ARCHIVED REPORT

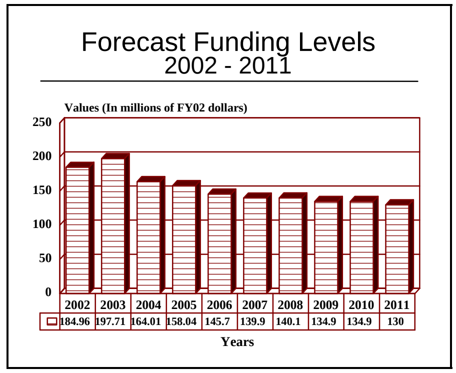
For data and forecasts on current programs please visit

www.forecastinternational.com or call +1 203.426.0800

Copernicus - Archived 02/2003

Outlook

- Funding remains strong for development and procurement
- US Navy and Marines continue on course for implementing Copernicus
- Due to the lack of specific information on Copernicus, the report will be archived in 2003. Developments on Copernicus can be followed in Forecast International's "Fleet Communications (Tactical)" report.



Orientation

Description. Copernicus is the next-generation overall computerized command, control, communications, computers, and intelligence (C^4I) architecture for the US Navy and Marine Corps.

Sponsor

US Navy
Space and Naval Warfare Systems Command
Naval Command, Control and Ocean Surveillance Center
Copernicus Project Office
San Diego, California (CA)
USA

Prime Contractor

Harris Corp
Government Communications Systems Division
PO Box 91000
Melbourne, Florida (FL) 32902
USA
Tel: +1 407 727 4000
Fax: +1 407 727 4167
Web site: www.harris.com
(Prime Contractor Communications Support System)

Contractors

Booz Allen & Hamilton Inc
8283 Greensboro Drive
Mclean, Virginia (VA) 22102
USA
Tel: +1 703 902 5000
Fax: +1 703 902 3333
Web site: www.bah.com

GRC International
(formerly Space & Sensors Associates)
1900 Gallows Road
Vienna, Virginia (VA) 22182
USA
Tel: +1 703 506 5000
Fax: +1 703 356 4289
Web site: www.grci.com

Northrop Grumman Corp
Electronics & Systems Integration Division
1111 Stewart Avenue
Bethpage, New York (NY) 11714-3580
USA
Tel: +1 516 575 5119
Fax: +1 516 575 3691
Web site: www.northgrum.com

Science Applications International Corp (SAIC)
10260 Campus Point Drive
San Diego, California (CA) 92121
USA
Tel: +1 619 546 6000
Fax: +1 619 546 6800
Web site: www.saic.com

Tiburon Systems Inc
1290 Parkmoor Avenue
San Jose, California (CA) 95126
USA
Tel: +1 408 293 4400
Fax: +1 408 293 4400

Unisys
Federal Systems
8008 Westpark Drive
McLean, Virginia (VA) 22102
USA
Tel: +1 703 556 5656
Fax: +1 703 556 5444
Web site: www.federal.unisys.com

ViaSat Inc
2290 Cosmos Court
Carlsbad, California (CA) 92009
USA
Tel: +1 619 438 8099
Fax: +1 619 438 8489
Web site: www.viasat.com

Status. Ongoing advanced development. Basic system concept is currently operational.

Total Produced. Since Copernicus is a conceptional C^4I architecture, there are no specific units to be identified as produced.

Application. Copernicus encompasses the entire US naval C^4I architecture by providing a structure for ashore, afloat and tactical information management systems.

Price Range. It's difficult to put a price tag on such a dynamic C^4I architecture. A preliminary estimate by the US Office of Naval Operations projected US$14.5 billion to be spent on C^4I systems and projects through 2000. Using budget figures from 1993 through 2005, an estimated US$1.47 billion is to be spent on the projects associated with Copernicus.

Technical Data

Design Features. The US Navy began to focus its command, control, communications, computers, and intelligence (C^4I) efforts on supporting individual ships. The overall goal appears to be implementing a strategy ensuring the compatibility of all services' C^3 programs. The US Navy's present C^4I architecture is hobbled by a number of shortfalls, especially in the communications department. The following two specific examples, identified by the Space and Electronic Warfare Directorate, illustrate some of the existing problems: a US Navy commander at sea is inundated with messages from shore (more than 33,000 sources possible) with no way of filtering out critical messages from routine traffic. Furthermore, these messages arrive in the wrong format (because of the multiplicity of narrative message types) and the wrong form (paper), thus keeping the commanders from gaining ready access to the appropriate information.

