

UNCLASSIFIED

FY 2001 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 2000

BUDGET ACTIVITY: 3

PROGRAM ELEMENT: 0603270N

PROGRAM ELEMENT TITLE: Advanced Electronic Warfare Technology

(U) COST: (Dollars in Thousands)

PROJECT NUMBER & TITLE	FY 1999 ACTUAL	FY 2000 ESTIMATE	FY 2001 ESTIMATE	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
E2194 Electronic Warfare Advanced Technology	9,562	10,302	8,988	9,441	9,475	9,468	9,368	CONT.	CONT.
R2090 Functional Recognition & Response	11,254	8,577	8,595	9,145	8,976	8,967	8,858	CONT.	CONT.
TOTAL	20,816	18,879	17,583	18,586	18,451	18,435	18,226	CONT.	CONT.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: Advanced Electronic Warfare Technology (AEWT) is the Navy's continuing, core Advanced Technology Development program for Electronic Warfare (EW) and is oriented to demonstrate and transition EW technology in cooperation with the other Services, placing special emphasis on Naval EW applications of Command and Control Warfare. This program continues to develop technologies which support the effective employment of naval force capabilities in the conduct of the Navy's Joint Mission Areas as defined by the Chief of Naval Operations (CNO) (i.e., Strike, Littoral Warfare, Intelligence, Surveillance and Reconnaissance, Strategic Mobility, Readiness and Training). The program is managed at the Office of Naval Research (ONR) by the same office that directs Program Element (PE) 0602270N (Navy EW Technology) and provides the vast majority of projects to this program for demonstration and potential transition to full scale development. The ONR program manager is also a principal of the Director of Defense Research and Engineering (DDR&E) Technology Panel for EW that oversees and coordinates Tri-Service 6.2 & 6.3 EW programs. Consequently, this program is planned jointly in accordance with Defense Science and Technology Reliance agreements that allocate various EW disciplines and their attendant technology development responsibilities between the Army, Air Force and the Navy. As part of the Integrated Science and Technology EW Program, it is subject to the review and execution oversight of the DDR&E. AEWT is

R-1 Line Item 19

Budget Item Justification
(Exhibit R-2, page 1 of 17)

UNCLASSIFIED

UNCLASSIFIED

FY 2001 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 2000

BUDGET ACTIVITY: 3

PROGRAM ELEMENT: 0603270N

PROGRAM ELEMENT TITLE: Advanced Electronic Warfare Technology

responsive to CNO guidance and the Systems Commands, warfighting requirements and needs. It develops EW technologies to counter a broad range of electromagnetic threats and is linked to future joint warfighting capabilities of "maintaining near perfect real-time knowledge of the enemy..." and "to counter the threat of...cruise missiles to the Continental United States and deployed forces." This program is a primary technology feed for the newly established Platform Protection IPT to the ONR-091 Future Naval Capabilities initiative.

(U) The program transitions new technologies to tactical aircraft (TACAIR), low observable aircraft, surface EW platforms, and Pre-planned Product Improvement programs (P3I) to address the modern threat (including multi-spectral/multi-modal sensors and seekers). This is accomplished by improving threat detection, identification, location and response through developmental upgrades and direct, advanced technology insertions. Currently, AEWT consists of two projects:

(U) E2194 - Electronic Warfare Advanced Technology: This project is a core continuing effort that transitions high-payoff EW technologies to the Fleet and reduces the integration risk of advanced EW systems. Primary focus is on providing threat warning and countermeasures, particularly infrared countermeasures (IRCM) to TACAIR platforms.

(U) R2090 - Functional Recognition & Response: Develops algorithms and techniques to recognize emitters by measuring and analyzing their observable, radar function parameters and develops generic countermeasures techniques to provide protection against any hostile emitter. Uses non-developmental items or develops hardware (as required) to implement Functional Recognition demonstrations and assess overall operational improvement to extant capabilities.

(U) The Navy Science and Technology (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 or 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.

