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FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 1999

BUDGET ACTIVITY: 3

PROGRAM ELEMENT: 0603707N

PROGRAM ELEMENT TITLE: Manpower, Personnel, and Training Advanced Technology Development

(U) COST: (Dollars in thousands)

PROJECT NUMBER & TITLE	FY 1998 ACTUAL	FY 1999 ESTIMATE	FY 2000 ESTIMATE	FY 2001 ESTIMATE	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
R0542 Human Factors Engineering (HFE)	2,983	3,171	3,294	3,392	3,482	3,579	3,666	3,756	CONT.	CONT.
R1770 Manpower and Personnel Development	3,037	4,156	4,210	4,290	4,361	4,441	4,536	4,633	CONT.	CONT.
R1772 Training Systems Development	8,896	13,651	13,128	13,514	13,716	13,948	14,254	14,571	CONT.	CONT.
R2378 Virtual Reality Environment/Training Research	3,529	0	0	0	0	0	0	0	0	3,529
R2379 Center for Integrated Manufacturing Studies	1,895	998	0	0	0	0	0	0	0	2,893
R2496 Advanced Distributed Learning	0	4,490	0	0	0	0	0	0	0	4,490
TOTAL	20,340	26,466	20,632	21,196	21,559	21,968	22,456	22,960	CONT.	CONT.

(U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This program element supports the Joint Support Areas for Manpower & Personnel, Training, and Readiness, Support & Infrastructure; it also supports the Joint Mission Area assessments for most warfare areas, and the Future Joint Warfighting Capabilities identified by the Joint Chiefs of Staff. It develops technologies that enable the Navy to select, assign and manage its people; to train effectively and affordably in classroom settings, in simulated environments and while deployed; and to operate and maintain complex weapon systems. It consists of the following technologies:

1. (U) HFE: These projects develop information management techniques, advanced interface technologies, and Decision Support System, all of which help ensure that complex systems will be operated and maintained more effectively, with fewer human-induced errors, and with greater safety.

2. (U) Manpower and Personnel: This project provides Navy personnel system managers with the ability to choose and retain the right people and to place them in jobs that best use their skills, training, and experience. Fleet readiness can be enhanced and personnel costs reduced via such technologies as modeling, mathematical optimization, advanced testing, statistical forecasting, and human performance measurement.

3. (U) Training Systems: This project improves mission effectiveness and safety by applying both simulation and instructional technology to the design of affordable education and training methods and systems. The project develops and

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evaluates systems to improve basic through advanced individual and team training, skill maintenance, and mission rehearsal capability. It improves training efficiency and cost-effectiveness by applying operations research, modeling and simulation, and instructional, cognitive, and computer sciences to the logistics, development, delivery, evaluation, and execution of training.

(U) The Navy S&T program includes projects that focus on or have attributes that enhance the affordability of warfighting systems.

(U) JUSTIFICATION FOR BUDGET ACTIVITY: This program is budgeted within the ADVANCED TECHNOLOGY DEVELOPMENT Budget Activity because it encompasses design, development, simulation, or experimental testing of prototype hardware to validate technological feasibility and concept of operations and reduce technological risk prior to initiation of a new acquisition program or transition to an ongoing acquisition program.

(U) PROGRAM CHANGE FOR TOTAL PE:

	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>
(U) FY 1999 President's Budget:	21,834	21,042	20,814
(U) Appropriated Value:	-	26,542	-
(U) Adjustments from FY 1999 PRESBUDG:	-1,494	+5,424	-182
(U) FY 2000 OSD/OMB Submission	20,340	26,466	20,632

(U) Funding: The FY 1998 decrease is due to Actual Update adjustment (-1,162) and Small Business Innovative Research (-332). The FY 1999 increase is due to Revised Economic Assumption (-61), Civilian Personnel Underexecution (-15) and Congressional Add for Advanced Distributed Learning (+4,500) and Integrated Manufacturing (+1,000). The FY 2000 decrease is due to Civilian Pay Rate (+31), Navy Working Capital Fund (+86) and Non Pay Inflation (-299).

(U) Schedule: Not applicable.

(U) Technical: Not applicable.

