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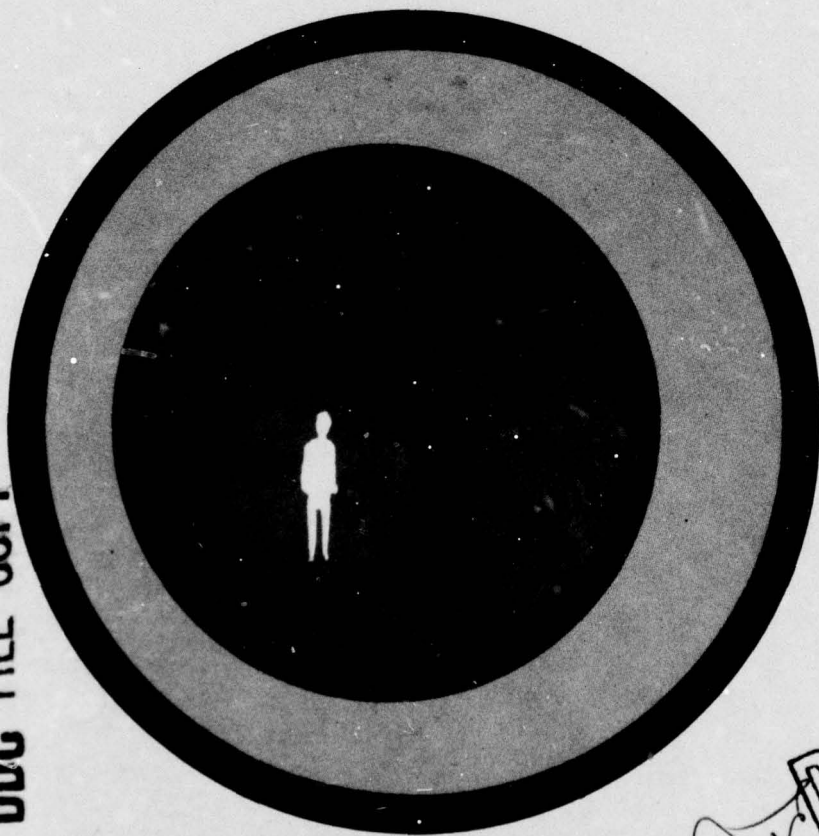
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TRAINING
ANALYSIS
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GROUP

TECHNICAL MEMORANDUM 77-3

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TRAINING REQUIREMENTS FOR THE NAVAL TECHNICAL
INFORMATION PRESENTATION PROGRAM: A NEEDS ASSESSMENT



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TRAINING ANALYSIS AND EVALUATION GROUP

ORLANDO, FLORIDA 32813

Technical Memorandum 77-3

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A Needs Assessment

Richard Braby, Ed.D.

Training Analysis and Evaluation Group

April 1977

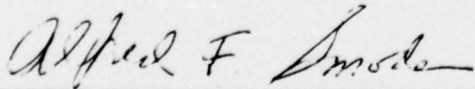
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David W. Taylor Naval Ship Research and Development Center,
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Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER Technical Memorandum 77-3	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) TRAINING REQUIREMENTS FOR THE NAVAL TECHNICAL INFORMATION PRESENTATION PROGRAM: A NEEDS ASSESSMENT.		5. TYPE OF REPORT & PERIOD COVERED Final Report Apr 1976 - Apr 1977
7. AUTHOR(s) Richard Braby, Ed.D.		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS Training Analysis and Evaluation Group Orlando, FL 32813		8. CONTRACT OR GRANT NUMBER(s) 14/TAEG-TM-77-3
11. CONTROLLING OFFICE NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		12. REPORT DATE Apr 1977
		13. NUMBER OF PAGES 94
		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution is unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Technical Manuals Classroom Training Maintenance Handbooks Onboard Training Textbooks Training Manuals Factory Training		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The purpose of this memorandum is to establish a dialogue between representatives of the Naval Technical Information Presentation Program (NTIPP) and the Naval Education and Training Command regarding the design of technical manuals (TMs) to better support training programs. Four broad issues which address Training Command interests in NTIPP are presented. For each issue background information is provided and one or more tentative recommendations are made.		

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20. ABSTRACT (continued)

The issues and recommendations are directed to various representatives of the NTIPP and the Training Command. Managers of NTIPP at the Naval Ship Research and Development Center (NSRDC) will find a general list of the training community needs and concerns related to TMs. Other groups will have an interest in specific issues and recommendations. The NTIPP project personnel will note a series of unresolved issues concerning the development of maintenance handbooks to better support classroom training, onboard training, and factory training. Personnel at CNET should note the need to sponsor a series of position papers to be presented to the Technical Manual Management Policy Council. School managers will find tentative recommendations on how they can participate with the Systems Commands in the development of maintenance manuals. Managers in the Program Development Center (PDC) will find a recommendation for a joint NTIPP/PDC design study to describe a state-of-the-art publishing system to reduce the cost of producing training manuals.

5/N 0102-LF-014-6601

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SECTION I

INTRODUCTION

The purpose of this memorandum is to establish a dialogue between representatives of the Naval Technical Information Presentation Program (NTIPP) and the Naval Education and Training Command regarding the design of technical manuals (TMs) to better support training programs.

The NTIPP is a Chief of Naval Material/Systems Command (CHNAVMAT/SYSCOM) program to improve maintenance handbooks and other types of technical data provided with new Navy equipment. The output of this 5-year, multi-million dollar program will be improved specifications, standards, procedures, media and formats for use in the production of TMs and a plan for a publishing system incorporating state-of-the-art word processing techniques for authoring, composing, typesetting, and printing.

The Naval Education and Training Command is a major user of maintenance handbooks and other types of TMs. More than half of all Navy shorebased training courses use maintenance handbooks as textbooks. The Naval Education and Training Command also publishes its own training materials. Included are rate training manuals, advancement in rate examinations, correspondence courses, programmed instruction modules, and Personnel Qualification Standards (PQS). It is estimated that by the early 1980's the Naval Education and Training Command's annual requirement for printed material could be over 1½ billion pages. The rising cost of producing manuals is of great concern to the Training Command. Ways of increasing the efficiency of production and use of TMs are being investigated.

Cost reductions in training maintenance technicians can be achieved through the use of more efficient maintenance handbooks. The handbook design impacts training costs in two ways. First, the complexity of the maintenance technician's job can be simplified through the use of innovative TM formats, such as "job performance aids" and "work packages." A simplified job structure requires less training time and reduces training costs. Second, the adequacy of the TM as a textbook on a piece of equipment is affected by the scope and accuracy of its content. Better TMs result in fewer pages of supplementary training materials and, therefore, reduced costs.

Four broad issues which address Training Command interests in NTIPP are presented in this memorandum. For each issue background information is provided and one or more tentative recommendations are made. This information is intended to stimulate discussions between representatives of NTIPP and the Training Command. It is expected that plans for Chief of Naval Education and Training (CNET) and NTIPP cooperation to improve the design of TMs will result from the anticipated discussions. To further support these discussions, additional information related to each issue is provided in appendices A through I. Also, reports forthcoming from the Training Analysis and Evaluation Group (TAEG) are described which discuss in more detail several of these issues.

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The issues and recommendations in section II of this memorandum are directed to various representatives of the NTIPP and the Training Command. The managers of NTIPP at the Naval Ship Research and Development Center (NSRDC) will find a general list of the training community's needs and concerns related to TMs. Other groups will have an interest in specific issues and recommendations. The NTIPP project personnel at the Ground Systems Group of the Hughes Aircraft Company will note a series of unresolved issues concerning the development of maintenance handbooks to better support classroom training (see Issue 1), on-board training (see Issue 2), and factory training (see Issue 4). Personnel in the N-5 division of CNET should note the need to sponsor a series of position papers for use in advising personnel in NTIPP and members of the Technical Manual Management Policy Council (see recommendation 1 under issue 1). "C" school managers will find tentative recommendations on how they can participate with the Systems Commands in the development of maintenance manuals (see recommendation 4 under issue 1). Managers in the Program Development Center (PDC) will find a recommendation for a joint NTIPP/PDC design study to describe a state-of-the-art publishing system to reduce the cost of producing training manuals (see issue 3).

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SECTION II

ISSUES AND TENTATIVE RECOMMENDATIONS

Four broad issues or problem areas must be explored jointly between the CNET and the NTIPP in addressing the training community's needs for improved TMs. These issues range from the requirements for improved content, organization, and formatting of TMs used in maintenance courses and onboard training to more cost-effective publishing techniques. The CNET will need to take the initiative to resolve some of these issues and NTIPP initiated action will be appropriate to other issues. As the work progresses, these efforts should come together in a symbiotic relationship to efficiently achieve mutual goals.

The observations and recommendations in this document concern only the needs of the training community for technical information. It is assumed that these needs can be met without downgrading the value of TMs for nontraining functions.

ISSUE 1: Can changes be made in the formats, content, and manuscript review procedures used in producing maintenance handbooks to improve their usefulness in shore-based maintenance training courses?

Chief of Naval Material publication managers are considering inviting CNET participation in the development of policy governing the TM development process. This function is proposed in draft NAVMAT Instruction 5600.10A (see appendix A). If formally issued, this instruction will invite the CNET to provide the CHNAVMAT Technical Manual Management Policy Council with guidance on readability/comprehensibility and instructional material criteria to ensure usable TMs. If the Training Command is to obtain TMs that serve well as textbooks in maintenance courses, CNET will need to define the unique requirements of training and articulate these requirements clearly to the Technical Manual Management Policy Council and to other managers who determine the policies that guide TM development. (See appendix B for information on how maintenance handbooks are used in training programs and problems being experienced with these handbooks.)

RECOMMENDATION 1: The Naval Education and Training Command should develop position papers, establish goals, and provide design requirements concerning the formats and content of TMs to better support shorebased maintenance training.

a. The types of documents needed in each stage of maintenance training must be identified. This includes defining the types of information to be covered and the level of detail required in various documents, such as maintenance handbooks, rate training manuals, programmed instruction modules, correspondence courses, PQS manuals, and factory training materials. This analysis would be used in establishing policies governing the content of various sources of information available to the technician and could lead to more complete coverage, less redundancy, and greater economy in technical data preparation.

b. Formats that support specific types of learning tasks must be defined and validated. Work packages and Job Performance Aids (JPAs) provide step-by-step directions to guide the technician in performing a proceduralized task. However, in many situations it is necessary for the technician to recall a procedure which is performed without a job aid or is merely cued by the job aid. In these instances the technician needs learning aids; i.e., information formatted to optimize learning. Technical manuals rarely include information formatted to aid in the memory and recall of job-task information. Formats for this purpose should be developed and validated.

CURRENT TAEG EFFORT

In response to this requirement, TAEG, with NTIPP support, has undertaken studies which will provide formats for presenting two types of job-task information in TMs. An expansion of this format design effort to support additional types of job tasks is required. (See appendices C and D for the plans outlining these studies.)

c. Requirements for classroom viewers to be used with TMs published as microform should be determined. A major objective of formal maintenance training is to teach the use of the technical data package available on-the-job. If this is to be accomplished, the proper viewing equipment must be available in the classroom, as well as on-the-job. When a TM development agency is considering using microfiche or another new medium for presenting technical data, the cost of all viewing equipment required, both classroom and on-the-job, should be included in the economic analysis leading to such a decision. The Chief of Naval Technical Training (CNTECHTRA) should make clear to TM developers the cost associated with the use of new media in classrooms. Naval Technical Training Command personnel have limited experience in using microfiche or other new media. Studies should be initiated to build a base of experience from which to determine how a classroom should be equipped if MIARS microfilm or microfiche are to be used as textbooks or primary reference documents in maintenance courses.

CURRENT TAEG EFFORT

TAEG, with NTIPP support, is evaluating the use of microfiche in a Navy classroom. Two studies are nearing completion (see appendix E for a description of these studies).

RECOMMENDATION 2: CNET representatives should assist in NTIPP/SYSCOM efforts to develop specifications for TMs. After the CNET develops goals related to the design of TMs and formats to be used in TMs to improve learning, representatives of CNET should assist the SYSCOMS in the writing of the next generation of specifications to be used in procuring TMs. Until representatives of the Training Command accomplish those goals stated in Recommendation 1, CNET

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efforts to assist in producing specifications for improved handbooks will be relatively unproductive.

RECOMMENDATION 3: CNET should establish goals, policies, and procedures to guide Training Command representatives at Navy Training Plan Conferences (NTPCs) in requesting appropriate types of TMs. OPNAV Instruction 1500.8H of 3 July 1975 (see appendix F) states that the purpose of the NTPC is to coordinate a plan for obtaining training program resources to support a new piece of equipment or nonhardware development. Resources identified in the plan include billets, personnel, training materials, and military construction required by the training programs. Representatives of CNET participate in these conferences. As goals are defined (Recommendation 1) and specifications created (Recommendation 2), CNET representatives at the NTPC could establish requirements for specific types of TMs to serve the various training purposes.

RECOMMENDATION 4: If the draft NAVMAT Instruction 5600.10A (see appendix A) is issued as a formal instruction, CNET should establish goals, policies, and procedures for participation in the in-process review and the verification stages of TM development for those TMs that will be used in "C" schools. After helping to establish a requirement for special types of TMs in the NTPC, the appropriate "C" school managers should monitor the development of the TMs to ensure that TMs useful to the training community are produced. This would include evaluating draft documents for readability/comprehensibility, content required for training, accuracy of data, and the utility of the formats as aids to the technician in learning that which must be recalled during job performance. Precedents for this type of CNTECHTRA participation with the SYSCOMS in maintenance handbook development can be found in the NAVAIR and TRIDENT TM development programs.

ISSUE 2: Can TMs be designed to better support the training of watchstanders aboard ships?

The PQS program is a fleet-wide effort supporting the training of watchstanders. OPNAV Instruction 3500.34B of 3 March 1975 (see appendix G) tasks CHNAVMAT and CNET to provide information in TMs for use in meeting PQS requirements. It states that NAVMAT will include information "in operator and maintenance technical manuals which will enhance their use as study references in meeting the requirements of PQS." It also states that CNET will advise NAVMAT concerning the "manner in which information to support PQS is to be included in operations and maintenance technical manuals." (CNET is also responsible to include PQS information in rate training manuals.) Background information on this issue is available in appendix H.

