing (HPC) Modernization Program (HPCMP) directly supports the needs of the warfighter for technological superiority and military dominance on the battlefield by providing the highest computational power available to U.S. weapons system scientists and engineers. By exploiting continuous advances in high performance computing technology, the defense research, development, test and evaluation (RDT&E) community is able to resolve critical scientific and engineering problems quicker and with more precision than any potential adversary threatening national security. The results of these efforts feed directly into the acquisition process by increasing our fundamental understanding of the battlefield environment as well as improving upon weapon system design, development, test, evaluation, deployment, operations and sustainment. As such, high performance computing (HPC) has been identified as a key enabling technology essential to achieving the objectives of the DoD's Science and Technology (S&T) and Developmental Test and Evaluation (DT&E) programs.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE January 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide / BA 3	R-1 ITEM NOMENCLATURE HIGH PERFORMANCE COMPUTING MODERNIZATION PE 0603755D8Z

(U) The HPCMP has established and supports four major shared resource supercomputing centers as well as several smaller, special-purpose distributed supercomputing centers. These centers directly support the DoD S&T and DT&E laboratories and centers and are accessible to local and remote scientists and engineers via high-speed network access. Providing for the adaptation of broadband, widely-used applications and algorithms to address S&T and DT&E requirements, along with continued training of users as new system designs and concepts evolve, is an integral part of the program. The program pursues continuous interaction with the national HPC infrastructure, including academe, industry, and other government agencies to facilitate the sharing of knowledge, tools, and expertise.

(U) The HPCMP user base includes approximately 4,300 computational scientists and engineers and over 60 DoD laboratories and developmental test and evaluation facilities. The integrated HPCM program consists of a set of four large Major Shared Resources Centers (MSRCs) that are responsible for as large a fraction of DoD's S&T and DT&E computational workload as feasible. These MSRCs provide extensive capabilities to address user requirements for hardware, software, programming environments, and training. A limited set of smaller shared resource centers, Distributed Centers (DCs), augment the MSRCs to form the total HPCMP computational capability. Distributed Centers address critical HPC requirements that cannot be met at MSRCs, such as real-time, and near real-time computing requirements, and leverage significant HPC expertise located at the remote sites. The MSRCs and DCs are currently interconnected with all S&T and DT&E user sites via the Defense Research and Engineering Network (DREN). Additionally the Common HPC Software Support Initiative (CHSSI) develops a set of critical common DoD applications programs that run efficiently on advanced HPC systems at the MSRCs and Distributed Centers.

(U) True modernization of DoD's HPC capability and fulfillment of the program's vision and goals requires an on-going program strategy that addresses all aspects of HPC. While advancing the level of hardware performance is critical to success, the higher objective is to enable better scientific research and technology development for superior weapons, warfighting and related support systems. The goals of the HPCMP are to:

- Provide the best commercially available, state-of-the-art HPC capacity and capability to enable weapons development and more capable warfighting systems,
- Ensure development of software tools, supportive programming environments, and applications to exploit the capabilities of HPC,
- Expand and train the DoD HPC user base to more effectively use HPC,
- Link users and HPC centers through robust high speed networking (thus facilitating classified and unclassified access and the creation of collaborative work environments), and
- Engage, leverage, contribute to, and be a major participant in the national HPC infrastructure and exploit benefits for Defense R&D.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE January 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide / BA 3	R-1 ITEM NOMENCLATURE HIGH PERFORMANCE COMPUTING MODERNIZATION PE 0603755D8Z

(U) Four major contracts to support each of the MSRCs were competitively awarded during FY 1996. These contracts provide equipment for up to five years and comprehensive support services for the next five to eight years. The four MSRCs and their location are:

- Aeronautical Systems Center (ASC), Wright-Patterson Air Force Base, OH
- Army Corps of Engineers Waterways Experiment Station (CEWES), Vicksburg, MS
- Army Research Laboratory (ARL), Aberdeen Proving Ground, MD
- Naval Oceanographic Office (NAVO), Stennis Space Center, MS

(U) Nichols Research Corporation of Huntsville, AL was awarded contracts to support both the ASC and CEWES MSRCs. Grumman Data Systems of Herndon, VA was awarded the contract to support the NAVO MSRC. Finally, Raytheon E-Systems of Garland, TX was awarded the contract to support the ARL MSRC. Each of the MSRC contracts contains provisions, i.e. established contract options, to allow significant expansion of high performance computing systems and related support systems over the first five years of the contract. These contract options ensure that MSRC system expansions can take place in a timely fashion during each fiscal year.

(U) There are currently 12 distributed centers. In FY 1998 five existing centers were upgraded. In FY 1999, one distributed center was retired. Also in FY 1999 multiple distributed center proposals will be evaluated resulting in three to five awards. The distributed centers and their locations are listed below:

- Arnold Engineering Development Center (AEDC), Arnold AFB, TN
- Air Armaments Center (ARC), Eglin AFB, FL
- Army High Performance Computing Research Center (AHPCRC), Minneapolis, MN
- Maui High Performance Computing Center (MHPCC), Maui, HI
- Naval Air Warfare Center (NAWC), Patuxent River NAS, MD
- Space and Naval Warfare Systems Center (SSCSD), San Diego, CA
- Naval Research Laboratory (NRL), Washington, DC
- Air Force Research Laboratory (AFRL-Rome), Rome, NY
- Space and Missile Defense Command (SMDC), Huntsville, AL
- Tank-Automotive Research, Development and Engineering Center (TARDEC), Warren, MI
- White Sands Missile Range (WSMR), NM

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE January 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide / BA 3	R-1 ITEM NOMENCLATURE HIGH PERFORMANCE COMPUTING MODERNIZATION PE 0603755D8Z

- Redstone Technical Test Center (RTTC), Huntsville, AL

(U) In addition to the distributed centers listed above, the Arctic Region Supercomputer Center (ARSC) has been funded by Congress in FY 1996, FY 1997, 1998 and FY 1999 and is providing computational resources to the HPCMP user community.

