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ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2 Exhibit)								DATE February 1999		
BUDGET ACTIVITY 1 - Basic Research				PE NUMBER AND TITLE 0601101A In-House Laboratory Independent Research						
COST (In Thousands)	FY1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	13325	13574	14193	14499	14829	16722	17530	18164	Continuing	Continuing
A91A In-House Laboratory Independent Research - Army Materiel Command	8672	9327	9807	10043	10301	11190	11634	12092	Continuing	Continuing
A91C In-House Laboratory Independent Research - Medical Research and Materiel Command	3769	3548	3665	3724	3784	4495	4846	4985	Continuing	Continuing
A91D In-House Laboratory Independent Research - Corps of Engineers	884	699	721	732	744	1037	1050	1087	Continuing	Continuing

A. Mission Description and Budget Item Justification: In-House Laboratory Independent Research (ILIR) provides a source of competitive funds to technical directors to stimulate high quality, innovative research with significant opportunity for payoff in Army warfighting capability. The ILIR program serves as a catalyst for major technology breakthroughs by giving laboratory directors flexibility in implementing novel research ideas and nurturing senior researchers as well as the most promising, developing scientists. The ILIR funding allocation is based on the quality of past performance. Each year, ILIR project reports are submitted from competing Army research organizations to the Office of the Assistant Secretary of Army (Research, Development, and Acquisition). These ILIR reports are subjected to a strenuous technical peer review by a review committee composed of leading scientists and engineers from the National Academy of Sciences, the Army Science Board, and Army Secretariat. ILIR funding allocation for the subsequent year is based on the score assessed by the ILIR review committee. Successful ILIR projects are typically transitioned to start-up projects under 6.1 or 6.2 mission funding within the organization. Since its establishment by DoD Directive number 3201.4, dated October 8, 1993, the Army's ILIR program has supported and will continue to promote the 1987 Defense Science Board Study on Technology Base Management's recommendation to attract and retain top flight science and engineering PhDs.

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B. Program Change Summary	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
Previous President's Budget (FY 1999 PB)	13678	14902	15726	16124
Appropriated Value	14113	13678		
Adjustments to Appropriated Value				
a. Congressional General Reductions	-435	-104		
b. SBIR / STTR	-226			
c. Omnibus or Other Above Threshold Reductions	-75			
d. Below Threshold Reprogramming	-52			
e. Rescissions				
Adjustments to Budget Years Since FY 1999 PB			-1533	-1625
Current Budget Submit (FY 2000 / 2001 PB)	13325	13574	14193	14499

Change Summary Explanation: FY99 Congressional committee language indicates likelihood that Congress will act to reduce 6.1 program growth. Congress reduced this PE in FY 1999 (-1224). FY 2000/2001 was adjusted accordingly.

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COST (<i>In Thousands</i>)	FY1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
A91A In-House Laboratory Independent Research - Army Materiel Command	8672	9327	9807	10043	10301	11190	11634	12092	Continuing	Continuing

Mission Description and Justification: This project provides funding for ILIR research, allocated among the seven Research, Development and Engineering Centers (RDECs) in the Army Materiel Command (AMC).

FY 1998 Accomplishments:

- 8672 - Missile RDEC -Conducted research on high quality projects leading to new and improved missile sensors, propulsion, guidance and control, and structural capabilities.
- Armaments RDEC -Evaluated unique phenomena in weapons and munitions related research, focusing on gun/cannon barrel erosion prevention and energetic materials for various weaponry applications.
- Tank-Automotive RDEC -Developed an improved understanding of advanced diesel engine technology through nonlinear models of compliant structures, heat transfer mechanisms for cold start engine phenomena, and non-invasive thermal imaging of engine combustion phenomena.
- Natick RDEC -Identified innovative technologies in the areas of molecular biology, biopolymers and modeling of personnel equipment characteristics.
- Edgewood RDEC -Investigated innovative approaches to pathogen detection including development of DNA super libraries and genome sequencing of pathogens; begin development of respirator encumbrance model for the individual soldier.
- Aviation RDEC -Demonstrated a new rapid, non-intrusive velocity measurement technique, Doppler Global Velocimetry, for measuring rotorcraft 3D flow fields.
- Communications-Electronics RDEC -Developed antenna and sensor technologies and computer models; improved intelligence data fusion techniques; upgraded sensor simulation/performance models.

Total 8672

FY 1999 Planned Program:

- 9170 - Missile RDEC - Continue research on high quality projects leading to new and improved missile sensors, propulsion, guidance and control, and structural capabilities; demonstrate and transition components and concepts.
- Armaments RDEC -Evaluate micro-electro mechanical systems (MEMS) technology for low-cost projectile guidance and control; continue investigations into real-time material characterizations and advanced energetic materials.