RECOMMENDATION: An NTIPP/CNET study should be conducted to determine what types of information supporting the use of PQS could be included in maintenance handbooks, operator guides, and rate training manuals. The study should include the development of formats for including PQS-type information in these documents. These results should be presented to the NAVMAT Technical Manual Management Council and to CNET with recommendations on how to incorporate proposed changes into existing specifications. It is acknowledged that redefining the roles of various standard sources of technical data will be a

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difficult task and will require the cooperation of those commands that could be affected by design change.

ISSUE 3: Can word processing and automated composition techniques be used within CNET to reduce the cost and/or improve the timeliness of producing rate training manuals, advancement in rate examinations, correspondence courses, PQS manuals and classroom instructional modules?

The PDC is the major publisher within CNET. This organization publishes the rate training manuals, advancement in rate examinations, and correspondence courses, and arranges for the printing of PQS manuals and classroom instructional modules. In FY 76 PDC published over 1,200 different training manuals for a total of nearly one-half billion pages. Had the program been fully funded, this figure would have approached one billion pages. New programs are being added which, by 1980, should add another one-half billion pages annually. Thus, by the early 1980's, the Training Command's annual publishing requirements for training documents could exceed one and a half billion pages. This would include about 125,000 pages of new material to be composed annually.

While some word processing equipment is being used, traditional methods of authoring and composing remain the mainstay of the publishing system. An initial investigation currently underway in TAEG indicates that computer technology being used by various publishers can also be used to reduce the cost of producing training manuals, and that innovations becoming available could make possible even greater savings.

RECOMMENDATION: A publishing system utilizing state-of-the-art techniques should be designed for use in producing Navy training manuals. A joint NTIPP/CNET design effort is recommended.

A preliminary investigation indicates that the design could be an adaptation of the TM publishing system being designed for NTIPP by Hughes Aircraft Company, Ground Systems Group.

CURRENT TAEG EFFORT

A preliminary investigation of needs and design concepts is being conducted by TAEG and PDC with NTIPP support. This includes: (1) an examination of current publication practices within CNET, including the development of baseline data such as procedures, output, man-hours used and costs, (2) the identification of innovations in publishing that would increase the efficiency of the process, and (3) an economic analysis of alternatives. The report of this preliminary study will be available by June 1977.

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ISSUE 4: Can the development of TMs, factory training materials, and "C" school instructional materials be better coordinated to produce more cost-effective materials for maintenance and training?

Technical manuals and factory training documents are developed under separate specifications and by different branches in most contractors' plants. Development of each type of technical data is monitored by a different code within the procuring agency. Additional instructional materials are developed within the Navy for use in the "C" schools. This fragmented approach leads to coordination problems, high costs, and less than optimum technical information.

Improving the communication between those developing TMs and training materials may be possible through the use of head/book trade-off analyses (see appendix I). Comprehensive head/book trade-off analyses have not been performed and the cost-effectiveness of performing such an analysis during TM development has not been established. In this type of analysis, information that the technician must obtain from a manual while performing a task and that which must be recalled from memory during task performance are listed separately. Using these lists, representatives from training and from TM development would jointly choose the content and formats of their respective products. Head/book trade-off techniques are being studied by Hughes Aircraft Company as a part of the NTIPP concept formulation contract.

RECOMMENDATION: An NTIPP task should be created for evaluating the use of a head/book trade-off analysis to coordinate TM/Training interests in the development of TMs. This should include an initial analysis to determine if the concept has sufficient merit. Then, if appropriate, the head/book trade-off analysis technique should be used in producing a TM. This effort should include: (1) preparing head/book trade-off analysis specifications, (2) conducting such an analysis during the initial stage in the development of a TM, (3) preparing the TM and training materials responsive to the results of the analysis, (4) using the materials in maintenance and training programs, and (5) evaluating the cost-effectiveness of the technique.

If the trial of the head/book trade-off analysis proves successful, the specification for these analyses could be issued for further use in the TM development process.

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APPENDIX A

DRAFT NAVMAT INSTRUCTION 5600.10A,
TECHNICAL MANUAL MANAGEMENT; POLICIES AND PROCEDURES

DRAFT

NAVMATINST 5600.10A
MAT 0422/WOH

NAVMAT INSTRUCTION 5600.10A

From: Chief of Naval Material

Subj: Technical Manual Management; policies and procedures

Ref: (a) OPNAVINST 4410.1A of 17 Apr 1975
(b) NAVMATINST 4000.20B of 27 Jun 1975
(c) NAVMATINST 4720.1 of 13 Dec 1975

Encl: (1) Technical Manual Management Policy Council (Responsibilities/
Membership)

1. Purpose. This Instruction:

a. Establishes objectives, policies and responsibilities for managing technical manual programs within the Naval Material Command, implementing and supplementing references (a), (b) and (c).

b. Establishes a policy council to assist in achieving the technical manual objectives of the CNO and the CNM.

2. Cancellation. This instruction cancels and supercedes NAVMAT Instruction 5600.10.

3. Background. Advances in weapon systems and data-presentation techniques, together with increased microform and readability/comprehensibility requirements are overtaking the Naval Material Command Technical Manual (TM) Program. A CNM Ad Hoc Committee has identified 16 areas of TM deficiencies and recommended that TM management, policies and procedures be strengthened at NAVMAT and SYSCOM headquarters. In letters (30 Jan 1976) to CINCLANT, CINCPAC and CNET, the Chief of Naval Material set forth the fundamental of "Formality in Equipment Operation and Maintenance" and recognized the strong role of the Naval Material Command in promulgating accurate, timely and usable technical documentation.

NAVMATINST 5600.10A

4. Scope. This instruction is applicable to all activities in the Naval Material Command with responsibility for the acquisition, updating and management of TMs. Although this instruction is limited to technical manuals associated with equipments/weapons/systems, as defined in paragraph 5a, management personnel must recognize the relationships with other Navy programs such as Integrated Logistic Support, Maintenance and Material Management (3-M) Systems, and Approval for Service Use (ASU), and coordinate technical manual planning accordingly.

5. Definitions

a. Technical Manuals are defined as publications and other forms of documentation containing a description of equipment, weapons, or systems, with instructions for effective use, including one or more of the following sections as required: instructions covering initial preparation and installation; operating instructions; maintenance instructions; overhaul instructions; parts listing and related technical information or procedures exclusive of those procedures of an administrative or tactical nature.

b. Principal Users of TMs are the personnel who install, check out, operate, maintain, align, repair, overhaul and test equipments/weapons/systems. Since the technical manual is often the basic source of technical information for equipment/system training and maintenance planning (PMS), the personnel associated with these activities are also considered principal users.

c. In-process reviews are held during the preparation of the TM to ensure that TMs are written in conformance with contract requirements. In-process reviews may be conducted at the contractor's facility or procuring activity designated site.

d. Validation of technical manuals is the process by which the preparing activity tests a manual for technical accuracy and adequacy. It is accomplished by actual performance of manual procedures checked against the actual system/equipment hardware for which the manual was written. Validation is normally conducted at the preparing activity or vendor's facility. In extenuating circumstances, validation may be conducted at an operational site.

e. Verification is the process by which the Navy tests and proves the accuracy and usability of the technical manual for operation and maintenance of the system/equipment. It is normally conducted at operational sites by fleet personnel.

6. Objectives. Formal management procedures should be applied to all technical manual programs, but principal attention must be directed to those programs associated with complex equipments/weapons/systems that have significant impact on Navy resources and that cross the lines of responsibility of the Naval Systems Commands and the Services. Specific emphasis must be exercised in the following areas:

a. Establish and maintain precise Fleet requirements for determining technical content, format and readability/comprehensibility criteria that will support fleet requirements.

b. Improve the usability of technical manuals.

c. Establish distribution criteria that will provide for concurrent hardware/TM availability.

d. Improve technical manual updating procedures for the life cycle of the hardware, including funding requirements.

e. Increase standardization and consolidation actions in all areas of technical manual matters.

- f. Control the introduction of TM Microforms and insure a minimum overlap of hard copy and microfilm.
- g. Improve technical manual identification and cross servicing procedures.
- h. Improve the collection and reporting of cost data.
- i. Encourage the use of advanced techniques for presenting technical information.
- j. Improve TM support for Foreign Military Sales (FMS) programs.

7. Technical Manual Management Policy Council. This Council, established by NAVMAT Instruction 5600.10, is to be strengthened in accordance with the recommendations the CNM Ad Hoc Committee which studies Central Management of Technical Manuals for the Fleet. Information concerning the purpose, responsibilities and membership of the Council is furnished in enclosure (1).

8. Responsibilities

a. In accordance with reference (a), the Chief of Naval Material will implement the policies of the Chief of Naval Operations and other higher authorities; establish objectives for the central management of NMC TMs; direct TM management actions which cut across the lines of responsibility of SYSCOMs/Project Managers; monitor NAVMAT activities having cognizance for procuring and updating TMs; coordinate with CNET to insure that technical manuals are compatible with training support requirements.

b. In accordance with his responsibilities and mission, the Chief of Naval Education and Training will provide to NAVMAT via the TM Management Policy Council guidance on readability/comprehensibility and instructional material criteria to ensure usable TMs; assign a CNET representative as a participant in the TM Management Policy Council for those meetings of significant training interest and provide assistance, as required, for verification of technical manuals.

9. Policies

a. The acquisition and maintenance of technical manuals shall include formal plans and procedures to ensure that the total manual program is effectively managed over the life cycle and that it is appropriately coordinated with the other elements of Integrated Logistic Support (ILS).

b. Specific TM requirements, including budgeting, acquisitioning, specifications, in-process review, validation, fleet verification, printing quantity and distribution shall be established as early as practicable in the planning process.

c. Technical manual procurement and acquisition must provide for adequate quality assurance procedures, including in-process review, validation and verification. The validating and verifying processes must include the complete or partial test or inspection of the information in the technical manual against the hardware or basic technical data to insure its accuracy and completeness.

d. Technical manuals must reflect the configuration of the hardware they support. They must be timely and parallel all approved engineering changes throughout the life cycle of the hardware, including in-service, out-of-production equipments/systems.

e. Technical manuals must be geared to the users. Precise user requirements must be established early in the program to insure that each principal user will receive and understand the technical information he needs to get on with his work.

f. Specifications and standards for technical manuals must be coordinated to the greatest extent practicable within the Department of the Navy and shall carry the Technical Manual Specifications and Standards (TMSS) symbol in the Department of Defense Index of Specifications and Standards (DODISS). New

specifications and revisions shall be coordinated with the Chief of Naval Material before issuance. Existing specifications shall be analyzed periodically for consolidation potential. TM specifications and standards not carrying the TMSS symbol shall be limited to one-time use.

g. Hardware contracts with technical manual requirements shall cite on Form 1423, Contract Data Requirements List, the technical manual specification or Technical Manual Contract Requirement (TMCR) to be followed. Options, waivers or other descriptions that allow deviation from the cited specification(s) or any part of the specification shall be approved on a case by case basis by the Technical Manual Management Officer or other official designated by the Systems Commanders.

h. Formal and uniform procedures for handling and funding changes to technical manuals shall be established within each Systems Command. These procedures should provide for the rapid feedback of information from user activities. Emphasis must be placed on accuracy of the changes and rapidity for accomplishing the changes so that the Operating Forces are provided with technical information that reflects the configuration of the hardware. Project Managers shall utilize the change procedures established by the Systems Commanders responsible for providing technical manual support.

i. Technical manuals shall be funded by the appropriation that funds the hardware and shall be procured on the hardware contract as separate line item(s). Costs for updating documentation to reflect engineering changes to both in-production and out-of-production hardware shall be funded by the appropriation that funds the hardware. Costs for revising technical manuals for out-of-production equipment shall be funded from O&MN accounts. Final cost data for the major preparation and publishing elements should be compared with cost

estimates, as furnished on DD Form 633-2 or similar estimates, validated and recorded as an integral phase of effective technical manual management. Costs for technical manuals being prepared to support Foreign Military Sales (FMS) shall be funded by the applicable FMS case.

j. Maximum use of commercial technical manuals is encouraged. However, it is essential that all proposed commercial technical manuals be evaluated by the cognizant technical authority to ensure that: (1) the proposed commercial manual precisely reflects the configuration of the hardware; (2) the technical content is compatible with the Navy maintenance concept for the hardware; and (3) the manual is geared to the principal users.

k. Cross-servicing agreements shall be extended, where feasible, to other DOD Components. It is the responsibility of the procuring activities to interrogate other Services, especially Services where commonality of hardware is anticipated, to determine whether or not a proposed manual is available or under procurement. As a corollary to this, all procuring activities must have procedures for the prompt processing of queries relative to technical manuals under their cognizance. To implement this policy the Navy maintains a Joint Interest List (JIL) data base at the Naval Air Technical Services Facility in Philadelphia.

l. Exploration of advanced techniques for presenting technical/engineering information is encouraged. However, coordination with and approval by the Chief of Naval Material is necessary before introducing new documentation concepts into the Operating Forces.

m. The technical manual shall serve as the basic source of technical information for equipment/weapons/systems training. Positive management action must be exercised to insure close liaison with the training community

and that there is proper integration during the development of technical manuals and training materials.

n. In accordance with reference (c) full Approval of systems/equipments for Service Use (ASU) will not be granted until technical documentation necessary for support of the system or equipment has been identified and there is assurance that TMs which have been validated by the contractor, verified by fleet personnel and corrected prior to printing will be delivered with the first deployed production item.

o. Each naval activity responsible for the management of technical manual programs will maintain a system for providing Navy TMs to foreign governments and international organizations eligible to participate in the Navy FMS program, to government contractors and to the general public. Control will be established to ensure that individual manuals are releasable to the requesting activity or individual and fees charged.

10. Action

a. Chief of Naval Material (MAT 042) shall:

- (1) Be the central point of contact for TM matters.
- (2) Chair meetings of the Technical Manual Management Policy Council.
- (3) Review SYSCOMS budget submissions to determine adequacy of resources to support TM policy and to defend budget requirements at CNM and higher levels.
- (4) Review SYSCOM TM policy instruction to ensure conformance with overall CNM policy.
- (5) Establish long range TM R&D goals and act as central point of contact for TM R&D efforts.

b. Syscoms/PMs shall:

(1) Disseminate, with implementing guidance information, this instruction to the activities in their organization responsible for all aspects of technical manual management.

(2) Assign senior representatives to the Technical Manual Management Policy Council. These representatives must have authority to speak for their respective Systems Commanders.