(U) The Defense Research and Engineering Network (DREN) provides wide area network (WAN) connectivity among the Department's High Performance Computing resources (high performance computing systems and the HPC user base of scientist and engineers in the research, development test and evaluation community) The DREN is implemented through the DREN Intersite Services Contract (DISC) awarded to American Telephone and Telegraph (AT&T) in FY 1996. This contract allows the government to purchase high-speed network service to anywhere in the United States at bandwidths ranging from 3.0 megabits per second to 622 megabits per second (OC-12), with upgrade potential to 2.4 gigabits per second (OC-48) over the five year life of the contract.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE January 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide / BA 3	R-1 ITEM NOMENCLATURE HIGH PERFORMANCE COMPUTING MODERNIZATION PE 0603755D8Z

COST *(In Millions)*	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	139.023	152.585	159.099	145.140	139.109	144.297	147.248	150.275	Continuing	Continuing
HPCM/P476	139.023	152.585	159.099	145.140	139.109	144.297	147.248	150.275	Continuing	Continuing

(U) Project Number and Title: P476 HPCM

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY1998 Accomplishments:

(U) Shared Resource Centers: The program continued the modernization and sustainment of the Shared Resource Centers. Additional HPC systems, storage, and scientific visualization capabilities were acquired to populate and upgrade the established MSRCs to fulfill a substantial portion of the projected HPC requirements of the laboratories and R&D centers. Contract options were executed to upgrade performance at four MSRCs, minimally tripling their computing capability over the two year period (FY 1997 and FY 1998). The program assessed and prioritized HPC requirements for DCs and deployed new systems at five existing DCs to accomplish S&T and DT&E mission needs which cannot be met effectively or efficiently at the MSRCs.

(U) Networking: The DREN fully replaced the Interim DREN in FY1998. The DREN started operation with 10 service delivery points on 1 July 1997. By the end of FY 1998, a total of 60 government facilities and 4 Internet network access points (NAPs) will be connected via DREN. Full Internet Protocol (IP) service is extended to all sites and more robust Asynchronous Transfer Mode (ATM) ATM services are provided to sites with local infrastructures capable of supporting these services (21 sites). Current communications bandwidths provided to sites range from 3 megabits per second to 155 megabits per second. Collaborative work continued with the Federal networking community to assure DREN remains compatible with future technology changes. ($21.742 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE January 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide / BA 3	R-1 ITEM NOMENCLATURE HIGH PERFORMANCE COMPUTING MODERNIZATION PE 0603755D8Z

(U) **Software Applications Support:** 34 individual Common High Performance Computing Software Support Initiative (CHSSI) projects completed alpha and in some cases beta testing in FY 1998. These testing efforts confirmed that sound engineering practices and principles are being employed. Comprehensive reviews were conducted across all 10 computational technology areas (CTAs). ($20.907 Million)

(U) **MSRC Sustainment:** The program sustained and supported the integration, operation, and use of existing HPC resources at the four MSRCs. ($72.073 Million)

(U) **Distributed Center Sustainment:** . The program funded sustainment and operations at the Maui High Performance Computing Center and the Arctic Region Supercomputer Center in accordance with FY 1998 Congressional language. Although not formally a HPCMP DC because it lacks a DoD sponsor, Arctic Region Supercomputer Center funding is included in the DC totals. The DC organization funds the sustainment and operations of the HPCMP equipment located at the site. Only a nominal amount of funding is allocated for DC program management. ($24.301 Million)

(U) **FY1999 Plans:**

(U) **Shared Resource Centers:** The program will sustain the existing capability and continue the modernization process by acquiring additional HPC systems, storage, and scientific visualization capabilities to populate and upgrade the established MSRCs to fulfill the projected HPC requirements of the laboratories and R&D centers. Contract options will continue to be executed to meet the required performance levels at the four MSRCs, minimally tripling their computing capabilities from the previous performance levels over the two year period (FY 1999 and FY 2000). The program will continue to identify evaluate and prioritize HPC requirements for DCs and will acquire and deploy new systems or upgrades to existing systems as needed to accomplish RDT&E mission needs.

(U) **Networking:** As researchers take greater advantage of their connectivity to high performance computing systems and other researchers, the bandwidth demands on DREN will continue to grow. As local infrastructures expand, more user sites will be able to take full advantage of the DREN ATM fabric. Thus the majority of the effort in FY 1999 will be to upgrade services to selected sites and increase bandwidth. Low end users will continue to be connected at 3 Mbps, mid and high range users will be connected at 155 Mbps (previous plans to connect high range users at 622 Mbps have been postponed due to funding reductions). Security enhancements will be implemented. Collaborative work will continue with the Federal networking community and standards associations to assure DREN remains compatible with future technology changes. Formal acquisition planning for the DREN follow-on contract will begin to assure new contracts are in place in FY 2001. ($22.691 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE January 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide / BA 3	R-1 ITEM NOMENCLATURE HIGH PERFORMANCE COMPUTING MODERNIZATION PE 0603755D8Z

(U) **Software Applications Support:** Development efforts in the CHSSI program will continue to mature as some CHSSI projects are completed, and others are begun. The CHSSI projects will continue developing shared scalable applications supporting software to exploit scalable HPC assets to their fullest. ($22.846 Million)

