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

BA: 03 PROGRAM ELEMENT: 0603271N
PROGRAM ELEMENT TITLE: RF Systems Advanced Technology

COST: (Dollars in Thousands)

Project Number & Title	FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate
R2913 RF Systems Advanced Technology	60,430	44,933	44,046	53,105	53,226	54,323	55,459
R9152 Common Affordable Radar Processor	4,060	5,933	0	0	0	0	0
R9153 E-2C Technical Upgrade for Optimized Radar	6,483	0	0	0	0	0	0
R9329 APY-6 REAL TIME PRECISION TARGETING RADAR	0	4,945	0	0	0	0	0
R9330 HIGHLY MOBILE TACTICAL COMMUNICATIONS	0	1,682	0	0	0	0	0
R9331 REMOTE OCEAN SURVEILLANCE SYSTEM (ROSS)	0	2,076	0	0	0	0	0
R9332 SCOUT (LPI) SURVEILLANCE RADAR DEMONSTRATION	0	2,472	0	0	0	0	0
Totals	70,973	62,041	44,046	53,105	53,226	54,323	55,459

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.

PROGRAM CHANGE SUMMARY:

	FY 2003	FY 2004	FY 2005
FY 2004-2005 President's Budget Submission	74,433	45,475	36,571
Cong. Rescissions/Adjustments/Undist Reductions	0	-734	0
Congressional Actions	0	17,300	0
Execution Adjustments	-368	0	0
Inflation Savings	0	0	-118
Manpower Adjustments	0	0	-56
Rate Adjustments	0	0	-58
SBIR Assessment	-3,092	0	0
Technical Adjustments	0	0	7,707
FY 2005 President's Budget Submission	70,973	62,041	44,046

PROGRAM CHANGE SUMMARY EXPLANATION:
Technical: Not applicable.

Schedule: Not applicable.

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

BA: 03 PROGRAM ELEMENT: 0603271N PROGRAM ELEMENT TITLE: RF Systems Advanced Technology
PROJECT NUMBER: R2913 PROJECT TITLE: RF Systems Advanced Technology

COST: (Dollars in Thousands)

Project Number & Title	FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate
R2913 RF Systems Advanced Technology	60,430	44,933	44,046	53,105	53,226	54,323	55,459

A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: The Radio Frequency (RF) Systems Advanced Technology 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. Work in this 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 2003	FY 2004	FY 2005
Advanced Multi-Function RF Technology	24,264	18,310	22,588

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 2003 Accomplishments:

- The Advanced Multi-function Radio Frequency Concept (AMRF-C) effort completed integration and testing of a wideband multi-function Communication and Electronic Warfare (EW) testbed.
- The AMRF-C effort demonstrated multiple simultaneous communication links with simultaneous EW receive and transmit functions which evaluated testbed functionality and quantified an initial set of performance metrics and characteristics.
- The AMRF-C effort, within the testbed, evaluated and documented multifunction system efficiencies while executing simultaneous transmit/receive functions. Evaluated functions included system resource management with system scheduling, conflict resolution, and adaptive response to changing operations and environments. Effort also evaluated isolation characteristics and interference issues that occur when conducting simultaneous functions using shared/common system elements. These metrics are now available to 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 EW.
- The AMRF-C effort will include initial designs for wideband transmitter technology with power and linearity sufficient to support communications, EW and limited radar functions.
- The AMRF-C effort will continue operation of the wideband multi-function Communications and EW testbed in support of multi-function system development and multi-function technology insertion and demonstration.

FY 2005 Plans:

- The AMRF-C effort will complete demonstrations of the communications and electronic warfare testbed.
- 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 EW functions.
- Initiate prototype efforts for DD-X Electronic Warfare implementation.

	FY 2003	FY 2004	FY 2005
Radio Communications RF Advanced Technology	21,459	17,439	13,586

Radio Communications Radio Frequency (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 2003 Accomplishments:

- Continued at sea testing and evaluation of an S-Band receive phased array.
- Continued 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 initiated sub system integration.
- Continued the development of a K/Ka/Q-Band phased array electronically steered aperture.
- Continued the development of the Naval Battleforce Network (NBN), and integrated: the airborne communications with multi-beam, multi-frequency antenna package; littoral mobile wireless networking, and composite routing technologies into the NBN.
- Continued development and initiated fabrication of an Integrated Very High Frequency (VHF)/Ultra High Frequency (UHF)/L-Band (IVUL)aperture.

