THE SUBMARINE TRAINING MASTER PLANNING SYSTEM

John B. Kirton, Jr.
Naval Underwater Systems Center
Code 2243, Building 1259
Middletown, Rhode Island 02840

ABSTRACT

A number of data bases and information systems have been designed and implemented to address various facets of submarine and surface training. These, heretofore, independent systems provide support for management of funding, resources, courses plus current and projected configuration data for fleet Combat Control Systems. The Submarine Training Master Planning System (STMPS) is being developed to selectively integrate the data collected and managed by these existing systems into a comprehensive, cohesive system that will provide senior managers with the tools to assess the current state of the submarine training community, make maximum use of resources through re-programming, perform comparative and "what-if" analyses and forecast long-term submarine training resource requirements. A prototype STMPS is projected to become operational in early 1989.

STMPS is being implemented using a variety of "off-the-shelf" computer hardware and software products to provide standard report generation, canned query capability, business graphics, facility layouts, electronic mail and ad hoc querying. Even the data is "off the shelf". In virtually every case, the STMPS development team is using data and/or reports that are currently available within the submarine training community. What is new however, is that the STMPS development team is screening this data, matching "similar" data from independent systems and normalizing the data so that it can be integrated and provided to senior managers for planning purposes.

This paper will review the STMPS charter, document the STMPS management, development and user organizations, describe the methodology being used to develop STMPS and present the capabilities that STMPS users can expect to receive.

INTRODUCTION

Within the next two decades the Submarine Force will undergo its most dramatic transition since the late 1950's and the advent of nuclear propulsion and strategic weapon systems. To counter the increasing numbers of threat platforms and the rapid growth in threat capabilities, the number of U.S. submarines and crews will increase over the next ten to fifteen years. Submarine weapons systems will become vastly more complex. The submarine Force will continue its progression from POSEIDON to TRIDENT, and from PERMIT and STURGEON to LOS ANGLES an SSN-21 Class submarines. Major advances will be made in weapon systems as evidenced by TRIDENT I1, SUBACS, and TOMAHAWKS. Achievement of these major advancements with a concurrent and progressive manpower, personnel, and training (MPT) program will demand considerable expertise and farsightnedness from our submarine MPT managers.

Due to rapid advances in technology, unique and lengthy technical training has become a necessity for most submarine personnel and extensive team training is required to ensure effective use of today's complex sensors, weapons, command and control systems. The expansion of submarine training dictated by these factors has led to more new classrooms, trainers, and equipment to handle the increased training load. At the same time, more funds have been required to maintain existing but aging facilities, trainers and equipment. Submarine MPT requirements continue to represent an ever increasing percentage of the overall resources available for the Submarine Force.

This situation has prompted the Deputy Chief of Naval Operations (Submarine Warfare) (OP-02) to examine the manner in which training policies and concepts are established, training resources acquired, and training effectiveness assured. CNO (OP-02) has concluded that gains could be made through development of an authoritative long range training planning system, to be called the Submarine Training Master Planning System (STMPS) which will: provide for analysis and determination of long range MPT requirements; assist Submarine Force leaders in the development of cost effective training concepts and policies; provide analysis tools which stay current with the Planning, Programming and Budgeting (PPBS) cycle, reflecting at all times, the best known plans for the future. STMPS can also be used to provide specific justification for programmed resources and to define the impact of budget reductions proposed during the budget review process. The system will be the prime vehicle for development and submission of new POM requirements to CNO. Submarine MPT requirements are linked directly to the present and projected submarine force levels, composition and modernization plans. STMPS will provide tools to keep MPT planning current with CNO approved plans for both strategic and general purpose (attack) submarines.

There are a considerable number of MPT related data bases and computer based information systems presently in existence. Most of

these were developed for localized, special purposes and have not been widely distributed. Collectively, this data represents the best available information for developing long range plans, however, each activity is responding to local direction for the design, administration and operation of these data bases. STMPS is establishing an integrated, cohesive data structure to enable senior managers to correlate information gleaned from these, heretofore, independent systems. A summary of the data base systems being used by STMPS is provided later in this paper.