(U) **MSRC Sustainment:** The program will sustain and support the integration, operation and use of HPC computational resources at the four Major Shared Resource Centers. The additional funds requested will provide for a full year of sustainment and operations for those systems purchased and deployed in FY 1998. Partial year sustainment and operations for systems purchased and deployed in FY 1999 is included in the total FY 1999 funding requested. Funding is provided for a high performance visualization center.
($86.202 Million)

(U) **Distributed Center Sustainment:** The program will fund sustainment and operations at the Maui High Performance Computing Center and the Arctic Region Supercomputer Center in accordance with FY 1999 Congressional language. Although not formally a HPCMP DC because it lacks a DoD sponsor, Arctic Region Supercomputer Center funding is included in the DC totals. The DC organization funds the sustainment and operations of the HPCMP equipment located at the site. Only a nominal amount of funding is allocated for DC program management. Only a nominal amount of funding is allocated for DC program management. ($20. 846Million)

(U) **FY2000 Plans:**

(U) **Shared Resource Centers:** The program will sustain the existing capability and continue the modernization process by acquiring additional HPC systems, storage, and scientific visualization capabilities to populate and upgrade the established MSRCs to fulfill the projected HPC requirements of the laboratories and R&D centers. Contract options will continue to be executed to meet the required performance levels at the four MSRCs, minimally tripling their computing capabilities from the previous performance levels over the two year period (FY 1999 and FY 2000). The program will continue to identify evaluate and prioritize HPC requirements for DCs and will acquire and deploy new systems or upgrades to existing systems as needed to accomplish RDT&E mission needs. Formal acquisition planning efforts will begin to assure new contracts are in place to support FY 2001 and beyond procurements.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE January 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide / BA 3	R-1 ITEM NOMENCLATURE HIGH PERFORMANCE COMPUTING MODERNIZATION PE 0603755D8Z

(U) **Networking:** As researchers take greater advantage of their connectivity to high performance computing systems and other researchers, the bandwidth demands on DREN will continue to grow. As local infrastructures expand, more user sites will be able to take full advantage of the DREN ATM fabric. Thus the majority of the effort in FY 2000 will be to upgrade services to all sites and increase bandwidth. Low end users will continue to be connected at 3 Mbps, mid range users will be connected at 155 Mbps and high range users will be connected at 622 Mbps. Operation of security systems and enhancements will continue. Collaborative work will continue with the Federal networking community and standards associations to assure DREN remains compatible with future technology changes. Formal acquisition efforts will assure follow-on contracts are in place to support DREN services in FY2001 and beyond. ($29.517 Million)

(U) **Software Applications Support:** Development efforts in the CHSSI program will continue to mature as some CHSSI projects are completed, and others are begun. The CHSSI projects will continue developing shared scalable applications supporting software to exploit scalable HPC assets to their fullest. ($22.535 Million)

(U) **MSRC Sustainment:** The program will sustain and support the integration, operation and use of HPC computational resources at the four Major Shared Resource Centers. Partial year sustainment and operations for systems purchased and deployed in FY 2000 and cost saving resulting in the retirement of older HPC systems are included in the total FY 2000 funding requested. Formal acquisition planning efforts will begin to evaluate options for sustainment support in FY2001 and beyond. ($86.201 Million)

(U) **Distributed Center Sustainment:** A one year budget adjustment provides sustainment and operations for the Maui High Performance Computing Center and the Arctic Region Supercomputer Center. The DC organization funds the sustainment and operations of the HPCMP equipment located at the site. Only a nominal amount of funding is allocated for DC program management. ($20.846 Million)

(U) **FY2001 Plans:**

(U) **Shared Resource Centers:** The program will sustain the existing capability and continue modernizing HPC systems, storage, and scientific visualization capabilities to fulfill a significant portion of the projected the R&D & laboratory and center HPC requirements. New contracts will be awarded to provide the next generation of HPC capability.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE January 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide / BA 3	R-1 ITEM NOMENCLATURE HIGH PERFORMANCE COMPUTING MODERNIZATION PE 0603755D8Z

(U) **Networking:** As researchers take greater advantage of their connectivity to high performance computing systems and other researchers, the bandwidth demands on DREN will continue to grow. Network services provided under DISC will transition to the follow-on service provider. Operation of security systems and enhancements will continue. Collaborative work will continue with the Federal networking community and standards associations to assure DREN remains compatible with future technology change. ($32.900 Million)

(U) **Software Applications Support:** Development efforts in the CHSSI program will continue to mature as some CHSSI projects are completed, and others are begun. The CHSSI projects will continue developing shared scalable applications supporting software to exploit scalable HPC assets to their fullest. ($22.446 Million)

(U) **MSRC Sustainment:** The program will sustain and support the integration, operation and use of HPC computational resources at the four Major Shared Resource Centers. ($88.948 Million)

(U) **Distributed Center Sustainment:** . The DC organization funds the sustainment and operations of the HPCMP equipment located at the site. Only a nominal amount of funding is allocated for DC program management. ($0.846 Million)

(U) **ACQUISITION STRATEGY:** Not Applicable

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE January 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide / BA 3	R-1 ITEM NOMENCLATURE HIGH PERFORMANCE COMPUTING MODERNIZATION PE 0603755D8Z

(U) B. Program Change Summary	FY1998	FY1999	FY2000	FY2001	Total Cost
Previous President's Budget	126.211	140.927	139.548	146.206	Continuing
Appropriated Value	149.880	153.927			Continuing
Adjustments to Appropriated Value					
a. Congressionally Directed undistributed reduction	(9.613)	(1.342)			
b. Rescission/Below-threshold Reprogramming, Inflation Adjustment	(1.244)		(.449)	(1.066)	
c. Other			20.000		Continuing
Current President's Budget	139.023	152.585	159.099	145.140	Continuing

Change Summary Explanation:

(U) **Funding:** The funding adjustment in FY 1998 is based on congressional adjustments in the Defense Appropriations Act and program budget reductions. The funding adjustments in FY 2000 are a result of revised inflation factors and program budget increases (including a FY 2000 specific program budget increase). The reduction in FY 2001 is a result of revised inflation factors and program budget decisions.