Copernicus is being developed to alleviate such chokepoints by creating a variety of computer networks to support information dissemination throughout the US Navy. These networks are also expected to provide better cooperation with the US Army. With the Copernicus architecture, the Commander-in-Chief (CINC) and the Officer in Tactical Command (OTC) will be the focal points for data, rather than the numerous shore-based data generators. The system is expected to be used throughout the entire US Navy; however, it will be reasonably limited to those communications, computer, electronic warfare, and intelligence programs used by more than one type of platform. Also, Copernicus is not expected to be used by many programs that lie outside the authority of those officials in charge of implementing it.

A variety of advances are being exploited in order to fully implement Copernicus. The SHF bandwidth is being augmented by limited, although highly automated, HF communications in order to provide intra-battle group links as well as an allied forces liaison. However, HF implementation depends on the availability of affordable HF components, as well as improved, reconfigurable SATCOM antennas. Additional memory capacity for at-sea platforms is being provided by widespread deployment of workstations and servers with an ever-increasing memory capacity. The additional memory results in lower data-transmission requirements. The coupling of dynamic bandwidth management (instead of dedicated channels) with an operating system results in efficient access to limited satellite capacity. This limited capacity was pointed out in the Persian Gulf War.

Other advances to be incorporated include the replacement of existing aged communications processors with newer and faster equipment that use more efficient message formats that emphasize binary instead of textual data. Other advances could include more efficient data-transfer techniques such as data compression and delta transmission.

The focal points of Copernicus are eight theater-wide, shore-based Global Information Exchange Systems (GLOBIXS). These GLOBIXSs collect and input information via the Defense Data Network and the Defense Satellite Communications System from various sensors and other sources. This data would in turn be analyzed through various mission-specific software tools, with the results then disseminated in a standard format to the CINC Command Complex (CCC). The latter is served by a consolidated fleet command center (FCC) that combines the functions of several existing organizations with the goal of forming a single, high-technology focus for the ashore CINC. Fourteen Tactical Data Information Exchange Systems (TADIXS) link the CCC to Tactical Fleet Command Centers (TFCCs). The TFCCS are located onboard aircraft carriers and amphibious command ships. The TADIXS takes care of command, direct targeting, force operations, and support functions.

A common workstation, the Fleet All-Source Tactical Terminal (FASTT), is used by both shore-based and shipboard command centers to handle all of the functions that presently require four independent systems. The latter are the Fleet Imagery Support Terminal (FIST), the Joint Operational Tactical System (JOTS), the Tactical Environmental Support System (TESS), and the Tomahawk Mission Display System (TMDS).

Variants/Upgrades

Advances in computer technology that allow ships at sea to process increased amounts of information have developed faster than the Copernicus concept itself. In 1995, the US Navy decided to update its strategy for Copernicus in order to keep the program current with the times. As Copernicus is being driven by the increasing power of computers, the US Navy plans to move tactical information from the commander's level down to individual ships, aircraft, and possibly weapons.

Copernicus-Forward. The US Navy, along with the US Air Force and its Horizon C^4I strategies, have shifted focus to Global Command and Control System (GCCS) and the full interoperability it would provide. Copernicus-Forward is an extension of the original Copernicus vision statement as published in 1991. It stresses a reliance on a common operating environment which allows for seamless sensor-to-shooter connections, from national-level GLOBIXS to subordinate command structures via tactical networks to forward deployed US Navy and joint command centers. The basic premise of the whole sensor-to-shooter function is to ensure that the commander can put a weapon on a target.

Program Review

Background. The advent of Copernicus addresses shortfalls that have developed over several decades. In World War II, one of the US Navy's crowning achievements was the organization of its command and control functions into a system based on the task force, with this organization largely enabling the concept of the task force itself. Using communications, the US Navy connected organic and non-organic sensors and intelligence fusion centers to the task force, which used these systems to support and develop tactical doctrine. The postwar period has been characterized by tremendous progress in C^4I technology, especially in computers and satellites, but the focus on form (i.e., technology) resulted in a growth of components all out of proportion to the overall C^4I capability. Now, the focus has shifted to a concept called operational technology, which strives to combine form with function to meld high technology with new command and control doctrine. The result is a shift in perspective from the traditional technological one to that of operations. This shift has been dubbed the Copernicus Effect, with the resultant new system dubbed the Copernicus Architecture.