(3) Review periodically technical manual specifications and submit consolidation recommendations and new specifications to the Chief of Naval Material (MAT 042) for review in accordance with paragraph 9f.

(4) Prevent the repeated use of documents, other than specifications and standards, for procuring technical manuals.

(5) Report to the Chief of Naval Material, within 90 days of the date of this instruction, the following information:

(a) Name and code of the designated personnel who will represent the Systems Commander, or Project Manager on the Technical Manual Management Policy Council.

(b) Plans for accomplishing the requirements of this instruction.

Distribution:

SNDL: K2 (20 ea)

CNM PMs (5 ea)

MAT 04

Copy to: (2 ea)

SNDL: A2A (NAVCOMPT, ONR only)

A3

A5

A6 (5 cys)

B5 (COMDT only)

C4J (NAVADMINU, Winston-Salem only)

MAT 01, 02, 02D, 03, 03L, 0325, 04T, 042

Stocked:

Technical Manual Management Policy Council

1. Purpose. To provide guidance and leadership for achieving the objectives and intent of this Instruction and to assist the Chief of Naval Material in the formulation of Navy policies for meeting the technical manual goals of the late 70's and 80's.
2. Responsibilities. The Policy Council will be primarily advisory in function and will serve as the focal point for policy discussions among the Chief of Naval Material and the Systems Commanders/Project Managers. Specific areas of responsibilities and the field of interest will include:
 - a. Developing procedures and techniques for over-all programs dealing with effective technical manual management.
 - b. Developing an effective intra-Navy communication network for the orderly and timely exchange of information in the subject area.
 - c. Reviewing and appraising on a continuing basis, existing policies with particular attention to the impact of these policies on the resources of the implementing Navy components, and recommending changes.
 - d. Assisting in the formulation of new policies so that the implementation impact is predictable and can be accomplished within the resources and organizational structure of the implementing activities.
 - e. Investigating and keeping abreast of advances in the technology of communicating technical information, and recommending potential Navy application.
 - f. Developing procedures for keeping industry informed of Navy policies and specifications. When facing industry the Navy position must be unified and consistent.
 - g. Establishing working groups, as necessary, to resolve specific management problems.

NAVMATINST 5600.10A

3. Membership. The Policy Council shall be composed of:

a. Chairman - CNM Representative from MAT 04, NAVMAT.

b. Permanent Members - Senior representatives from the Systems Commands, CNM designated Project Management Offices with major technical manual responsibilities, and the Navy Publications and Printing Service.

c. Additional Participants. The Office of the Chief of Naval Operations (OP-04), Chief of Naval Education and Training, Headquarters, Marine Corps (CSY-10), Director of Naval Laboratory Programs, the representatives of Operating Forces and other interested Navy components will be invited to participate when topics within their sphere of interest are agenda items.

4. Meetings. The Policy Council shall meet semiannually or at the call of the Chairman.

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APPENDIX B
MAINTENANCE MANUALS IN SHOREBASED TRAINING COURSES

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MAINTENANCE MANUALS IN SHOREBASED TRAINING COURSES

This appendix presents information on how maintenance manuals are currently being used in shorebased classroom training. Included is information on the number and variety of courses using these handbooks, the student load in these courses, how the handbooks are used as textbooks, and information on the types of problems being experienced.

MAINTENANCE MANUALS IN SCHOOLS

Over half of the Navy's training courses teach maintenance skills, such as to adjust, align, assemble, calibrate, disassemble, inspect, repair, and service a specific piece of Navy equipment. The Catalog of Navy Training Courses (CANTRAC), 30 July 1976, lists 3,849 courses of which 2,010 concern the maintenance of specific pieces of Navy equipment.

Responsibility for conducting these maintenance courses is distributed among 15 managers within the Navy training community. Table B-1 lists the commands that manage these maintenance courses and identifies the number of courses that each command controls. Based on the data in table B-1, the CNTECHTRA has curriculum control over 2,017 courses or 52 percent of all courses listed in the CANTRAC. It also shows that 1,375 of these CNTECHTRA courses concern the maintenance, repair, or calibration of specific pieces of equipment. Fleet commands control 1,389 courses of which 454 are oriented towards maintenance of specific equipment.

Three classes of schools offer most of the maintenance training in Navy classrooms. The "A" schools provide basic technical knowledge and skills required to prepare for job entry or for further specialized training. The emphasis in the "A" school is on basic knowledge. Maintenance fundamentals are taught but equipment-specific maintenance procedures are not included. Maintenance handbooks are occasionally used in these schools.

The "C" schools provide the advanced knowledge, skills, and techniques for performing a particular job. The "C" school courses typically concern a specific piece of equipment, and maintenance handbooks serve as textbooks in these courses.

The "F" (Fleet) schools provide technical training to meet the needs of the Fleet or type commanders. This includes operator and maintenance training for members of ship's company and for those technicians en route to duty aboard ships. These are courses of less than 13 days duration. Maintenance manuals are widely used in these fleet courses.

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TABLE B-1. SUMMARY OF CANTRAC DATA ON THE NUMBER OF MAINTENANCE COURSES BY EACH COURSE COORDINATOR

Course Coordinator	Total Courses in CANTRAC	Number of Maintenance Courses
Chief of Naval Technical Training		
Aviation Skill Courses	(880)	(757)
Other	<u>(1,137)</u>	<u>(618)</u>
Sub Total	2,017	1,375
Chief, Bureau of Medicine and Surgery (with exception of Medical Officer Department Courses)	105	12
Commander, Naval Air Force, U.S. Atlantic Fleet	162	85
Commander Naval Air Force, U.S. Pacific Fleet	367	134
Commander Submarine Force, U.S. Atlantic Fleet	164	61
Commander, Naval Surface Force, U.S. Atlantic Fleet	61	5
Commander, Naval Surface Force, U.S. Pacific Fleet	74	2
Commander, Training Command U.S. Atlantic Fleet	207	54
Commander, Training Command U.S. Pacific Fleet	177	36
Commander, Submarine Force, U.S. Pacific Fleet	177	77
Commanding Officer, Naval Air Systems Command Representative, U.S. Atlantic Fleet	57	34
Commanding Officer, Naval Air Systems Command Representative, U.S. Pacific Fleet	139	125
Chief of Naval Education and Training	61	0
Chief of Naval Air Training	34	0
Chief of Naval Reserve	41	9
Other commands not assigned above	6	1
TOTALS	<u>3,849</u>	<u>2,010</u>

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Table B-2 shows a CNTECHTRA projection of the number of students and the average student load in "A," "C," and "F" schools for FY 77. It is estimated that over 16,000 students will be in "C" and "F" schools at any time during FY 77. Many of these students will make routine use of maintenance handbooks.

TABLE B-2. PROJECTED FY 77 ENLISTED STUDENT INPUTS AND AVERAGE STUDENT LOAD BY SCHOOL CLASSIFICATION

	<u>Class A</u>	<u>Class C</u>	<u>Class F</u>
Input	179,755	69,103	400,184
Average Onboard	19,440	11,497	4,619

EXAMPLES. Two examples illustrate how maintenance handbooks are used in schools. The first is a "C" school course in which a traditional maintenance handbook is used. In the second, also a "C" school course, a Symbolic Integrated Maintenance Manual (SIMM) is used. These examples were selected to illustrate how two fundamentally different types of TMs are used in maintenance courses.

Example 1: Ground Controlled Approach Electronics Maintenance Course, Radar Set AN/CPN-4A, Class "C"

This 4-week 2-day course prepares electronic technician Class "A" school graduates and other personnel with equivalent training to maintain with minimum supervision the AN/CPN-4A precision approach radar system. The following types of skills are taught: (1) the location of information in TMs for use in operating and maintaining the radar system, (2) the use of appropriate test equipment, (3) the performance of checks and tests, (4) the location of malfunctions, and (5) the performance of corrective maintenance actions.

The course is offered 11 times a year at the Naval Air Technical Training Center (NATTC), Memphis, for seven to eleven students in each class. A traditional group instruction format is used; i.e., lecture/discussion and laboratory periods. Grading is by performance testing in the laboratory.

The equipment handbook, the Handbook of Service Instructions, AN/CPN Radar Set, NA 16-30CPN4-4, serves as the textbook in this course. In addition, 75 pages from NA 16-30CPN4-5, containing extended block and schematic diagrams and other types of frequently used technical data, have been reproduced as a training manual. Many locally prepared changes were incorporated into these diagrams before they were reprinted.

Two other training documents were published by CNET for use in this course. The Student Information Book contains information sheets, laboratory assignments, home-study assignments including reading assignments from the equipment handbook, and performance tests. The other CNET document is the Instructor Guides consisting of lesson plans used by the instructor in conducting lectures.

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The equipment handbook and a number of other documents were used in preparing the Student Information Book and the Instructor Guides. A bibliography for the course is presented in table B-3. It lists those documents issued to students, those used by the instructor while writing the course or teaching it, and those documents considered to be basic references and held in the course library.

Example 2: Carrier Air Traffic Control Center Equipment Maintenance Course, AN/SPN-41, Class "C"

This 7-week course provides Navy electronics technicians with the knowledge and skill to properly operate and maintain the AN/SPN-41 Radar Transmitting Set. The following types of information and skills are taught: (1) the use of the SIMM, (2) information about the AN/SPN-41 equipment--theory of operation, adjustments, and corrective and preventive maintenance, (3) skill in the initial alignment of the system and in the determination that all auxiliary equipment inputs are correct, and (4) skill in maintaining the radar set.

The course is offered four times a year at NATTC, Memphis, for seven or eight students in each class. It is conducted in the traditional group instructional format; i.e., lecture/discussion and laboratory periods.

The textbooks for this course are the TMs for the AN/SPN-41, NAVELEX 0967-384-6010, a SIMM formatted set of manuals. The SIMMs consist of oversized illustrations supported by narrative. The illustrations present logically arranged functional block diagrams, blocked schematics with keyed text, and maintenance dependency charts. The extensive use of symbols and shaded/line art is employed to convey maximum information in a small space. Physical and functional relationships of systems and hardware are clearly denoted. All the data required to troubleshoot, maintain, and repair a given unit or assembly is in a single work package that can be used without referring to other parts of the manual. A set of SIMMs is issued to each student for use in the course. The instructor lectures from these manuals with each student following the discussion in his own manual. The student uses these manuals in completing both laboratory and home-study assignments.

Four training documents are published by CNET for use in the course. For the student there are (1) the Course of Study containing the course outline, a description of each lesson and laboratory period, and the schedule of home-study assignments, (2) Information Sheets with information not found in the equipment handbooks, and home-study lessons to be accomplished using the SIMM handbooks, (3) Laboratory Assignments which contain detailed directions for each laboratory period, and (4) Instructor Guides which contain detailed lesson plans from which the instructor lectures. He uses the SIMM diagrams and schematics as visual aids.

The instructors state that SIMM formatted manuals provide better support for training programs than traditional formatted manuals when digital circuitry is being taught. One shortcoming they noted was that information on the purpose or role performed by a component or subsystem is not described. Thus much of the information needed on the theory of operation must be created by the instructor.

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TABLE B-3. PUBLICATIONS USED IN THE GROUND-CONTROLLED APPROACH ELECTRONICS MAINTENANCE COURSE, RADAR SET AN/CPN-4A

Course Bibliography	Issued to Students	Used by Instructors in Preparing or Conducting Course	Back-ground Library	Notes
<u>CNET Publications:</u>				
1. Student Information Book Radar Set AN/CPN-4A	X			Info sheets Lab/Home-study Assignments (176 pp.)
2. Radar Circuit Diagram Radar Set AN/CPN-4A	X			11" X 34" (176 pp.)
3. Instructor Guides Radar Set AN/CPN-4A		X		Lesson Plans
4. Aviation Electronics Technician 1 and C, NAVPERS 10318 Series			X	
5. Basic Electronics, NAVPERS 10087 Series			X	
<u>CNO Publications:</u>				
1. U.S. Standard for Terminal Instrument Procedures (TERPS), OPNAV 3722.16 Series		X		
<u>Commercial Publications:</u>				
1. Principles of Radar, Massachusetts Institute of Technology, Current Edition		X		
2. Radar System Engineering, Ridenour, Massachusetts Institute of Technology, Radiation Laboratory Series, Volume I		X		
3. Vacuum Tube Amplifiers, Valler and Wallman, Massachusetts Institute of Technology, Radiation Laboratory Series, Volume 18		X		

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TABLE B-3. PUBLICATIONS USED IN THE GROUND-CONTROLLED APPROACH ELECTRONICS MAINTENANCE COURSE, RADAR SET AN/CPN-4A (continued)

Course Bibliography	Issued to Students	Used by Instructors in Preparing or Conducting Course	Back-ground Library	Notes
<u>Department of the Air Force Publications:</u>				
1. Precision Remoting Circuits Student Text, KE-E-27B-0780, Keesler Technical Training Center		X		
<u>Department of the Navy Publications:</u>				
1. Department of the Navy Safety Precautions for Shore Activities, NAVSO P-2455		X		
<u>Equipment Handbooks:</u>				
1. AN/CPN-4A NA 16-30CPN4-4	X			Text for course
2. AN/CPN-4A NA 16-30CPN4-5		X		Radar circuit diagrams copied from this document
3. AN/CPN-4A NA 16-30CPN4-6		X		
4. AN/FPN-52 NAVEXLEX 0967-385-2010		X		
5. AN/PSM-4 NS 0967-911-5010			X	
6. AN/USM-116 NS 0969-126-8010			X	
7. AN/USM-140 NS 0967-905-5010			X	
8. OS-24/GPN T.O. 33A1-13-23-2			X	
9. TS-147D/UP NAVSHIPS 91716			X	
10. TS-148/UP NAVWEPS T.O. 16-TS148-5			X	
11. TS-488 TM 11-6625-220-10			X	

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TABLE B-3. PUBLICATIONS USED IN THE GROUND-CONTROLLED APPROACH ELECTRONICS MAINTENANCE COURSE, RADAR SET AN/CPN-4A (continued)

Course Bibliography	Issued to Students	Used by Instructors in Preparing or Conducting Course	Back-ground Library	Notes
<u>NAVSHIPS Publications:</u>				
1. Parts Catalog, AN/CPN-4, NAVSHIPS 92266.4, 12 July 1954			X	
2. Radar Electronic Fundamentals, NAVSHIPS 900,016			X	
<u>NAVWEPS Publications:</u>				
1. Electronic Circuit Analysis, NAVWEPS 00-80T-79			X	

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The SIMMs and many other documents were used in preparing the CNET training manuals. A bibliography for this course includes 24 documents. Table B-4 lists these documents and indicates how they support the course.

