EXHIBIT R-2, FY 2002 RDT&E,N BUDGET ITEM JUSTIFICATION Date: June 2001

BUDGET ACTIVITY: 4

PROGRAM ELEMENT: 0603207N
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications

(U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION:

The Air Ocean Tactical Applications (AOTA) Program Element is specifically tailored to emphasize techniques which expand knowledge and improve understanding of the meteorological and oceanographic (METOC) environment and its impact on combat systems performance. AOTA focuses on shallow water and other harsh environments, and regional conflict and crisis response scenarios. Projects in this program element develop atmospheric and oceanographic data assimilation techniques, forecast models, data base management systems and associated software for use in both mainframe and tactical scale computers. Global Geospatial Information and Services efforts within this program address the bathymetric and gravimetric needs of the Navy. Also developed are algorithms to process remotely sensed satellite data for integration into other systems and tactical applications. In addition, the projects provide for demonstration and validation of specialized METOC instrumentation and measurement techniques, new sensors, communications and interfaces. Included are techniques to assess, predict and enhance the performance of current and proposed undersea surveillance, tactical and mine warfare and weapons systems. AOTA METOC products are tailored for, and will be incorporated into the Global Command and Control System/Maritime (GCCS/M) and/or onboard combat systems to provide accurate operational system performance predictions. These METOC products will also be incorporated into fleet trainers to provide realistic environments in support of warfare simulations. Finally, this project upgrades the accuracy of the U.S. Naval Observatory's Master Clock system; develops near-real-time earth orientation predictions; develops very precise determination of positions of both faint and bright stars; and supports satellite tracking and space debris studies.

(U) JUSTIFICATION FOR BUDGET ACTIVITY: This program is funded under DEMONSTRATION & VALIDATION because it develops and integrates systems for experimental test related to specific ship or aircraft applications.

EXHIBIT R-2a, FY 2002 RDT&E,N PROJECT JUSTIFICATION Date: May 2001

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2341
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: METOC Data Acquisition

PROJECT NUMBER & Title	FY 2000 Actual	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	To Complete	Total Program
X2341 METOC Data Acquisition										
	8,066	8,676	9,180						CONT.	CONT.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: The major thrust of the meteorology and oceanography (METOC) Data Acquisition Project is to develop, demonstrate, and validate METOC data collection methods and sensors, and to evolve the ability to provide timely and accurate METOC data and products to the Tactical Commander. As the emphasis on Naval Warfare has evolved from blue water operations to the littoral and hinterland battlespace, METOC data requirements have likewise evolved. The littoral and hinterland regions are extremely dynamic and complex, characterized by strong and highly variable oceanographic and atmospheric conditions. As a result, the need to accurately characterize these parameters is more crucial than ever in planning and executing Amphibious Warfare, Mine Warfare, Special Operations, Anti-Submarine Warfare, and Strike Warfare operations. Routinely available data sources, such as climatology, oceanographic and meteorological numerical models, and satellite remote sensing are inadequate to support these warfare areas in the littoral and hinterland regions. Current operational sensors, such as the standard balloon launched radiosonde, are deployed from platforms that are frequently located great distances from the area of interest. The principal challenge is to provide a means for the collection and dissemination of METOC data in highly variable and dynamic littoral environmental conditions or in denied, remote or inaccessible areas over extended periods of time. The principal goals of this project are to: 1) Provide the means to rapidly and automatically acquire a broad array of METOC data using both off-board and on-board sensors; 2) provide an on-scene assessment capability for the tactical commander; 3) provide the tactical commander with real-time METOC data and products for operational use; 4) demonstrate and validate the use of tactical workstations and desktop computers for processing and display of METOC data and products using latest networking technologies; 5) demonstrate and validate techniques which employ data compression, connectivity and interface technologies to ingest, store, process, distribute and display these METOC data and products; 6) develop new charting and bathymetric survey techniques necessary to reduce the

EXHIBIT R-2a, FY 2002 RDT&E,N PROJECT JUSTIFICATION Date: May 2001

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2341
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: METOC Data Acquisition

existing 300 ship year shortfall in coastal hydrographic survey requirements; and, 7) develop an expanded database for predictive METOC models in areas of potential interest.