(U) **Schedule:** Not Applicable

(U) **Technical:** In accordance with FY 1999 congressional language, the High Performance Computing Modernization Program used additional FY 1999 RDT&E funding for operations, sustainment and upgrades at the Maui High Performance Computing Center and the Arctic Region Supercomputing Center.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE January 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide / BA 3	R-1 ITEM NOMENCLATURE HIGH PERFORMANCE COMPUTING MODERNIZATION PE 0603755D8Z

(U) C. Other Program Funding Summary Cost

Procurement Line P-1 Line, PROCUREMENT, DEFENSE-WIDE (OSD High Performance Computing - Major Equipment)

($ in Millions)

FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Complete	Total Cost
87.100	91.435	62.705	40.422	50.796	49.748	50.782	52.392	Continuing	Continuing

MILESTONE SCHEDULE:	Fiscal Years
Milestone II Decision Review	1Q 1996
Awards for MSRC Contracts (Performance Level 1)	2Q, 3Q, 4Q 1996
Award for DREN (DISC)	4Q 1996
MSRC Performance Level 1 Capability Installed	1Q 1997-4Q 1997
In-Process Review	3Q 1997
FY 1997 HPC Modernization Plan Updated	3Q 1997
MSRC Performance Level 2 Capability Installed	2Q 1997- 3Q 1998
DREN Initial Performance Capability	3Q 1997
FY 1998 HPC Modernization Plan Updated	2Q 1998
IDREN to DREN Transition Complete	4Q 1998
MSRC Performance Level 3 Capability Installed	2Q 1999- 3Q 2000
MSRC Follow-on Contract(s) (Recompete)	2Q 2001
DREN Follow-on Contract (Recompete)	1Q 2001

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE January 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide / BA 3	R-1 ITEM NOMENCLATURE HIGH PERFORMANCE COMPUTING MODERNIZATION PE 0603755D8Z

(U) **D. Schedule Profile** Not Applicable

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)									DATE February 1999	
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3							**R-1 ITEM NOMENCLATURE** Joint Wargaming Simulation Management Office PE 0603832D8Z			
COST*(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	60.059	60.518	68.456	68.250	70.552	71.954	73.456	74.899	Continuing	Continuing
JSM/P476	60.059	60.518	68.456	68.250	70.552	71.954	73.456	74.899	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification

(U) BRIEF DESCRIPTION OF ELEMENT

(U) The Defense Modeling and Simulation Office has corporate-level responsibility for the cooperation and synergism of modeling and simulation (M&S) activities within the Department of Defense. M&S has demonstrated the capability to revolutionize the way in which the Department makes decisions and conducts its operations. Working as a system of systems, M&S can support a full range of applications (e.g. joint training, doctrine development, formulation and assessment of operational plans, mission rehearsal, force structuring and the acquisition of new systems). To ensure effective and efficient use of M&S, the Department has developed a strategy fostering interoperability and re-use, embodied in the Department of Defense Modeling and Simulation Master Plan, which serves as the basis for execution of this program. The major element of the strategy is development of a common technical framework (CTF) for M&S consisting of three components: the High Level Architecture (the most important); Conceptual Models of the Mission Space (CMMS); and Data Standardization. Supporting these is a broad range of shared common services which include environmental representation; human and organizational behavioral representation; verification, validation and accreditation of simulations; a modeling and simulation resource repository; a modeling and simulation operational support activity; and outreach and education initiatives to ensure standardized and timely implementation of the plan. As a result of this effort, the Department will be able to improve readiness, enhance mission rehearsal, optimize investment decisions, and achieve cost-effective acquisitions.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Joint Wargaming Simulation Management Office PE 0603832D8Z

COST*(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	60.059	60.518	68.456	68.250	70.552	71.954	73.456	74.899	Continuing	Continuing
JSM/P476	60.059	60.518	68.456	68.250	70.552	71.954	73.456	74.899	Continuing	Continuing

(U) Project Number and Title: P476 JSM

(U) PROGRAM ACCOMPLISHMENTS AND PLANS

(U) FY1998 Accomplishments:

(U) Continued development of support software for testing and Federation Object Model (FOM) development; incorporated modification to legacy systems to interoperate through the HLA; completed competitive procurement process for Runtime Infrastructure (RTI) software; continued development, integration, test and standardization; began HLA compliance testing and simulation certification. ($ 27.428 Million)

(U) Integrated operational Conceptual Models of the Mission Space (CMMS) into M&S Resource Repository (MSRR); continued to integrate Component knowledge acquisition projects into CMMS; provided CMMS Toolset products to support campaign-level analysis and training related knowledge acquisition by integrating the Join t Simulation System (JSIMS), Joint Warfare System (JWARS), National Air and Space (Warfare) Model (NASM), Warfighters' Simulation 2000 (WARSIM 2000), and JSIMS Maritime knowledge acquisition products into the CMMS Library; conducted CMMS evaluation experiments to establish scope, priority, and compatibility of acquisition and operational test and evaluation related CMMS requirements for subsequent inclusion in the CMMS Toolset; continued to develop security policies for the CMMS Library.
($ 2.890 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Joint Wargaming Simulation Management Office PE 0603832D8Z