MAJOR PROBLEMS. Many maintenance handbooks do not provide the information needed in maintenance training courses. This conclusion was reached in a study conducted by the NSRDC.¹ In this study various training commands were queried concerning their use of the manuals supplied with Navy equipment. Information was obtained from the Chief of Naval Technical Training; Chief of Naval Air Training; Commander, Training Command, U.S. Atlantic Fleet; Commander, Nuclear Weapon Training Command Pacific; and the Commanding Officer, Fleet ASW Training Center Pacific. The largest user of TMs in the Training Command, the Chief of Naval Technical Training, described the overall quality of the TMs used in his command.

"It is not possible, without a thorough and indepth study, to make an assessment of the number of TMs considered inadequate for training. An informal survey among responsible training staff personnel, however, led to the conclusion that most of the TMs extant fall into this category with the notable exception of NAVAIR TMs."²

Four types of problems concerning the content, formats, and availability of TMs were described in the NSRDC study.

1. Essential information is not presented in sufficient detail, is inaccurate, or is missing. Most frequently mentioned were inadequate (a) theory of operation, (b) information on the interface with other pieces of equipment, and (c) supporting data on changes made during final stages of equipment development.

2. Manuals are written at a reading level not matched to the reading ability of the students. Some rates have a high GCT/ARI prerequisite which in conjunction with the complexities of the job make it appropriate for the TMs supporting these jobs to have a higher reading level. Other rates have low GCT/ARI prerequisites and involve less complex tasks and should be supported with less complex written materials. Publication policies and practices do not respond to this situation.

3. Some TM formats make training difficult to perform. The major complaint is that the student must refer to a series of manuals and supplements in order to learn a single task. It is reported that students learning to move nuclear weapons from one site to another must research through more than 50 manuals, pamphlets, instructions, and notices. Graduates approach this task with some trepidation due to the difficulty of obtaining assurance they have

¹ Implications of Technical Manual/Navy Training Interfaces for Navy Technical Manual System (NTMS) Concept Formulation, 1975, David W. Taylor Naval Ship Research and Development Center, Bethesda, MD.

² Ibid.

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TABLE B-4. PUBLICATIONS USED IN THE CARRIER AIR TRAFFIC CONTROL CENTER EQUIPMENT MAINTENANCE COURSE, AN/SPN-41

Course Bibliography	Issued to Students	Used by Instructors in Preparing or Conducting Course	Back-ground Library	Notes
<u>CNET Publications:</u>				
1. Course of Study, AN/SPN-41 Transmitter Set	X			
2. Information Sheets, AN/SPN-41 Transmitter Set	X			
3. Laboratory Assignments, AN/SPN-41 Transmitter Set	X			
4. Instructor Guides, AN/SPN-41 Transmitter Set		X		
5. Basic Electronics	NAVPERS 10087C Vol II		X	
6. Electronics Technician 1 and Chief	NAVPERS 10192D		X	
<u>Commercial Publications:</u>				
1. Applications Manual for Operational Amplifiers, Philbrick/Nexus Research, The Teledyne Company, Dedham, Mass., 1968.		X		
<u>Handbook of Operating/Service Instructions for:</u>				
1. AN/PSM-4C	NAVSHIPS 92051		X	Test Equip.
2. AN/SPN-41	NAVELEX 0967-384-6010	X		SIMM text
3. AN/USM-140D/U	NAVSHIPS 95706		X	Test Equip.
4. AN/USM-206A	NAVSHIPS 0969-002-7020 NAVSHIPS 0969-002-7011		X	Test Equip.
5. AN/USM-116	NAVSHIPS 0280-667-7005		X	Test Equip.
6. AN/ARA-63			X	

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TABLE B-4. PUBLICATIONS USED IN THE CARRIER AIR TRAFFIC CONTROL CENTER EQUIPMENT MAINTENANCE COURSE, AN/SPN-41 (continued)

Course Bibliography	Issued to Students	Used by Instructors in Preparing or Conducting Course	Back-ground Library	Notes
<u>NAVSHIPS Publications:</u>				
1. EIMB - Test Methods and Practices	NAVSHIPS 0967-000-0130		X	
2. EIMB - Electronic Circuits	NAVSHIPS 0967-000-0120		X	
3. NAVSHIPS Technical Manual, Electronics Chapter 9670	NAVSHIPS 0901-670-0002	X		
<u>NAVWEPS Publications:</u>				
1. Basic Theory and Application of Transistors	NAVWEPS 00-80T-86		X	
2. Electronic Circuit Analysis, Vol II	NAVWEPS 00-80T-79, Vol II		X	
<u>Miscellaneous Publications:</u>				
1. Artificial Respiration, NAVMED P-5003		X		
2. COMNAVAIRPACINST 3722.2 (Current)			X	
3. COMNAVAIRLANTINST 3722.2 (Current)			X	
4. Safety Precautions for Shore Activities, NAVMAT P-5100, 1970		X		
5. United States Navy Synchros, OP-1303		X		

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responded to all the requirements. In contrast, other TMs based on formats such as Functionally Oriented Maintenance Manuals (FOMMs) and work packages contain all the information needed to perform a task and also reduce the complexity of the task. Through the use of material of this type the time required to learn to perform tasks is reduced.

4. The lack of standardization in the formats of maintenance manuals adds to the learning load of students. For every manual the student uses, he must learn how it is organized and how to use the various formats by noting the type of information that is actually available in the manual.

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APPENDIX C

STUDY PLAN: TECHNICAL MANUAL FORMATS FOR SYMBOL TABLES;
AN EXPERIMENTAL EVALUATION OF ALTERNATIVE LEARNING AID FORMATS

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STUDY PLAN: TECHNICAL MANUAL FORMATS FOR SYMBOL TABLES;
AN EXPERIMENTAL EVALUATION OF ALTERNATIVE LEARNING AID FORMATS

The Naval Ship Research and Development Center is currently managing the Naval Technical Information Presentation Program (NTIPP) in an effort to improve the usefulness of Navy technical manuals (TMs) in the 1980's. The emphasis in this project is on job aids; i.e., information formatted to assist a technician while performing a task on the job.

A related project, the Analysis of Various Onboard Instructional Delivery Systems, is being conducted by the TAEG for the CNET. This project concerns the design of formats (page layout guidelines) as learning aids in support of on-the-job training (OJT). This phase of the TAEG study addresses topics closely related to the NTIPP effort.

Most TMs contain both information to be learned before attempting to perform a task and information to be referred to during task performance. The latter is commonly referred to as a Job Performance Aid (JPA). The JPA is a set of step-by-step instructions designed to guide a technician while performing a task. It is designed to communicate information quickly and precisely. While many tasks can be performed using JPAs the technician must also be trained in general skills that are required but not proceduralized in the JPA.

Certain types of tasks (or task elements) may not be performed efficiently using JPAs. When events occur rapidly and require an immediate response, the technician does not have the luxury of time to look up the next step in a written procedure. Here, the technician must rely on memory. Such is the case where a technician is required to recognize a series of symbols on a display and make the immediate appropriate response to the symbol. Training to the required level of such a skill must be accomplished prior to performing the task.

Formats used to present this type of technical information are fundamentally different in structure from JPA formats. Training materials are designed to enhance learning and recall of information as needed. In designing such learning formats, then, it is important to draw on theories of learning and communication that describe how people acquire information, store it, and retrieve it from memory.

In this study, learning formats will be developed that promote optimal learning. They will be based on guidelines presented in TAEG Report No. 23. These guidelines are a compilation of general learning principles describing optimal procedures for learning various types of job tasks. Formats based on these guidelines should optimize the learning functions of acquiring, storing, and recalling information, with the goal that technicians using materials based on these formats will be better able to recall the information over an extended period of time.

³ James A. Aagard, Ph.D. and Richard Braby, Ed.D., Learning Guidelines and Algorithms for Types of Training Objectives. TAEG Report No. 23, 1976, Training Analysis and Evaluation Group, Orlando, FL. AD A023066.

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Some of the formats developed within this study will be for use with microfiche. This medium is expected to be widely used in the 1980's. Many new TMs will be published on microfiche, and existing manuals will be republished in this medium. Currently, the Navy Shipboard Microfiche Program is screening 90,000 TMs for republishing on microfiche. This medium is also considered useful for onboard training because of the small storage space needed onboard ships and its low production cost.

If TMs are to support various types of learning tasks, in addition to serving as JPAs, a family of technical data formats will need to be developed. Different sets of formats will be needed for different types of tasks. An initial list of the types of job-tasks (or elements of job-tasks) for which learning material formats should be developed include: (1) procedure learning, (2) signal classifying, (3) system familiarization and nomenclature, (4) simple decision making, and (5) recognizing symbols.

PURPOSE

The purpose of this study is to evaluate alternative TM formats that support a technician in learning to recognize the symbols used in his job. The symbols in this study are alphanumeric characters such as those used on weather maps and in formatted teletype messages.

This study plan describes only the experimental phase of the symbol learning study. Phases of the task which will be described in the final report are: (1) development of the formats, (2) design of the computer data base and the computer programs to be used for composing the instructional materials, (3) production of the instructional materials, and (4) an economic analysis comparing computer-aided authoring with traditional authoring.

This is the first in a series of studies to develop formats optimizing learning tasks. Many of the formats, computer programs, and economic analysis procedures developed within this symbol learning project will be used in the follow-on task of developing formats for procedure learning. This symbol learning task serves as a test-bed for techniques to be used in the major task which concerns creating procedure learning formats for use in TMs.

METHOD

SUBJECTS. A sample of 60 subjects, trainees at the Aerographer School, Lakehurst, New Jersey, will be assigned to one of five experimental groups of 12 subjects each. Subjects will be pretested on a paired-associate learning task in order to balance the experimental groups in terms of differential ability.

STIMULUS MATERIALS. The symbolic weather words and letter groups to be used in this study will be either (1) types of general weather reports (e.g., CAVOK, PILOT, SHIP, TESAK) or (2) weather condition symbols (e.g., CONTRA, MONT, SLEET). The types of symbols to be used will be determined after closer scrutiny of the Aerographer School curriculum to insure that these symbols are not a routine part of training. The materials will be presented in a standard 8½" X 11" paper format and 48X/270 image/black and white/negative image microfiche.

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The training materials will be formatted in four ways on microfiche: format 1, Symbol Table; format 2, Symbol Table plus Learning Guidelines; format 3, Simple Program; and format 4, Optimal Program. Format 1 is a tabular listing of weather symbols and their definitions. Format 2 includes the table in format 1 as well as brief instructions on how to study the table. Format 3 incorporates the features of formats 1 and 2 and includes practice exercises and feedback loops. Format 4 incorporates many additional learning aids along with the weather symbols. Table C-1 depicts the four formats with respect to their learning guideline content. These learning guidelines are described in detail in Aagard and Braby (1975).⁴ Format 1 will also be presented on hard copy.

APPARATUS AND EQUIPMENT. Ten Realist/Vantage microfiche readers will be used. These readers were selected since they are commonly used in Navy schools. Also this type of reader was found by Keeler and Rizzo (1976)⁵ to be most efficient from a human factors standpoint.

Three memory drums will be used in the pretesting of the subjects' paired-associate learning ability.

DESIGN. To examine the effects of format on learning and retention, the data will be arranged in a 1 x 4 factorial design. Four of the format comparisons will use the microfiche medium. The effects of medium on learning and retention will be examined by comparing an additional experimental group using a hard-copy symbol table to the group using the microfiche symbol table (see table C-2). Only two types of media will be compared as this is a partial replication and extension of a study being conducted by Rizzo (1977)⁶ comparing the effect on learning of microfiche versus hard copy. The dependent variables will be error rate by type of error for the initial learning task and number of symbols retained for the recall task. Time to criterion will be recorded during the learning task for use in the economic analysis.

⁴ Richard Braby, Ed.D., James M. Henry, William F. Parrish, Jr., and William M. Swope, Ph.D. A Technique for Choosing Cost-Effective Instructional Delivery Systems. TAEG Report No. 16. 1975. Training Analysis and Evaluation Group, Orlando, FL. AD A012859.

⁵ F. Laurence Keeler, Ph.D. and William A. Rizzo. An Evaluation of Microfiche Reader Types for Use with Programmed Instruction. TAEG Report No. 35. 1976. Training Analysis and Evaluation Group, Orlando, FL. AD A029714.

⁶ William A. Rizzo. Demonstration and Evaluation of a Microfiche-Based Audio/Visual System. Technical Memorandum 77-2. 1977. Training Analysis and Evaluation Group, Orlando, FL.

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TABLE C-1. FORMATS FOR PRESENTING SYMBOLS WITH LEARNING GUIDELINES THAT MAY BE IMPLEMENTED WITH EACH FORMAT

Symbol Learning Guidelines (See TAEG Report No. 23)	FORMATS			
	Symbol Table (paper and microfiche)	Symbol Table + Learning Guidelines (microfiche)	Simple Program (microfiche)	Optimal Program (microfiche)
1. Meaningful tasks				X
2. Stimulus predifferentiation				X
3. Optimum set size		X	X	X
4. Contiguity	(X)	X	X	X
5. Randomize practice events			X	X
6. Mnemonics				X
7. Self pacing/KOR	(X)	X	X	X
8. Overlearning/ Refresher training			X	X
9. Measure overt performance		X	X	X
10. Individualize instruction				
11. Fading of reinforcement and KOR				X

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TABLE C-2. EXPERIMENTAL DESIGN

		FORMAT			
		Symbol Table	Symbol Table & Learning Guidelines	Simple Program	Optimal Program
MEDIUM	Microfiche	Group 1	Group 2	Group 3	Group 4
	Paper	Group 5			

PROCEDURE. Subjects will be prebriefed on the objectives of the study as well as their participation in terms of training, testing, and retesting.

In the training period, subjects will study the symbols using the learning format for the group to which they are assigned. Groups 1 through 4 will be furnished a microfiche reader, training materials on microfiche, pencils, and response sheets. Group 5 will use hard copy (paper) training materials. Instructions provided the subjects will vary as a function of the learning format. The time will be recorded when the subject begins training. When the subject feels he has learned the symbols well enough to take the criterion test, that time will be recorded. Time consumed in testing and errors will be recorded. Retraining and retesting (if required) will be recorded similarly. (See Scoring Sheet, attachment 1.) Subjects will study the symbols until a score of 100 percent on the criterion test is achieved. The experimenter will not tell the subjects which symbols were missed on the criterion test, only the number of errors each time the test is failed. This is to prevent restudying of just those symbols identified incorrectly. Subjects will be debriefed on the types of errors made during testing and retesting upon reaching the criterion of 100 percent correct responses.