STMPS ORGANIZATION

The STMPS project organization chart shows the sponsor, management and development team relationships. The development contractor is ORI, Inc. The STMPS executive board meets periodically to establish goals and objectives and review project status. Various members of the develoment team correspond informally on a continual basis and meet at least monthly on a formal basis for technical reviews. The projected user community for STMPS will encompass representatives from the submarine training activities, training functional commands, training branches within the Type Commander and Systems command staffs, and the submarine training managers at the Chief of Naval Education and Training (CNET), the Naval Military Personnel Command (NMPC) and the Office of the Chief of Naval Operations (OPNAV). The following user activities were represented at the STMPS User Review Group meeting conducted during 26-28 January, 1988:

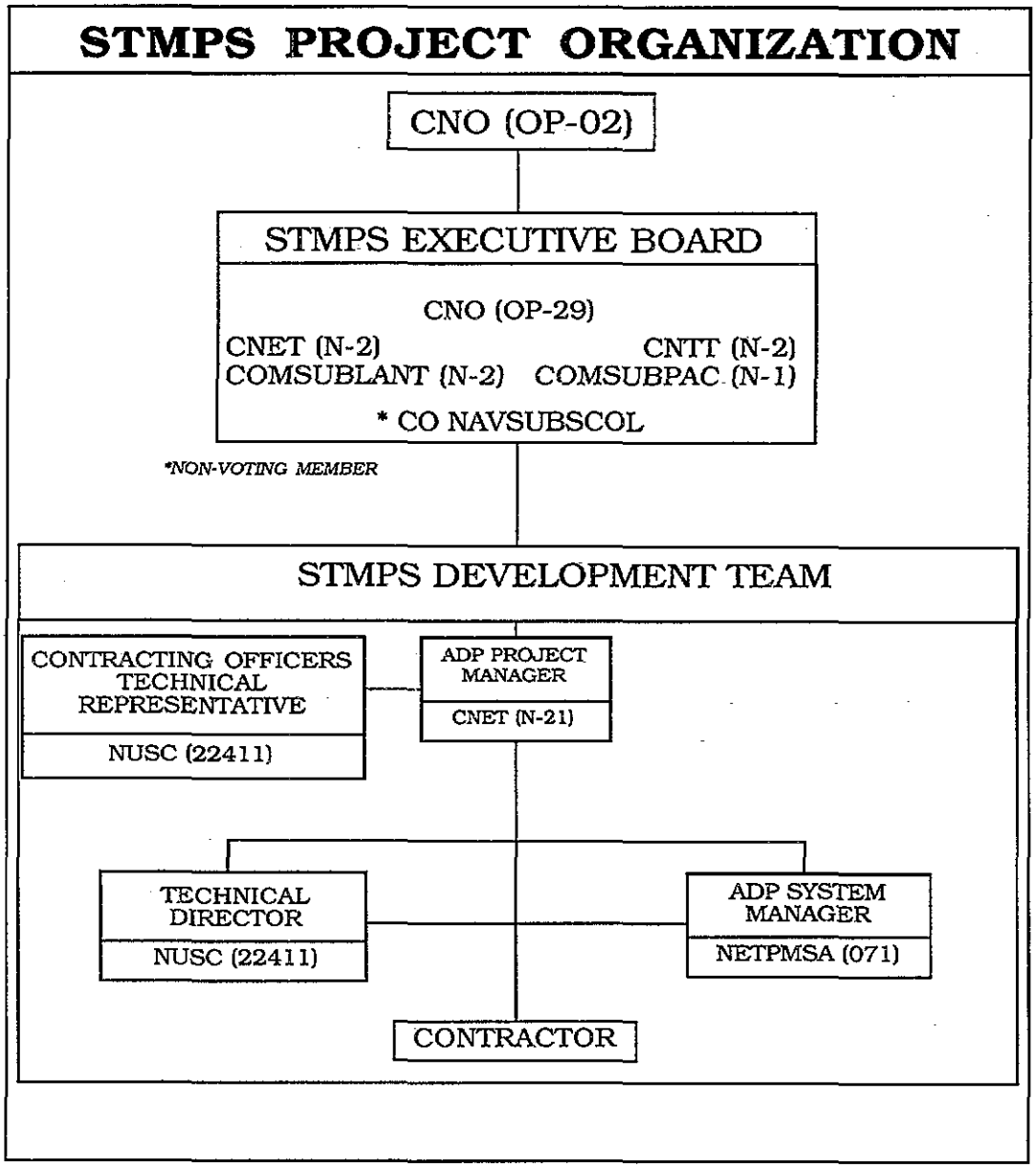
CNO OP-29, Washington, D.C.
CNET, Pensacola, FL
CNTECHTRA, Memphis, TN
COMSUBLANT, Norfolk, VA
COMSUBPAC, Pearl Harbor, HI
NAVGMSCOLDET, Norfolk, VA
NAVSEA, Washington, D.C.
NAVSUBSCOL, New London, CT
NAVSUBTRACENPAC, Pearl Harbor, HI
NTSC, Orlando, FL
Strategic Systems Program Office, Washington, D.C.
TRITRAFAC, Bangor, WA
TRITRAFAC, Kings Bay, GA

