FY 2004/2005 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET DATE: February 2003
Exhibit R-2

BUDGET ACTIVITY: 3 PROGRAM ELEMENT: 0603271N
PROGRAM ELEMENT TITLE: RF Systems Advanced Technology

COST: (Dollars in Thousands)

PROJECT NUMBER/ TITLE	FY 2002 ACTUAL	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	FY 2006 ESTIMATE	FY 2007 ESTIMATE	FY 2008 ESTIMATE	FY 2009 ESTIMATE
R2913 RF Systems Advanced Technology	69,650	63,626	45,475	36,571	53,330	53,494	54,538	55,599
R9025 Multi-Function, Multi-Band, Multi-Beam Communications Antenna System (M3CAS)	4,131							
R9152 Common Affordable Radar Processor (CARP)	0	4,156	0	0	0	0	0	0
R9153 E-2C Technical Upgrade for Optimized Radar	0	6,651	0	0	0	0	0	0
Total	73,781	74,433	45,475	36,571	53,330	53,494	54,538	55,599

A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: Work in this Program Element (PE) addresses technologies critical to enabling the transformation to network centric warfare which utilizes multiple, simultaneous and continuous communications/data links between platforms while simultaneously performing the functions of Electronic Warfare (EW) and radar surveillance. The Radio Frequency (RF) Systems Advanced Technology Program addresses RF technology for Surface and Aerospace Surveillance Sensors and systems, Electronic Warfare sensors and systems, RF Communication Systems, and Multi-Function sensor systems. The program emphasizes near to mid-term transition opportunities by developing and demonstrating technologies which enable options for Time Critical Strike, Missile Defense, Fleet Force Protection, and Knowledge Superiority and Assurance Future Naval Capabilities (FNC). Within the Naval Transformational Roadmap, this investment will achieve transformational capabilities required by: “Sea Shield” Theater Air and Missile Defense; as well as technically enable “Sea Strike” Persistent Intelligence, Surveillance, and Reconnaissance (ISR).

Due to the number of efforts in this PE, the programs described herein are representative of the work included in this PE.

FY 2004/2005 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET DATE: February 2003
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BUDGET ACTIVITY: 3 PROGRAM ELEMENT: 0603271N
PROGRAM ELEMENT TITLE: RF Systems Advanced Technology

B. PROGRAM CHANGE SUMMARY:

	FY 2002	FY 2003	FY 2004	FY 2005
FY 2003 President's Budget Submission:	80,433	65,098	60,991	53,253
Adjustments from FY 2003 President's Budget:				
Congressional Plus-Ups		11,050		
Execution Adjustments	-4,818			
Congressional Rescissions/Adjustments/Undistributed Reduction	-390	-908		
SBIR Reduction	-1,444			
S&T Program Reductions			-14,189	-15,739
NWCF Rate Adjustments			-129	-11
Efficiencies at NWCF Activities			-149	-144
Pay Raise/Inflation Adjustments		-807	-1,049	-788
FY 2004/2005 President's Budget Submission:	73,781	74,433	45,475	36,571

PROGRAM CHANGE SUMMARY EXPLANATION:

Schedule: Not applicable
Technical: Not applicable

COST: (Dollars in Thousands)

PROJECT NUMBER/ TITLE	FY 2002 ACTUAL	FY2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	FY 2006 ESTIMATE	FY 2007 ESTIMATE	FY 2008 ESTIMATE	FY 2009 ESTIMATE
R2913 RF Systems Advanced Technology	69,650	63,626	45,475	36,571	53,330	53,494	54,538	55,599

FY 2004/2005 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET DATE: February 2003
Exhibit R-2a

BUDGET ACTIVITY: 3 PROGRAM ELEMENT: 0603271N PROGRAM ELEMENT TITLE: RF Systems Advanced Technology