After successful completion of the criterion test, each subject will be asked to complete a questionnaire tapping subjective opinions and recommendations regarding the training mode.

Retention tests will be administered at post-training intervals of 1 hour, 24 hours, and 1 week. There will be no refresher training prior to the retention tests. The retention tests should give insight regarding the effects of format and medium on retention of the symbols over time. After the final retention test, questions will be answered concerning the study, and subjects will be thanked for their participation.

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DATA ANALYSIS. The effects of the following variables will be examined:

1. effect of format on learning and retention
2. effect of presentation medium
3. effect of format on error frequency and type of errors
4. response frequencies on questionnaire items.

Resource Requirements

TAEG furnished:

3 Experimenters
10 Realist/Vantage microfiche readers
Response sheets
Scoring sheets
Pencils
Training materials

Aerographer School furnished:

70 "A" school students to serve as subjects. It is anticipated that each student will be used as follows:

Week 1 - Pretesting - 1 hr
Week 2 - Training and testing - 3 hrs
Week 3 - Retention testing and interview - 1 hr

Room for conducting study

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SCORING SHEET

Group No. _____ Subject _____ Pre-Test Score _____

	START	STOP	TIME	ERROR TYPE			
				I	II	III	TOT.
Initial Training Criterion Test							
Retraining Retest							
Retraining Retest							
Retraining Retest							
Retraining Retest							
Retraining Retest							
Retraining Retest							
Retraining Retest							
Retraining Retest							
Retraining Retest							
	TOTALS						

Retention Test: 1 hr.							
24 hrs.							
1 wk.							
	TOTALS						

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APPENDIX D

STUDY PLAN: TECHNICAL MANUAL FORMATS FOR PRESENTING PROCEDURES;
AN EXPERIMENTAL EVALUATION OF ALTERNATIVE LEARNING AID FORMATS

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STUDY PLAN: TECHNICAL MANUAL FORMATS FOR PRESENTING PROCEDURES; AN EXPERIMENTAL EVALUATION OF ALTERNATIVE LEARNING AID FORMATS

BACKGROUND

Maintenance handbooks and operator guides are widely used as texts in training the maintainers and operators of Navy equipment. This is one of the major functions served by these TMs. A handbook or guide is first used in contractor conducted factory training to qualify the initial maintenance and operator personnel on a new piece of equipment. This type of training is funded by the CHNAVMAT. The manuals are then used as texts in "C" schools sponsored by CNET to provide a source of formally trained technicians throughout the life of the equipment. The handbooks and guides are also used in "F" school short courses and in onboard training to meet the immediate needs of Fleet commands for training in specific job skills. While the CHNAVMAT has the responsibility to develop TMs to support these training functions, the CNET has a responsibility to guide the CHNAVMAT in improving the design of TMs so as to better support the needs of the training community.

These TMs frequently present job-task information in the form of procedure checklists. Using these checklists the technician adjusts, aligns, assembles, calibrates, disassembles, inspects, operates, or services a piece of equipment. These checklists are typically a series of brief statements, each aiding the technician in recalling previously learned detailed procedures for that step. While the checklist is a guideline for task performance, the efficient use of the checklist typically requires training.

PURPOSE

The purpose of this study is to design and field test formats for technical data to be used by maintenance technicians in learning to repair and calibrate Navy equipment. Specifically, the formats will:

1. Increase the accuracy with which procedures are performed at the conclusion of training
2. Reduce the time required to learn to perform repair and calibration procedures when compared with the time required using traditionally formatted materials, and
3. Reduce the cost of producing technical data on maintenance procedures by defining formats that can be produced via computer aided authoring and composition techniques.

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TECHNICAL APPROACH

FORMAT DESIGN. Innovative formats will be designed according to the principles for procedure learning presented in Aagard and Braby (1976)⁷ and the standards in Price (1975).⁸

TECHNICAL DATA PACKAGES. Concept demonstration instructional material using these innovative formats will be developed. The instructional materials will support two job-tasks--an equipment repair task and an operator task, both typically learned during onboard training and for which no training is provided in the "A" school.

COMPUTER AIDED AUTHORIZING AND COMPOSITION TECHNIQUES. The actual development of the instructional material will be accomplished using computer aided authoring and composition techniques being developed within TAEG. These techniques consist of:

1. Authoring Workbook. This workbook lists the headings for all the equipment-specific information that the author must write. It includes the steps in the procedure and all the information needed to perform these steps. It also organizes this information for entry into a computer data base.

2. Computer Data Base. The information written by the author in his workbook is keyed or scanned into computer memory. This information can then be displayed on a CRT and edited as required. It can be used to supply information on line to the computer program used in the automatic formatting of information for use in the learning modules.

3. Composition Program. A computer program organizes the job-task information contained in the data base into a sequence of frames according to the formats developed in the first phase of this study. The frames of information are then stored in memory. They can then be edited on a CRT terminal and printed automatically via a typewriter, a computer output microfilm (COM) device, or in some other way. Copies are produced using standard techniques.

FIELD TESTING. A field test will be conducted to determine if the innovative instructional material enhances the learning of procedures in an onboard training environment. Three types of instructional materials will be evaluated and compared; i.e., existing paper TM checklists, experimental paper modules, and experimental microfiche modules. The experimental modules will consist of information formatted to optimize the learning of these procedures. Recent graduates from an "A" school who have undergone no onboard training on the experimental tasks will serve as the subjects. A total of 60 subjects will be

⁷ James A. Aagard, Ph.D. and Richard Braby, Ed.D. Learning Guidelines and Algorithms for Types of Training Objectives. TAEG Report No. 23. 1976. Training Analysis and Evaluation Group, Orlando, FL AD A023066.

⁸ Harold E. Price, Development of a Draft Specification for Technical Manual Quality Assurance. 1975. BioTechnology, Inc. Prepared for Naval Ship Research and Development Center, Bethesda, MD. Contract N00167-76-C-0012.

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randomly assigned to six experimental groups consisting of 10 subjects per group. Subjects will be essentially naive regarding the tasks to be learned. They will be trained to perform either an operator or a repair task using either the TM checklist or one of the experimental modules. Upon completion of the training the subjects will be given a proficiency test and a written test designed to measure their level of learning and ability to perform the designated task. Scores on proficiency and written tests will be evaluated in a 2 x 3 factorial design illustrated below.

		Type of Training Material		
		Traditional Tech Manual	Innovative Tech Manual	Innovative Tech Manual Microfiche
OPERATOR TASK				
REPAIR TASK				

ECONOMIC ANALYSIS. The Training Effectiveness and Cost Effectiveness Prediction (TECEP) cost model will be used in documenting the cost of producing and using the innovative and the traditional TMs. The cost model appears in TAEG Report No. 16.⁹ An analysis will be made in which the costs and benefits of the various formats will be compared.

RECOMMENDATIONS

Based on this study, recommendations will be made on how to:

- present procedure checklists in TMs in such a manner that they support training
- format training materials to be used in teaching procedures
- use computer aids in authoring these materials.

DELIVERABLE PRODUCTS

The following products will be delivered at the end of the project:

1. specifications of formats for presenting procedures in TMs or in training modules associated with these manuals

⁹ Richard Braby, Ed.D., James M. Henry, William F. Parrish, Jr., and William M. Swope, Ph.D. A Technique for Choosing Cost-Effective Instructional Delivery Systems. TAEG Report No. 16. 1975. Training Analysis and Evaluation Group, Orlando, FL. AD A012859.

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2. sample modules using these formats
3. a report describing the experimental evaluation of these modules and recommendations that result from this study
4. computer programs for automatic composition of author workbooks, related data bases, and training modules for proceduralized tasks.

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APPENDIX E

BE&E SCHOOL MICROFICHE STUDY PLAN

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BE&E SCHOOL MICROFICHE STUDY PLAN

INTRODUCTION

A microfiche reader usability study by Keeler and Rizzo¹⁰ demonstrated that typical recruits can readily be trained to use a variety of microfiche readers as well as perform the branching task required in programmed instruction. In addition, study results indicated that significant differences exist across types of readers in time of loading/unloading, time to perform the branching task, and error rates for the branching task. These findings encouraged the continuation of the next phase which will examine the effects of the microfiche medium on training efficiency.

STATEMENT OF THE PROBLEM

As the logistics problems related to the ever-increasing volume of training materials become more acute, alternate instructional media are being considered for schoolhouse as well as onboard Navy training. While microforms have been used for several years in educational institutions to present textual materials, the effect of this medium on the learning process is a relatively new area of investigation. Before decisions can be made regarding the use of microfiche for training, a comprehensive trade-off study is necessary to examine the relative cost considerations of traditional media vs. microfiche. The comparative dollar costs for acquisition, handling, and storing of the training materials are readily quantifiable. However, the costs in terms of differential learning have yet to be determined.

PURPOSE

The purpose of this phase of the study program is to examine the effects of the microfiche medium on training efficiency. Training efficiency, for this purpose, will be defined in terms of the time required for an individual to complete a course of programmed instruction.

TECHNICAL APPROACH

The Basic Electricity and Electronics (BE&E) School, Service School Command, Orlando, has been selected for this purpose, based on the following factors:

1. Self-paced nature of this training
2. Existing in-house use of microfiche hardware for testing
3. The Realist/Vantage I readers in place at the BE&E School were found to be superior during the first phase of this study
4. Adaptability of the BE&E curriculum to the microfiche medium
5. Availability of CMI for data accounting.

¹⁰ F. Laurence Keeler and William A. Rizzo, An Evaluation of Microfiche Reader Types for Use With Programmed Instruction. TAEG Report No. 35. 1976. Training Analysis and Evaluation Group, Orlando, FL. AD A029714.

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A sample of trainees attending the BE&E School will complete the curriculum using training modules that have been converted to microfiche. The performance of these trainees will then be compared to similar trainees who have used traditional hard copy.

METHOD

SUBJECTS.

1. Experimental Group. A sample of approximately 30 males, representing a cross-section of BE&E trainees will be divided into three groups of equal size:

- LOW - Predicted completion in less than average time
- MEDIUM - Predicted completion in average time
- HIGH - Predicted completion in greater than average time

(The range of predicted completion times for each category will be determined upon scrutiny of the distribution of predicted times of previous trainees.)

2. Control Group. The control group will consist of an equal number of BE&E trainees, matched by categories, to the experimental group. The control group will use the traditional hard-copy training materials.

SCHEDULING OF SUBJECTS. Scheduling of subjects will be contingent upon availability of resources at the BE&E School. The number of experimentals at any one time will probably be limited to six. Since the training is self-paced, trainees complete the curriculum at varying rates. As an experimental trainee finishes, a replacement will be assigned as quickly as possible.

INSTRUCTIONAL MATERIALS. The core of the BE&E curriculum consists of 14 hard-copy booklets or "modules" of programmed instruction. These modules will be appropriately edited for conversion to microfiche (e.g., substitution of microfiche frame numbers for page numbers and page number references). The microfiche copies of the modules will not differ from the hard copy with regard to content or lesson format.

EQUIPMENT. The following equipment is required for use by the experimental group:

1. six learning carrels, large enough to accommodate the microfiche reader as well as the breadboard and test equipment used by the trainee
2. six Realist/Vantage I microfiche readers with backup replacement units for use within the school
3. six Realist/Vantage I readers for use in the dormitory.

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TRAINING FOR THE EXPERIMENTAL GROUP. Each individual assigned to the experimental group will receive one-half hour of instruction on the use of the microfiche reader, the format of the microfiche, and the branching task. The phase I study demonstrated that this time period provides sufficient instruction and practice for the trainees to effectively use the microfiche equipment.

EXIT INTERVIEW FOR EXPERIMENTAL GROUP. A TAEG representative will interview each experimental subject upon completion of the curriculum to discuss subjective experiences with the microfiche medium. Any problems encountered will be discussed at this time. The interview will be conducted using a detailed questionnaire and will last approximately one-half hour.

DATA RECORDING. The time for each subject, experimentals as well as controls, to complete each module will be recorded by the appropriate learning center supervisor. Additional time spent by the trainee on night study and/or study of "enrichment materials" will be reported by the trainee to the learning center supervisor for recording. Times will be recorded either by the CMI system, if operational, or manually recorded, otherwise. Module and performance test scores for experimentals and controls will also be recorded and compared.

DATA ANALYSIS. The 2x3 factorial design for this experiment is depicted as follows:

	Category		
	LOW	MEDIUM	HIGH
Experimentals			
Controls			

Effects due to Groups, Categories, and Group X Category Interaction will be analyzed by a two-way analysis of variance. Questionnaire response frequencies will be compared using a chi-square test, with Yato's correction.

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APPENDIX F

OPNAV INSTRUCTION 1500.8H, PREPARATION AND IMPLEMENTATION OF NAVY
TRAINING PLANS (NTPs) IN SUPPORT OF HARDWARE AND NON-HARDWARE
ORIENTED DEVELOPMENTS (without Enclosure (1))



DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
WASHINGTON, D. C. 20350

IN REPLY REFER TO

OPNAVINST 1500.8H
OP-992F
3 July 1975

OPNAV INSTRUCTION 1500.8H

From: Chief of Naval Operations

Subj: Preparation and implementation of Navy Training Plans (NTPs) in support of hardware and non-hardware oriented developments

- Ref:
- (a) SECNAVINST 5000.1, System Acquisition in the Department of the Navy
 - (b) SECNAVINST 4000.29A, Development of Integrated Logistic Support for Systems/Equipments
 - (c) OPNAVINST 1500.11G, Naval Aviation Training Program Policies, Responsibilities and Procedures
 - (d) OPNAVINST 4950.1F, Administration of Foreign Personnel under the Military Assistance Training Program
 - (e) OPNAVINST 1500.44, Responsibilities for Development of Training Requirements and Training Plans
 - (f) OPNAVINST 11010.20C, Facilities Projects Manual
 - (g) OPNAVINST 4490.2B, Availability of Equipment for Training Purposes
 - (h) NAVCOMPT Manual, Volume 7, Paragraph 075148
 - (i) OPNAVINST 1500.2E, Establishment and Coordination of Factory Training Programs for Military and Civilian Personnel; responsibility and procedures for
 - (j) SECNAVINST 4350.8A, Engineering and Technical Services; assignment of responsibility for management and control of
 - (k) OPNAVINST 5300.3, Development and Review of Enlisted Manpower Requirements in Naval Ships
 - (l) OPNAVINST 1500.19C, Authority and Responsibility of Fleet Commanders in Chief for Naval Training Activities Ashore

Encl: (1) Guide for Preparation and Implementation of Navy Training Plans

1. Purpose. This instruction establishes policies and procedures, and assigns responsibilities for planning, programming and implementing actions necessary to provide training support for systems, subsystems, subsystem components and non-hardware

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oriented developments, to ensure:

a. Coordination of billets, personnel, military construction schedule, training support requirements and training program planning concurrently with hardware development and production; and

b. Efficient and adequate training programs phased with the introduction of new developments or modification to existing systems or subsystems.

c. Support of the policy and management principles established by references (a) and (b) for system acquisition in the Department of the Navy.