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R0542 Human Factors Engineering (HFE)	2,983	3,171	3,294	3,392	3,482	3,579	3,666	3,756	CONT.	CONT.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: The goal of this project is to improve platform, task force and battle group operations by developing human factors technology for incorporation into operational systems and training programs. General objectives of the project are to enhance human performance effectiveness, reduce design-induced critical human performance errors, and accelerate insertion of advanced HFE technology into existing and new weapons systems. Outcomes from this technology reduce operational errors, provide a better match between personnel and skill/knowledge requirements, and reduce training requirements. The project emphasizes human-centered design and has tasks that address: integration and display of operator-oriented navigation/targeting information; adaptive automation in support of human operators; three dimensional (3-D) visualization of command and control information; modeling and simulation (MST) tools for design and evaluation of ship manning; human computer interface requirements in workstation design; collaborative support technologies for distributed planning and analysis; advanced sonar operator perception techniques; command and control warfare analysis aids, advanced data fusion and presentation techniques; decision support for joint and coalition Command, Control, Communication, Computers & Intelligence systems; multi-modal sonar workstation design; advanced alerting techniques; and intelligent integration of doctrine and display technology.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1998 ACCOMPLISHMENTS:

- (\$412) Initiations:
 - (U) Modeling and Simulation Tools (MST) to Support The Design For Human Performance In Early Phases Of Ship Acquisition - This addressed the lack of a formal, validated technique for identifying, analyzing, and integrating human performance requirements sufficiently early in the ship design process in order to address

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human impacts. Initiated integration of a set of validated MST tools to ensure manning and human performance requirements are adequately addressed early in the design process resulting in more effective ship designs.

- (\$455) Continuations:
 - (U) Combat Enhancement through Integrated Decision Support (CEIDS) - Developed a functional specification for a Decision Support System (DSS) for the Joint Operations Center on the COMTHIRDFLT flagship to support the decision making requirements of the Battle Watch Captain. Interview and observational data were collected during operational exercises and analyzed. Unique DSS functional specifications were developed and several modifications were embedded into the Tactical Decision support System for evaluation. Work continued on the development of a detailed functional specification of the DSS-2 for use by system engineers in developing a functional, integrated prototype. Work also continued on the knowledge engineering tasks aboard the USS Coronado.
- (\$393) Continuations:
 - (U) Open Systems Advanced Workstation (OSAW) - Developed IT-21 compliant ergonomic workstation supporting multi-modal user control and input. The workstation includes high-resolution flat panel displays integrated with touch screens, speech recognition and synthesis system, and 3D sound localization system. Developed multi-modal user interface for the Enhanced Common Operational Picture application. Performed the research on the usage of a multiple display workstation with an emphasis on supervision and multi-tasking environments.
- (\$527) Completions:
 - (U) Image-Based Navigation (IBN) - Conducted a flight technology demonstration of on-board perspective view images with overlays for targeting and tactical decision making in a precision strike close air support mission environment. Successfully completed efforts to determine how to store "still images" in the data page section of an Aircraft Optical Disk for use as auxiliary target recognition aids during flight test. Flight test results were documented in a final report as well as specific recommendations as to the pilot-interface design best suited for image-based navigation.
- (\$1,196) Completions:
 - (U) Collaborative Tools for Command Center Staff (COLLAB) - A collaborative software program was delivered to the CINCLANTFLT Action Officers who develop the Mission Needs Statements (MNS) and Operational Requirements Documents (ORD) for the entire Navy. The tools in the program give the Officers improved information access on approved MNS and ORD documents from OPNAV and the personal contacts and documents Officers use in their review of documents. Because of the database structure and archival information availability, use of this new program will result in more thoroughly researched MNS and ORDs that are actually processed in a shorter time frame. The application is in integration testing for operational use on the SIPRNET. The access to the

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collaborative application on the SIPRNET will provide expanded participation in the MNS/ORD development process. At the conclusion of the project, the program will become a permanent part of the MNS & ORDs processing system.

- (U) Command and Control Warfare Commander (C2WC) - Developed a new architecture for the information warfare (IW)/C2WC to allow him to pull IW data from various Intel and Joint Maritime Command Information System databases as well as solutions from various specialized stovepipe analysis tools into his own working database. Continued to develop further components required for that data to be integrated with data, analyses, and recommended responses developed by the IW Officer and his team. When completed our prototype will provide a proof of concept demonstration of an integrative decision aid and associated architecture that allows the IW Officer and various collaborators to perform IW planning, efficiently generating various required products and outputs to be further integrated into comprehensive Combined Joint Task Force mission plans. The Joint IW Officer of Second Fleet will evaluate the prototype.
- (U) Advanced Acoustic Detection (AAD) - A report documenting the development of a qualitative model of an active sonar automatic classification function (AAP/ETC) was prepared. The report includes a detailed description of how the qualitative model can be utilized in quantitative experiments investigating human interface design requirements for the automatic function. Data was collected in experiments evaluating color-code formats of our design for active sonar search displays. Our data supports specific recommendations for more efficient active search display formats. Results will be documented in a report at the conclusion of the project.