(U) Completed initial build of HLA related data standards and t he associated Object Model Data Dictionary System (OMDDS) and made them available through the internet; completed the identification and designation of an additional 500 Authoritative Data Sources (ADS) and structured the ADS database for formal life-cycle maintenance; began development of a registration template as a specification for identifying, registering, and assessing data products; demonstrated distributed data quality guidelines, tools, and utilities; established CSS and associated DIFs for HLA OMDD, Order of Battle (OB), and Synthetic Environments (through the Synthetic Environment Data Representations Interchange Specification (SEDRIS)); began integration of end-user data verification and validation (V&V) guidelines into the Model and Simulation Verification, Validation, and Accreditation (VV&A) RPG; began development of data producer Data Quality Assurance Guidelines; completed development and initial deployment of the Data Verification Interactive Editor (DAVIE) data quality tool; continued development of data standards for the authoritative representation of the natural environment, units and systems with a focus on the SEDRIS for the natural environment; obtained IEEE approval of the IDEF1X97 modeling language; conducted a formal comparison of IDEF1X97, UML, and STEP to specify complex data; executed the mission of Functional Data Administration for M&S in accordance with DoD 8320.1. ($ 4.200 Million)

(U) Completed initial development of a weather scenario generation cap ability for use by simulation developers and exercise planners in specifying consistent and correlated scenarios to achieve analysis, testing, and training simulation evaluation objectives; established the initial operational criteria for the MEL and rehosted its access site from research laboratory to the M&S Operational Support Activity; developed the software capability for access to resources over the SIPRNet; keywords redefined and metadata descriptions reworked for improved system performance an d interface with other MSRR Libraries. ($ 12.500 Million)

(U) Completed National Research Council report on modeling human and organizational behavior which outlined future investments in this critical area. ($ 1 Million)

(U) Initiated Phase 1 of the VV&A Recommended Practices Guide revision; produced draft guide for the program manager and developed foundation for a guide for the VV&A practitioner; integrated the concepts of M&S and end-user data V&V (referred to as VV&A and VV&C); developed first-order VV&A history templates as well as templates which capture information related to producer quality assurance activities. ($ 1.300 Million)

(U) Completed development of and developmental testing on the initial MSRR prototype, including necessary research and engineering to operate the same software on both the unclassified Internet and classified SIPRNet in conformance with current security guidance; software released three times, which included independent developmental and operational testing associated with each release; completed system engineering associated with installation of the initial prototype at the Modeling and Simulation Operational Support Activity (MSOSA); trained the registrar and established help desk functions. ($ 4.740 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Joint Wargaming Simulation Management Office PE 0603832D8Z

(U) Assessed Modeling and Simulation Operational Support Activity (MSOSA) performance and adjusted structure and procedures to meet evolving user needs, including access to planning tools and other modeling and simulation assets; upgraded MSOSA operational support system to incorporate current developments in electronic information research and network technologies. ($ 3.500 Million)

(U) Expanded awareness of DoD's M&S initiatives worldwide through full participation in major M&S conferences, and support for 12 related technical conferences and seminars; developed greater visibility throughout DoD and the M&S industry via an aggressive web-based public affairs/outreach program; assisted NATO partners established US-like M&S standards, procedures, and policies. ($ 1.200 Million)

(U) Finalized DoD-wide M&S education and training plan; conduct ed first formal DoD-level M&S education courses with the execution of 10 iterations of the M&S Staff Officers Course; expanded M&S formal courses of instruction with the development of the Executive-level Course, the Program Managers Course, and an M&S primer course; conducted technical seminars, workshops and symposia on M&S; inserted M&S technology into major joint warfighter exercises. ($ 1.300 Million)

(U) FY1999 Plans:

(U) Continue development of HLA technology, prototypes of enhanced capabilities and applications of advanced technology; expand support, including high performance infrastructure for users of modeling and simulation, to enable them to exploit fully the increased capabilities that will be fielded under the HLA initiative, to include JSIMS and JWARS; design, develop and prototype the M&S technologies required to implement technology needed to federate simulations operating at different levels of security to support applications for training, analysis and acquisition. ($ 26.200 Million)

(U) Develop and deliver the third and fourth operational builds of the CMMS Toolset to support integration and exchange of simulation implementation-independent functional descriptions of military operations and tasks; focus on the knowledge engineering activities conducted by simulation development subject matter experts who employ conceptual models to design and implement HLA Federations and M&S applications; CMMS Toolset support for simulation developer knowledge engineering activities will be demonstrated by direct collaboration with JWARS and JSIMS Enterprise simulation developers and with HLA transition efforts; CMMS Toolset will be extended to support engineering and engagement level of detail required in acquisition and operational test and evaluation applications; experiments will be conducted to establish the scope, priority, and compatibility of requirements to support a multitude of equipment and systems characteristics and performance specifications. ($ 3.200 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Joint Wargaming Simulation Management Office PE 0603832D8Z

(U) Continue development of HLA related data standards and associated OMDD efforts; develop and deliver the first and second operational builds of the OB data access Toolset; provide OB data access Toolset support for M&S community via direct collaboration with the OSD PA&E Joint Data System, the JSIMS Enterprise, and selected HLA transition efforts; extend the registration template to support additional repository requirements and security and release policies and procedures; develop and coordinate producer Data Quality Assurance guidelines; distribute/install Data Quality tools at additional DoD locations; begin CSS, associated DIFs, and data standards development for targets/facilities information; continue to nominate and obtain final standards approval for other M&S data elements for inclusion in the DoD Data Dictionary System (DDDS); provide Functional Data Administration for M&S in accordance with DoDD 8320.1. ($ 2.500 Million)