2. Cancellation. OPNAVINST 1500.8G of 28 June 1972 is hereby cancelled.

3. Existing and pending training plans. Updates of existing Navy Training Plans (NTP) and those initial NTPs currently in preparation do not need to be converted to the NTP formats prescribed herein unless it is convenient to do so.

4. Scope. This instruction applies to planning for the training of military personnel of the U. S. Navy, Naval Reserve and U. S. Marine Corps and Marine Corps Reserve. Additionally, this instruction is applicable to personnel of other U. S. Services when a multiservice adaptation of a new system, equipment, or other development is introduced by the Navy. As used in this instruction, the term training applies to both training and education and should be applied within that context. Further guidance with respect to planning for aviation and foreign training is provided in references (c) and (d), respectively. The direction herein is applicable to planning for the training associated with the introduction of technological, managerial and doctrinal developments, the expansion or modification of existing NTPs (when updates occur), the re-establishment of previous training programs, and other actions requiring acquisition or allocation of personnel and training resources. Application of this instruction to the Naval Nuclear Power Training Program is subject to the restrictions imposed by agreements between the Department of the Navy and the U. S. Energy Research and Development Administration, which affect the overall training program for personnel associated with the operation and maintenance of nuclear propulsion plants. The procedures herein may be applied to planning for the training of civilian employees and foreign personnel concurrently with the planning for the training of military personnel. Enclosure (1) provides a procedural guide to assist in the formulation of a NTP.

5. Discussion

a. Planning and Programming Training Requirements Concurrently with Hardware Development and Production. The lead time necessary to program for and to acquire billets, personnel and training resources, to formulate and establish the training program and to train and detail personnel is normally equivalent to the lead time required for the development, procurement, and installation in the Fleet of the new material, technology, or managerial process to be supported. Therefore, total training requirements, including ship, shore, staff, and student billets and personnel, instructional systems (to include but not limited to such items as instructional guides, training equipment, audio visual aids, and devices), military construction for (or modification of) training facilities, services and other resources necessary to establish initial, follow-on and replacement training operations must be incorporated in the planning, programming and budgeting process during the initial hardware development phase and made increasingly definitive as this development progresses. Such planning is required for the development of NTPs necessary to support the Integrated Logistic Support concept and other planning documents provided for in references (a) and (b). Concurrently, action must be initiated to define new knowledge and skills which may be required, to make necessary changes in enlisted and officer billet classification, to adjust procedures for personnel administration when necessary, to establish or modify training programs and to change manning documents. For programming purposes, the minimum lead times required to meet ready-for-training dates are (1) five years for military construction projects, (2) four years for major training devices, and (3) three years for billets and expense dollars.

b. Coordination of Training Requirements for Operational Life of Hardware. With respect to a new system, equipment, or other development, personnel trained in installation, operation, maintenance and operational employment must be available for operational and technical evaluation, for operational introduction, and for each subsequent installation. Development and implementation of the training program must be closely coordinated with the development, procurement and installation of the

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hardware. Thereafter, replacement personnel must be trained in numbers required for the full operational life of the hardware. The training program must be maintained current to reflect any hardware modifications which may affect the numbers and types of skills required to support them and to reflect ship and shore personnel work assignment practices. Close and effective coordination between the Offices of the Chief of Naval Operations, Commandant of the Marine Corps, Chief of Naval Material, Chief of Naval Personnel, Chief of Naval Education and Training, Fleet Commanders in Chief, and other principals, is essential to the establishment and continued support of a suitable training program.

c. Identification of Manpower Needs. The formal NTP prepared in accordance with enclosure (1), in addition to establishing the training program, serves as an official document to identify the need to change Navy end-strength to accommodate training and training support manpower requirements. Applicable Deputy Chief of Naval Operations (DCNOs) or Director, Major Staff Offices (DMSOs) provide for Navy end-strength adjustments during the annual development of the Program Objectives Memorandum (POM). Alternatively, the NTP identifies the requirement for the Chief of Naval Operations to reprogram manpower assets when an increase to Navy end-strength is not required or cannot be obtained.

d. Identification of Training Requirements. Under the provisions of reference (e), each DCNO and DMSO has a direct responsibility to determine training requirements for his applicable operational areas and to ensure that training plans satisfy these requirements, based on an appropriate validation, test and evaluation of training programs. The NTP, prepared in accordance with enclosure (1), will provide the vehicle to adequately define the resources to satisfy these requirements.

e. Identification of Facility Requirements. It is essential that facility requirements to accommodate new training be identified as early as possible. New facilities or existing facility alterations which cost in excess of \$50,000 (excluding repairs) will normally require five years to program, construct, and be ready for training equipment installation. Urgently required projects costing less than \$300,000 and meeting the urgency criteria of paragraph 2104 of reference (f) may be obtained in approximately 18 months; however, obtaining approval of these projects is usually difficult. Therefore, new training

requirements for which major facility impacts are indicated (new construction in excess of \$50,000) and for which trained personnel must be available concurrent with or prior to Fleet introduction, must be identified at least five years prior to Fleet introduction of the equipment. An approximation of the facility scope and requirement (as a minimum) must also be available in the same time frame. If this lead time is not feasible, then factory training must be incorporated into the NTP until the required facilities can be programmed and developed.

6. Policy. All planning, programming and implementing actions for new systems, subsystems, subsystem components and non-hardware oriented developments will include the resources necessary to analyze, establish and maintain correlated personnel and training programs.

5 a. Billets, personnel, military construction schedule, training hardware and training requirements and capabilities will be estimated during the early stages of systems development for purposes of performance, cost effectiveness and trade-off evaluations.

b. Total training requirements will be determined and incorporated into the POM and budget cycles for each project as early as necessary to ensure that trained personnel are available for operational and technical evaluation, as well as for the operational introduction of the related system, subsystem, subsystem component, or non-hardware oriented development. Simultaneous action will be taken to identify new knowledge and skills required and to revise the enlisted and officer structures, qualifications, classification procedures, training programs and manpower allowances accordingly.

c. Recognizing that specific technical details relating to the design of the system, subsystem, subsystem component, or non-hardware oriented development to be introduced may not be available in the early stages of a new development, it may be necessary that the initial NTP be prepared based on experienced judgement. Though lacking in detail, the initial draft NTP will provide timely notification of those developments having a major impact on training resource requirements and the planning, programming and budgeting thereof. Technical program data, which are the basis for determining if a NTP is required, must be provided to the applicable DCNO or DMSO in a timely manner to ensure the development and approval of the NTP for introduction of required resources into the programming cycle. A formal

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approved NTP is required for identification of training for the Technical Evaluation (TECHEVAL) and Operational Evaluation (OPEVAL) and, in any event, at least three years in advance of the planned Fleet introduction date. An update conference of these NTPs will be held as frequently as necessary and will be convened and chaired by the applicable DCNO or DMSO.

d. On Quick Reaction Capability (QRC) or Rapid Development Capability (RDC) procurement programs or other accelerated procurements, a NTP will be developed as soon as possible; comment regarding QRC or RDC status will be included in all training documentation related to this type of accelerated procurement.

e. As stated in reference (g), when operational installation and manning by Navy military personnel are anticipated, the availability of the hardware for training purposes has a higher priority and more demanding delivery schedule than the operational installation. Compliance with this policy will be monitored by the Chief of Naval Operations and waivers will be granted only in extreme cases.

f. The approved NTP is the official statement of billets, personnel, and training requirements to support the introduction and operational use of new systems, equipments and other developments, including non-hardware related development, i.e., managerial procedures. The validity of the information presented in the NTP and continued improvement of the confidence level are to be the uppermost concern of all participants in the NTP development process.

7. Planning concept

a. The requirement to plan for billets, personnel, and training exists regardless of the means by which a new development is documented, planned, produced, or installed in the Navy. Amplification of the planning concept and procedures for this planning are provided in enclosure (1).

b. The principal events in the planning cycle are:

(1) Prompt identification and assignment of Principal Development Activity (PDA) or Project Manager (PM) for new systems, subsystems, subsystem components, and non-hardware oriented developments being introduced.

(2) Timely provision of technical program data to the applicable DCNO or DMSO sponsor for determination regarding

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need for NTP and for delegation of authority in connection therewith.

(3) Development of draft NTP by applicable PDA; initiation of action to obtain inputs from other cognizant commands, as considered necessary, on major elements of the NTP.

(4) Provision of draft NTP to all concerned principals forty calendar days prior to convening a Navy Training Plan Conference (NTPC).

(5) Submission of comments and recommendations on draft NTP to PDA at least ten calendar days prior to NTPC.

(6) Convening of a NTPC to finalize the draft NTP.

(7) Review, validation, approval and distribution of the NTP.

(8) Incorporation of elements of the approved NTP into other documents as suitable to their purpose.

(9) Initiation of programming actions for billet, personnel and training resources as set forth in the approved NTP.

(10) Identification of billet, personnel and training requirements in budgets, manning documents, equipment procurement plans, and other documentation.

(11) Implementation of the approved NTP.

(12) Repetition of these events in the frequency and formality necessary to maintain the NTP current with the status of the development.

8. Responsibilities

a. Chief of Naval Operations

(1) Provide policy, procedural guidance and coordinating action in planning and implementing training programs in support of new developments and major modifications which impact on training. (DNET (099))

(2) Participate in the development of NTPs by assisting in the definition of skills and approving manpower requirements to support the introduction of new developments. (DCNO (Manpower))

(3) Initiate reprogramming of operational billet assets as necessary to support the introduction of new systems, equipments, or other developments. (Applicable DCNO or DMSO sponsor)

(4) Direct, supervise, and/or initiate the development of NTPs to support the operational introduction of new systems, equipments or other development. (Applicable DCNO or DMSO sponsor)

(5) Convene and chair NTPC for the introduction of new systems, subsystems, subsystem components and non-hardware oriented developments, as appropriate. (Applicable DCNO or DMSO sponsor)

(6) Approve and promulgate NTPs and all subsequent updates in the NTP formats outlined in enclosure (1). (DNET)

(7) Coordinate the efforts of the bureaus, offices and commands of the Navy in support of training programs. (DNET)

(8) Make appropriate programming submissions and support the budgetary process, as necessary, to implement approved NTPs. (Applicable DCNO or DMSO sponsor and DNET)

(9) Ensure implementation of NTPs, and monitor and evaluate the quality of training provided. (Applicable DCNO or DMSO sponsor)

(10) Promulgate semi-annually a list of effective NTPs. (DNET)

(11) Promulgate semi-annually a schedule of NTPCs (initial or updates). (DNET)

(12) Rewrite manpower authorizations, as necessary, if the NTP manpower requirements can be expressed within the overall end-strength and grade ceiling limits. (DCNO (Manpower))

b. Commandant of the Marine Corps

(1) Participate in the development of NTPs in all cases where the training of Marine Corps personnel will be affected.

(2) Evaluate the adequacy and implementation of NTPs and the quality of training resulting in cases where the training affects Marine Corps personnel; provide recommendations to

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the Chief of Naval Operations considered necessary to improve training where Marine Corps personnel are affected.

c. Chief of Naval Material

(1) Assign to the cognizant Systems Command, other support agency, or designated Project Manager responsibilities as PDA incident to the approval of a requirement for a hardware or non-hardware oriented development.

(2) Identify at least semi-annually to applicable DCNO and DMSO a list of hardware and/or non-hardware oriented developments for which a NTP or NTPC must be considered.

(3) Review proposed NTPs prepared to support the introduction of a new or revised system, equipment, or other development.

(4) Coordinate training support actions among the Naval Material Command components, when required.

d. Systems Commanders, Project Managers and other Principal Development Activities designated by the Chief of Naval Material

(1) Provide to the Chief of Naval Material semi-annually at the end of the first and third quarter of each fiscal year a list of systems, subsystems, subsystem components, and non-hardware oriented developments for which NTPs should be considered and NTPCs and update conferences should be convened.

(2) Develop draft NTPs to support the introduction of new systems, equipments or other developments when directed by the Chief of Naval Operations.

(3) Conduct logistic support analysis (LSA), as required to assist in determining, among other logistic requirement, qualitative and quantitative manpower requirements (military or civilian) to support the introduction of new systems, equipments, or other developments.

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- (4) Unless otherwise directed by the Chief of Naval Operations, announce and host NTPCs, and prepare the draft NTP on new systems, equipment, or other developments.
- (5) Program, budget, allocate and employ resources to implement initial training and/or factory training, as set forth in approved NTPs, coordinating with the Training Agency responsible for follow-on and/or replacement training.
- (6) Program, budget, allocate and employ resources to prepare and furnish required training materials and quality control, with specification input support provided by the Training Agency.
- (7) Ensure that elements of NTPs are incorporated within other planning and funding documents, as appropriate.
- (8) Report progress, slippages and revisions in implementing NTPs to applicable DCNO and DMSO sponsor when considered appropriate.
- (9) Conduct regular review of NTPs and associated programs to identify need for changes as the result of reprogramming, budget changes, development or production schedule changes, equipment modification and other factors. Advise all other NTP principals of the circumstances and need for the change.
- (10) Initiate action, consistent with the provisions of references (a) through (j), for development, procurement, allocation, installation, and depot level overhaul or repair of training systems and equipment, and for intermediate level maintenance of training systems and equipment when CNO has not designated a specific intermediate level maintenance activity.
- (11) Provide for alterations, conversion and rehabilitation of the Training Agencies' facilities required incident to installation and removal of training equipment consistent with the provisions of reference (h).
- (12) Provide for the review, by the Chief of Naval Education and Training (CNET), of contractor furnished instructional material designed for use within CNET training programs concurrent with the technical accuracy and adequacy review.
- (13) Arrange for and provide factory or other specialized contract training and arrange for inter-service contract training when required in accordance with the provisions of reference (i).