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BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601101A In-House Laboratory Independent Research	PROJECT A91A
<p>FY 1999 Planned Program: (continued)</p> <ul style="list-style-type: none"> - Tank-Automotive RDEC -Correlate ignition delays with combustion temperature and pressure profiles; automate multibody dynamic systems modeling using algebraic constraints; calculate 3-D stress distributions in thick composite materials. - Natick RDEC -Validate models of materials/fabric/food constituents against known parameters, transfer results to core basic research and applied research programs in ration and clothing research. - Edgewood RDEC -Initiate project to prove concept for virus detectors. Begin construction of data reduction/analysis algorithms needed for the development of a satellite/high altitude chemical imaging sensor. - Aviation RDEC -Investigate application of "smart materials" and/or micro-electro mechanical systems (MEMS) for alleviation of dynamic stall to improve rotor aerodynamics. - Communications-Electronics RDEC -Upgrade battlefield visualization tools; transition antenna technologies; improve power sources technology, advance sensor technology base. <ul style="list-style-type: none"> • 157 - Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs <p>Total 9327</p> <p>FY 2000 Planned Program:</p> <ul style="list-style-type: none"> • 9807 - Missile RDEC - Conduct research on high quality projects leading to new and improved missile sensors, propulsion, guidance and control, and structural capabilities; demonstrate and transition components and concepts. Armaments RDEC -Evaluate micro-electro mechanical systems (MEMS) technology for low-cost projectile guidance and control; continue investigations into real-time material characterizations and advanced energetic materials. Tank-Automotive RDEC -Continue research to correlate ignition delays with combustion temperature and pressure profiles; automate multibody dynamic systems modeling using algebraic constraints; calculate 3-D stress distributions in thick composite materials. - Natick RDEC -Develop new models of materials/fabric/food constituents against known parameters, transfer results to core basic research and applied research programs in ration and clothing research. - Edgewood RDEC - Conduct research to prove concept for a specific virus detector. Begin construction of data reduction/analysis algorithms needed for the development of a satellite/high altitude chemical imaging sensor. - Aviation RDEC -Continue investigation of "smart materials" and/or micro-electro mechanical systems (MEMS) for alleviation of dynamic stall to improve rotor aerodynamics. - Communications-Electronics RDEC -Transition antenna technologies; improve power sources technology, advance sensor technology base. <p>Total 9807</p>		
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BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601101A In-House Laboratory Independent Research	PROJECT A91A
<p>FY 2001 Planned Program:</p> <ul style="list-style-type: none"> • 10043 - Missile RDEC - Conduct research on high quality projects leading to new and improved missile sensors, propulsion, guidance and control, and structural capabilities; demonstrate and transition components and concepts. Armaments RDEC –Continue evaluation micro-electro mechanical systems (MEMS) technology for low-cost projectile guidance and control; continue investigations into real-time material characterizations and advanced energetic materials. Tank-Automotive RDEC –Validate research on ignition delays with combustion temperature and pressure profiles; automate multibody dynamic systems modeling using algebraic constraints; calculate 3-D stress distributions in thick composite materials. - Natick RDEC -Validate models of materials/fabric/food constituents against known parameters, transfer results to core basic research and applied research programs in ration and clothing research. - Edgewood RDEC –Conduct research for a specific virus detector based on previously validated concepts. Continue construction of data reduction/analysis algorithms needed for the development of a satellite/high altitude chemical imaging sensor. - Aviation RDEC –Validate concepts for "smart materials" and/or micro-electro mechanical systems (MEMS) for alleviation of dynamic stall to improve rotor aerodynamics. - Communications-Electronics RDEC -Upgrade battlefield visualization tools; Continue to transition antenna technologies; improve power sources technology, advance sensor technology base. <p>Total 10043</p>		
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BUDGET ACTIVITY 1 - Basic Research				PE NUMBER AND TITLE 0601101A In-House Laboratory Independent Research				PROJECT A91C		
COST (In Thousands)	FY1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
A91C In-House Laboratory Independent Research - Medical Research and Materiel Command	3769	3548	3665	3724	3784	4495	4846	4985	Continuing	Continuing
<p>Mission Description and Justification: Represents funds to conduct ILIR research allocated among the six laboratories of the Medical Research and Materiel Command, including the Aeromedical Research Laboratory, the Institute of Surgical Research, the Institute of Environmental Medicine, the Medical Institute of Chemical Defense, the Medical Institute of Infectious Diseases and Walter Reed Army Institute of Research.</p> <p>FY 1998 Accomplishments:</p> <ul style="list-style-type: none"> • 3769 - Devised Polymerase Chain reaction (PCR) tests for the diagnosis of scrub typhus and brucellosis. <ul style="list-style-type: none"> - Demonstrated the feasibility in a mouse model of immunizing against VEE by the nasal mucosal route. - Demonstrated the potential of DNA plasmids containing genes for Ebola virus glycoproteins to immunized mice. - Developed the software and computer network architecture that successfully integrated the physiological heat strain model into a real-time remote weather sensing system. - Developed a model of hemorrhage to evaluate resuscitation simulation care on the battlefield. - Developed a reproducible model in rabbits to determine the effects of renal occlusion and hemorrhage and of resuscitation parameters. <p>Total 3769</p> <p>FY 1999 Planned Program:</p> <ul style="list-style-type: none"> • 3455 - Continue research for medical countermeasures against naturally occurring infectious diseases which can have significant impacts on military operations to protect the force from infection and sustain operations. <ul style="list-style-type: none"> - Continue research in medical defense against environmental extremes and operational hazards to health focusing on physiological and psychological factors limiting soldier effectiveness. - Continue research to understand the basic mechanisms of combat related trauma, identifying innovative treatment and surgical procedures to extend the time of death due to loss of blood and organ failure (“golden hour”) following trauma. • 93 - Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs <p>Total 3548</p> <p>FY 2000 Planned Program:</p>										
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BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601101A In-House Laboratory Independent Research	PROJECT A91C
<ul style="list-style-type: none"> • 3665 - Continue research for medical countermeasures against naturally occurring infectious diseases which can have significant impacts on military operations to protect the force from infection and sustain operations. 		
<p>FY 2000 Planned Program: (continued)</p> <ul style="list-style-type: none"> - Continue research in medical defense against environmental extremes and operational hazards to health focusing on physiological and psychological factors limiting soldier effectiveness. - Continue research to understand the basic mechanisms of combat related trauma, identifying innovative treatment and surgical procedures to extend the “golden hour” following trauma. 		
<p>Total 3665</p>		
<p>FY 2001 Planned Program:</p> <ul style="list-style-type: none"> • 3724 - Continue research for medical countermeasures against naturally occurring infectious diseases which can have significant impacts on military operations to protect the force from infection and sustain operations. - Continue research in medical defense against environmental extremes and operational hazards to health focusing on physiological and psychological factors limiting soldier effectiveness. - Continue research to understand the basic mechanisms of combat related trauma, identifying innovative treatment and surgical procedures to extend the “golden hour” following trauma. 		
<p>Total 3724</p>		
<p>Project A91C</p>	<p align="center"><i>Page 7 of 9 Pages</i></p>	<p align="right">Exhibit R-2A (PE 0601101A)</p>