Project Number: R2913
Project Title: RF Systems Advanced Technology

A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: Work in this project addresses technologies critical to enabling the transformation to network centric warfare which utilizes multiple, simultaneous and continuous communications/data links between platforms while simultaneously performing the functions of Electronic Warfare (EW) and radar surveillance. The Radio Frequency (RF) Systems Advanced Technology project addresses RF technology for Surface and Aerospace Surveillance sensors and systems, Electronic Warfare sensors and systems, RF Communication Systems, and Multi-Function sensor systems. The project emphasizes near to mid-term transition opportunities by developing and demonstrating technologies which enable options for Time Critical Strike, Missile Defense, Fleet Force Protection, and Knowledge Superiority and Assurance Future Naval Capabilities (FNC). Within the Naval Transformational Roadmap, this investment will achieve transformational capabilities required by: "Sea Shield" Theater Air and Missile Defense; as well as technically enable "Sea Strike" Persistent Intelligence, Surveillance, and Reconnaissance (ISR).

B. ACCOMPLISHMENTS/PLANNED PROGRAM:

	FY 02	FY 03	FY 04	FY 05
Surface and Aerospace Surveillance Advanced RF Systems	16,465	14,707	9,184	7,198

Surface and Aerospace Surveillance Advanced RF Systems address development of sensor technologies and systems for transition into new and existing naval platforms. The technology activity focuses on providing the Navy with high performance affordable surveillance systems that are responsive to identified naval needs for real time situational awareness, long range target detection, discrimination, identification, tracking and targeting of air and surface threats in all operating conditions.

FY 2002 ACCOMPLISHMENTS:

- Under the Missile Defense (MD) Future Naval Capability (FNC), Littoral Affordability (classified program) completed its final year in this PE. It continues in FY 2003 as part of PE 0603123N.
- Under the MD FNC, the Ultra High Frequency (UHF) Electronically Scanned Array (UESA) E-2C antenna project was completed. Results of materials testing and structural analysis were provided to Naval Air Systems Command. This technology is now part of the Radar Test Bed in Hawaii (see below).
- Under the Time Critical Strike (TCS) FNC the initial design of a pod-mounted Precision Surveillance and Targeting (PS&T) radar system based on AN/APY-6 technology for in-flight captive carry for Navy F/A-18 aircraft was completed.
- The UESA Advanced Technology Demonstration completed in FY 2002 with delivery of a full scale electronically scanned array and composite dome designed to meet the E-2C requirements. The system will be installed at the Kauai, Hawaii Mountaintop test bed for integration and active radar testing.
- The Advanced Signal Processing (ASP) effort developed techniques for enhanced surveillance and tracking of air targets with airborne sensors.

FY 2003 PLANS:

- Under the TCS FNC, due to a change in program requirements, re-configure the design of the PS&T radar from the previous pod-mounted configuration for F/A-18 carriage to an internal carriage configuration for time critical targeting demonstrations on board the Navy's Global Hawk Broad Area Maritime Surveillance (BAMS) Unmanned Airborne Vehicle (UAV). The PS&T radar system is based on previously developed AN/APY-6 technology.
- Complete the ASP effort resulting in hardware for the Radar Modernization Program (RMP) demonstration and evaluation.
- Within the MD FNC Affordable Ground Based Radar (AGBR) effort, begin an advanced development model (ADM) for insertion into the USMC Multi-Role Radar System (MRRS) for development in the Fiscal Year 2005 time frame.

FY 2004 PLANS:

- Within the TCS FNC, continue development of a flyable PS&T radar system for integration and time critical targeting demonstrations aboard the Navy's Global Hawk BAMS UAV.
- Within the MD FNC AGBR effort, continue fabrication of an ADM for insertion into the USMC Multi-Role Radar System development program.

FY 2005 PLANS:

- Within the TCS FNC, continue development of a flyable PS&T radar system for integration and time critical targeting demonstrations aboard the Navy's Global Hawk BAMS UAV.
- Within the MD FNC AGBR effort, complete fabrication and testing of an ADM for the USMC Multi-Role Radar System development program in anticipation of a Milestone B decision in FY 2005.