3. (U) FY 1999 PLAN:

- (\$622) Initiations:

- (U) Adaptive Automation (AA) - Develops a DSS incorporating adaptive automation that provides a dynamic function allocation of operational tasks. The adaptive automation will recognize high operator/pilot workload conditions and transfer normal monitoring and adjustment tasks, as well as other, more routine, human-initiated tasks, to automation. The AA will also recognize high Operating Tempo and potentially stressful situations to dynamically re-allocate appropriate operational tasks. Accomplishments include: (1) identification of the most appropriate target platform(s) and operators to demonstrate these advanced automation decision support tools and techniques (2) identification of appropriate mission scenarios and Measures of Effectiveness, and (3) preliminary selection of those adaptive automation technologies that seem best suited to the operator/pilot environment.

- (\$1,014) Initiations:

- (U) Decision Support System for Coalition Operations (DSSCO) - Develop a DSS that assists U.S. military personnel in developing operational decisions in a cross-cultural coalition military environment. The DSS will aid U.S. decision makers in collaborative planning, situation assessment, response management, and plan

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revision across culturally diverse military and civilian organizations as well as in coalition operations and operations other than war. The first year will address the taxonomy and identification of relevant parameters for developing and maintaining situation awareness in a multi-cultural context as well as compilation of past coalition operations and lessons learned associated with planning, re-planning, and executing operation other than war.

- (U) Sonar Workstations (SWKS)- Develop a prototype version of a SWKS demonstrating the critical technologies of: (1) multiple flat-panel visual displays and helmet mounted display technology, (2) three-dimensional synthetic audio, 3) multi-modal control and input methods including touch (augmented with a stylus), automatic speech recognition and synthetic speech production, 4) information management user support including modality change, attention alerting mechanisms.
- (U) Display and User Enhancement Technologies (DUETS) - Develop a cost-effective, user sensitive, and mission relevant add-on 3-D display for use with Command, Control, Communication, Computers & Intelligence (C4I) operational systems. This project will (1) review the critical human performance (e.g., perceptual, cognitive, and motor-response) issues related to specific 3-D display and object manipulation techniques, (2) identify a C4I system suitable for 3-D capability, (3) analyze C4I system actions and procedures used to display the battle space environment and maintain the common tactical picture (4) add a system independent 3-D display to an operational C4I system, and design and develop 3-D object manipulation and display techniques for user actions related to increased understanding of the battle space environment, and (5) demonstrate and evaluate 3-D object manipulation and display concepts.- (U) Advanced Alerting (ADALT) - Establish requirements, design and prototype an attention allocation subsystem which can be upgraded and improved beyond the simple buzzer-alert model used with contemporary naval command and weapon control systems.
- (\$450) Continuations:
 - (U) In CEIDS the re-hosted Tactical Decision-Making Under Stress (TADMUS) software will be evaluated in a next generation tactical aircrew environment and new display parameters will be added based upon user evaluation from both laboratory and field tests. Approved TADMUS software will be incorporated into actual shipboard combat system computers and the displays will be located within battle staff space for real-world testing and evaluation.
- (\$550) Continuations:
 - (U) In MST, document and analyze the current process for designing ship and weapon systems. Develop a process model for ship and weapon system design - the generic design process for new ship and weapon systems and identify those events where human factor considerations are critical. Categorize the high payoff areas for human performance modeling and simulation tools. Survey existing modeling and simulation tools and applications. Assess existing MST tools and applications for applicability in evaluating ergonomic and human performance requirements.