DEVELOPMENT STRATEGY

STMPS development has been conducted and documented in accordance with DOD Standard 7935 for Automated Data Systems Documentation and NAVDAC Publication 24.1, ADP Project Management Practices and Procedures. Among the fundamental precepts established for the development of STMPS were: this would be a system designed by functional people and implemented by ADP people; the need for additional reporting requirements would be minimized by making maximum utilization of existing Navy documents, publications, procedures and data base systems; "off-the-shelf" hardware and software is to be used whenever practical; and that a prototype system was to be delivered for "hands on" use and evaluation by a subset of the user community before full implementation.

Development Contractor Selection Criteria

ORI, Inc. was competitively selected as the development contractor because of their background and experience related to submarine training resource planning and acquisition. The principal functional system designers are all qualified submarine officers and Navy instructors with extensive Navy manpower, personnel and training experience including policy formulation at the OPNAV level.
Naval Operations (OPNAV). The following user


STMPS PROJECT ORGANIZATION
CNO (OP-02)
STMPS EXECUTIVE BOARD
CNO (OP-29)
CNET (N-2)
CNTT (N-2)
COMSUBLANT (N-2)
COMSUBPAC (N-1)
* CO NAVSUBSCOL
*NON-VOTING MEMBER
STMPS DEVELOPMENT TEAM
CONTRACTING OFFICERS TECHNICAL REPRESENTATIVE
NUSC (22411)
ADP PROJECT MANAGER
CNET (N-21)
TECHNICAL DIRECTOR
NUSC (22411)
ADP SYSTEM MANAGER
NETPMSA (071)
CONTRACTOR

Software/Hardware Selection Criteria

The development team realized that the data elements that we decided to track would undoubtedly change over the course of the development cycle and even after the system was delivered. This suggested that we wanted to use a relational data base management system. ORACLE was chosen because of its rich collection of utilities and transportability. The WANG VS-100 was chosen as the mainframe because of the central site host's (Naval Education and Training Program Support Activity) expertise and favorable pricing scheme. Selection of Zenith's Z-248 personal computer was based upon economics and the desire to be compatible with the hardware already in place at the various user sites.

Development Chronology

The development team compiled a set of basic products that the system should be able to provide based upon their own experience and guidance from OP-29 and CNET-N21. They also surveyed existing submarine training data bases to establish that these products could, indeed, be generated if the data were made available. A demonstration package consisting of proposed reports, queries and graphs was then developed and presented to potential users. A prototype data base structure was designed based upon the inherent data element relationships, the ability of this structure to support the basic output products and the ability of the staff to maintain this data base from existing Navy data base systems.