The use of Copernicus refers to the Renaissance astronomer of that name who published a ground-breaking thesis that astronomical mathematics had grown so complex and full of contrived variables that it was no longer relevant. The problem he proposed was attributable, in large part, to the geocentric (earth as center of universe) focus of the era. Copernicus proposed a shift to a sun-orientated focus, thus simplifying and correcting the prevailing doctrine by maintaining that the planets orbit the sun. When applied to the US Navy, the geocentric version would be the present state of affairs with its individual shore-based sensors and their accompanying support organizations acting as individual centers of the universe.

The last two decades have brought a proliferation of dedicated communications networks (based on various formats) that supported the officer-in-tactical-command. This resulted in the creation of three basic problem areas. Poor correlation of data resulted from the networks being sensor-specific, which meant that human intervention was required in order to properly consolidate the data from the different systems. The proliferation of these nets imposed intolerable burdens on UHF communications networks, which traditionally have been in short supply. Finally, these systems were overly oriented toward addressing the Soviet threat. While some progress has been made in recent years, shortfalls still persist in the form of an inadequate communications architecture, continued proliferation of a multitude of different hardware and software, and multilevel security. Furthermore, military procurement is such that the delays, caused by various milestones, result in the fielding of systems that are a generation behind the technology of their commercial counterparts.

One of the earliest decisions made under the Copernicus concept involved the systems to be adopted through Copernicus. Systems based on pre-1985 technology were considered obsolete. These could be either upgraded or scrapped completely. All systems were to meet a 1992-94 development deadline, with work to be stopped on any strategic/global project that could not be delivered by 1995. While industry at first was quite skeptical because of the staggering costs that would be involved in replacing just the pre-1985 equipment, the US Navy's communications problems during the Persian Gulf War finally removed much of the skepticism.

During the spring of 1993, GTE Government Systems Corp and the US Navy conducted the first live, two-way video teleconference between a ship at sea and various shore-based command centers. The teleconference was conducted between the captain of the aircraft carrier USS *George Washington*, the Chief of Naval Operations, the Commander-in-Chief of US Atlantic Command, the Commander-in-Chief of the US Atlantic Fleet based in Norfolk, Virginia, and the Pentagon. The video segment was part of a six-week commercial satellite communications demonstration sponsored by GTE. The main goal of the demonstration was to show how commercial satellites can contribute to the US Navy's plan to revolutionize C^4I infrastructure under the Copernicus doctrine.

The US Navy is also de-emphasizing the traditional procurement approach of building new communications systems. The old system, building from the ground up, was changed in favor of making better use of existing communications and computer assets through such measures as procuring better desktop computers and improving data processing and management. US Navy officials estimate that hardware costs incurred under the Copernicus concept will come down by a factor of 100 or more when compared with systems that have been procured using the old custom-built-from-the-ground-up method.

PE#0204163N – Fleet Communications. This program element develops joint/combined individual and organizational message handling to US Naval ships, US Marine Corp Vans, and selected MSC and USCG platforms. Additional projects include the following: development of a fleet interface to the Defense Messaging System (DMS) and legacy ashore messaging systems, development of an architecture for an integrated naval communication system for ship-to-ship and ship-to-shore communications, the development of communications systems elements to provide command and control of deployed ballistic missile submarines (SSBNs), and development and maintenance of the Tri-Service transmission system.

<u>Project X0725 – Communications Automation</u>. This project is responsible for developing an anti-jam radio system which uses shipboard interfaces, interface mitigation, radio frequency distribution (including antennas), high-speed burst data transmission, and relocatable Very High Frequency (VHF) relay. It continues to provide automating and communications upgrades, such as the US Navy Modular Automated Communications System (NAVMACS), which automates the message receiving, distribution, and preparation functions aboard ships.