R-1 Line Item 19

Budget Item Justification
(Exhibit R-2, page 2 of 17)

UNCLASSIFIED

UNCLASSIFIED

FY 2001 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 2000

BUDGET ACTIVITY: 3

PROGRAM ELEMENT: 0603270N

PROGRAM ELEMENT TITLE: Advanced Electronic Warfare Technology

B. (U) PROGRAM CHANGE SUMMARY FOR TOTAL PE:

	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
(U) FY 2000 President's Budget	18,093	18,984	18,429
(U) Appropriated Value		18,984	
(U) Execution Adjustments	2,922		
(U) Congressional Rescissions		-105	
(U) Minor Program Adjustments			-460
(U) Various Rate Adjustments	-78		-386
(U) SBIR/STTR Transfer	-121		
(U) FY 2001 PRESBUDG Submission	20,816	18,879	17,583

(U) CHANGE SUMMARY EXPLANTION:

(U) Schedule: Not applicable.

(U) Technical: Not applicable.

R-1 Line Item 19

Budget Item Justification
(Exhibit R-2, page 3 of 17)

UNCLASSIFIED

UNCLASSIFIED

FY 2001 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 2000

BUDGET ACTIVITY: 3

PROGRAM ELEMENT: 0603270N

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(U) COST: (Dollars in Thousands)

PROJECT NUMBER & TITLE	FY 1999 ACTUAL	FY 2000 ESTIMATE	FY 2001 ESTIMATE	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
E2194 Electronic Warfare Advanced Technology	9,562	10,302	8,988	9,441	9,475	9,468	9,368	CONT	CONT

A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: The program transitions new technologies to Tactical Air (TACAIR), low observable aircraft, surface Electronic Warfare (EW) platforms, and Pre-planned Product Improvement programs, with emphasis on TACAIR, to address the modern threat (including multi-spectral/multi-modal sensors and seekers) by improving threat detection, identification, location and response through developmental upgrades and direct, advanced technology insertions.

(U) This project is a core continuing effort that transitions high-payoff EW technologies to the Fleet and reduces the integration risk of advanced EW systems. Primary focus is on providing threat warning and countermeasures, particularly infrared countermeasures (IRCM) to TACAIR platforms.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1999 ACCOMPLISHMENTS: During FY99 Electronic Warfare Advanced Technology (EWAT) continued to enhance survivability of tactical aircraft against threats operating in the infrared (IR) region of the spectrum. Advancements in threat counter-countermeasure techniques drive research in IR countermeasure and warning technologies. Developing solutions for the EW suite requires exploitation of a variety of technologies resulting in

R-1 Line Item 19

Budget Item Justification
(Exhibit R-2, page 4 of 17)

UNCLASSIFIED

UNCLASSIFIED

FY 2001 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 2000

BUDGET ACTIVITY: 3

PROGRAM ELEMENT: 0603270N

PROJECT NUMBER: E2194

PROGRAM ELEMENT TITLE: Advanced Electronic
Warfare Technology

PROJECT TITLE: Electronic Warfare
Advanced

Technology

multiple tasks within the EWAT Project. Although EWAT's primary focus lies in IR warning and response, enhancements to radio frequency (RF) warning and self-protection are also being investigated. Projects currently ongoing that support the technology demonstrations that the EWAT team addresses are: Advanced IR Threat Countermeasures, Advanced Threat Analyses, Tactical Aircraft Directed IR Countermeasures, Integrated Laser and IR Threat Warning Concepts, Integration and Live Fire Demonstration, Advanced Graphical Display and Electronic Warfare Sensor Fusion, Advanced RF Threat Warning and Self-Protection, and Advanced Electronic Warfare Technical Research.