EXHIBIT R-2a, FY 2002 RDT&E,N PROJECT JUSTIFICATION Date: May 2001

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2341
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: METOC Data Acquisition

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1.(U) FY 2000 ACCOMPLISHMENTS:

- (U) ($1,121) Completed integration of MEASURE Interface Processor (MIP) into airborne unmanned vehicles (UAV's). Continued development of Battlespace characterization techniques to measure environmental data in-situ and transmit to Fleet assets.
- (U) ($1,266) Continued sensor developments for ROV/AUV, and continued sensor integration and development of UAV sensors in Tier II Plus Vehicles.
- (U) ($1,050) Continued assessments of temporal and spatial variability of littoral environments for acoustic data inversion.
- (U) ($920) Began development of advanced techniques to acquire and manage ambient noise data.
- (U) ($1,100) Continued development of next-generation sensors for MEASURE, Moriah and aerosol measurements.
- (U) ($984) Continued development of data connectivity with the next generation Tomahawk mission planning system and GCCS/M. Began development of data connectivity with the next generation Tactical Air Mission Planning System (TAMPS 7.0)
- (U) ($775) Completed instrumentation demonstration and validation of joint RMS vehicle for remote littoral bathymetry/mine hunting.
- (U) ($850) Continued information management and DMAP functions.

EXHIBIT R-2a, FY 2002 RDT&E,N PROJECT JUSTIFICATION Date: May 2001

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2341
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: METOC Data Acquisition

2. (U) FY 2001 PLAN:

- (U) ($1,275) Complete sensor developments for ROV/AUV, and continue sensor integration and development of UAV sensors in Tier II Plus Vehicles.
- (U) ($1,175) Continue assessments of temporal and spatial variability of littoral environments for acoustic data inversion.
- (U) ($1,305) Continue development of advanced techniques to acquire and manage ambient noise data.
- (U) ($1,180) Complete development of next-generation sensors for MEASURE, MORIAH and aerosol measurements.
- (U) ($1,170) Complete development of data connectivity with the next generation Tomahawk mission planning system. Continue development of data connectivity with the next generation Tactical Air Mission Planning System (TAMPS 7.0) and GCCS/M.
- (U) ($1,621) Begin development of next-generation acoustic data acquisition techniques
- (U) ($950) Continue information management and DMAP functions.

3. (U) FY 2002 PLAN:

EXHIBIT R-2a, FY 2002 RDT&E,N PROJECT JUSTIFICATION Date: May 2001

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2341
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: METOC Data Acquisition

- (U) ($1,075) Complete sensor integration and development of UAV sensors in Tier II Plus Vehicles. Begin development of sensor suite for Tier III Vehicles.
- (U) ($1,425) Continue assessments of temporal and spatial variability of littoral environments for acoustic data inversion.
- (U) ($1,265) Continue development of advanced techniques to acquire and manage ambient noise data.
- (U) ($1,068) Begin development of autonomous clandestine sensors for measurements in denied areas.
- (U) ($1,280) Complete development of data connectivity with the next generation Tactical Air Mission Planning System (TAMPS 7.0) and GCCS/M. Begin development of data connectivity with Joint C4ISR.
- (U) ($2,047) Continue development of next-generation acoustic data acquisition techniques
- (U) ($1,020) Continue information management and DMAP functions.

EXHIBIT R-2a, FY 2002 RDT&E,N PROJECT JUSTIFICATION Date: May 2001

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2341
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: METOC Data Acquisition

B. (U) PROGRAM CHANGE SUMMARY:

(U) Funding: FY 2000 adjustments are due to Across the Board Reduction (-48), Miscellaneous Navy adjustments (-338), SBIR Assessments (-183) and Section 8055 Congressional Proportionate Rescission (-34).

(U) Funding: FY2001 adjustments are due to Section 8086 .7% Pro-rata Reduction (-61) and a Government recission of (-19).

(U) Schedule: Not applicable.

(U) Technical: Not applicable.

C. (U) OTHER PROGRAM FUNDING SUMMARY:

(U) RELATED RDT&E: PE 0604218N, Air/Ocean Equipment Engineering - AN/SMQ-11 satellite receiver/recorder system engineering to receive data from DMSP onboard selected ships and shore sites.