FY 2004 Plans:

- Complete integration and performance evaluation of the S-Band receive phased array and transition into the Naval Fires Network.
- Continue 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.
- Continue fabrication and assembly of a K/KA/Q-Band phased array aperture, and begin initial test and evaluation to verify performance and operating characteristics.
- Continue development and integration of the NBN.
- Continue development, demonstration and performance characterization of the integrated IVUL prototype antenna.
- Initiate development of Next Generation Buoyant Cable Antenna (NGBCA) advanced development unit for submarine applications.

FY 2005 Plans:

- Complete demonstration of dual frequency, electronically steered X/Ku-Band RF communications aperture and transition to the Naval Sea Systems Command (NAVSEA).
- Complete fabrication and assembly of a K/KA/Q-Band phased array 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.
- Continue demonstration and performance optimization of the integrated IVUL prototype antenna.
- Continue development of NGBCA advanced development demonstration unit.

	FY 2003	FY 2004	FY 2005
Surface and Aerospace Surveillance Advanced RF Systems	14,707	9,184	7,872

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 2003 Accomplishments:

- Completed the Advanced Signal Processing (ASP) effort resulting in hardware for the Radar Modernization Program (RMP) demonstration and evaluation.
- Within the Missile Defense (MD) FNC, Affordable Ground Based Radar (AGBR) effort, began fabrication of an advanced development model (ADM) radar for demonstration prior to the USMC Multi-Role Radar System (MRRS) Milestone B decision in FY 2005 timeframe.
- Under the Time Critical Strike (TCS) FNC, due to a change in program requirements, re-configured the design of the Precision Surveillance and Targeting (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.

FY 2004 Plans:

- Within the MD FNC AGBR effort, complete fabrication and begin testing of an ADM radar for insertion into the USMC MRRS development program.
- 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.

FY 2005 Plans:

- Within the MD FNC AGBR effort, complete testing of an ADM radar for the USMC Multi-Role Radar System development program in anticipation of a Milestone B decision in FY 2005.
- 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.
- Conduct system architecture and design studies for an advanced development model S-Band Digital Array Radar (DAR) for the next generation "CG" surface combatant.

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

CONGRESSIONAL PLUS-UPS:

R9152	FY 2003	FY 2004
COMMON AFFORDABLE RADAR PROCESSOR (CARP)	4,060	5,933

FY 03 funds focused on the 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. FY04 funds will be used to make a form fit phase III data distribution module and conduct demonstration.

R9153	FY 2003	FY 2004
E-2C TECHNICAL UPGRADE FOR OPTIMIZED RADAR	6,483	0

Funds developed a state of technology radar system/technology testbed concept which supports development and maturation of advanced technology enablers for the next generation E-2C Airborne Early Warning Radar system.

R9329	FY 2003	FY 2004
APY-6 REAL-TIME PRECISION TARGETING RADAR	0	4,945

The program will update the current AN/APY-6 with a wideband surface mode, increase the number of test flight hours and add additional software for surface target identification.

R9330	FY 2003	FY 2004
HIGHLY MOBILE TACTICAL COMMUNICATIONS	0	1,682

The program will integrate Iridium satellite communications with current Expeditionary Maneuvering Warfare (EMW) Line-of-sight terrestrial tactical communication systems, and provide a demonstration of this Iridium tactical communication overlay technology.

R9331	FY 2003	FY 2004
REMOTE OCEAN SURVEILLANCE SYSTEMS (ROSS)	0	2,076

The program will develop electro-optic technology for wide area surveillance in maritime environments.

R9332	FY 2003	FY 2004
SCOUT (LPI) SURVEILLANCE RADAR DEMONSTRATION	0	2,472

The program will initiate modifications to the timing and waveform subsystem for high resolution modes for the Scout radar system.