- (U) ADVANCED IR THREAT COUNTERMEASURES: Conducted and completed flight testing of advanced infrared countermeasures (IRCM) flare technologies for tactical fixed wing and rotary aircraft not scheduled to receive Advanced Strategic and Tactical Expendable (ASTE) decoys.
- (U) ADVANCED THREAT ANALYSES: Finalized studies on Symptom Ares. Began the analysis of the advanced Sensor Pantry air-to-air threat through hardware-in-the-loop testing of the threat system. Analyses from this focus area provide a defined and traceable specification of counter-measure (CM) requirements.
- (U) TACTICAL AIRCRAFT DIRECTED IR COUNTERMEASURES (TADIRCM): Performed laboratory, ground, and flight testing of the TADIRCM System in a pod on the EWAT QF-4 in preparation for a live fire demonstration.
- (U) INTEGRATED LASER AND IR THREAT WARNING CONCEPTS: Developed a co-located two color mid-wave IR focal plane array missile warning sensor and integrated a laser warning capability into the same form factor.
- (U) INTEGRATION AND LIVE FIRE DEMONSTRATION: Completed conversion of QF-4S to an EW aircraft test bed. Integrated pod version of TADIRCM into the QF-4S aircraft.
- (U) ADVANCED GRAPHIC DISPLAY AND ELECTRONIC WARFARE SENSOR FUSION: Integrated the Advanced Graphical Display concept of the enemy's Launch Acceptability Region (LAR) into the F/A-18's head-up-display. Investigated advanced graphical presentations for development of a concept of sensor fusion hardware for TACAIR EW Systems.
- (U) ADVANCED RF THREAT WARNING AND SELF-PROTECTION: Conducted laboratory, ground, and flight tests of the wavelet transforms and Navy Integrated Antenna Down-converter (NIAD) antenna element and transitioned them to

R-1 Line Item 19

Budget Item Justification
(Exhibit R-2, page 5 of 17)

UNCLASSIFIED

UNCLASSIFIED

FY 2001 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 2000

BUDGET ACTIVITY: 3

PROGRAM ELEMENT: 0603270N

PROJECT NUMBER: E2194

PROGRAM ELEMENT TITLE: Advanced Electronic
Warfare Technology

PROJECT TITLE: Electronic Warfare
Advanced

Technology

the AN/ALR-67 (V)2 Upgrade program as a technology upgrade option. Initiated RF Towline conceptual study of Fiber-Optic Towed Decoy (FOTD).

- (U) ADVANCED ELECTRONIC WARFARE TECHNICAL RESEARCH: Conducted advanced EW technical research at the Naval Postgraduate School for next-generation EW warning and response for naval aviation.
- (U) INVESTIGATION OF OPTIMUM LOGIC AND ALGORITHMS FOR AIRBORNE USE OF INSTANTANEOUS FREQUENCY MEASUREMENT RECEIVERS IN THE LOOK-THROUGH MODE. Upgraded algorithms of radar warning receiver (RWR) systems for sensitivity improvements, began prototype hardware in the loop testing and conducted laboratory demonstration.

2. (U) FY 2000 PLAN: The EWAT project will continue a strong focus in electro-optical (EO/IR) countermeasure technologies, however, the RF self-protection area will receive increased emphasis. Advancements in threat counter-countermeasure techniques will continue to drive research in IR countermeasure and warning technologies. Although EWAT's main concentration is expected to remain in infrared EW technologies, advancements in RF wavelet processing for sensitivity improvements are projected to mature. EWAT will also demonstrate advanced graphical cockpit displays based on prior years research establishing situational awareness guidelines. Projected focus areas that support the technology demonstrations that the EWAT team addresses are: Advanced IR Threat Countermeasures, Advanced Threat Analyses, Tactical Aircraft Directed IR Countermeasures, Integrated Laser and IR Threat Warning Concepts, Integration and Live Fire Demonstration, Advanced Graphic Display and EW Sensor Fusion, Advanced RF Threat Warning and Self-Protection, and Advanced EW Technical Research.

- (U) ADVANCED IR THREAT COUNTERMEASURES: Optimize either the advanced tactical 6" expendable or the ASTE technology for low / slow aircraft not scheduled to receive ASTE expendables.
- (U) ADVANCED THREAT ANALYSES: Complete the analysis of the advanced Sensor Pantry air-to-air threat. Initiate Sage Flat threat analysis. Execution of the analysis requires seeker acquisition so that hardware-in-the loop simulations can be performed.