In FY97, work focused on NAVMACS, the continuation of DMS Tactical Afloat efforts, C^3 technology accommodation to include Automated Digital Network System (ADNS), integrating TAC-4 hardware, and development of connectionless protocols to support Tactical DMS Afloat. C^3, Computers, Intelligence, Sensors, and Reconnaissance analyses and studies were conducted; and connectionless protocols and the time-shared link protocol, to support DMS over various RF paths to include UHF LOS, were developed.

In FY98, activities included the continuation of FY97 projects and the development of interfaces for classified DMS (MSSI Guards). Other work was scheduled, such as the co-hosting of DMS Multifunctional Interpreter (MDI), establishing full message profiling, and integrating the co-host DMS intermediate Message Transfer Agent (IMTA).

NAVMACS II/SMS related FY99 activities continued DMS Tactical Afloat research and development efforts, provided test and evaluation of DMS components and protocols in a SMS/IT-21 network centric environment, and integrated DMS components and protocols with SMPT and other legacy protocols. Other efforts conducted in FY99 included intersystem integration and testing for shipboard SMS, and FAMIS interface testing of Smart-push/Warrior-pull with P-MUL broadcast was initiated. Accommodation to C^3 technology was continued.

The scheduled plan for work in FY00 included the continuation of Tactical DMS/SMS Afloat migration efforts, the continuation of emergent technology accommodation including the Navy Virtual Internet (NVI), and the conclusion of FAMIS interface testing. This project was also expected to conduct integration and evaluation of messaging High Assurance Guard (HAG and fleet testing of SMS).

Project X2074 – CSS. A subsegment of Copernicus is the Communications Support System (CSS), a flexible multimedia resource and circuit-sharing distributed network management architecture. It results in better data prioritization and a more even distribution of existing equipment and communications systems; it also provides a secure wide-area virtual network. The CSS allows data exchange by a wide variety of media, including voice, facsimile, video, imagery, real-time information, file transfer, and message formats. The CSS was especially critical in implementing the TADIXS, which was especially aggravated by the requirement that commercial off-the-shelf (COTS) equipment be used. (COTS reportedly has shortfalls in areas such as antenna technology, limited bandwidth, and COMSEC.) Regarding COMSEC, the CSS effort involved the National Security Agency from the start, an exception to other earlier efforts in which the agency would only be brought in at the certification stage.

In May 1992, Harris was awarded an US$8.4 million five-year contract for CSS system architecture, design and integration, communications theory, and electrical and digital design. There were three major phases of the early operational capability program. Phase I was completed and included the successful use of SHF (super high frequency) to supply interoperable expanded bandwidth.

Phase II, initiated in 1993, was believed to involve multimedia over UHF/HF line-of-sight and UHF satellite communications. Project accomplishments during this time period included completing CSS requirements for operational concept, architecture, system specification, and security policy; prototyping the initial Integrated Network Manager (INM); prototyping CSS functionality; integrating circuit switch Integrated Services Digital Network (ISDN) technology into Automated Integrated Communication System (AICS) Advanced Technology Demonstrations (ATD); developing a CSS user level encryption specification; and completing the Early Operational Capability II equipment and software prototype.

By FY94, CSS efforts had achieved the following: addition of the Light Airborne Multi Purpose Systems (LAMPS), Joint Tactical Information Distribution Systems (JTIDS), and Common Data Link (CDL) to the CSS architecture; design of the resource planning, monitoring, and management subsystem for the INM; design of the multimedia mission area subnet virtual network for Space and Electronic Warfare Commander (SEWC); exploration of Asynchronism Transfer Mode (ATM) technology for dynamic internetting; development of profiles for digital, voice, and video users; design and fabrication of the EOC III prototype; and installation and test of EOC II.

Development of an interface with the Global Grid was initiated in FY95. Other work in this time period consisted of completing planning for the Joint Network Manager Topology, finalizing Increment I Prototype of the Multilevel Security Design IAW Joint Architecture initiative, investigating in the laboratory/advanced commercial communications products, and implementing/demonstrating Internet Protocol (IP) networking and platform integrated network management via multiple media (SHF, VHF, EHF, and Line-of-Site (LOS)).

Installation and testing of the latest EOC prototype was completed during FY96. Fielding of CSS Increment I was also accomplished during this time period. Work began on the fabrication, test, and demonstration of CSS Increment II INM, including the development of the IF RF Network. Incremental design, implementation, and testing of the interface of CSS with the Joint Maritime Command Information Systems (JMCIS) continued through FY97.