(U) Complete interchange mechanism full definition and expand technology insertion efforts to further develop test capabilities; expand software tools for SEDRIS transmittal generation and verification; initiate SEDRIS standardization through established standards organizations both nationally and internationally; evaluate sources and document procedures for the use of alternate sources for database generation, to include commercial options; provide additional tools, reference datasets, policies and procedures for the generation of integrated databases expanding existing terrain and ocean capabilities and integrating atmospheric data and effects; initial exploitation of atmospheric scintillation effects in simulations; expand representational resource experiments in high-resolution Simulation Based Acquisition (SB A)-related areas; complete development of a weather scenario generation capability; provide initial procedures for data acquisition through littoral classification and climatological data manipulation; initiate operational capability for MEL with both Internet and SIPRNet capability; complete metadata specification and implementation in access and resource site software; incorporate atmosphere and space models and algorithms catalog, and expand resource availability across the MEL system. ($ 10.518 Million)

(U) Continue extension of conceptual model of mission space technical framework to human and organizational behavior; examine limits of SEDRIS data model for human behavior; establish Special Interest Area on the World Wide Web. ($ 1.500 Million)

(U) Transition VV&A guidance from the theoretical to the application level; develop V&V methodology as it applies to federations, SBA, Analysis of Alternatives, and new development efforts (e.g., JWARS and JSIMS); support VV&A advancement through information exchange (VV&A history templates) and curriculum development; define VV&A tool concepts. ($ 3.000 Million)

(U) Modify and enhance MSRR common, physical and software infra structure based on network and database state-of-art and user requirements, including federation with other repositories, to form a collaborative, distributed repository system; continue documentation of MSRR; continue population of the MSRR system providing: (a) directories /catalogs; (b) data standardization resources (e.g., process and data models, data dictionary); (c) reusable data, algorithms, models and simulations; and (d) tools for browsing and accessing, linking across resources, configuration management, etc.; initiate transition to appropriate agency; modify software based on user requirements.($ 4.200 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Joint Wargaming Simulation Management Office PE 0603832D8Z

(U) Continue MSOSA operations providing one-on-one assistance/education to the M&S community while transitioning to the new Modeling and Simulation Information Analysis Center (MSIAC) organization.($ 4.500 Million)

(U) Continue emphasis on outreach activities to include expanded M&S conference support and web-based public affairs activities. ($ 1.400 Million)

(U) Institute development of fully interactive user, staff officer, manager and executive level courses that address training, acquisition and analysis domains; conduct technical seminars, workshops and symposia; develop, field and populate web-based electronic libraries to make all M&S course of instruction immediately available to the M&S community; widely disseminate M&S formal instruction through production and distribution of videos and CD-ROMS; insert M&S technology into major joint warfighter exercises; refine and enhance the capability of the models and simulations developed to support DoD's acquisition process. ($ 3.500 Million)

(U) FY2000 Plans:

(U) Apply increased advanced integrated automation to federation development and operation, demonstrating additional (20%) reduced costs to create a new federation; use advanced experimentation to support domestic and international standards organizations. ($ 26.897 Million)

(U) Transition the CMMS Toolset to operational status; update and maintain the CSS, DIFs, and KAT Tools, CMMS Library, and supporting conversion, quality assurance, integration, and analysis tools; update and maintain the CMMS Recommended Practices Guide; support operational use of the CMMS Toolset by the M&S community; adapt components of the CMMS Toolset to support equipment and systems characteristics and performance specifications; conduct experiments to establish the scope, priority and compatibility with human behavior representations. ($ 3.360 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Joint Wargaming Simulation Management Office PE 0603832D8Z

(U) Transition OMDDS to operational status; update and maintain HLA related data standards and required M&S ADS data; develop and deliver the third and fourth operational builds of the OB data access Toolset; review and update Data Quality Assurance guidelines; review and update DAVIE tool; distribute/install DAVIE tool at additional DoD locations; review and update DE-RPG to ensure appropriateness; maintain existing DIFs; continue to develop CSS, associated DIFs, and data standards for additional environmental representations, units/systems, and operations /human behavior; continue to nominate and obtain final standards approval for other M&S data elements for inclusion in the DDDS; assess Data Security requirements for on-going M&S efforts; provide Functional Data Administration for M&S in accordance with DoDD 8320.1. ($ 6.900 Million)

(U) Continue SEDRIS path toward national and international standardization; complete user defined interchange experiments; initiate establishment of a consortium to manage SEDRIS products and definition in consort with target standardization organizations; develop integrated ocean database generation procedures that support transition from deep to shallow water operations and provide correlated environmental effects for SBA, training and analysis; high-resolution atmospheric effects and target scene depiction will also be studied in multi-resolution scenarios; initial work in space data use in simulation will emphasize growing interest in solar maximum events; continue to expand resource listings to include model and algorithm coverage for all environmental domains; compliance with evolving international metadata standards will be addressed; additional MEL services will be assessed from an established users and implementers consortium comprised of Military, Government, Industry and Academic members from both domestic and international organizations. ($ 12.900 Million)

(U) Initiate recommended practices guide for enhancing simulations with human and organizational behavior representations; continue special interest area in human behavior. ($ 1.400 Million)

(U) Expand scope of VV&A guidance to address system and human behavior representations, live player interoperability, and fidelity issues; prototype VV&A tool concepts. ($ 2.900 Million)

(U) Maintain resource repositories to enable/encourage the reuse of models, simulations and related assets; federate with additional repositories within DoD; develop specialized structures, as necessary, to support innovative DoD programs which will increasingly depend on reuse; increase emphasis on offering incentives to M&S community to populate the repositories. ($ 4.400 Million)

(U) Initiate transition from MSOSA to MSIAC. MSIAC will operate under yearly core-level of funding. ($ 4.700 Million)

(U) Continue emphasis on outreach activities to include expanded M&S conference support and web-based public affairs activities. ($ 1.500 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Joint Wargaming Simulation Management Office PE 0603832D8Z