(U) ACQUISITION STRATEGY: Not applicable

Exhibit R-3 Project Cost Analysis (page 1)										Date: May 01		
APPROPRIATION/BUDGET ACTIVITY: RDT&E, N/BA5		PROGRAM ELEMENT: 0603207N						PROJECT NAME AND NUMBER: X2341 METOC DATA ACQUISITION				
Cost Categories	Contract Method & Type	Performing Activity & Location	Total FY00+ PY Cost	FY01 Cost	FY01 Award Date	FY02 Cost	FY02 Award Date	FY03 Cost	FY03 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Product Development	WX	NRL	6,429	3,992	N/A	4,325	N/A		N/A	CONT	CONT	
	WX	NAWC-AD Lake	778	0	N/A	0	N/A		N/A	CONT	CONT	
	CP	ARL/APL	3,000	1,100	N/A	1,122	N/A		N/A	CONT	CONT	
	WX	NSWC	0	850	N/A	867	N/A		N/A	CONT	CONT	
	N/A	MISC	4,058	2,184	N/A	2,305	N/A		N/A	CONT	CONT	
Subtotal Product Development			14,265	8,126	NA	8,619	NA		N/A	CONT	CONT	
Remarks:												
Support	CP	SSA	1,065	550	N/A	561	N/A		N/A	CONT	CONT	
Subtotal Support			1,065	550	N/A	561	N/A		N/A	CONT	CONT	

Remarks

Exhibit R-3 Project Cost Analysis (page 2)									Date: May 01				
APPROPRIATION/BUDGET ACTIVITY: RDT&E, N/BA5			PROGRAM ELEMENT: 0603207N						PROJECT NAME AND NUMBER: X2341 METOC DATA ACQUISITION				
Cost Categories	Contract Method & Type	Performing Activity & Location	Total FY00+ PY Cost	FY01 Cost	FY01 Award Date	FY02 Cost	FY02 Award Date	FY03 Cost	FY03 Award Date	Cost To Complete	Total Cost	Target Value of Contract	
Subtotal T&E													
Remarks													
Subtotal Management													
Remark													
Total Cost			15,330	8,676	N/A	9,180	N/A	10,387	N/A	CONT	CONT		
Remarks													

EXHIBIT R-2a, FY 2002 RDT&E,N PROJECT JUSTIFICATION Date: May 2001

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2342
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: METOC Data Assimilation and Modeling

(U) COST (Dollars in thousands)

PROJECT NUMBER & Title	FY 2000 Actual	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	To Complete	Total Program
X2342 METOC Data Assimilation and Modeling.										
	11,711	14,659	13,591						CONT.	CONT.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: The meteorological and oceanographic (METOC) Data Assimilation Project is a multi-faceted program which includes: 1) development, demonstration and validation of atmospheric and oceanographic data assimilation techniques, forecast models, database management systems, and associated software for use in both mainframe and tactical scale computers. Included are numerical oceanographic and atmospheric models for the Large Scale Computers at the Navy Fleet Numerical Meteorology and Oceanography Center, Monterey, CA and the Naval Oceanographic Office, Stennis Space Center, MS. These models, combined with a global communications network for data acquisition and distribution, form a prediction system which provides METOC data and products necessary to support naval operations worldwide in virtually every mission area; 2) other models, which focus on ocean thermal structure and circulation, and surf and tide prediction; 3) techniques to process and manage satellite remotely-sensed environmental data at Oceanography Centers ashore and on ships equipped with the AN/SMQ-11 satellite receiver/recorder. These techniques allow for the integration and tactical application of significant oceanographic and atmospheric data derived from satellite-borne sensors. Included are techniques and algorithms for the processing of sensor measurements, conversion of raw signal data to geophysical information, analysis schemes encompassing Artificial Intelligence and Expert Systems, and other satellite data applications and field validation of end products; and, 4) a family of acoustic system performance models beginning with active system models and databases in the low-, mid-, and high-frequency regimes and culminating with high fidelity simulation products. As weapons and sensors become more sophisticated and complex, the marine environment has an increasingly significant impact on system performance. Operational limitations induced by the ocean and atmosphere must be understood, and the resulting constraints on mission effectiveness and system employment minimized. Hence, the operating

forces require more accurate worldwide forecasts of METOC conditions with increased temporal and spatial resolution. An additional challenge is posed by the emergence of new satellite sensors, which are continually adding new sources of disparate data types. In order to fully exploit this dynamic and massive volume of data, modern data base management systems (DBMS) are required, and must be tailored for individual computer configurations. Improved representation of smaller-scale phenomena, particularly in the littoral, is also an important consideration.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1.(U) FY 2000 ACCOMPLISHMENTS:

- (U) ($1,047) Continued modeling and simulation of atmosphere and ocean environmental effects on Navy systems.
- (U) ($1,002) Continued developments of techniques for coupled air/ocean data assimilation.
- (U) ($400) Participated in selected fleet exercises and demonstrations.
- (U) ($925) Completed development of MPP version of NOGAPS and the shipboard version of tactical scale nested model for operational use.
- (U) ($1,385) Began development of next generation high resolution coupled air/ocean forecast models.
- (U) ($1,412) Completed development of next-generation tropical cyclone forecast model and the Arabian Gulf/Arabian ocean model. Continued development of coastal and enclosed basin tactical scale oceanographic models for selected geographical locations in response to emergent requirements.
- (U) ($1,165) Continued development of capabilities to assimilate and quality control METOC data from satellite sensors and conventional data sources using 4D variational techniques.

- (U) ($1,250) Continued development of techniques for bathymetry and surf zone and high resolution micro-topography algorithms and automated objective processing in the littoral.

- (U) ($1,285) Continued development of shipboard shallow water ocean circulation model, next generation tide and surf models, and automated graphical applications for tactical data visualization.

- (U) ($1,025) Continued the development of mid-frequency bottom loss/bottom scatter models and databases for shallow water environments.

- (U) ($815) Continued the verification and validation of products and data assimilation techniques developed for fleet applications.

2. (U) FY 2001 PLAN:

- (U) ($1,256) Continue modeling and simulation of atmosphere and ocean environmental effects on Navy systems.

- (U) ($1,355) Complete developments of techniques for coupled air/ocean data assimilation. Begin development of variational techniques for coupled assimilation.

- (U) ($579) Participate in selected fleet exercises and demonstrations.

- (U) ($1,253) Continue development of next generation high resolution coupled air/ocean forecast models.

- (U) ($1,250) Continue development of coastal and enclosed basin tactical scale oceanographic models for selected geographical locations in response to emergent requirements.

- (U) ($1,165) Complete development of capabilities to assimilate and quality control METOC data from satellite sensors and conventional data sources using 4D variational techniques.

- (U) ($1,150) Continue development of techniques for bathymetry and surf zone and high resolution micro-topography algorithms and automated objective processing in the littoral.

- (U) ($1,185) Continue development of shipboard shallow water ocean circulation model, next generation tide and surf models, and automated graphical applications for tactical data visualization.

- (U) ($1,026) Begin development of next-generation active and passive acoustic models.

- (U) ($1,025) Continue the development of mid-frequency bottom loss/bottom scatter models and databases for shallow water environments.

- (U) ($915) Continue the verification and validation of products and data assimilation techniques developed for fleet applications.
- (U) ($2,500) This is a one-year effort to develop improved hydrographic data collection, data processing, and production techniques based on a Congressional add to establish the National Center of Excellence in Hydrography at the University of Southern Mississippi. There is no outyear funding identified to continue this effort.

3. (U) FY 2002 PLAN:

- (U) ($1,312) Continue modeling and simulation of atmosphere and ocean environmental effects on Navy systems.

- (U) ($1,275) Continue development of variational techniques for coupled assimilation.

- (U) ($635) Participate in selected fleet exercises and demonstrations.

- (U) ($1,810) Continue development of next generation high resolution coupled air/ocean forecast models.

- (U) ($1,504) Continue development of coastal and enclosed basin tactical scale oceanographic models for selected geographical locations in response to emergent requirements.

EXHIBIT R-2a, FY 2002 RDT&E,N PROJECT JUSTIFICATION Date: May 2001

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2342
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: METOC Data Assimilation and Modeling

- (U) ($1,105) Begin development of new capabilities to assimilate and quality control METOC data from satellite sensors and conventional data sources using Artificial Intelligence techniques.
- (U) ($1,500) Continue development of techniques for bathymetry and surf zone and high resolution micro-topography algorithms and automated objective processing in the littoral.
- (U) ($1,225) Complete development of shipboard shallow water ocean circulation model, next generation tide and surf models, and automated graphical applications for tactical data visualization.
- (U) ($1,185) Continue development of next-generation active and passive acoustic models.
- (U) ($1,035) Continue the development of mid-frequency bottom loss/bottom scatter models and databases for shallow water environments.
- (U) ($1,005) Continue the verification and validation of products and data assimilation techniques developed for fleet applications.