The project agenda for FY97 continued incremental design, implementation of CSS and JMCIS integration, fielding support of CSS Increment II, and the fabrication test and demonstration of CSS Increment III INM, including implementation and testing of the IF RF Network.

Efforts during FY98 concentrated on building, testing, demonstrating, and supporting the fielding of ADNS Afloat Build 2.0 and Submarine Build 2.0 (a segment of JMCOMS Build). Other work focused on the building, testing, developing, and support of JMCOMS Build 3.

Installation of shore Network Operations Center Facilities with new hardware is complete. Upgrading of ship hardware began in FY99 and will be completed in FY03. Incremental hardware and software upgrades scheduled through FY03 and beyond will provide the following capabilities:

Phase 1: Upgrade ship/shore equipment with IP capable devices

- Build 1: Install IP orientated/software that meets Y2K compliance
- Build 2: Integrate voice, data, video capability

Phase 2 – Upgrade to IT21 (Information Technology for the 21st Century) Windows NT systems and complete transition to multi-media environment via JMCOMS and the Automated Digital Network System (ADNS, see separate program summary)

Project X1083 – Shore to Ship Communications System. This project develops communications system elements which provide positive command and control of deployed ballistic missile submarines (SSBNs). It also provides enhancements to the shore-to-ship transmission systems, shipboard receiver systems, and development of the Submarine Low Frequency (LF)/ Very Low Frequency (VLF) Versa Module Eurocard (VME) Receiver (SLVR) System (formerly the Advanced VLF/LF VME (AVR/VME) receiver system). Continuing evaluation of this communications system is provided via the Strategic Communications Assessment Program (SCAP). The fixed VLF/LF project is developing an energy-efficient, solid-state power amplifier for VLF shore-based transmitters of the submarine broadcast system, investigating improvement of radio frequency high-voltage insulators used in these stations through the High voltage Insulator Program (HVIP), and measuring and analyzing atmospheric noise and signal propagation through the Coverage Prediction Improvement Program (CPIP).

Project accomplishments during FY93 included continuing SCAP, HVIP, and CPIP atmospheric studies; validating the 3-D electric field prediction program and continuance of non-ceramic HVI tests and insulator studies; continuing the VLF test bed analysis; completing the SLVR System Requirements Review; beginning the Solid State Power Amplifier Replacement SSPAR Program development effort; and initiating the SLVR development effort.

SCAP, HVIP, and CPIP atmospheric studies continued during FY94. Validation of the 3-D electric field prediction program, HVIP tests, and new high-voltage Radio Frequency insulator materials investigations also continued during this time period. Other project work included converting and approving CVLF program documentation for SLVR including operation requirements documentation and the acquisition strategy report, completing the Preliminary Design Review of SLVR E&MDM, continuing the VLF Testbed Analysis, beginning SSPAR SRR, and conducting Cutler Bandwidth Enhancement reactor driver testing.

NOTE: Restructuring caused by the redirection of the project to include Planned Product Improvements (P^{3}I) for coverage of the Medium Frequency and High Frequency bands caused several SLVR schedule changes in FY94.

The Preliminary Design Review of the SSPAR Engineering and Manufacturing Design Model (E&MDM) was conducted during FY95, as was the Critical Design Review for SSPAR. Development of software documentation of coding for SLVR, custom hardware for SLVR, and the crypto interface capability efforts continued throughout the year. Other efforts focused on conducting the Critical Design Review for SLVR; continuing SCAP efforts, the VLF Test Bed Analysis, CPIP atmospheric studies, HVIP insulator; and design and development of SSPAR E&EMD, including continuing with the CDR, and starting prototype fabrication.

SLVR Lab testing and assessment were conducted in FY96. Work continued on SLVR CSS Phase I integration, VLF Test bed analysis, SCAP, and evaluation strategic communications. SSPAR E&MDM hardware and software integration and factory tests were slated to be completed during this time frame and installed at the Naval Radio Transmitting Facility at Jim Creek. HVIP insulator and bushing development and test continued.