(U) Execute transition of existing formal M&S courses of instruction to other agencies. DMSO will concentrate on effort to greatly expand the development and distribution of new courses to support the entire M&S community through electronic technologies. ($ 3.500 Million)

(U) FY2001 Plans:

(U) Demonstrate runtime infrastructure advances using next-gene ration software and hardware to increase (20%) performance for the same cost, using commercial software to replace 50% of customer software; continue to use advanced experimentation for enhanced standards, policies and procedures. ($ 26.167 Million)

(U) Continue to support operational usage of the CMMS Toolset; continue adaptation of CMMS Toolset to support equipment and systems characteristics and performance specifications; adapt components of the CMMS Toolset to support human behavior representation as appropriate; update and maintain the CMMS RPG; continue the development of CSS and associated DIFs for CMMS subject matter descriptions; update and maintain knowledge acquisition tools and utilities to support CMMS activities. ($ 3.200 Million)

(U) Transition Order of Battle data access Toolset to operation al status; support operational usage of OMDDS; update and maintain HLA related data standards and required M&S ADS data; develop and deliver the first and second operational builds of the Targets and Facilities data access Toolset; review and update Data Quality Assurance guidelines; review and update DAVIE tool; distribute/install DAVIE tool at additional DoD locations; review and update DE-RPG to ensure appropriateness; maintain existing DIFs; continue to develop CSS, associated DIFs, and data standards for additional environmental representations, units/systems, and operations/human behavior; continue to nominate and obtain final standards approval for other M&S data elements for inclusion in the DDDS; assess Data Security requirements for on-going M&S efforts; provide Functional Data Administration for M&S in accordance with DoDD 8320.1. ($ 6.700 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Joint Wargaming Simulation Management Office PE 0603832D8Z

(U) Complete national and international SEDRIS standardization to include formal establishment of a management consortium; initiate investigation in the use and expansion of the SEDRIS data representation model in supporting dynamic changes in the physical environment; investigate very high resolution database designs that incorporate computer-added design files, and micro-climate environmental information for use in dynamic fly-throughs in urban terrain; continue to reduce integrated database generation timelines to meet evolving operational mission planning and mission rehearsal timeline requirements; demonstrate production and operational use of measures of database consistency to assess interoperability potential and tailor database design, generation and/or modification activities in establishing simulation federations and conducting exercise scenarios; complete initial pass at model and algorithm discovery and access in all environmental domains; fully link the MEL system with the National Spatial Data Infrastructure and appropriate international systems to ensure a robust capability to support U.S. DoD needs thus establishing a "one stop shop" capability for all environmental information needs. ($ 1300 Million)

(U) Initiate the development of technologies and tools to support incorporation of authoritative representations of human and organizational behavior into DoD simulations. ($ 1.300 Million)

(U) Expand scope of VV&A guidance to address complex cognitive processes and dynamic environment including terrain and atmosphere; populate VV&A tool sets. ($ 2.841 Million)

(U) Maintain resource repositories to enable/encourage the reuse of models, simulations and related assets; increase emphasis on offering incentives to M&S community to populate the repositories.($ 4.600 Million)

(U) Complete transition from MSOSA to MSIAC; MSIAC will operate under yearly core-level of funding.($ 4.843 Million)

(U) Continue emphasis on outreach activities to include expanded M&S conference support and web-based public affairs activities. ($ 1.600 Million)

(U) Complete transition of existing formal M&S courses of instruction to other agencies; expand the development and distribution of new courses to support the entire M&S community through electronic technologies.($ 4.00 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Joint Wargaming Simulation Management Office PE 0603832D8Z

(U) B. Program Change Summary	FY1998	FY1999	FY2000	FY2001	Total Cost
Previous Presidents Budget	61.46	70.696	69.636	69.484	Continuing
Appropriated Value	64.338	61.496	0	0	Continuing
Adjustments to Appropriated Value					
a. Congressionally Directed Undistributed Reduction	-4.069	-0.977			
b. Rescission/Below-threshold Reprogramming, Inflation Adjustment	0	0	-0.32	-0.266	
c. Other	-0.21	0	-1.5	-1.5	
Current Presidents Budget	60.059	60.518	68.456	68.25	Continuing

Change Summary Explanation: Funding changes are due to congressional undistributed reductions and inflation adjustments.

(U) Funding: Funding changes are the result of below threshold program adjustments and revisions in inflation projections.

(U) Schedule: N/A

(U) Technical: Funding changes are the result of below threshold program adjustments and revisions in inflation projections.

(U) C. OTHER PROGRAM FUNDING SUMMARY COST: N/A

(U) D. ACQUISITION STRATEGY: N/A

(U) E. SCHEDULE PROFILE: N/A

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)									DATE February 1999	
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3							**R-1 ITEM NOMENCLATURE** Nuclear Matters PE 0605160D8Z			
COST*(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	0	0	1.495	1.493	1.492	1.490	1.489	1.487	Continuing	Continuing
Nuclear Matters/P476	0	0	1.495	1.493	1.492	1.490	1.489	1.487	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification

(U) BRIEF DESCRIPTION OF ELEMENT

(U) The Nuclear Matters (NM) program has been established in PE0605160D8Z. Nuclear weapons receive special consideration within OSD because of their political and military importance, destructive power, and the potential consequences of an accident or unauthorized act. Consequently, nuclear weapons issues must receive senior level attention, action, and support. NM provides technical policy guidance to senior OSD leadership on complex and demanding issues pertaining to nuclear stockpile sustainment. The office works closely with OSD Policy, the Department of Energy, Congress, and foreign governments to provide guidance for – and oversight of – a wide variety of nuclear weapons activities. In support of these activities, the program provides for analysis and assessments of issues associated with the reliability, safety, security, transportation, command and control, maintenance, storage, and sustainability of the enduring stockpile.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Nuclear Matters PE 0605160D8Z