EXHIBIT R-2a, FY 2002 RDT&E,N PROJECT JUSTIFICATION Date: May 2001

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2342
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: METOC Data Assimilation and Modeling

B. (U) PROGRAM CHANGE SUMMARY:

(U) Funding: FY 2000 adjustments are due to Across the Board Adjustments (-68), SBIR Assessments (-98), Section 8055 Congressional Proportionate Rescission (-48) and Miscellaneous Navy Adjustments (-364).

(U) Funding: FY 2001 adjustments are due to Section 8086 .7% Pro-rata Reduction (-104),Section 66744 National Center of Excellence in Hydrography Congressional Add (2,500), and Government wide recission (-32).

(U) Schedule: Not applicable.

(U) Technical: Not applicable.

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

D. (U) ACQUISITION STRATEGY: Not applicable.

Exhibit R-3 Project Cost Analysis (page 1)												Date: May 01
APPROPRIATION/BUDGET ACTIVITY: RDT&E, N/5A5		PROGRAM ELEMENT:0603207N						PROJECT NAME AND NUMBER: X2342 METOC DATA ASSIMILATION AND MODELING				
Cost Categories	Contract Method & Type	Performing Activity & Location	Total FY00+ PY Cost	FY01 Cost	FY01 Award Date	FY02 Cost	FY02 Award Date	FY03 Cost	FY03 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Product Development	WX	NRL	16,101	8,714	N/A	9,319	N/A		N/A	CONT	CONT	
	WX	NAWC-WD, PM	790	410	N/A	418	N/A		N/A	CONT	CONT	
	N/A	MISC	5,593	2,880	N/A	3,696	N/A		N/A	CONT	CONT	
		NAVOCEANO		2,500								
Subtotal Product Development			22,848	14,504	N/A	13,433	N/A		N/A	CONT	CONT	
Remarks:												
Support	CP	SSA	295	155	N/A	158	N/A		N/A	CONT	CONT	
Subtotal Support			295	155	N/A	158	N/A		N/A	CONT	CONT	

Remarks

Exhibit R-3 Project Cost Analysis (page 2)								Date: May 01				
APPROPRIATION/BUDGET ACTIVITY: RDT&E, N/5A5		PROGRAM ELEMENT:0603207N						PROJECT NAME AND NUMBER: X2342 METOC DATA ASSIMILATION AND MODELING				
Cost Categories	Contract Method & Type	Performing Activity & Location	Total FY00+PY Cost	FY01 Cost	FY01 Award Date	FY02 Cost	FY02 Award Date	FY03 Cost	FY03 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Subtotal T&E												
Remarks												
Subtotal Management												
Remarks												
Total Cost			22,779	14,659	N/A	13,591	N/A	13,140	N/A	CONT	CONT	
Remarks												

EXHIBIT R-2a, FY 2002 RDT&E,N PROJECT JUSTIFICATION Date: May 2001

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2343
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: Tactical METOC Applications

(U) COST (Dollars in thousands)

PROJECT NUMBER & Title	FY 2000 Actual	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	To Complete	Total Program
X2343 Tactical METOC Applications										
	7,280	7,755	8,056						CONT.	CONT.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: The METOC Data Applications project is a continuing effort to develop and field state-of-the-art software capabilities that provide sensor, communication, and weapon system performance assessments across the full spectrum of open ocean and littoral operating environments. These assessments allow mission planners and warfighters, from the unit to theater level, to tactically optimize sensor employment on airborne, surface, and subsurface platforms in support of all Naval Composite Warfare mission areas including Undersea Warfare (USW), Anti-Submarine Warfare (ASW), Mine Warfare (MIW), Amphibious Warfare (AMW), Anti-Surface Warfare (ASUW), Anti-Air Warfare (AAW), Strike Warfare (STW), and Special Warfare. Emphasis is placed on products to support littoral and regional conflict scenarios. Performance assessments leading to improvements in tactical control are conducted through a two-tiered approach: 1) METOC Decision Aids (MDAs); and, 2) Tactical Decision Aids (TDAs). MDAs consist of a series of analysis tools which characterize the electromagnetic (EM), electro-optical (EO), atmospheric, oceanographic, and acoustical properties of the battlespace based on the best environmental scene description available at the time (i.e., some combination of historical and/or real-time (or near real-time) in-situ data. TDAs, also developed under this project, then use this information to predict how various weapons and sensor systems will perform given the current METOC conditions, and present these predictions in various tabular and graphic formats used by mission planners and combat/weapon system operators to develop ASW and MIW search and localization plans, USW/AAW/ASUW screens, STW profiles, AMW ingress and egress points, and other considerations. Project X2343 MDAs and TDAs use data obtained by sensors developed in Project X2341 (METOC Data Acquisition) and assimilated by software produced by Project X2342 (METOC Data Assimilation and Modeling), also contained in this Program Element. They also used data obtained through direct interfaces to the combat systems. A current emphasis area of the project is the development of new combat system and mine warfare performance prediction and MDA/TDA capabilities required to characterize and/or predict sensor and weapons