TECHEVAL and OPEVAL for SLVR were scheduled to be completed in FY97, followed by the achievement of Milestone III. SLVR CSS Phase I integration was also scheduled to be completed by the end of FY97. Work on SCAP continued through the year. The VLF Testbed Analysis was canceled as a result of FY97 funding reductions. By the end of the year, SSPAR E&MDM on-site testing was slated to be completed. Other project work focused on starting high-voltage and antenna component development and testing.

Efforts for FY98 focused on continuing high voltage and antenna component development and testing. A Follow-on Test and Evaluation of SLVR, integration, and test of the KG-38 replacement was planned, with CSS Phase II integration also scheduled during this time period. Like many of the efforts initiated in FY98, both SCAP work and the evaluation of CEP continued into FY99.

Along with continuing FY98 projects, the FY99 work schedule included installing and testing the SSPAR Engineering and Manufacture Development (EMD) Model.

Activities for FY00 included the continuation of high-voltage and antenna component development and testing, the continuation of ELF and Signal Processing integration into SLVR development, the commencement of SCSS 01.0 Phase integration and implementation, the continuation of SCAP, and the conduction of continuing evaluations (CEP).

Project X0795 – MEECN. This project, Minimum Essential Emergency Communications Network

(MEECN), is the Tri-Service transmission system which ensures delivery of Emergency Action Messages (EAM) to strategic platforms. This project identifies, researches, and develops improvements to the MEECN primarily in the Very Low Frequency and Low Frequency (VLF/LF) ranges of the network.

For the FY98/99/00 period, MEECN funding averaged US$0.622 million. Therefore, this project is not included in the **Funding** section because of its low amount. However, the main focuses of the project are listed below.

In FY98, numerous activities were planned, with the focus being the completion of MITB development, the continuation of Turbo Code application to MEECN codes, the continuation of atmospheric noise data collection and analysis, support of SLVR (the Modified Miniature Receive terminal (MMRT) MEECN Message Processing Mode (MMPM) and the High Data Rate (HIDAR) mode certification testing), the continuation of crypto replacement coordination, and the development/update of Naval Command, Control, Communications, Computers, Intelligence, Sensors, and Reconnaissance (C4ISR) implementation guidance.

The scheduled activities for FY99 included the continuation of Turbo Code application to MEECN Modes, the initiation of improved MEECN Mode development, the initiation of study for the integration of NONAP and Signal Separator AJ algorithms, the investigation of HIDAR/Block II compatibility, and the continuation of crypto replacement coordination.

The planned MEECN project activities for FY00 included the following: completing Turbo Code application to MEECN Modes, continuing the development of improved MEECN Mode, continuing the NONAP and Signal Separator AJ algorithms integration study, and continuing the crypto replacement coordination effort.

Funding

Specific funding information is not available because of the conceptual nature of the program. While a figure of US$14.5 billion has been bandied about in reference to the Copernicus program as a whole, it actually refers to preliminary estimates by the Office of Naval Operations of projected C4I expenditures through the year 2000.

A few of Copernicus's specific projects do have individual project funding within Program Element #0204163N Fleet Communications.

US FUNDING

	FY98		FY99		FY00		FY01(Req)	
	QTY	AMT	QTY	AMT	QTY	AMT	QTY	AMT
RDT&E (US Navy)								
PE#0204163N								
Fleet Communications:								
Project X0725 Communication Automation	-	1.60	-	1.73	-	2.62	-	3.35
Project X2074 CSS	-	1.75	-	0	-	0	-	0
Project X0795 Support of MEECN	-	0.48	-	0.70	-	0.69	-	0.56
Project X1083 Shore to Ship Comm. Sys.	-	12.13	-	12.43	-	8.07	-	8.12
Total	-	15.96	-	14.86	-	12.01	-	12.03

	FY02(Req) QTY	FY02(Req) AMT	FY03(Req) QTY	FY03(Req) AMT	FY04(Req) QTY	FY04(Req) AMT	FY05(Req) QTY	FY05(Req) AMT
Fleet Communications:								
Project X0725 Communication Automation	-	2.90	-	1.96	-	2.01	-	2.07
Project X2074 CSS	-	0	-	0	-	0	-	0
Project X0795 Support of MEECN	-	0.52	-	0.70	-	0.74	-	0.76
Project X1083 Shore to Ship Comm. Sys.	-	6.84	-	7.05	-	7.65	-	7.42
Total	-	10.26	-	9.71	-	10.40	-	10.25

All US$ are in millions.