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- (\$525) Completions:
 - (U) In OSAW, conduct final performance demonstrations of the workstation in operational environments. Transition the multi-modal interface design guideline and ergonomic design to DD-21 and Q-70 programs.
- (U) (\$10) Portion of extramural program reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.
- 3. (U) FY 2000 PLAN:
 - (\$2,811) Continuations:
 - (U) In AA, complete knowledge engineering of operator/pilot tasks. Identification of avionics architecture and software support systems insertion points.
 - (U) In ADALT,- identify and map both visual and auditory alerting modalities onto ongoing tactical console operator task activities.
 - (U) In DUETS,- design and implement the prototype 3-D displays, procure 3-D hardware. Complete 3-D software tools. Design user interface. Perform software modifications to identified C4I system. Draft mission scenarios based on identified C4I track database. Validate scenarios with subject matter experts. Implement 3-D user interface for finalized scenarios.
 - (U) In DSSCO,- conduct evaluations in military exercises to assess decision requirements for operation other than war (OOTW) planning with coalition military forces and civilian organizations in demanding, uncertain situations. Define, and partially implement, the prototype design requirements for DSS for coordinated OOTW operations.
 - (U) In SWKS, develop quantitative procedures for laboratory evaluations of proposed Integrated Undersea Warfare-21 display formats will be developed and initial testing started. Special attention will be given to quantifying risks and gains associated with multi-modal display support for data fusion and multi-source information integration. Work will begin on development of appropriate laboratory demonstrations of interface concepts.
 - (U) In MST,- develop plan for integrating, modifying, and augmenting identified available models and tools. Modify and augment existing tools and techniques to facilitate integration. Develop strategy to fill the gaps. Define a plan to validate the tool set. Validate and modify tool set.
 - (\$483) Completions:
 - (U) In CEIDS, complete at-sea demonstration of revised TADMUS display software for battle group personnel. Incorporate all user evaluations in embedded training modules and then transition to Third Fleet Flagship. Begin development and testing of AEGIS application of TADMUS Decision Support Software.

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B. (U) PROGRAM CHANGE SUMMARY: See program change total summary for P.E.

C. (U) OTHER PROGRAM FUNDING SUMMARY:

(U) RELATED RDT&E:

(U) PE 0601152N (In-House Independent Laboratory Research)

(U) PE 0601153N (Defense Research Sciences)

(U) PE 0602233N (Readiness, Training & Environmental Quality Technologies)

(U) PE 0602270N (Technology Development)

(U) PE 0603226N (Advanced Distributed Simulation)

(U) PE 0603792N (Advanced Technology Transition)

(U) PE 0604703N (Manpower, Personnel, Training, Simulation and Human Factors)

D. (U) SCHEDULE PROFILE: Not applicable.

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R1770 Manpower and Personnel Development	3,037	4,156	4,210	4,290	4,361	4,441	4,536	4,633	CONT.	CONT.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This project supports the Manpower & Personnel Joint Support Area by responding to requirements for technologies that will maintain or improve fleet readiness while reducing personnel end strength; enable the Navy to manage the force effectively and efficiently; and optimize the selection and assignment of personnel to highly demanding jobs. The major goals are to ensure that the Navy has a force that is flexible, integrated, responsive, and affordable so that skilled personnel are available to handle complex weapons systems when needed; and that smaller forces will have greater capabilities by placing the right person in the right job at the right time. The program supports the delivery of new technologies in modeling, mathematical optimization, advanced testing, statistical forecasting, and human performance measurement.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1998 ACCOMPLISHMENTS:

- (\$2,197) Continuations:

- (U) Developed methods to eliminate multiple Armed Services Vocational Aptitude Battery selection composite eligibility cut scores for highly technical, difficult-to-fill Nuclear Field ratings. Developed simplified/new selection composites that potentially increase Nuclear Field recruit eligibility pool by 1,500, while increasing graduation rates by 3-5%.
- (U) developed a web-based prototype variable dimensional community management tool that simultaneously supports three modeling options (reenlistment, advancement, and rotation). The prototype was expanded to include all ratings and Enlisted Management Communities.