A formal set of proposed output products was developed and presented at a STMPS User Review Group meeting in January 1988. The purpose of the meeting was to provide the user community with a project status and to review the proposed products and rate them as highly desirable, nice to have or useless. The ADP development of the products were then prioritized based upon the compilation of these ratings.

Memoranda of agreements were established with appropriate data system custodians to ensure the availability of the data elements throughout the life cycle of the project. By early 1988, the development team had a data base structure, a prioritized list of output products to be developed and access to sufficient hardware and software to begin initial ADP development on personal computers. By late Winter/early Spring full-scale ADP development was underway on the local personal computers and the host site mainframe. Monthly technical reviews were held to assess progress, put out fires and approve and document adjustments to the data base structure. A comprehensive set of management and technical documentation has been developed and maintained throughout this process and consists of a Concept Document, a Functional Description, a Data Base Report and a System Specification as well as many other supporting documents, reports and survey results.

STMPS COMPONENTS

STMPS consists of a number of components all of which are required to provide for a successful system. The chief component of any system of this nature is the expertise and attitudes of the management staff (CNET-N21) and ADP operations staff (NETPMSA-071) responsible for the care and feeding of the data base. In addition, STMPS consists of the following:

Hardware

Central Site

- WANG-VS100 mainframe; 16 MB memory, 932 MB disk storage
- asynchronous device controller/modems to support 8 dial-up users
- magnetic tape drive
- 1100 line per minute band printer
- Hewlett Packard color plotter
- Z-248 PC; 640 KB memory, 2.6 MB extended memory, 120 MB disk storage
- 20 MB removable cartridge disk drive
- EGA color monitor

Remote Site Workstations

- Z-248 PC; 640 KB memory, 2.6 MB extended memory, 120 MB disk storage
- EGA color monitor
- color graphics printer
- 20 MB removable cartridge disk drive
- 9600 baud modem