R-1 Line Item 19

Budget Item Justification
(Exhibit R-2, page 6 of 17)

UNCLASSIFIED

UNCLASSIFIED

FY 2001 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 2000

BUDGET ACTIVITY: 3

PROGRAM ELEMENT: 0603270N

PROJECT NUMBER: E2194

PROGRAM ELEMENT TITLE: Advanced Electronic
Warfare Technology

PROJECT TITLE: Electronic Warfare
Advanced

Technology

- (U) TACTICAL AIRCRAFT DIRECTED INFRARED COUNTERMEASURES (TADIRCM): Complete Aerial Cable Car and podded TADIRCM system on a manned QF-4 against threat missile tests. Perform a live fire missile flight test of the TADIRCM System using an unmanned QF-4 aircraft with the TADIRCM pod installed.
 - (U) INTEGRATED LASER AND IR THREAT WARNING CONCEPTS: Start feasibility & prototype development for long wave (LW) integration into 2 color IR technology. Work includes performing laboratory testing of the integrated electro-optical/infrared missile-warning concept.
 - (U) INTEGRATION AND LIVE FIRE DEMONSTRATION: Support EO/IR/RF threat warning and countermeasures demonstrations through flight tests of advanced systems on the QF-4 EW test bed aircraft. Possibly flight test the advanced FOTD.
 - (U) ADVANCED GRAPHIC DISPLAY AND ELECTRONIC WARFARE SENSON FUSION: Continue interfacing with the fleet for improved situational awareness and use man-in-the-loop simulations to demonstrate the sensor fusion system in a laboratory environment.
(U) ADVANCED RF THREAT WARNING AND SELF-PROTECTION: Continue research into RF self-protection for tactical aircraft including techniques to reduce radar warning receiver ambiguities and enhance angle-of-arrival determination and new RF applique techniques for ALR-67 (V2) & (V3). Continue NIAD development efforts. Initiate advanced RF towline technology development. Investigate the use of a Wavelets technology insertion into the Global Positioning System (GPS) in order to detect RF Jamming waveforms.
 - (U) ADVANCED ELECTRONIC WARFARE TECHNICAL RESEARCH: Conduct advanced EW technical research at the Naval Postgraduate School for next-generation EW warning and response for naval aviation. Perform studies on aim point and the effect on IRCM Requirements.
3. (U) FY 2001 PLAN: The EWAT project will continue a strong focus in EO/IR countermeasure technologies. In addition, work will be done to evaluate combining LW, IR, and RF technologies into a single warning sensor. The RF self-protection area will also receive increased emphasis. Advancements in threat counter-countermeasure techniques will continue to drive research in IR countermeasure and warning technologies. Although EWAT's main concentration is expected to remain in infrared EW technologies, advancements in RF applique signal processing for sensitivity

R-1 Line Item 19

Budget Item Justification
(Exhibit R-2, page 7 of 17)

UNCLASSIFIED

UNCLASSIFIED

FY 2001 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 2000

BUDGET ACTIVITY: 3

PROGRAM ELEMENT: 0603270N

PROJECT NUMBER: E2194

PROGRAM ELEMENT TITLE: Advanced Electronic
Warfare Technology

PROJECT TITLE: Electronic Warfare
Advanced

Technology

improvements are projected to mature. EWAT will also demonstrate advanced graphical cockpit displays based on prior year's research establishing situational awareness guidelines. Projected focus areas that support the technology demonstrations that the EWAT team addresses are: Advanced IR Threat Countermeasures, Advanced Threat Analyses, Tactical Aircraft Directed IR Countermeasures, Integrated Laser and IR Threat Warning Concepts, Integration and Live Fire Demonstration, Advanced Graphic Display and EW Sensor Fusion, Advanced RF Threat Warning and Self-Protection, and Advanced EW Technical Research.