EXHIBIT R-2a, FY 2002 RDT&E,N PROJECT JUSTIFICATION Date: May 2001

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2343
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: Tactical METOC Applications

system performance in the highly complex littoral environments in support of regional conflict scenarios. It addresses multi-warfare areas, particularly Mine Warfare, shallow water ASW, and missile and air defense/strike capabilities.

EXHIBIT R-2a, FY 2002 RDT&E,N PROJECT JUSTIFICATION Date: May 2001

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2343
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: Tactical METOC Applications

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 2000 ACCOMPLISHMENTS:

- (U) ($915) Continued development of AREPS and began development of next generation Electro-optical decision aids.
- (U) ($2,527) Continued to incorporate prototype Mine Warfare tactical decision aids in baseline surface ship, air and submarine performance prediction systems. Continued to maximize littoral operation support by ensuring interoperability of system via existing Fleet communication mechanisms.
- (U) ($1,448) Continued to apply advanced COTS visualization techniques to facilitate operator understanding of complex littoral environmental effects on sensor performance and integrate into appropriate platform ADMs. Performed at-sea evaluation of new capabilities.
- (U) ($1,240) Continued to integrate platform vulnerability assessment TDA into surface ship, submarine and air ADMs to perform vulnerability assessment for acoustic and non-acoustic sensors and weapons. Evaluated functionality during at-sea tests.
- (U) ($1,150) Continued to incorporate additional environmental sensor interface capabilities to allow for real time monitoring and measurement of key environmental parameters in support of the Oceanographer of the Navy’s Battlespace METOC Data Acquisition, Assimilation and Applications strategy. Implemented in the platform ADMs and evaluated at-sea.

2. (U) FY 2001 PLAN:

- (U) ($1,025) Complete development of AREPS. Continue development of next generation Electro-optical decision aids. Begin development of an advanced electromagnetic propagation model incorporating artificial intelligence techniques.

- (U) ($2,652)Continue to incorporate prototype Mine Warfare tactical decision aids in baseline surface ship, air and submarine performance prediction systems. Continue to maximize littoral operation support by ensuring interoperability of system via existing Fleet communication mechanisms.

- (U) ($1,668) Continue to apply advanced COTS visualization techniques to facilitate operator understanding of complex littoral environmental effects on sensor performance and integrate into appropriate platform ADMs. Perform at-sea evaluation of new capabilities.

- (U) ($1,135) Continue to integrate platform vulnerability assessment TDA into surface ship, submarine and air ADMs to perform vulnerability assessment for acoustic and non-acoustic sensors and weapons. Evaluate functionality during at-sea tests.

- (U) ($1,275) Continue to incorporate additional environmental sensor interface capabilities to allow for real time monitoring and measurement of key environmental parameters in support of the Oceanographer of the Navy's Battlespace METOC Data Acquisition, Assimilation and Applications strategy. Implement in the platform ADMs and evaluate at-sea.

3. (U) FY 2002 PLAN:

- (U) ($975) Complete development of next generation Electro-optical decision aids. Continue development of an advanced electromagnetic propagation model incorporating artificial intelligence techniques.

- (U) ($3,051) Continue to incorporate prototype Mine Warfare tactical decision aids in baseline surface ship, air and submarine performance prediction systems. Continue to maximize littoral operation support by ensuring interoperability of system via existing Fleet communication mechanisms.

- (U) ($1,775) Continue to apply advanced COTS visualization techniques to facilitate operator understanding of complex littoral environmental effects on sensor performance and integrate into appropriate platform ADMs. Perform at-sea evaluation of new capabilities.