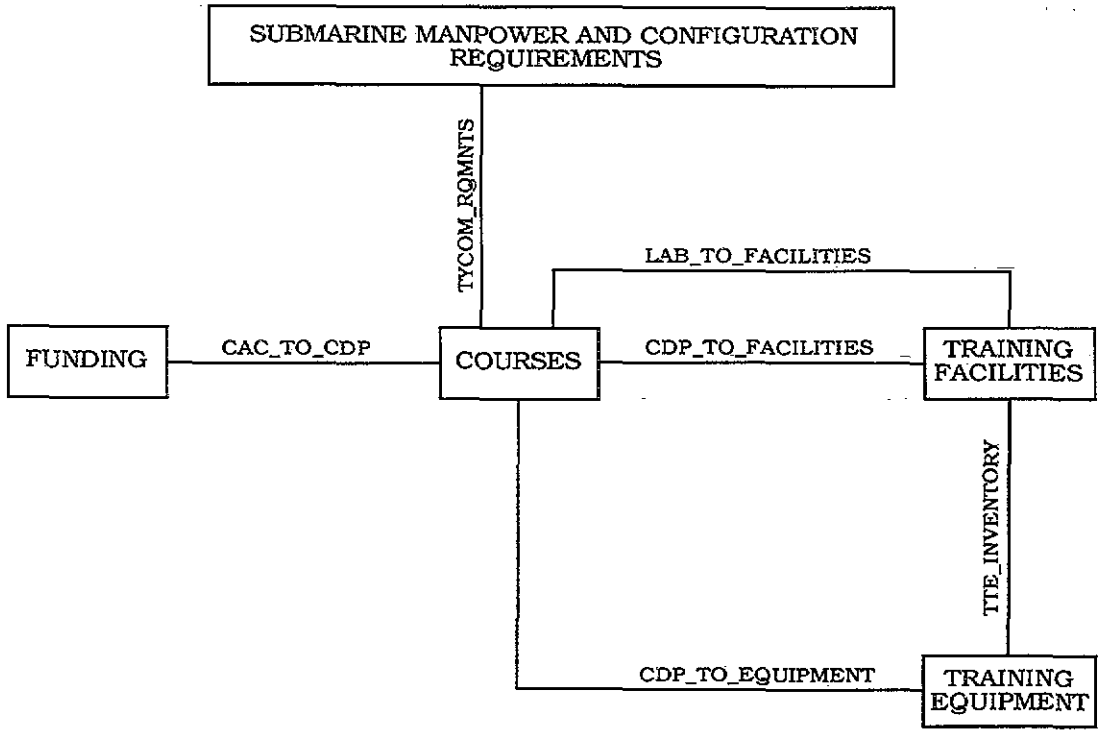
Software

- Data Base Management System: ORACLE (both mainframe and PCs)
- Procedural Language: C
- Graphics: CADKEY/HALO/EASY*SQL

Data Base Structure

The global STMPS data base architecture is depicted on the following chart. The grouping of data by modules is for documentation purposes only. It is possible to group any data element in any module with a data element from any other module via the ad hoc query language. The tables that comprise each module are presented here to provide a general flavor for the kind of data being tracked within the system. A complete description of every table and each data element is available in the STMPS data dictionary. The miscellaneous tables listed under the "Data Base Administration" heading are not easily pigeonholed into any particular module but are, nevertheless, an integral part of the data base. The tables listed under the heading "Linking" don't belong to any one module but rather, provide logical bridges from one module to another e.g. CDP_to_Equipment contains data that relates to equipments that are used during a particular course.

GLOBAL STMPS DATA BASE ARCHITECTURE



Submarine Manpower and Configuration Requirements Module

- Ship Configuration Descriptions
- Ship Configuration Time Series (i.e. Current and projected configurations)
- Ship_Manpower
- Shore_Civilian_Manpower
- Shore_Officer_Manpower
- Enlisted_Manpower

Courses Module

- Course Identification Numbers (CINs)
- Course Data Processing Numbers (CDPs)
- CDP_Time_Series
- Skill_Pipelines
- Skills_to_Train
- CDP_Lab_Descriptions
- Lab_Time_Series

Training Facilities Module

- Buildings
- Rooms

Training Equipment Module

- Equipment_Overhaul_Planning

Funding Module

- Activity_Groups
- Budget_Time_Series
- Cost_Account_Subactivity_Groups
- CPATS_Program_Description
- CPATS_Program_Changes
- CPATS_Program_Time_Series
- CPATS_Expense_Elements
- Sub_Activity_Groups

Data Base Administration Tables

- Homeport_to_Training
- Department_Names
- Geographical_Location_Names
- SEA_Tours
- User_Identification_Code (UIC)

Linking Tables

- CDP_to_Equipment
- CDP_to_Facility
- CAC_to_CDP
- LAB_to_Facilities
- TTE_Inventory

Data Flow

Data is periodically collected from each of the Navy Data Base Systems listed below, screened for accuracy and completeness and split into adds, changes and deletes. After the updates have been applied to the data base, affected STMPS projections are recalculated using the algorithms, procedures and planning factors listed below. The central site data base is then distributed to the various user sites on magnetic media. Some user sites receive the complete data base (e.g. OP-29) and some sites receive only the portions of the data base that relate to their individual activity.