- (U) ADVANCED IR THREAT COUNTERMEASURES: Ground and flight test the optimized 6" expendable for low / slow aircraft not scheduled to receive ASTE expendables.
- (U) ADVANCED THREAT ANALYSES: Complete the analysis of the Sage Flat surface-to-air threat. Initiate a Sage Flat follow-on threat analysis. Execution of the analysis requires seeker acquisition so that hardware-in-the-loop simulations can be performed. Procure a missile asset for exploitation.
- (U) TACTICAL AIRCRAFT DIRECTED INFRARED COUNTERMEASURES (TADIRCM): Complete the live fire missile flight test of the TADIRCM System using an unmanned QF-4 aircraft with the TADIRCM pod installed and begin testing the integration of LW technology in the 2 color IR warning sensor.
- (U) INTEGRATED LASER AND IR THREAT WARNING CONCEPTS: Complete prototype development for LW integration into 2 color IR technology. Work includes performing laboratory, ground, and flight testing of the integrated electro-optical/infrared missile-warning concept.
- (U) INTEGRATION AND LIVE FIRE DEMONSTRATION: Support EO/IR/RF threat warning and countermeasures demonstrations through flight tests of advanced systems on the QF-4 EW test bed aircraft. Possibly flight test the advanced RF towline technology.
- (U) ADVANCED GRAPHIC DISPLAY AND ELECTRONIC WARFARE SENSON FUSION: Continue interfacing with the fleet for improved situational awareness and use man-in-the-loop simulations to demonstrate the sensor fusion system in a laboratory environment.
- (U) ADVANCED RF THREAT WARNING AND SELF-PROTECTION: Continue research into RF self-protection for tactical aircraft including techniques to reduce radar warning receiver ambiguities and enhances angle-of-arrival

R-1 Line Item 19

Budget Item Justification
(Exhibit R-2, page 8 of 17)

UNCLASSIFIED

UNCLASSIFIED

FY 2001 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 2000

BUDGET ACTIVITY: 3

PROGRAM ELEMENT: 0603270N

PROJECT NUMBER: E2194

PROGRAM ELEMENT TITLE: Advanced Electronic
Warfare Technology

PROJECT TITLE: Electronic Warfare
Advanced

Technology

determination and new RF applique techniques for ALR-67 (V2) & (V3). Flight test the NIAD antennae and advanced towline technology. Conduct flight tests of an airborne GPS system augmented with Wavelets technology in order to determine the systems detection capability of RF jamming waveforms.

- (U) ADVANCED ELECTRONIC WARFARE TECHNICAL RESEARCH: Conduct advanced EW technical research at the Naval Postgraduate School for next-generation EW warning and response for naval aviation.

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

(U) RELATED RDT&E: This Program Element (PE) adheres to Defense Reliance Agreements on EW with oversight and coordination provided by the DDR&E and is associated with efforts that are being pursued under the following Army and Air Force PEs:

- (U) PE 0602204F (Aerospace Avionics)
- (U) PE 0602270A (Electronic Warfare Technology)
- (U) PE 0602270F (Electronic Warfare Technology)
- (U) PE 0603270A (Advanced Electronic Warfare Technology)
- (U) PE 0603270F (Advanced Electronic Technology)
- (U) PE 0602601F (Phillips Lab Exploratory Development)
- (U) PE 0603605F (Advanced Weapons Technology)
- (U) PE 0601153N (Defense Research Sciences)
- (U) PE 0602234N (Materials, Electronics and Computer Technology)
- (U) PE 0602270N (Electronic Warfare Technology)
- (U) PE 0603217N (Air Systems and Weapons Advanced Technology)
- (U) PE 0603792N (Advanced Technology Transition)
- (U) PE 0604270N (EW Development)

R-1 Line Item 19

Budget Item Justification
(Exhibit R-2, page 9 of 17)

UNCLASSIFIED

UNCLASSIFIED

FY 2001 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 2000

BUDGET ACTIVITY: 3

PROGRAM ELEMENT: 0603270N

PROJECT NUMBER: E2194

PROGRAM ELEMENT TITLE: Advanced Electronic
Warfare Technology

PROJECT TITLE: Electronic Warfare
Advanced

Technology

D. SCHEDULE PROFILE: Not applicable.

R-1 Line Item 19

Budget Item Justification
(Exhibit R-2, page 10 of 17)

UNCLASSIFIED

UNCLASSIFIED

FY 2001 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 2000

BUDGET ACTIVITY: 3

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(U) COST: (Dollars in Thousands)