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- (U) Integrated the Annualized Cost of Leaving econometric module developed in the recently completed 6.3 Economics of Retention project into the Navy Enlisted Force Analysis Model (NEFAM). This long range policy analysis model will be critical in managing the enlisted inventory by skills as the Navy slows the rapid downsizing and emerging retention problems threatens a hollow force. Developed a prototype flow data assessment system.
 - (U) Completed the first phase of the Computing and Communications technology experiment for the Boston area Navy Recruiters. This experiment compared the productivity and quality of life for Navy Recruiters for a group with the advanced technology tools (Laptops with mobile tools, cell phones and reengineered business practices) and a control group.
 - (U) Developed comprehensive distribution process maps and researched and developed a prototype alternative enlisted manning, allocation and requisition model. The prototype alternative requisition model simultaneously optimizes the manning, allocation and requisition processes, which leads to a better global solution for allocation of the scarce enlisted inventory to maximize fleet readiness. At the same time greatly simplifies the process for better operational efficiency and increased flexibility to handle additional requirements for the distribution computer systems under design by the System Executive Office for Manpower and Personnel.
 - (U) Researched and quantified permanent change of station (PCS) cost and personnel readiness metrics and relationships. Developed and experimented with simulation modeling environments, which includes an optimization algorithm. This hybrid environment will be essential to effectively modeling the more complex problems that require optimization and dynamic simulation over time.
- (\$840) Completions:
 - (U) Completed testing and evaluation of the integrated Officer Planning system. This provides an integrated Officer Personnel Management environment that supports the development of effective polices to combat the developing Officer shortages in the critical and expensive pilot and nuclear communities.
 - (U) Completed the Manpower & Personnel Vision of the Future sub-project that developed a conceptual vision of the future Manpower & Personnel system as an integrated system to reduce sub-optimization. The vision details needed technologies as well as process changes required to integrate the manpower/personnel processes.
2. (U) FY 1999 PLAN:
- (\$1,121) Initiations:
 - (U) Investigate and apply advanced survey technologies to develop new survey instruments (tools) for Manpower and Personnel policy decision-makers. Navy's Toolkit for Enhancing Measurement of Personnel Opinions (TEMPO) will capitalize on advances in survey instrumentation and technology resulting in a state-of-the-art survey assessment capability for Manpower and Personnel policy makers. TEMPO will be assessed and tested within the

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context of a research and development effort to determine the extent to which it is feasible with dispersed and mobile Navy personnel.

- (U) Initiate Comprehensive Officer Force Management Environment sub-project. This effort will build from the 6.2 research integrated distribution and force management project to design a comprehensive Officer modeling environment that includes readiness assessment. The research will focus on the development of an intelligent data-mining approach that will uncover emerging trends and identify data problems.
- (U) Initiate Simulation Modeling Tool for Manpower Requirements sub-project. Development of a prototype simulation model that will capture the relationship between Navy force structure (e.g., ships, aircraft) and supporting infrastructure. Such a model would be expected to provide manpower, financial and facility planners with a tool to assess the impact of changes in force structure size, configuration and operating tempo on the size of the Navy's infrastructure. The first year's effort will focus on detailing the functional requirements, data needs and developing the model design.
- (\$555) Continuations:
 - (U) Research and develop algorithmic corrections for modeling anomalies associated with high and low end point or extreme value cases for the NEFAM. Develop prototype linkages between the Navy Enlisted Strength Planning system and NEFAM. Develop an intelligent automated user override processing approach to minimize the potential for human error.
- (\$2,480) Completions:
 - (U) Complete development of the Assessment Planning Model that calculates personnel flows for training and their associated training costs.
 - (U) Complete development of Selection and Classification Management tools for Chief of Naval Recruiting.
 - (U) Complete Modeling and Information Advances project that provides support for school and sea/shore optimization. Implement school and sea/shore optimization to the web-based prototype variable dimensional community management tool. Approaches to incorporate advancement cycle forecasting and Fiscal Year interpolation to cycles will be evaluated.
 - (U) Simulate alternative recruit operational classification processes and optimize the Navy's recruit classification algorithms. Develop and incorporate a vocational interest instrument to maximize job satisfaction and performance and minimize attrition.
 - (U) Complete the Computing and Communications technology experiment for the Boston and the San Diego area Navy Recruiters. The results, costs and benefits will be evaluated and Navy-wide implementation recommendations will be developed.
 - (U) Expand the prototype alternative enlisted manning, allocation and requisition model to integrate personnel assignment. Conduct pilot testing and evaluated expanded prototype. Develop preliminary design of sea-shore

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crediting model. The model nearly eliminates the Operating Tempo priority inefficiencies and inequities in the current projection date based approach.

- (U) Complete PCS/Temporary Duty Under Instructions (TEMDUINS) Model for improved decision making, bound resource expenditures per assignment cycle (every two weeks), and improve linkages between personnel unit readiness and PCS/TEMDUINS budgets.