Source Data Base Systems

The following Navy data base systems provide data for STMPS use:

- CAMPRS-CNET Automated Manpower Resources System
  The purpose of CAMPRS is to track and store manpower allocated to the CNET claimancy and to permit maintenance of the up-to-date manpower status. Manpower change requests received and approved by CNET are entered into CAMPRS as they are forwarded to CNO (OP-01) for ultimate approval and update of the Navy Manpower Data Accounting System (NMDAS). The managing agency for CAMPRS is NETPMSA.
- CANTRAC-Catalog of Navy Training Courses
  This system tracks information related to every Navy training course. It resides at Wright-Patterson AFB, Dayton, Ohio and is managed by NETPMSA.
- CENTRA-Centralized Training Equipment Management System
  This system tracks technical training equipment requirements being utilized to accomplish Navy formal training. The data base system is managed by NETPMSA.
- CPATS-CNET Program and Tracking System
  This system provides resource tracking of functional program resources from POM identification through budget execution. The system is managed by and located at NETPMSA.
- NFADB-Navy Facilities Assets Data Base
  NFADB provides a central repository for information on owned and leased real property used by the NAVY. The system is managed and located at the Facilities System Office (FACSO), Pt. Hueneme, CA
- NITRAS-Navy Integrated Training Resources and Administration System
  NITRAS is an automated system for management and support of all Navy formal training which has been identified within the Navy training command structure. This system is managed at NETPMSA.
- NMDAS-Navy Manpower Data Accounting System
  This system is used to maintain the Navy's authoritative statement of the quantity and type of billets assigned to each Navy activity. It is managed by CNO (OP-12G) and CNMPC (NMPC-1642) and located at NMPC, Navy Annex Arlington, VA.

STMPS Data Grouped by Source

The following table lists the relative proportions of the STMPS data base projected to be provided by the various Navy data bases. The entry labeled STMPS refers to data calculated by or obtained via table lookups by the STMPS software, loaded by the development team on a one time basis or requiring routine maintenance. This data was derived by grouping all data elements by their respective data source after multiplying the estimated number of records for each table times the number of data elements in that table that are provided by a particular source.

SOURCE	% STMPS
CAMPRS	1.2
CANTRAC	13.1
CENTRA	2.1
CPATS	23.7
NFADB	0.1
NITRAS	20.1
NMDAS	5.1
STMPS	33.3

Procedures and Algorithms

Normalization of UICs

Every Navy training site, ship, etc. has a User Identification Code (UIC) assigned to it. Some activities have multiple UICs, i.e., one for its mission, one for funding and one for training. During the data base design phase it became obvious that various source Navy data base systems tracked the UIC that related most closely to the particular mission that the data base system was tasked to support. CPATS tracks funding UICs (e.g. NAVSUBSCOL, NLON-00750), while NITRAS is tracking student UICs (e.g. NAVSUBSCOL, NLON-30565) for the same entity. Therefore, when data is processed by STMPS software, normalized UICs are assigned to the source data UICs providing a transparent linch pin between data modules that would otherwise be independent.

Annual Training Input Requirements (ATIR)

The ATIR calculation procedures are used to determine the number of students that must enter a particular pipeline each year in order to achieve a specified number of trained personnel. These procedures are used by the Navy and the Marine Corps and are documented in the Navy Training Plan Manual (OPNAV P-111-1-86). STMPS software provides for three methods of generating ATIR projections. The first method relies on ship manpower Navy Enlisted Classification Code (NEC) requirements and homeport information stored in the data base. The second method provides for STMPS central staff intervention in establishing input parameters. The third method is available to users as part of a "what-if" capability being provided as part of the workstation.

Planning Factors and Assumptions

All planning factors and assumptions embedded within the STMPS software have been documented in an enclosure letter from the Chief of Naval Education and Training, CNET-N21, serial number 1500 dtd 27 May 1988. Among the types of factors addressed are: assumptions for various course attributes (i.e. capacity, student/instructor ratios, complexity factors) during outyear projections and rules governing limiting resource factors (personnel, equipment or space) on capacity assumptions for course convening estimates.

STMPS CAPABILITIES

STMPS offers an extensive variety of tools for processing, analyzing and presenting submarine training data. Analysts have the opportunity to use software developed for specific purposes to generate formal reports and view graphic representations of preselected variables via a menuing hierarchy that provides access to the STMPS approved data base. Some users will elect to use canned reporting and graphic commands to analyze data that they have modified or created themselves based upon local knowledge, while others may create their own reports and charts using the ad hoc query language and graphics package. All users will be able to communicate with any other STMPS user via the electronic mail facility. The following sections are included to describe a few of the STMPS products that will be available to all users. A complete list of products and sample formats is contained in the STMPS User's Manual.

