RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)									DATE June 2001	
APPROPRIATION/BUDGET ACTIVITY RDT&E/Defense-Wide/BA 3							R-1 ITEM NOMENCLATURE Automatic Target Recognition **PE 0603232D8Z**			
COST *(In Millions)*	FY2000	FY2001	FY2002						Cost to Complete	Total Cost
Total Program Element (PE) Cost	7.488	7.465	7.716						Continuing	Continuing
ATR/P232	7.488	7.465	7.716						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 targets. 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. 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. ATR capabilities are becoming essential to the Warfighter, as the Services pursue `network-centric` concepts for exploiting sensor imagery and information acquired through large arrays of sensors at all echelons. An OSD initiative, Smart Sensor Web (SSW), seeks to exploit this concept even further by providing greatly enhanced situational awareness for the Warfighter at the lower echelons, such as the battlefield commander. SSW will leverage on-going Service investments and will critically depend on application of ATR technology to achieve its goals.

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(U) Increasing ATR operational effectiveness requires research and development to enhance sensors and algorithmic image processing. Additionally, improved, more efficient procedures must be developed for measuring and demonstrating ATR effectiveness. This is very important as 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.

(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 more quickly.

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(U) Project Number and Title: P232 ATR

(U) PROGRAM ACCOMPLISHMENTS AND PLANS

(U) FY 2000 Accomplishments:

(U)`Best Practices` for standardized ATR evaluation and assessment will be established and promulgated through the Automatic Target Recognition Working Group (ATRWG). Standard metrics to describe ATR performance and associated problem sets will be adopted which cover surveillance, weapon and attack applications of ATR's. The Problem Set generation and ATR 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. These data sets will be distributed and made available via the VDL. A closer technical relationship will be established between the ATR and Hyperspectral communities, with increased emphasis on technology issues dealing with the assessment of Long Wavelength Infrared (LWIR) hyperspectral imaging for ATR. Initial taxonomy will be defined for hyperspectral algorithms and a preliminary performance assessment will be established and used to refine a system level performance model. A report will be issued comparing optical and digital correlator processing. The first Problem Sets will be delivered and used to evaluate ATR algorithms for SAR imagery, The Services` synthetic image generation capabilities will be applied to multi-spectral ATR's as a means assessing ATR performance over a wider range of operating conditions. During this time period more extensive subsystem technology effectiveness demonstrations will be conducted which support the transition efforts begun in FY99. These efforts will focus on the SADARM and LRAS3 initiatives begun in FY99. Modeling and simulation tasks will be conducted to provide software and hardware in the loop effectiveness analyses refine design requirements and manufacturing

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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. An assessment of hyperspectral performance and operational utility will continue as a basis for future investment decisions. The timing of these assessments will be consistent with the current schedules for ASRP flight demos and launches of Warfighter -1 and the Navy Earth Map Observer. Additional efforts will be launched for the development of experimental testbeds by the Services to evaluate advanced `smart` sensor technology for enhancing the situational awareness of the battlefield commander - Smart SensorWeb (SSW). Initial SSW experiments will be conducted at selected test sites.($ 7.488 million)

(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. Experimentation for advanced technology assessments for Smart Sensor Web at test sites will continue. Further integration of the SSW sensorwebs will be pursued.($ 7.465 million)

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(U) FY 2002 Plans:

(U) Building on the database from sensor data collected during FY01, algorithms will be benchmarked for detection and false alarm performance. Continuing with the sensor fusion initiative started in FY00, technical emphasis will continue to be focused on refining and developing ATR algorithms based on multi-sensor inputs. Using the new classified and unclassified nodes established in FY01 at AFRL and NVESD, performance results and raw data will be distributed and analyzed using the Virtual Distributed Laboratory (VDL). High Performance Computing assets will be incorporated to allow faster access and shorter algorithm processing cycles. The role of synthetic and hybrid data will be expanded in FY02 by comparing ATR algorithm performance for measured vs inserted targets. Hyperspectral databases will be expanded and enhanced using Forest Radiance II and Desert Radiance III data. Hyperspectral ATR performance predictions will be demonstrated. In the ATR transition area, additional IR problem sets will be collected and scoring and analysis methods for moving vehicles will be completed for LRAS3. LADAR algorithms for SADARM II will be demonstrated and evaluated. Mid-wave IR tests will be conducted using RsSTAR.($ 7.716 million)

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(U) B. Program Change Summary	**FY2000**	**FY2001**	**FY2002**	**Total Cost**
Previous President's Budget Submit	7.529	7.534	4.673	Continuing
Appropriated Value	0.000	7.534	0.000	Continuing
Adjustments to Appropriated Value				
a. Congressionally Directed Undistributed Reduction	0.000	-0.052	0.000	
b. Rescission/Below-threshold Reprogramming, Inflation Adjustment	.229	0.017	0.000	
c. Other	0.000	0.000	3.043	
Current President's Budget	7.488	7.465	7.716	Continuing

Change Summary Explanation

(U) Funding: FY 2000 changes are a result of reprogrammings in support of initial efforts for Smart Sensor Web advanced technology applications. FY 2001 reductions reflect Section 8086 adjustments.

(U) Schedule: N/A

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(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