3. (U) FY 2000 PLAN:

- (\$2,288) Initiations:

- (U) Initiate prototype development for assessing Total Force Manpower Management System (TFMMS) Change Requests sub-project. This sub-project's objective is to explore the feasibility of using artificial intelligence: Expert Systems, Fuzzy Logic, and Neural Networks to develop a prototype system to improve the TFMMS manpower change process. The inability of TFMMS to capture the critical Navy manpower business practices with respect to sea-shore rotation, Defense Officer Personnel Management Act, validity of application of military essentiality codes, Navy Enlisted Classification requirements, and others results in inaccurate demand signals to the fleet that must be corrected. The preliminary prototype system will be designed based on the preliminary knowledge developed during this first year.
- (U) Initiate Shore-based Forces Attrition Model. The objective of this effort is to demonstrate new technologies applicable to estimating the quantity and quality of personnel replacements and fillers needed to support contingency and war plans. These new technologies will be synthesized into a demonstration system that will assist OPLAN, mobilization and personnel planners to better manage Active and Reserve Component personnel for use as attrition replacements.
- (U) Evaluate the feasibility of a personnel battlefield simulator that would develop an interactive personnel "war gaming" simulator that would visually model the Manpower and Personnel processes, to provide the expected location and utilization status of all personnel resources at a point in time.
- (U) Initiate the reengineering of officer career paths to evaluate the feasibility of alternative force structure to support reduced manning that would result from the Smart ships under development. The current career paths may not support the more experienced and senior force structures dictated by the reduced manning initiatives under development to support the reduced manning.
- (U) Initiate the development of intelligent distribution agents to increase the flexibility and responsiveness of the distribution system to emerging readiness and other requirements, as well as priorities.
- (U) Initiate the development of selection and classification instruments that will support reduced manning that would result from the Smart-ships under development.

- (\$1,472) Continuations:

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- (U) Continue development of a prototype intelligent data-mining agent to implement the approach developed the previous year. Research the development of a model capable of simulating any and all potential trends uncovered by the intelligent data-mining agent. The modeling environment will be designed to evaluate the possible emerging scenarios and their probabilities. The development of an advanced visual interface will begin to enable the manpower manager to turn the voluminous data into decision-making information.
- (U) Continue development of a prototype simulation model that will capture the relationship between Navy force structure (e.g., ships, aircraft) and supporting infrastructure. Such a model would be expected to provide manpower, financial and facility planners with a tool to assess the impact of changes in force structure size, configuration and operating tempo on the size of the Navy's infrastructure.
- (U) Continue the evaluation of the Navy's TEMPO to capitalize on advances in survey instrumentation and technology resulting in a state-of-the-art survey assessment capability for Manpower and Personnel policy makers. TEMPO will be assessed and tested within the context of a research and development effort to determine whether the results are valid and able to be generalized to larger Navy populations.

- (\$450) Completions:

- (U) Design and evaluate data visualization of complex scenarios to increase the NEFAM use for simultaneous multiple issue analysis. Implement cost estimates for projected force structure. Develop a steady state profile with a given set of flow rates, inventory and targets. Test and evaluate the prototype linkages between the Navy Enlisted Strength Planning system and NEFAM to integrate the short and long term planning horizons. Complete, test and evaluate prototype data assessment system. Modify and test prototype models for the existing computer environment.

B. (U) PROGRAM CHANGE SUMMARY: See total program change summary for P.E.

C. (U) OTHER PROGRAM FUNDING SUMMARY: Not applicable.

(U) RELATED RDT&E: This project adheres to Tri-Service Reliance Agreements on Manpower and Personnel Technology. Work is related to and fully coordinated with efforts in:

(U) PE 0601152N (In-House Independent Laboratory Research)

(U) PE 0601153N (Defense Research Sciences)

(U) PE 0602233N (Readiness, Training & Environmental Quality Technologies)

(U) PE 0603007A (Human Factors, Personnel and Training Advanced Technology)

(U) PE 0603227F (Personnel, Training, and Simulation Technology)

D. (U) SCHEDULE PROFILE: Not applicable.

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FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 1999

BUDGET ACTIVITY: 3

PROGRAM ELEMENT: 0603707N

PROGRAM ELEMENT TITLE: Manpower, Personnel, and Training Advanced Technology Development

(U) COST: (Dollars in thousands)

PROJECT NUMBER & TITLE	FY 1998 ACTUAL	FY 1999 ESTIMATE	FY 2000 ESTIMATE	FY 2001 ESTIMATE	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
R1772 Training Systems Development	8,896	13,651	13,128	13,154	13,716	13,948	14,254	14,571	CONT.	CONT.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This project supports the Training Joint Support Area, as well as most Joint Mission Areas (JMAs) and Joint Chiefs of Staff Future Joint Warfighting Capabilities, all of which depend on high quality training to ensure mission success. The project responds to requirements for effective and affordable education, training and mission rehearsal capability by applying advanced simulation technology and innovative instructional concepts to the design of individual and team training methods and systems. It applies operations research, modeling and simulation, and instructional, cognitive, and computer sciences in order to address requirements for improving (a) training through put, efficiency and affordability necessary for "right-sizing" both the operational forces and the training infrastructure; (b) the effectiveness of training for increasingly complex weapons systems employed in littoral warfare, under fast-paced and stressful conditions, and with limited opportunities for "real-world" practice; and (c) training assessment and training system feedback capabilities for maximizing training responsiveness to operational requirements. Examples of JMA requirements supported by tasks in this project include: training for near-real-time targeting (Strike); training operators and decision makers to respond to data received and processed at increasing speeds (Command, Control, Communications, Computers & Information Warfare); and training personnel to deal with target sets that are variable and difficult to identify as friendly or hostile (Intelligence, Surveillance, Reconnaissance).