	FY 02	FY 03	FY 04	FY 05
Radio Communications RF Advanced Technology	25,217	24,919	17,439	10,100

Radio Communications RF Technology addresses critical naval communications technology deficiencies and needs that are not addressed by the commercial technology sector. The activity's goal is enabling network-centric operations by addressing high-bandwidth, reliable interoperable communications at all levels of command and technology to enable rapid and reliable utilization of government and commercial telecommunication assets worldwide.

FY 2002 ACCOMPLISHMENTS:

- Awarded contract for system design and requirements studies which include development of a concept of operations and a military utility assessment for the Littoral Mobile Wireless Network.
- Initiated design and development of the Integrated Very High Frequency (VHF)/Ultra High Frequency (UHF)/L-Band (IVUL) aperture.

- Initiated development of an electronically steerable K/Ka/Q-Band phased array for communications applications.
- Initiated development of prototype demonstration hardware for a dual frequency, electronically steered X/Ku-Band radio frequency (RF) communications phased array to provide tactical data link connectivity to theater assets.
- Continued the development of the Naval Battleforce Network (NBN) to provide local communications relays for Amphibious Ready Groups. Initiated integration of: the airborne communications and multi-beam, multi-frequency antenna; littoral mobile wireless networking, and composite routing technologies into the NBN.
- Continued the development and initiated the testing of an S-Band Receive communications Phased Array prototype .

2003 PLANS:

- Continue the development of the NBN, and integrate: the airborne communications with multi-beam, multi-frequency antenna package; littoral mobile wireless networking, and composite routing technologies into the NBN.
- Continue development and initiate fabrication of an integrated VHF/UHF/L-Band aperture.
- Continue the development of a K/Ka/Q-Band electronically steered aperture.
- Continue development of prototype demonstration hardware for a dual frequency, electronically steered X/Ku-Band RF Communications phased array to provide tactical data link connectivity to theater assets and initiate sub system integration.
- Continue to conduct testing and evaluation of an S-Band receive phased array.

FY 2004 PLANS:

- Continue fabrication and assembly of a K/KA/Q-Band aperture program, and initiate testing and evaluation.
- Continue development and integration of the NBN.
- Complete development, demonstration and performance characterization of the integrated VHF/UHF/L-Band prototype antenna and transition to Naval Sea Systems (NAVSEA) Command for a planned FY05 at sea demonstration aboard a DDG platform.
- Complete prototype hardware development and demonstration for a dual frequency, electronically steered X/Ku-Band RF Communications aperture to provide tactical data link connectivity to theater assets and transition to the NAVSEA Command.
- Complete integration and performance evaluation of the S-Band receive phased array and transition into the Naval Fires Network.

FY 2005 PLANS:

- Complete fabrication and assembly of a K/KA/Q-Band aperture, conduct demonstrations to characterize performance and operational utility and develop transition plans.
- Continue integration and begin initial testing and evaluation of the fully integrated NBN.

	FY 02	FY 03	FY 04	FY 05
Advanced Multi-Function RF Technology	27,968	24,000	18,852	19,273

Advanced Multi-function Radio Frequency (AMRF) Technology emphasizes development, demonstration and transition of wideband, high performance multifunction radio frequency (RF) apertures capable of transmitting and receiving multiple, simultaneous, independent RF beams while providing reduced signature and numbers of apertures. AMRF Systems Technology developments directly support the Department of Defense Joint Warfighter Science and Technology Plan and the Defense Technology Area Plans. Efforts within this activity have attributes that focus on enhancing the affordability of warfighting systems.

FY 2002 ACCOMPLISHMENTS:

- The Advanced Multi-function Radio Frequency Concept (AMRF-C) effort initiated integration and testing of a wideband multi-function Communication and Electronic Warfare test bed.
- Completed hardware development of AMRF-C subsystems including: a high band multi-function receiver, high band beam former and signal generator.
- The program completed the design, development, evaluation and documentation of the system resource allocation manager software, and completed development and implementation of real-time control software.