COST*(In Millions)*	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total Program Element (PE) Cost	0	0	1.495	1.493	1.492	1.490	1.489	1.487	Continuing	Continuing
Nuclear Matters/P476	0	0	1.495	1.493	1.492	1.490	1.489	1.487	Continuing	Continuing

(U) Project Number and Title: P476 Nuclear Matters

(U) PROGRAM ACCOMPLISHMENTS AND PLANS

(U) FY2000 Plans:

(U) Analyses are produced in preparation of the annual Nuclear Weapons Deployment Request to the President and support activities for senior level groups such as the Joint Advisory Committee on Nuclear Weapons Surety. Analyses and assessments providing guidance for preparation of the annual Nuclear Weapons Stockpile Memorandum, Long Range Planning Assessment to the President, NWC Chairman's Annual Report to Congress, and NWC Standing and Safety Committee actions. Products provide basis for technical policy recommendations to the President, Secretary of Defense, and Chairman of the Nuclear Weapons Council. ($ 0.575 Million)

(U) Nuclear Weapons Council (NWC) Support:

(U) Provide support to the NWC staff and members via products on technical is sues concerning the evolution of the nuclear weapons complex and infrastructure. Analyses support development of agenda items for the NWC. ($ 0.350 Million)

(U) Maintaining the Deterrent Infrastructure:

(U) Provide analyses on sustaining nuclear weapons safety, use control, survivability, certification, transportation, and reliability. These efforts support DoD oversight of such DOE stockpile stewardship activities as: nuclear weapon sustainment and revalidation, development of an assured tritium supply, life extension programs, and stockpile stewardship and maintenance.($ 0.350 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Nuclear Matters PE 0605160D8Z

(U) Policy Support and Guidance for International Obligations:

(U) Provide oversight and guidance to activities and organizations such as the NATO Senior Level Weapons Protection Group, the Joint Theater Surety Management Group, and Congressionally approved technical exchanges with foreign nations. ($ 0.22 Million)

(U) FY2001 Plans:

(**U) Recurring Obligations and Requirements Development**

(U) Analyses are produced in preparation of the annual Nuclear Weapons Deployment Request to the President and support activities for senior level groups such as the Joint Advisory Committee on Nuclear Weapons Surety. Analyses and assessments providing guidance for preparation of the annual Nuclear Weapons Stockpile Memorandum, Long Range Planning Assessment to the President, NWC Chairman's Annual Report to Congress, and NWC Standing and Safety Committee actions. Products provide basis for technical policy recommendations to the President, Secretary of Defense, and Chairman of the Nuclear Weapons Council. ($ 0.573 Million)

(U) Nuclear Weapons Council (NWC) Support:

(U) Provide support to the NWC staff and members via products on technical issues concerning the evolution of the nuclear weapons complex and infrastructure. Analyses support development of agenda items for the NWC. ($ 0.35 Million)

(U) Maintaining the Deterrent Infrastructure:

(U) Provide analyses on sustaining nuclear weapons safety, use control, survivability, certification, transportation, and reliability. These efforts support DoD oversight of such DOE stockpile stewardship activities as: nuclear weapon sustainment and revalidation, development of an assured tritium supply, life extension programs, and stockpile stewardship and maintenance. ($ 0.350 Million)

(U) Policy Support and Guidance for Internati onal Obligations:

(U) Provide oversight and guidance to activities and orga nizations such as the NATO Senior Level Weapons Protection Group, the Joint Theater Surety Management Group, and Congressionally approved technical exchanges with foreign nations. ($ 0.220 Million)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Nuclear Matters PE 0605160D8Z

(U) B. Program Change Summary	FY1998	FY1999	FY2000	FY2001	Total Cost
Previous Presidents Budget	0	0	0	0	Continuing
Appropriated Value	0	0	0	0	Continuing
Adjustments to Appropriated Value					
a. Congressionally Directed Undistributed Reduction	0	0	0	0	
b. Rescission/Below-threshold Reprogramming, Inflation Adjustment	0	0	0	0	
c. Other	0	0	1.495	1.493	
Current Presidents Budget	0	0	1.495	1.493	Continuing

Change Summary Explanation: Funding changes are due to budget decisions.

(U) Funding: When it was first created, the Nuclear Matters funding line was placed under the Counterproliferation Program for administrative purposes. Under the Defense Reform Initiative (DRI), the Counterproliferation program and its funding line is being moved to the Defense Threat Reduction Agency while the office of Nuclear Matters will report to the Director, Defense Research and Engineering. Therefore, funds for Nuclear Matters will be transferred from PE0605160D8Z to PE0605160BR in FY99. Beginning in FY00, the Nuclear Matters Program will be funded in PE0605160D8Z.

(U) Schedule: N/A

(U) Technical: When it was first created, the Nuclear Matters funding line was placed under the Counterproliferation Program for administrative purposes. Under the Defense Reform Initiative (DRI), the Counterproliferation program and its funding line is being moved to the Defense Threat Reduction Agency while the office of Nuclear Matters will report to the Director, Defense Research and Engineering. Therefore, funds for Nuclear Matters will be transferred from PE0605160D8Z to PE0605160BR in FY99. Beginning in FY00, the Nuclear Matters Program will be funded in PE0605160D8Z.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense Wide/BA 3	**R-1 ITEM NOMENCLATURE** Nuclear Matters PE 0605160D8Z

(U) C. OTHER PROGRAM FUNDING SUMMARY COST: N/A

(U) D. ACQUISITION STRATEGY: N/A

(U) E. SCHEDULE PROFILE: N/A