In a previous related effort, CNO (OP-02) directed the development of a Submarine Training Activity Management Plan (STAMP) for each submarine training site. These STAMPs address the assets required to support planned training courses at each site and identify increments and decrements of courses, graduates, instructor requirements and operating funds. Initial STAMPs have been completed for the six submarine training sites. A Consolidated STAMP (CSTAMP) which summarizes STAMP data for all sites is under development. The STAMP and CSTAMP efforts are now consolidated with and will remain an integral part of STMPS.

Reports

Standard reports can be categorized as follows:

Courses - course details selected by CDP number or CIN/UIC; course title, location, length, complexity, frequency, NEC, prerequisites and purpose are all listed

Requirements - reports in this category will provide configuration levels by homeport, Type Commander requirements

Resources ing activity - these reports will contain training manpower, equipment/device locations and requirements for courses.

Graphics

Graphics are available in three basic styles:

Business

Line graphs, bar and pie charts are all availabile for variables such as: the number of courses available at an activity for the next 7 years; planned, actual and projected student populations at an activity for some specified number of years; current and projected FCS/CCS configurations grouped by homeport for the next 10 years; summary of officer billets for the next 5 years grouped by activity.

Facilities

Facilities graphics consist of floor plans for trainers and labs and overall activity diagrams showing building locations.

Pipelines

Pipelines can be displayed graphically showing prerequisites, component courses and NEC awarded.

Ad Hoc Queries

Any collection of data elements can be accessed, grouped and formatted by any STMPS user via the query language. The STMPS User Manual contains instructions on how to use the query language and a detailed layout of the data base. Users can develop their own library of queries to be applied to STMPS approved data and/or data that they have modified or created. Consider the following example of a question that would give rise to an ad hoc query. Suppose an activity is faced with a budget cut or loss of vendor support for maintenance of a particular training device. What NECs and, therefore, what shipboard configurations would be jeopardized.

What-if

As previously stated throughout this paper, users have an opportunity to change any data element in their local copy of the data base in order to apply local knowledge or develop "what-if" scenarios to be applied to existing or ad hoc output products. Consider the following questions: What is the impact on training (i.e. number of trainees per year, equipment and facilities requirements) if the current CCS upgrade schedules are accelerated or delayed by 6 months, 2 years, etc. These questions can be analyzed by adjusting the local copies of the appropriate tables in the Submarine Manpower and Configuration Module and applying the ATIR software algorithm.

E-Mail

Any STMPS dial-up user can send or receive electronic mail to/from any other STMPS user via the electronic mail facility hosted at the central site.

CONCLUSION

This paper has been written to provide an overview of the STMPS project including the charter, development team composition and development strategy. Also included have been a description of the STMPS components and capabilities. The project is currently on track and a prototype system is expected to become operational in early 1989. The development team has consistently resisted the temptation to compromise functional requirements to ease the procurement process or ADP development efforts and is well along towards providing senior MPT managers with tools to support the decision making process.

REFERENCE

DOD Standard 7935 Automated Data System Documentation
NAVDAC Publication 24.1 ADP Project Management Practices and Procedures
OPNAV P-111-1-86 Navy Training Plan Manual
STMPS CONCEPT DOCUMENT dated March 1986
STMPS FUNCTIONAL DESCRIPTION dated July 1987
STMPS DATA BASE REPORT dated March 1986
STMPS SYSTEM SPECIFICATION dated February 1988

ABOUT THE AUTHOR

Mr. John B. Kirton, Jr. has worked at the Naval Underwater Systems Center for 20 years. He has developed information systems that support a variety of engineering disciplines and has consulted on several others. He holds a BS in Mathematics from the University of Massachusetts.