PROJECT NUMBER & TITLE	FY 1999 ACTUAL	FY 2000 ESTIMATE	FY 2001 ESTIMATE	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
R2090 Functional Recognition & Response	11,254	8,577	8,595	9,145	8,976	8,967	8,858	CONT.	CONT.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This project develops and demonstrates countermeasures to previously unknown threat systems which may be encountered for the first time during hostilities. Threat systems include anti-ship missile seekers, surface-to-air guidance systems, aircraft intercept radars, and ship surveillance and targeting systems. The Specific Emitter Identification (SEI) technology developed in this program significantly enhances the ability to quickly and accurately perform Combat Identification (ID) and support the Joint Mission Areas as defined by the Chief of Naval Operations (i.e., Joint Strike, Intelligence, Surveillance and Reconnaissance, etc.). Existing Electronic Warfare (EW) warning and countermeasure systems will be modified with techniques demonstrated under this program that do not rely on specific parameters. The approach will demonstrate related technology developed in the EW technology base through field trials and at-sea demonstrations.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1999 ACCOMPLISHMENTS: This objective focused on developing and demonstrating detection, identification and electronic attack of previously unknown threat systems that may be encountered for the first time during hostilities. Threat systems include anti-ship missile seekers, surface-to-air guidance systems, aircraft intercept radars, and ship surveillance and targeting systems. After detection and classification, the project focused on generating generic responses that rapidly and effectively counter the threat. Existing EW warning systems were

R-1 Line Item 19

Budget Item Justification
(Exhibit R-2, page 11 of 17)

UNCLASSIFIED

UNCLASSIFIED

FY 2001 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 2000

BUDGET ACTIVITY: 3

PROGRAM ELEMENT: 0603270N

PROJECT NUMBER: R2090

Functional Recognition/

PROGRAM ELEMENT TITLE: Advanced Electronic

PROJECT TITLE:

Response

Warfare Technology

modified with techniques demonstrated under this program that do not rely on previously known parameters. The approach demonstrated related technology developed in the EW technology base through field trials and at-sea demonstrations.

- (U) Demonstrated and transitioned optimal Functional ID architecture into the Navy's Advanced Integrated Electronic Warfare System (AIEWS).
- (U) Demonstrated and transitioned optimal Functional ID architecture into the Navy's EA-6B and for a potential follow-on aircraft.
- (U) Demonstrated Functional ID, SEI and generic countermeasures to support development of AIEWS.
- (U) Evaluated Canadian Naval Electronic Warfare System (CANEWS-2) receiver system and identification algorithms to determine usefulness for application in AIEWS.
- (U) Initiated system integration for the AN/UYX-3 (SEI Processor) and development for new Digital Signal Processing (DSP) codes against modern radar modulations
- (U) Fabricated and demonstrated flight ready 40 GHz fiber optic links for communication over tow line with either ALE-50 or future millimeter wave towed decoy.
- (U) Competed initial version of the Networked Real-time 2 dimensional/3 dimensional (2-D/3-D) display for use on Unix Silicon Graphics machines and Sun and Windows NT PC workstations. Initial version transitioned to multiple Navy users and revisions are continuing.
- (U) Demonstrated at sea a high power Advanced Multifunction Radio Frequency (AMRFS) Electronic Countermeasures Transmitter using modern phased array technology which can concurrently function as both a jammer and communications link.

2. (U) FY 2000 PLAN:

R-1 Line Item 19

Budget Item Justification
(Exhibit R-2, page 12 of 17)

UNCLASSIFIED

UNCLASSIFIED

FY 2001 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 2000

BUDGET ACTIVITY: 3

PROGRAM ELEMENT: 0603270N

PROJECT NUMBER: R2090

Functional Recognition/

PROGRAM ELEMENT TITLE: Advanced Electronic

PROJECT TITLE:

Warfare Technology

Response

- (U) FUNCTIONAL RECOGNITION: The SEI technology developed in this program significantly enhances the ability to quickly and accurately perform Combat ID and support the Joint Mission Areas as defined by the Chief of Naval Operations (i.e., Joint Strike, Intelligence, Surveillance and Reconnaissance, etc.).
 - (U) Provide system integration of the AN/UYX-3 (SEI Processor) into Increment 1 of the AIEWS, finalize improvements to existing DSP code, continue software partitioning and finalize re-hosting and integration with new DSPs, presenting Increment 1 with a capability of identifying specific emitters by radar signature, thus greatly enhancing the Combat ID of the system.
 - (U) Final report of this one-year effort will be provided to the AIEWS office. Technologies developed by Canada (CANNEWS 2) can be applied to address improvements to the complex pulse train de-interleaving requirements of AIEWS, allowing for transition of these technologies coupled with the SEI processing capability providing enhanced pulse train analysis.
 - (U) Design and fabricate high speed digital receiver and refine algorithms for application of the Double Delta precision DF system addressing the requirement of precise Angle of Arrival (AOA) information in support of de-interleaving of multiple emitters, situational awareness, and directional countermeasures.
- (U) GENERIC RESPONSE: Existing Electronic Warfare countermeasures systems will be modified with techniques demonstrated under this program that do not rely on specific parameters.
 - (U) Modify existing Synthetic Aperture Radar (SAR) countermeasures development hardware by providing multiple transmit antennas and controls to address the problem posed by the advanced interferometric SAR radars and denying these systems surveillance and targeting capabilities against United States (US) forces.
 - (U) Develop multi-spectral techniques for airborne EW systems perform field tests with surrogate systems and commence integration into Millimeter Wave Countermeasures pod to provide naval aircraft with a capability against anti-air threats employing both microwave and millimeter wave frequencies.

R-1 Line Item 19

Budget Item Justification
(Exhibit R-2, page 13 of 17)

UNCLASSIFIED

UNCLASSIFIED

FY 2001 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 2000

BUDGET ACTIVITY: 3

PROGRAM ELEMENT: 0603270N

PROJECT NUMBER: R2090

Functional Recognition/

PROGRAM ELEMENT TITLE: Advanced Electronic

PROJECT TITLE:

Response

Warfare Technology

- (U) Fabricate a Millimeter Wave (MMW) Fiber Optic Towed Decoy (FOTD), integrate with an onboard techniques generator, and flight test against threat simulators demonstrating a capability in the MMW frequency range for application to tactical aircraft in addressing the MMW threat.
 - (U) Develop self-adaptive Electronic Attack (EA) techniques employing Artificial Intelligence (AI) against the counter-surveillance and counter-targeting threats for introduction into Increment 2 (EA) of the AIEWS program.
 - (U) Conduct proof of concept demonstrations of advanced High Band Photonic Beamforming network for the Advanced Multifunction Radio Frequency System (AMRFS).
- (U) EW EFFECTIVENESS: This objective is focused on developing hardware and software models/simulations which allows one to evaluate EW concepts, hardware, techniques and software. Representative scenarios in part or in total must be available. The type of tools required must be representative of the threat, which may include Low Probability of Intercept, selectable radar parameters, and sophisticated signal processing. These tools will be available for both laboratory and field tests.
 - (U) Model ownship monostatic clutter effects, bistatic clutter and assess the environmental effects on the SEI technology, thus providing an analysis of the expected real world performance of a sensitive, high precision DF, SEI capable Electronic Support (ES) sensor in the detection and identification of threats.
 - (U) Develop improved 2-D/3-D display graphics and interfaces to provide a visual playback of field tests and digital modeling for users to evaluate the tests results providing a better understanding of system effectiveness, in particular when unknown threats are encountered for the first time.
3. (U) FY 2001 PLAN:

R-1 Line Item 19

Budget Item Justification
(Exhibit R-2, page 14 of 17)

UNCLASSIFIED

UNCLASSIFIED

FY 2001 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 2000

BUDGET ACTIVITY: 3

PROGRAM ELEMENT: 0603270N

PROJECT NUMBER: R2090

Functional Recognition/

PROGRAM ELEMENT TITLE: Advanced Electronic

PROJECT TITLE:

Warfare Technology

Response

- (U) FUNCTIONAL RECOGNITION: The SEI technology developed in this program significantly enhances the ability to quickly and accurately perform Combat ID and support the Joint Mission Areas as defined by the Chief of Naval Operations.
 - (U) Demonstrate technologies that can support system integration of the AN/UYX-3 (SEI Processor) into the Engineering Development Model (EDM) of AIEWS, continue software partitioning and perform at-sea tests demonstrating a capability of identifying specific emitters by radar signature, thus greatly enhancing the Combat ID of the system.
 - (U) Develop the AN/UYX-4 next generation SEI processor, which will provide an advanced SEI technology refresh capability to combat systems and develop an integration approach for incorporating these technologies into operational systems.
 - (U) Integrate and field test the Double Delta precision Direction Finding (DF) system demonstrating the ability of meeting the requirement of precise AOA information in support of de-interleaving of multiple emitters, situational awareness, and directional countermeasures.
- (U) GENERIC RESPONSE: Existing Electronic Warfare countermeasures systems will be modified with techniques demonstrated under this program that do not rely on specific parameters.
 - (U) Field test modified SAR countermeasures development hardware against an Air Force surrogate system demonstrating the ability to deny information to the advanced interferometric SAR radars and denying these systems surveillance and targeting capabilities against US forces for introduction into Increment 2 (EA) of the AIEWS program.
 - (U) Complete development of a low cost Millimeter Wave Countermeasures pod to provide naval aircraft with a capability against anti-air threats employing both microwave and millimeter wave frequencies.
 - (U) During at-sea tests, demonstrate self-adaptive Electronic Attack (EA) techniques employing Artificial Intelligence (AI) against the counter-surveillance and counter-targeting threats for introduction into Increment 2 (EA) of the AIEWS program.

R-1 Line Item 19

Budget Item Justification
(Exhibit R-2, page 15 of 17)

UNCLASSIFIED

UNCLASSIFIED

FY 2001 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 2000

BUDGET ACTIVITY: 3

PROGRAM ELEMENT: 0603270N

PROJECT NUMBER: R2090

Functional Recognition/

PROGRAM ELEMENT TITLE: Advanced Electronic

PROJECT TITLE:

Response

Warfare Technology

- (U) Conduct laboratory and field trials against simulators or surrogates to determine effectiveness of the coherent EA techniques against the emerging coherent Anti-ship Missile (ASM) threats for application to Increment 2 (EA) of the AIEWS program.
- (U) Define and develop High Band Beamformer for AMRFS.
- (U) EW EFFECTIVENESS: This objective is focused on developing hardware and software models/simulations which allows one to evaluate EW concepts, hardware, techniques and software. Representative scenarios in part or in total must be available. The type of tools required must be representative of the threat, which may include Low Probability of Intercept, selectable radar parameters, and sophisticated signal processing. These tools will be available for both laboratory and field tests.
 - (U) Model multiple ownship emitters and combine with ownship monostatic clutter effects, bistatic clutter to assess the environmental effects on the SEI technology, thus providing an analysis of the expected real world performance of a sensitive, high precision DF, SEI capable ES sensor in the detection and identification of threats.
 - (U) Demonstrate network playback capability during fleet exercises and transition to Navy test ranges for users to evaluate the tests results providing a better understanding of system effectiveness, in particular when unknown threats are encountered for the first time.

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

(U) RELATED RDT&E PROGRAMS: This PE adheres to Defense Reliance Agreements on EW with oversight and coordination provided by the DDR&E and is associated with efforts that are being pursued under the following Army and Air Force PEs:

(U) PE 0602204F (Aerospace Avionics)

R-1 Line Item 19

Budget Item Justification
(Exhibit R-2, page 16 of 17)

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FY 2001 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 2000

BUDGET ACTIVITY: 3

PROGRAM ELEMENT: 0603270N

PROJECT NUMBER: R2090

Functional Recognition/

PROGRAM ELEMENT TITLE: Advanced Electronic

PROJECT TITLE:

Response

Warfare Technology

- (U) PE 0602270A (Electronic Warfare Technology)
- (U) PE 0603270A (Electronic Warfare Technology)
- (U) PE 0603270F (Electronic Combat Technology)
- (U) PE 0601153N (Defense Research Sciences)
- (U) PE 0602234N (Materials, Electronics and Computer Technology)
- (U) PE 0602270N (Electronic Warfare Technology)
- (U) PE 0603217N (Air Systems and Weapons Advanced Technology)
- (U) PE 0603792N (Advanced Technology Transition)
- (U) PE 0604270N (EW Development)

D. SCHEDULE PROFILE: Not applicable.

R-1 Line Item 19

Budget Item Justification
(Exhibit R-2, page 17 of 17)

UNCLASSIFIED