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

2. (U) FY 1998 PLAN:

- (\$1,237) Initiations:
 - (U) Initiated development of Deployable Sonar Operator/Tactician Training (DSOT) using Interactive Multisensor Analysis Training (IMAT) methodology. IMAT methods are being generalized for sonar and tactical-planning

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Budget Item Justification
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FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 1999

BUDGET ACTIVITY: 3

PROGRAM ELEMENT: 0603707N

PROJECT NUMBER: R1772

PROGRAM ELEMENT TITLE: Manpower, Personnel, and
Training Advanced Technology
Development

PROJECT TITLE: Training
Systems Development

training for on-board use in submarine pre-deployment and exercise training. DSOT also supports advanced training for submarine Acoustic Rapid Commercial-Off-The-Shelf Insertion (A-RCI).

(\$550) Initiations:

- (U) Initiated the development and demonstration of an automated, deployable, multimedia system for training tactical knowledge and decision making skills. Selected an authoring tool for the creation of multimedia training materials and lessons in the area of tactical decision-making (TDM) in the AEGIS environment, and a delivery tool for the actual presentation and management of instruction.

• (\$2,221) Continuations:

- (U) Implemented and continued development/demonstration/evaluation of IMAT technologies. IMAT uses advanced scientific visualizations of physics-based models for acoustic and electromagnetic/electro-optical properties of threat platforms and weapons, environmental effects on energy propagation, and sensor/processor systems, to build conceptual training for air, surface, and subsurface shore and at-sea enlisted and officer training in undersea warfare. Evaluations to date show that IMAT greatly improves school performance and reduces training development costs. Conducted at-sea training for submarine, surface, and air anti-submarine warfare (ASW) exercises; results showed that IMAT training provided significant improvements in performance.

• (\$3,048) Continuations:

- (U) Demonstrated component technologies for a Transportable Strike/Assault Rehearsal System (TSTARS) for precision strike. Continued development and adaptation of physics based models for Forward Looking Infrared Radar, radar, and night vision devices for real time training applications. Evaluated training mission rehearsal requirements, simulation components and supporting databases.
- (U) Training Effectiveness Assessment Methodology (TEAM) - Demonstrated an automated performance recording system to greatly improve deployable tactical training and decision making. Continued development of human performance models in order to automate performance assessment of individual and team skills.

• (\$320) Completions:

- (U) Implemented Virtual Environment Training for Engineering (VET-E) prototype training program at surface warfare officer's school (SWOS), Newport, for schoolhouse test and evaluation. Provided on-site user support and technical documentation to the SWOS instructors, evaluators, and students. Collected, evaluated, and analyzed beta test data and document results. Conducted initial cost-benefit analysis for Integrated Logistic Support package. Drafted and finalized life cycle management plan.

• (\$1,520) Completions:

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FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 1999

BUDGET ACTIVITY: 3

PROGRAM ELEMENT: 0603707N

PROJECT NUMBER: R1772

PROGRAM ELEMENT TITLE: Manpower, Personnel, and
Training Advanced Technology
Development

PROJECT TITLE: Training
Systems Development

- (U) Implemented improved virtual environment training for a submarine piloting system (VESUB) in order to provide better training to reduce the potential of ship-handling errors and save lives and property. Conducted training effectiveness evaluations at two submarine training facilities. Demonstrated connection to ship handling trainer for team training.
- (U) Implemented vastly improved shipboard instructor training support (SITS) based on new technology onboard a ship in support of afloat training and Battle Force Tactical Training in order to improve tactical team training and complex decision making.