(14) Provide engineering and technical service as authorized by reference (j).

(15) Provide technical manuals for use in initial and follow-on training.

e. Chief of Naval Personnel

(1) Participate in the development of NTPs by assisting in matching the skills required to support the introduction of new developments to those skills required in the current and projected personnel system. (Pers-2, 4, 5)

(2) Select and assign the requisite numbers and types of Navy personnel specified in the Manpower Authorization (OPNAV 1000/2) as necessary to implement the approved NTP. (Pers-4 and 5)

(3) Conduct NTPCs on proposed changes to Navy rating and similar personnel structure matters when directed by the Chief of Naval Operations.

(4) Review proposals in draft NTP for impact on the communities of personnel involved. In the event of non-concurrence, provide an alternative with supporting rationale. (Pers-4 and 5) In the case of new skills or technology changes, their impacts on the occupational classification system should be determined and proposed modifications to the system should be included (Pers 2)

(5) Conduct occupational task analyses as specified by the Chief of Naval Operations in support of new systems and developments. (Pers-2)

(6) Take timely action to establish new personnel classification categories necessary to support new systems and developments. (Pers-2)

(7) Participate in NTPC as appropriate.

f. Chief of Naval Education and Training

(1) Participate as the Training Agency (TA) in the development of the NTP in support of new systems, equipments or other developments which impact on training activities and programs within the Naval Education and Training Command (NAVEDTRACOM).

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(2) Provide planning, programming and budgetary data which form the basis for manpower and other resource requirements for the NAVEDTRACOM activities and programs.

(3) Establish manpower and other resource requirements and their priorities to support the training activities and programs involved within the NAVEDTRACOM.

(4) Establish and conduct training based on requirements approved by the Fleet Commanders in Chief in accordance with reference (1).

(5) For training within NAVEDTRACOM cognizance, designate the appropriate activity which will participate in the review of, and provide comments on contractor furnished and initial training materials to ensure initial training format is adequate and compatible with follow-on and/or replacement training.

(6) Review and provide comments concerning contractor furnished or other initial training course curricula and instructional materials.

(7) Program, budget, allocate and employ training resources to participate in initial training and to implement follow-on and/or replacement training as set forth in approved NTPs.

(8) Identify need for changes to NTP and advise the Chief of Naval Operations of the circumstances and need for the recommended change.

(9) Participate in NTPC.

g. Commander in Chief U. S. Atlantic Fleet; Commander in Chief of U. S. Pacific Fleet; Chief, Bureau of Medicine and Surgery; Chief of Naval Reserve

(1) As appropriate, participate in the development of NTPs.

(2) Incorporate elements of approved NTPs in other planning and funding documents as appropriate.

(3) Establish and conduct courses of instruction as necessary to implement approved NTPs.

(4) Program, budget, allocate and employ personnel and training resources to participate in initial training and to implement follow-on and/or replacement training approved in NTP.

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(5) Evaluate the adequacy of NTPs and the quality of resultant training. Recommend to the Chief of Naval Operations actions necessary to improve training.

9. Action. Addressees will take action necessary to carry out responsibilities as set forth in paragraph 8, above.

10. Reports

a. The New Development Training Plan (NEDTRAPLAN) is a Command and Management Information System intended to provide an automated means of recording, updating, and displaying the resources, major milestones and actions and/or decisions required for implementation of NTPs. The initial introduction of the data into the NEDTRAPLAN will be accomplished by DNET (099).

b. Semi-annual review and update of the data will be accomplished by the cognizant DCNO and DMSO's. Review and updates will be completed at the beginning of the first and third quarters. This system will not only include approved NTPs but will identify new developments which ultimately may necessitate development of a NTP. While it is recognized this latter category will include only minuscule data with the initial input, it will serve to ensure planning for long range developments are initiated in a timely manner.

c. The NEDTRAPLAN will be available for use of the Training and Education Requirements Panel (TRP) during each Program Objective Memorandum (POM) development cycle in order to ensure that new/revised resource requirements are included in the POM.

d. The format of the NEDTRAPLAN is furnished as Appendix A.

e. Symbol OPNAV 1540-3 is assigned this reporting requirement.



C. N. MITCHELL
Deputy Director
Naval Education & Training

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APPENDIX G

OPNAV INSTRUCTION 3500.34B, PERSONNEL QUALIFICATION STANDARDS
(PQS) PROGRAM



DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
WASHINGTON, D. C. 20350

IN REPLY REFER TO

OPNAVINST 3500.34B
Op-9911

8 MAR 1975

OPNAV INSTRUCTION 3500.34B

Subj: Personnel Qualification Standards (PQS) Program

Ref: (a) OPNAVINST 3500.32A, Subj: Shipboard Training
(b) OPNAVINST 1500.11F, Subj: Naval Aviation Training
Program policies, responsibilities and procedures

1. Purpose. To promulgate policy, procedures and responsibilities for the Personnel Qualification Standards program.

2. Cancellation. OPNAVINST 3500.34A of 20 August 1971 is hereby canceled.

3. Definition. The Personnel Qualification Standards (PQS) program is a method for qualifying officer and enlisted personnel to perform assigned duty. A Personnel Qualification Standard is a written compilation of knowledge and skills, derived from task analysis, required to qualify for a specific watch station, maintain a specific equipment or system, or perform as a team member within the assigned unit. A watch station, as it applies to PQS, refers to those positions normally assigned by a watchbill, usually of four-hour duration, and, in the majority of cases, operator oriented. Maintenance refers to those tasks which pertain to technical upkeep of equipments and systems. Performance as a team member within the unit refers to those collections of knowledge and skills appropriate for standardized qualification which are not peculiar to a specific watch station or equipment, but apply more broadly within the unit. A PQS is in the format of a qualification guide, which asks the questions a trainee must answer to verify his readiness to perform a given task, and provides a record of his progress and final certification. (R)

4. Background

a. The concept of standards for personnel qualification is not new to the Navy. For many years past and in many functional areas, various forms of qualification standards have been in use. The observation of an officer's performance on the bridge as the basis for the captain certifying that officer to be a qualified officer of the deck constitutes the application of performance standards. The first lieutenant applies a similar approach to "hands on" performance evaluation in the qualification of helmsmen and boat coxswains. The detailed check off list approach to watch

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station qualification in submarines is another example of the application of qualification standards. The processing of the Navy aviator through a replacement air wing also represents the application of standards for personnel qualification.

b. There are many functional areas in which standards for personnel qualification have not been promulgated, are not consistent in usage, or, if they had existed in the past, have fallen into disuse. The increasing need for improved job performance within a fast-flowing stream of Navy personnel continues to make proper qualification of individuals a matter of urgent significance.

A) c. The method for systematically examining and recording the knowledge and skill required for task performance is known as task analysis. Navy Occupational Standards and Personnel Qualification Standards are to be developed from the common data base generated by task analysis. Occupational Standards state the skill standards required for professional in-rate duties. Personnel Qualification Standards provide, in the main, the operational skill standards for watch station duties. The training required in support of these standards is to be met through the coordinated design of school and on-board training programs and associated training material.

A) d. The Personnel Qualification Standards developed to date have proven to be beneficial to those commands that have fully supported the PQS as an element of a well-managed unit training program. In those commands where the PQS program has not been successful, some of the following conditions have existed:

(1) Ineffective management of the overall unit training program.

(2) Failure to use sufficient numbers of supervisory personnel to execute the PQS program, or the unit's overall training program.

(3) Failure to establish a program to prepare supervisory personnel as PQS qualifiers.

(4) Failure to establish and maintain an adequate PQS reference library of technical, procedural, and rate training manuals.

(5) Failure to establish individual qualification goals or time limits.

(6) Ineffective or nonexistent monitoring of individual qualification progress.

5. Policy. In implementing the PQS program, the following policies are promulgated: (R)

a. The PQS program is an element of the overall unit training program, as addressed in reference (a) for shipboard training and in reference (b) for aviation training. As an element of the shipboard training program, PQS is to be incorporated as the keystone program for unit watch station qualification. The responsibilities for shipboard training as stated in reference (a) are equally valid for the PQS qualification program. However, to permit rapid and effective implementation of the PQS program into the overall shipboard and aviation training programs, specific responsibilities are detailed in this instruction. Once satisfactory implementation is achieved, the need for this instruction will have been met and its contents will then be incorporated into references (a) and (b).

b. Those PQS to be developed and their development priorities will be approved by the Chief of Naval Operations. PQS will be developed with emphasis primarily on surface shipboard watch station qualifications. However, some development assets will continue to be allotted to aviation related PQS, a limited number of high priority engineering equipment operating and maintenance PQS, certain PQS for areas of general applicability across many occupational groups, and updating of existing PQS.

c. Implementation of PQS is appropriate in surface ships and aviation units, and is directed for use therein as individual PQS packages are published. There are no current plans to develop PQS for specific use in submarines, since existing qualification programs predating PQS are in force and are viable. The PQS program is not applicable to nuclear propulsion or the FBM weapons systems, which are handled under special procedures and are therefore not included in the scope of this instruction.

6. Responsibilities and action

a. Chief of Naval Operations

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(1) Director, Naval Education and Training (OP-099)

(a) Promulgate policy for stating requirements, organizing, supporting, and administering the PQS program.

A) (b) Integrate and promulgate PQS development priority listings, updating such listings semi-annually in June and December.

R) (c) Evaluate PQS program effectiveness and determine when its management should be incorporated fully into references (a) and (b).

A) (d) Publicize the PQS program as the keystone program for shipboard watch station qualification.

A) (e) Coordinate action by Deputy Chiefs of Naval Operations and Directors, Major Staff Offices, as specified below.

A) (f) Coordinate development of a plan for inclusion of PQS, where appropriate, as one of the prerequisites for rate advancement.

A) (2) Deputy Chiefs of Naval Operations, and Directors, Major Staff Offices, in areas of cognizance:

(a) Approve requirements and set priorities for PQS development.

(b) Provide procedures to effect changes to unit training organization and administration to achieve successful PQS implementation into unit training programs.

A) b. Fleet Commanders in Chief

(1) Direct the PQS program as one element of unit training in their respective fleets.

(2) Forward new PQS requirements and recommended development priority to the Chief of Naval Operations (OP-099) as needs are identified.

(3) Establish organization and procedures for PQS program administration, in accordance with policy direction of the Chief of Naval Operations.

(4) Establish PQS implementation teams to assist individual commands with the introduction of PQS into unit training programs.

(5) Include an evaluation of PQS management and effectiveness as part of the command inspection of unit training programs.

(6) Provide personnel, insofar as resources permit, to participate in workshop development of new and revised PQS.

(7) Submit recommendations to the Chief of Naval Operations to improve PQS implementation and existing PQS material.

c. Chief of Naval Personnel

(A)

(1) Provide for recording of PQS qualifications in service records as part of Navy training history.

(2) Include consideration of the PQS program in research conducted on procedures for shipboard training and training administration.

(3) Include completion of the appropriate PQS as prerequisite for assignment of those NEC's which may be earned by on-the-job training.

(4) Provide policy direction concerning the appropriate use of PQS as a source for questions in the preparation of advancement in rate examinations.

(5) Participate with the Director, Naval Education and Training and the Chief of Naval Material in the development of a plan for appropriate inclusion of PQS as one of the prerequisites for rate advancement.

d. Chief of Naval Material

(1) Review all new and revised PQS related to equipments, systems, and other technical areas under his cognizance, to ensure technical adequacy.

(2) Identify in Navy training plans the requirements for new construction PQS development.

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- R) (3) Provide to the Chief of Naval Education and Training task and skill analysis data upon which applicable PQS can be developed.
- A) (4) Provide for inclusion of information in operational and maintenance technical manuals, which will enhance their use as study references in meeting the qualifications requirements of PQS.
- A) (5) Provide personnel to participate in workshop development of new and revised PQS when fleet personnel possessing sufficient technical expertise are not available.
- A) (6) Participate with the Director, Naval Education and Training and the Chief of Naval Personnel in the development of a plan for appropriate inclusion of PQS as one of the prerequisites for rate advancement.

e. Chief of Naval Education and Training

- (1) Fund and develop PQS which have been approved for development by the Chief of Naval Operations.
- R) (2) Review and approve PQS prior to publication, subject to concurrence by the command(s) concerned.
- R) (3) Establish the means for changing existing PQS to reflect new requirements and improvements, based on fleet experience, and for identifying such changes in PQS revisions.
 - (4) Incorporate the use of PQS by individuals undergoing shore-based formal training.
- R) (5) Provide for inclusion in rate training manuals, which will enhance their use as study references in meeting the requirements of PQS.
- R) (6) Publish a total listing of PQS available to the fleet, updating at least semi-annually in August and February, together with a list of PQS in development and planned for development.
 - (7) Provide support to the Fleet Commanders in Chief by:
 - A) (a) Providing training to PQS implementation teams.

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(b) Publishing guides for the on-board use and administration of PQS.

(c) Participating in the development of organization and administration plans, to assist in effecting satisfactory implementation of PQS into unit training programs.

(A)

(8) Provide support to the Chief of Naval Material in:

(a) Determining the requirement for task and skill analysis data upon which Navy workshops can write PQS for new construction units.

(R)

(b) Determining the manner in which information to support PQS is to be included in operational and maintenance technical manuals.

J. L. Holloway III
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APPENDIX H

THE CYCLIC PATTERN OF WATCHSTANDING TRAINING ABOARD SHIPS

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THE CYCLIC PATTERN OF WATCHSTANDING TRAINING ABOARD SHIPS

The PQS Program is designed for use in watchstanding training aboard ship. There are PQS manuals provided for over 600 shipboard positions. These manuals list questions the technician must answer and skills he must perform to be certified as qualified to stand watch. They also refer the trainee to other sources of information required in this certification process, such as TMs.

Watchstanding training occurs most frequently during certain specified phases in a ship's operating cycle. During other phases of the cycle, this type of training will rarely be conducted.

Designers of onboard training material should understand this cycle of ship operations in order to create materials that support specific needs in the ship's operations and to form realistic expectations on the extent that these materials will be used.