EXHIBIT R-2a, FY 2002 RDT&E,N PROJECT JUSTIFICATION Date: May 2001

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2343
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: Tactical METOC Applications

- (U) ($1,115) Continue to integrate platform vulnerability assessment TDA into surface ship, submarine and air ADMs to perform vulnerability assessment for acoustic and non-acoustic sensors and weapons. Evaluate functionality during at-sea tests.

- (U) ($1,140) Continue to incorporate additional environmental sensor interface capabilities to allow for real time monitoring and measurement of key environmental parameters in support of the Oceanographer of the Navy's Battlespace METOC Data Acquisition, Assimilation and Applications strategy. Implement in the platform ADMs and evaluate at-sea.

B. (U) PROGRAM CHANGE SUMMARY:

(U) Funding: FY 2000 adjustments are due to Across the Board reductions (-43), SBIR Assessment (-127), Section 8055 Congressional Proportionate Rescission (-30), and Miscellaneous Navy Adjustments (-227).

(U) Funding: FY 2001 adjustments are due to Section 8086 .7% Pro-rata Reduction (-55); Government Wide Recission (-17K).

(U) Technical: Not applicable.

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

(U) RELATED RDT&E: PE 0604218N (Air/Ocean Equipment Engineering). TESS/NITES will incorporate METOC data applications.

D. (U) ACQUISITION STRATEGY: Not applicable.

Exhibit R-3 Project Cost Analysis (page 1)												
APPROPRIATION/BUDGET ACTIVITY: RDT&E, N/BA5			PROGRAM ELEMENT:0603207N						Date: May 01			
									PROJECT NAME AND NUMBER: X2343 TACTICAL METOC APPLICATIONS			
Cost Categories	Contract Method & Type	Performing Activity & Location	Total FY00+ PY Cost	FY01 Cost	FY01 Award Date	FY02 Cost	FY02 Award Date	FY03 Cost	FY03 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Product Development	WX	NUWC	1,400	740	N/A	755	N/A		N/A	CONT	CONT	
	WX	SSC SD	720	365	N/A	372	N/A		N/A	CONT	CONT	
	WX	NRL	600	305	N/A	311	N/A		N/A	CONT	CONT	
	CP	IPD	6,486	4,028	N/A	4,298	N/A		N/A	CONT	CONT	
	CP	LOCKHEED	1,053	400	N/A	571	N/A		N/A	CONT	CONT	
	N/A	MISC	3,389	1,612	N/A	1,438	N/A		N/A	CONT	CONT	
Subtotal Product Development			13,648	7,450	N/A	7,745	N/A		N/A	CONT	CONT	
Remarks:												
Support	CP	IPD	595	305	N/A	311	N/A		N/A	CONT	CONT	
Subtotal Support			595	305	N/A	311	N/A		N/A	CONT	CONT	

Remarks

Exhibit R-3 Project Cost Analysis (page 2)												Date: May 01
APPROPRIATION/BUDGET ACTIVITY: RDT&E, N/BA5			PROGRAM ELEMENT:0603207N									PROJECT NAME AND NUMBER: X2343 TACTICAL METOC APPLICATIONS
Cost Categories	Contract Method & Type	Performing Activity & Location	Total FY00+PY Cost	FY01 Cost	FY01 Award Date	FY02 Cost	FY02 Award Date	FY03 Cost	FY03 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Subtotal T&E												
Remarks												
Subtotal Management												
Remarks												
Total Cost			14,243	7,755	N/A	8,056	N/A	8,555	N/A	CONT	CONT	

Remarks

EXHIBIT R-2a, FY 2002 RDT&E,N BUDGET ITEM JUSTIFICATION Date: May 2001

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2344
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: Precise Timing and Astrometry

(U) COST (Dollars in thousands)

PROJECT NUMBER & Title	FY 2000 Actual	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	To Complete	Total Program
X2344 Precise Timing and Astrometry										
	1,384	1,446	1,505						CONT.	CONT.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: The major thrusts of the Precise Timing and Astrometry Project in direct support of the U.S. Naval Observatory (USNO) are to: 1) address DoD requirements for needed increases in positioning accuracies of modern weapons systems by the determination of star positions (including objects at other than optical wavelengths) and the stellar inertial reference system (to which all navigation, guidance, and positioning systems are ultimately referred); 2) develop techniques for the prediction of the Earth's instantaneous orientation with respect to the stellar inertial reference system; 3) oversee the determination and dissemination of precise time information using the Navy/DoD Master Clock System and precise time distribution networks; and, 4) develop advanced electronic light detectors and interferometry in the optical and infrared wavelength regions for very precise determination of the positions of both faint and bright stars, satellite tracking, and space debris studies. DoD Instruction 5000.2 assigns to the Navy the responsibility for coordinating Precise Time and Time Interval (PTTI) requirements and for maintaining a PTTI reference standard (astronomical and atomic) for use by all DoD Services, Federal agencies, and related scientific laboratories. The Navy is also responsible for providing astronomical data for navigation, positioning, and guidance, including space. Some operational and many emerging requirements surpass current support capabilities. In response to these DoD requirements, this project transitions Research (6.1) and Exploratory Development (6.2) efforts, as well as developments in the civilian sector, into the operational capabilities and products of the USNO.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 2000 ACCOMPLISHMENTS:

EXHIBIT R-2a, FY 2002 RDT&E,N BUDGET ITEM JUSTIFICATION Date: May 2001

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2344
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: Precise Timing and Astrometry

- (U) ($494) Continued evaluation of GPS time transfer capability.
- (U) ($494) Continued evaluation of cesium fountain clock and VLBI/GPS demonstration for earth orientation parameters.
- (U) ($396) Continued InSb (Indium-Antimony) detector survey.

2. (U) FY 2001 PLAN:

- (U) ($425) Complete evaluation of GPS time transfer capability. Begin development of next-generation time transfer capabilities.
- (U) ($285) Complete evaluation of cesium fountain clock and continue VLBI/GPS demonstration for earth orientation parameters.
- (U) ($403) Complete InSb (Indium-Antimony) detector survey.
- (U) ($333) Begin exploitation of emergent Master Clock technologies.

3. (U) FY 2002 PLAN:

- (U) ($375) Continue development of next-generation time transfer capabilities.
- (U) ($425) Continue VLBI/GPS demonstration for earth orientation parameters.
- (U) ($705) Continue exploitation of emergent Master Clock technologies.

EXHIBIT R-2a, FY 2002 RDT&E,N BUDGET ITEM JUSTIFICATION Date: May 2001

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2344
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: Precise Timing and Astrometry

B. (U) PROGRAM CHANGE SUMMARY:

(U) Funding: FY 2000 adjustments are due to Across the Board adjustments (-8), SBIR Assessments (-3), and Section 8055 Congressional Proportionate Rescission (-6), and Miscellaneous Navy Adjustments (-43).

(U) Funding: FY 2001 adjustments are due to Section 8086 .7% Pro-rata Reduction (-10), Government Wide Recission (-3).

(U) Schedule: Not applicable.

(U) Technical: Not applicable.

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

(U) RELATED RDT&E: None

D. (U) ACQUISITION STRATEGY: Not applicable.

Exhibit R-3 Project Cost Analysis (page 1)												Date: May 01
APPROPRIATION/BUDGET ACTIVITY: RDT&E, N/BA5			PROGRAM ELEMENT: 0603207N									PROJECT NAME AND NUMBER: X2344 PRECISE TIMING AND ASTROMETRY
Cost Categories	Contract Method & Type	Performing Activity & Location	Total FY00+ PY Cost	FY01 Cost	FY01 Award Date	FY02 Cost	FY02 Award Date	FY03 Cost	FY03 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Product Development	WX	NAVAL OBSERVATORY	2,788	1,446	N/A	1,505	N/A		N/A	CONT	CONT	
Subtotal Product Development			2,788	1,446	N/A	1,505	N/A		N/A	CONT	CONT	
Remarks:												
Subtotal Support												

Remarks

Exhibit R-3 Project Cost Analysis (page 2)								Date: May 01				
APPROPRIATION/BUDGET ACTIVITY: RDT&E, N/BA5		PROGRAM ELEMENT: 0603207N						PROJECT NAME AND NUMBER: X2344 PRECISE TIMING AND ASTROMETRY				
Cost Categories	Contract Method & Type	Performing Activity & Location	Total FY00+ PY Cost	FY01 Cost	FY01 Award Date	FY02 Cost	FY02 Award Date	FY03 Cost	FY03 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Subtotal T&E												
Remarks												
Subtotal Management												
Remarks												
Total Cost			2,788	1,446	N/A	1,505	N/A	1,533	N/A	CONT	CONT	
Remarks												

R-1 Shopping List - Item No 43(36) of 43 (27)

Exhibit R-3, Project Cost Analysi