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BUDGET ACTIVITY 1 - Basic Research				PE NUMBER AND TITLE 0601101A In-House Laboratory Independent Research				PROJECT A91D			
COST (<i>In Thousands</i>)		FY1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
A91D In-House Laboratory Independent Research - Corps of Engineers		884	699	721	732	744	1037	1050	1087	Continuing	Continuing

Mission Description and Justification: Represents funds to conduct ILIR research allocated among the four laboratories within the Army Corps of Engineers, including the Topographic Engineering Center, the Waterways Experimental Station, the Construction Engineering Research Laboratories and the Cold Regions Research and Engineering Laboratory.

FY 1998 Accomplishments:

- 884 - Conducted research in the terrain representation process and terrain data generation by sponsoring related topics in these areas at the Topographic Engineering Center.
 - Determined in vitro molecular and cellular toxicity of common/fielded explosives to establish biomarkers of exposure at the Waterways Experimental Station.
 - Developed simplified, parameter-insensitive, sensorless machine control techniques at the Construction Engineering Research Laboratories.
 - Explored physics-based correlations between mechanical and electrical properties of sea ice as a basis for translation of satellite sensor data to physical behavior and examined means to characterize the diffusion of various chemical species through frozen soils and permafrost at the Cold Region Research and Engineering Laboratory.
- Total 884

FY 1999 Planned Program:

- 681 - Exploit image statistics from multi-scale transforms for extraction of topographic information from imagery.
 - Investigate the feasibility of shaft sensorless control systems capable of determining the vibration characteristics of rotating machine technology.
 - Develop hyperspectral approach for snow cover property assessment.
 - Develop transport mechanisms (including chemical interactions) of contaminants through porous media at micropore scale.
 - 18 - Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs
- Total 699

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BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
1 - Basic Research	0601101A In-House Laboratory Independent Research	A91D
<p>FY 2000 Planned Program:</p> <ul style="list-style-type: none"> • 721 - Continue to exploit image statistics from multi-scale transforms for extraction of topographic information from imagery. - Demonstrate the feasibility of shaft sensorless control systems capable of determining the vibration characteristics of rotating machine technology. - Evaluate hyperspectral approach for snow cover property assessment. - Evaluate alternative transport mechanisms (including chemical interactions) of contaminants through porous media at micropore scale. <p>Total 721</p> <p>FY 2001 Planned Program:</p> <ul style="list-style-type: none"> • 732 - Transition techniques developed from image statistics from multi-scale transforms for extraction of topographic information from imagery. - Transition shaft sensorless control systems technology to determine the vibration characteristics of rotating machines. - Validate hyperspectral approach for snow cover property assessment. - Validate promising alternative transport mechanisms (including chemical interactions) of contaminants through porous media at micropore scale. <p>Total 732</p>		
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