2. (U) FY 1999 PLAN:

- (\$1,377) Initiations:
 - (U) Initiate the development of Conning Officer Virtual Environment (COVE) modular training technologies for teaching shiphandling knowledge and skills for various classes of ships. The technology demonstrator will deliver initial, intermediate, advanced, and remedial, "seaman's eye," shiphandling instruction and practice which alternatively tests and remediates until mastery is complete for a wide variety of shiphandling tasks.
 - (U) Initiate the development of PCM, a system that supports planning and real-time control and modification of learning-based scenarios in large-scale modeling and simulation training environments.
- (\$3,052) Initiations:
 - (U) Initiate the development of Computer Simulation Based Training System with Intelligent Tutoring Components (CSITS). This project provides quality-reasoning skills about circuits and troubleshooting of systems.
- (\$3,800) Continuations:
 - (U) Conduct DSOT development and evaluation, including on-board data collection. For evaluation purposes, prototype systems will be built for test and evaluation aboard ship. Scenario-based performance exercises will be constructed to include opportunities for users to develop search plans and propose tactics to deal with particular sonar or environmental circumstances. Evaluation methods for user planning and tactical knowledge will be developed.
- (\$3,195) Continuations:
 - (U) Demonstrate authoring tool for the creation of multimedia training materials and lessons in the area of TDM in the AEGIS environment, and a delivery tool for the actual presentation and management of instruction.
 - (U) Continue development of required technology components and demonstrate TSTARS for precision strike using validated training mission rehearsal requirements, simulation components and supporting databases.
- (\$1,000) Completions:

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Budget Item Justification
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FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 1999

BUDGET ACTIVITY: 3

PROGRAM ELEMENT: 0603707N

PROJECT NUMBER: R1772

PROGRAM ELEMENT TITLE: Manpower, Personnel, and
Training Advanced Technology
Development

PROJECT TITLE: Training
Systems Development

- (U) Complete IMAT development and evaluation in shore school based Undersea Warfare training and at-sea ASW exercises.

- (\$1,200) Completions:

- (U) Implement TEAM automated performance recording and assessment of individual and team skills in order to greatly improve deployable tactical training and decision making.

- (U) (\$27) Portion of extramural program reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.

3. (U) FY 2000 PLAN:

- (\$1,100) Initiations:

- (U) Initiate the development of Computer-based Automated Training Effectiveness Evaluation System (CATEES).

- (\$11,464) Continuations:

- (U) Continue DSOT development and evaluation Phase II, including A-RCI interface and further at-sea test and evaluation.

- (U) Design and develop initial software components for the COVE intelligent tutoring system, instructor/operator system, and marine simulation. Conduct task analysis for shiphandling tasks.

- (U) Continue the development of an authoring tool for the creation of multimedia training materials and lessons in the area of tactical decision making (TDM) in the AEGIS environment, and a delivery tool for the actual presentation and management of instruction. Conduct a training effectiveness evaluation.

- (U) Continue CSITS development and initiate controlled experiments on cognitive processing, misconceptions and instructional strategies.

- (U) Continue PCM development, focusing primarily on designing and developing common data structures to enable distributed databases to act in a collaborative manner.

- (\$564) Completions:

- (U) Implement TSTARS for precision strike using validated training mission rehearsal requirements, physics based sensor models for Forward Looking Infrared Radar and night vision goggles, correlated sensor displays, and supporting data bases.

B. (U) PROGRAM CHANGE SUMMARY: See total program change summary for P.E.

C. (U) OTHER PROGRAM FUNDING SUMMARY: Not applicable.

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FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 1999

BUDGET ACTIVITY: 3

PROGRAM ELEMENT: 0603707N

PROJECT NUMBER: R1772

PROGRAM ELEMENT TITLE: Manpower, Personnel, and
Training Advanced Technology
Development

PROJECT TITLE: Training
Systems Development

(U) RELATED RDT&E: This project adheres to Tri-Service Reliance Agreements on Training Systems technology. Work is related to and fully coordinated with efforts in:

- (U) PE 0601152N (In-House Independent Laboratory Research)
- (U) PE 0601153N (Defense Research Sciences)
- (U) PE 0602233N (Readiness, Training & Environmental Quality Technologies)
- (U) PE 0603216A (Synthetic Flight Simulator Devices Development)
- (U) PE 0604703N (Personnel, Training, Simulation, and Human Factors)
- (U) PE 0603007A (Human Factors, Personnel, and Training Advanced Technology)
- (U) PE 0603227F (Personnel, Training, and Simulation Technology)
- (U) PE 0605798D (Joint Services Manpower and Personnel Technology)

D. (U) SCHEDULE PROFILE: Not applicable

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