FY 2003 PLANS:

- The AMRF-C effort will complete integration and testing of a wideband multi-function Communication and Electronic Warfare test bed.
- The AMRF-C effort will demonstrate multiple simultaneous communication links with simultaneous electronic warfare receive and transmit functions to evaluate test bed functionality and to quantify an initial set of performance metrics and characteristics.
- The AMRF-C effort will evaluate and document system efficiencies while executing simultaneous transmit/receive functions; system resource management to include system scheduling, conflict resolution and adaptive response to changing operations and environments; and determination of isolation characteristics and interference issues that occur when conducting simultaneous functions using shared/common system elements. These metrics will serve as design guidelines for Multi-function RF system architectures.

FY 2004 PLANS:

- The AMRF-C effort will initiate development of a multi-function system capable of demonstrating integrated communications and electronic warfare.
- The AMRF-C effort will include initial designs for wideband transmitter technology with power and linearity sufficient to support communications, electronic warfare and limited radar functions.
- The AMRF-C effort will continue demonstration of AMRF-C communications of EW testbed.

FY 2005 PLANS:

- Initiate integration of sub-array and subsystem components to demonstrate a scaled multi-function RF system capable of meeting the RF requirements for communications and electronic warfare functions.
- The AMRF-C effort will complete demonstrations of communications and electronic warfare testbed.

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Exhibit R-2a

BUDGET ACTIVITY: 3 PROGRAM ELEMENT: 0603271N Project Number: R2913
PROGRAM ELEMENT TITLE: RF Systems Advanced Technology Project Title: RF Systems Advanced Technology

C. OTHER PROGRAM FUNDING SUMMARY:

NAVY RELATED RDT&E:
PE 0204152N (E-2 Squadrons)
PE 0601153N (Defense Research Sciences)
PE 0602271N (RF Systems Applied Research)
PE 0602123N (Force Protection Applied Research)
PE 0603123N (Force Protection Advanced Technology)
PE 0602235N (Common Picture Applied Research)
PE 0603235N (Common Picture Advanced Technology)
PE 0602131M (Marine Corps Landing Force Technology)
PE 0603640M (Marine Corps Advanced Technology Demonstration)

NON-NAVY RELATED RDT&E: Not applicable

D. ACQUISITION STRATEGY: Not applicable.

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BUDGET ACTIVITY: 3 PROGRAM ELEMENT: 0603271N Project Number: Various
PROGRAM ELEMENT TITLE: RF Systems Advanced Technology Project Title: Congressional Plus-ups

Congressional Plus-Ups:

	FY 02	FY 03
R9025: Multi-Function, Multi-Band, Multi-Beam Communications Antenna System (M3CAS)	4,131	N/A

Multi-Function, Multi-Band, Multi-Beam Communications Antenna System (M3CAS): Funds provided have enabled the Navy's S&T RF communications programs that are developing multi-function, multi-band, multi-beam phased array apertures for Naval surface combatants to determine and address risk factors associated with platform integration and electromagnetic compatibility issues in the early stages of development. The M3CAS funding provided Navy developers and acquisition planners with engineering models for use in optimizing aperture placement aboard the host platform to maximize operational utility and effectiveness in all operating environments.

R9152: Common Affordable Radar Processor (CARP)	N/A	4,156

Common Affordable Radar Processor: Funds provided will focus on development of advanced processor technology to enable Navy radar system contact and track information to be converted to digital formats at the output of the radar array for subsequent routing and distribution to operator displays and combat systems using commercial information protocol interfaces, data transfer standards and processes.

R9153: E-2C Technical Upgrade For Optimized Radar	N/A	6,651

E-2C Technical Upgrade For Optimized Radar: Funds provided will provide for development of a state of technology radar system/technology testbed concept which will support development and maturation of advanced technology enablers for the next generation E-2C Airborne Early Warning Radar system.