Source: Department of the Navy, Fiscal Year 2001 Budget Estimates, February 2000

Recent Contracts

As Copernicus is composed of several segments, some which are full-scale programs in their own right, specific contracts have been difficult to identify. The following contracts are believed to be involved with the Copernicus effort:

Contractor	**Award ($ millions)**	**Date/Description**
Space & Sensor Associates	20.8	Apr 1996 – Indefinite delivery/indefinite quantity, time & materials contract for technical support services for C^4I. Completed March 1998. (N00039-96-D-0074).
Booz Allen & Hamilton	6.9	Dec 1996 – CPFF contract to provide technical and engineering support services for the C^4I systems for the US Navy Space & Naval Warfare Systems Command in Arlington, Virginia. The services include mission and technology analysis, procurement planning, management and data analysis, interface analysis, logistics concept formulation, technical support, and software support. This contract includes options which, if exercised, would bring the cumulative value of this contract to US$35.1 million. Contract is expected to be completed by September 2001. (N00039-97-C-0039).
Logicon	9.8	Sep 1998 – Modification to a previously awarded contract (N00244-96-C-5078) for technical support services for standard design engineering, analysis, developmental and certification testing, test operations analysis report and configuration management as they pertain to C^4I systems at the US Navy Center for Tactical Systems Interoperability. Contract completed September 1999.

Timetable

Month	**Year**	**Major Development**
Sep	1990	Program initiated
Jun	1992	CSS Early Operational Capability (EOC) Phase I became operational
Jul	1992	First ship-to-shore teleconference completed
	1993	New STM for CSS introduced
Mid	1993	CSS EOC Phase II initiated

Month	Year	Major Development
Mid	1994	CSS EOC Phase III initiated
Mid	1995	CSS EOC Phase IV initiated
	1996	Fielded CSS Increment I
2Q	1997	SLVR TECHEVAL & OPEVAL
2Q	1998	SLVR Milestone III slipped as a result of software design issues involving Fiber Data Distributed Interface and timing interfaces which have now been corrected
	1999	Integrated Broadcast DMS

Worldwide Distribution

At the present time, Copernicus is primarily a **US Navy** program.

Forecast Rationale

The US Navy and Marine Corps' Copernicus program is an overall computerized command, control, communications, computers and intelligence (C^{4}I) architecture designed to be responsive to the warfighter. This architecture aims to capitalize on advances in technology, to field these systems quickly, and to shape the US Navy's doctrine to reflect these changes.

There is not one particular program element in the US Navy Budget specifically for Copernicus. Most of the activity for Copernicus is found under PE#0204163N – Fleet Communications. This PE is broken down into four projects: Project X0725 – Communication Automation, Project X2074 – Communication Support Systems, Project X1083 – Shore-to-Ship Communications System, and Project X0795 – Support of MEECN.

Full descriptions of these projects are in the **Program Review** section of this report.

As the Copernicus program matures, RDT&E activities are expected to decrease while procurements are likely to increase. The development of other unknown projects relating to Copernicus is possible as the program progresses. New technologies or combat scenarios could demand additional dimensions to the Copernicus C^{4}I architecture. Copernicus in still in its infancy and is expected to have a healthy life cycle. Although funding for projects in support of Copernicus will continue in the years to come, this report will be archived next year. A separate report titled "Fleet Communications (Tactical)" is issued with the Forecast International C^{3}I binder service.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR FUNDING ($ in millions)

			High Confidence Level			Good Confidence Level			Speculative				
Designation	Application	Thru 01	02	03	04	05	06	07	08	09	10	11	Total 02-11
COPERNICUS	C4I PROCUREMENT	546.530	174.700	188.000	153.600	147.800	136.000	130.000	130.000	125.000	125.000	120.000	1430.100
COPERNICUS	C4I RDT&E	232.841	10.259	9.705	10.406	10.244	9.700	9.900	10.100	9.900	9.900	10.000	100.114
Total Funding		779.37	184.96	197.71	164.01	158.04	145.70	139.90	140.10	134.90	134.90	130.00	1530.21