Fleet commanders schedule ships to be in specific states of readiness at predetermined times. One readiness condition leads to the next and a pattern or cycle of operations is formed. This sequence of readiness conditions is described in terms of a Ship Operating Cycle. For different classes of ships this cycle may vary from 55 to 72 months.

The cycle of operations for an operational combatant ship typically starts with a Regular Overhaul, which is followed by a period of Initial Type Training, encompassing various degrees of combat readiness. The next phase usually includes a Forward Transit to an operating area, Forward Deployment, and a Return Transit. This is typically followed by a Post-deployment Upkeep period. This sequence is repeated until the ship enters its next scheduled overhaul period.

This basic cycle of operation is described in the following pages for six classes of ships in the Atlantic Fleet. The cycle is described as it was in 1975. Although the elements of the cycle may differ between fleets, or changes occur over time, the following account generally describes the periodic phases in a ship's operating schedule.

The types of training performed during each phase of the cycle are described; types of training that will not be performed in each phase are also noted. Table H-1 describes the cycle of operation for six classes of ships, and includes the months for each phase of the cycle. Table H-2 presents an estimate of the rate that PQS materials are used in these classes of ships and indicates probable heavy, medium, and low use rates by phase in the cycle of operation.

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TABLE H-1. CINCLANTFLT SHIP OPERATING CYCLES*

DD		DDG		CG	
Phase	Months	Phase	Months	Phase	Months
ROH	10.00	ROH	11.00	ROH	11.50
ITT	2.62	ITT	3.20	ITT	3.20
"B"	2.40	"B"	2.56	"B"	2.56
"A"	2.48	"A"	1.80	"A"	1.80
Transit	0.46	Transit	0.46	Transit	0.46
Forward Deploy	5.10	Forward Deploy	5.10	Forward Deploy	5.10
Transit	0.325	Transit	0.325	Transit	0.325
PDU	1.38	PDU	1.38	PDU	1.38
"A"	8.01	"A"	8.01	"A"	8.01
Transit	0.46	Transit	0.46	Transit	0.46
Forward Deploy	5.10	Forward Deploy	5.10	Forward Deploy	5.10
Transit	0.325	Transit	0.325	Transit	0.325
PDU	2.07	PDU	3.00	PDU	3.00
ITT	1.00	ITT	1.00	ITT	1.00
"A"	6.32	"A"	5.39	"A"	5.39
Transit	0.46	Transit	0.46	Transit	0.46
Forward Deploy	5.10	Forward Deploy	5.10	Forward Deploy	5.10
Transit	0.325	Transit	0.325	Transit	0.325
Pre-ROH	<u>1.00</u>	Pre-ROH	<u>1.00</u>	Pre-ROH	<u>1.00</u>
Total	55 Mos.	Total	56 Mos.	Total	56.50 Mos.

*CINCLANTFLT 1975

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TABLE H-1. CINCLANTFLT SHIP OPERATING CYCLES* (continued)

FF		CV		AOE	
Phase	Months	Phase	Months	Phase	Months
ROH	8.50	ROH	12.00	ROH	9.00
ITT	2.86	ITT	2.24	ITT	2.53
"B"	2.40	"B"	1.94	"B"	1.19
"A"	2.24	"A"	3.11	"A"	3.78
Transit	0.46	Transit	0.46	Transit	0.46
Forward Deploy	5.10	Forward Deploy	5.10	Forward Deploy	5.10
Transit	0.325	Transit	0.325	Transit	0.325
PDU	1.38	PDU	3.00	PDU	0.92
"A"	8.01	ITT	1.68	ITT	0.93
Transit	0.46	"B"	1.94	"A"	7.54
Forward Deploy	5.10	"A"	2.77	Transit	0.46
Transit	0.325	Transit	0.46	Forward Deploy	5.10
PDU	2.07	Forward Deploy	5.10	Transit	0.325
ITT	1.00	Transit	0.325	PDU	1.84
"A"	6.32	PDU	3.00	ITT	0.93
Transit	0.46	ITT	1.68	"A"	6.62
Forward Deploy	5.10	"B"	1.94	Transit	0.46
Transit	0.325	"A"	2.77	Forward Deploy	5.10
Pre-ROH	1.00	Transit	0.46	Transit	0.325
		Forward Deploy	5.10	PDU	0.92
		Transit	0.325	ITT	0.93
		PDU	3.00	Pre-ROH	1.00
		ITT	1.68		
		"B"	1.94		
		"A"	2.77		
		Transit	0.46		
		Forward Deploy	5.10		
		Transit	0.325		
		PRE-ROH	1.00		
	55.50 Mos.		72.00 Mos.		59.00 Mos.

*CINCLANTFLT 1975

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TABLE H-2. ESTIMATED USE RATES FOR PQS MANUALS EXPRESSED IN PERCENT OF SHIP'S OPERATING CYCLE FOR THREE LEVELS OF USE

	Heavy Use	Medium Use	Low Use
DD	9%	63%	28%
DDG	10%	59%	31%
CG	10%	59%	32%
FF	10%	64%	26%
CV	13%	55%	32%
AOE	11%	64%	25%
Averages	10.5%	60.7%	29.0%

NOTE: Heavy use projected for ITT and forward transit periods
 Medium use projected for "B," "A," and Forward Deployment
 Low use projected for ROH, PDU, Return Transit, and Pre-ROH

Maintenance handbooks are used in conjunction with the PQS program, although the extent of their use has not been measured and may be slight. Normally, PQS manuals refer the trainee to TMs appropriate to his job. However, discussions with a limited number of ships' PQS program managers indicate that trainees seldom take the time to look up the information in the manual because today's manuals make this a tedious process. In fact, much of the information is obtained by word of mouth from others on the watch.

REGULAR OVERHAUL (ROH)

During the first one-third of the shipyard regular overhaul period the engineering personnel are extremely busy removing equipment from the ship for overhaul in the yard (rip-out). Supply personnel are implementing the Supply Overhaul Assistance Program (SOAP), a program in which spare equipment and supplies other than that to be immediately consumed are moved to a warehouse for inventory, freeing ship spaces for yard work. The second one-third of the yard period is a slack period for non-engineering ship's personnel. The final one-third is a high intensity work period in which the equipment is brought back onboard, checked out, and problems corrected.

PERSONNEL. Upon arrival at the shipyard, the manning level of the ship drops. Transfers take place, including unscheduled transfers of a few key petty officers to meet manning problems of other ships. The command usually approves requests for early outs, leave, and medical/dental care.

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TRAINING. It is during this period that personnel are sent to "A" and "C" schools and to type commander required courses. This is especially true of personnel in the Operations Department. Engineering personnel also prepare for the Propulsion Examining Board Initial Light Off Inspection (approximately 1 hour a day for one-half of the yard period). This involves indepth systems lectures in preparation for oral and written examinations, including leadership oral examinations for engineering petty officers and oral examinations for CO/XO. The ship's company must pass the inspection before the boilers can be lit off at the end of overhaul.

The PQS are used less during this period than any other period because appropriate watches are not stood and because the equipment required for this training is normally not in operating condition.

INITIAL TYPE TRAINING, (ITT)

Following a regular overhaul or post-deployment upkeep period the ship goes to sea to allow the crew to work together for the first time. In addition to training, it is at this time that the engineering equipment and weapon systems are tested and sensors aligned. The Propulsion Examining Board At Sea Inspection must be passed during this period. At the end of this period the ship goes through refresher training.

PERSONNEL. A major rotation of the crew has taken place. Most members must qualify or requalify to stand the various watches.

TRAINING. An intensive training effort takes place during this period. Watchstanding is at a peak; PQS is used more during this period than at any other time. Refresher training is conducted on seagoing skills including damage control, general quarters, engineering casualties, drills for man overboard, landing at a pier, etc. Team training is minimal during this period; basic evolutions dealing with single ship operations are conducted.

DEPLOYED BRAVO

This is a period of individual ship exercises using submarine and air services and a period for obtaining special certifications and completing inspections necessary for being fully mission ready. Special assist teams come aboard (e.g., MOTU, Combat System Service Teams and Nuclear Weapons assist visits). Toward the end of this period the ship's company will commence pre-deployment preparations, including sending the 90 day letter, study of Sixth Fleet operating procedures, and taking on the necessary supplies.

PERSONNEL. The essential watchstanders have been qualified prior to this period. Now additional watchstanders are qualified using routine training procedures.

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TRAINING. The PQS continue to be used but in a routine manner. The special assist teams provide tutoring on problem areas. Routine training periods (perhaps 1 hour a day) focus on activities in the immediate schedule of the ship. Required type commander exercises are conducted.

DEPLOYED ALPHA

The ship is considered mission ready. During this period major fleet exercises are conducted and multiship operations are performed.

PERSONNEL. If a staff is to come aboard, it does so at this time.

TRAINING. Included are wardroom briefings on operation orders, ship procedures, electronic warfare doctrine, etc. Routine training periods (perhaps 1 hour a day) are focused on activities in the immediate schedule of the ship. Exercises required by the type commander are conducted.

TRANSIT (to deployment area)

This period is devoted to refining multiship skills while moving into the forward area. A series of mini-exercises are conducted with the other ships in the operating team. The ship is moving toward the end of its supply line with no immediate outside help available.

PERSONNEL. High motivation exists as personnel anticipate forward operations.

TRAINING. This is a good time for PQS training and the teaching of Sixth Fleet doctrine. Also, training is conducted in public relations for liberty while deployed.

FORWARD DEPLOYMENT

This period contains advanced operating exercises and real assignments. The intensity of operations during forward deployment varies sporadically and is usually less intense than fleet exercises conducted to prepare for deployment.

PERSONNEL. Some turnover of personnel takes place.

TRAINING. The PQS are used to upgrade the watchstanders and candidates.

TRANSIT (from deployment area)

This transit is made quickly with few scheduled exercises or diversions. Work performed is generally in preparation for stand-down or upkeep maintenance to be performed after arrival at homeport. Planning for leave/liberty is done at this time.

PERSONNEL. Relaxed atmosphere, high morale as a result of returning home.

TRAINING. Little team training is performed. Individuals may plan shore-based training, including "A" and "C" school courses, for the time in port.

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POST-DEPLOYMENT UPKEEP (PDU)

This is a stand-down or cold-iron period; ships boilers are not heated. The period provides maximum leave and liberty following deployment.

PERSONNEL. The largest group of people leave the ship at this time and include those not shipping over and those attending school. Senior enlisted frequently receive details of their next assignment. The ship still has more expertise onboard than it had when it left the yard but miscellaneous manning problems in the team have occurred.

TRAINING. Almost no training is performed. Some school assignments may be arranged at this time.

PRE-REGULAR OVERHAUL (PRE ROH)

This period is devoted to inservice inspections by the ship's company and the type commander and in preparing a work package that specifies:

1. work to be done by the shipyard
2. work to be accomplished by ship's force
3. follow-on work to be done outside the yard after overhaul.

PERSONNEL. Personnel are assigned off-ship training for yard period as appropriate.

TRAINING. Personnel who will stay with the ship during the yard period are indoctrinated in the work to be accomplished in the yard, how to get along in the yard, and how to perform their duties in the yard. Training schedules for "A," "C," and specialized schools are prepared now.

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APPENDIX I
HEAD/BOOK TRADE-OFF ANALYSIS

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HEAD/BOOK TRADE-OFF ANALYSIS

A Head/Book Trade-off Analysis is described by Chenzoff.¹¹ The draft Data Item Descriptions (DIDs) that follow describe this type analysis and were submitted to the Naval Air Development Center by Chenzoff. The DIDs have not been formally issued by the Navy.

¹¹ Andrew P. Chenzoff, Integrated Development of Training/Performance-At-Requirements for Naval Air Maintenance Personnel, 1973, Applied Science Associates, Inc., Valencia, PA. Prepared for Naval Air Development Center, Warminster, PA. Contract No. N62269-73-C-0597.

1 DATA ITEM DESCRIPTION	2 IDENTIFICATION NO(S)	
	AGENCY	NUMBER
1 TITLE Head/Book Trade-off (HBTO) Ground Rules		UDI-M-XXX3
3 DESCRIPTION/PURPOSE 3.1 Head/Book Trade-off Ground Rules are one of several intermediate products generated during the performance-aid task analysis. They are used to decide whether tasks identified in the maintenance task analysis are to be covered in performance aids,	4 APPROVAL DATE	
	5 OFFICE OF PRIMARY RESPONSIBILITY	
	6 DDC REQUIRED	
	8 APPROVAL LIMITATION	
7 APPLICATION INTERRELATIONSHIP 7.1 This DID describes data required by AR-XX, paragraph 3.2.2.8. 7.2 The Head/Book Trade-off Ground Rules must be established before the Task Identification Matrix is annotated, as specified in UDI-M-XXX4 and paragraph 3.2.2.9 of AR-XX. 7.3 Head/Book Trade-off Ground Rules revision shall be proposed whenever data developed later in the Integrated Development of Training/Performance-Aid Requirements indicate that a different trade-off would be beneficial to maintenance task performance.	9 REFERENCES (Mandatory as cited in block 10)	
	MCSL NUMBER(S)	
10 PREPARATION INSTRUCTIONS 10.1 Unless otherwise indicated herein, documents cited in this block of the issue in effect on the date of invitation for bids or requests for proposals/quotations, form a part of this Data Item Description to the extent specified herein. 10.2 Representatives of the Navy and the contractor shall generate the Head/Book Trade-off (HBTO) ground rules. One example of the type of ground rule that can be made is the following: "Instructions to remove or reinstall outer LRU protective covers, dust covers, etc., will be omitted from the performance aids. However, all access steps required for performance of tasks within WRUs shall be described in the MIAs." 10.3 In deciding what combination of training and performance aids will be used to support job performance requirements, the following factors should be considered: a. Ease of learning b. Ease of communication by book		

3. DESCRIPTION/PURPOSE (continued)

training, or both. The ground rules are determined through the joint efforts of the Navy and the contractor.

3.2 The purpose of the HBTO ground rules is to make explicit the rules governing allocation of task coverage to performance aids and/or training.

10. PREPARATION INSTRUCTIONS (continued)

- c. Task criticality
- d. Task difficulty (how prone to inadequate performance)
- e. Importance of reaction time or response rate
- f. Frequency of task performance
- g. Number of similar tasks
- h. Psychomotor skill component of task
- i. Rate of stimulus input
- j. Rate of response output
- k. Equipment complexity
- l. Equipment accessibility
- m. Environmental considerations
- n. Mission criticality
- o. Consequences of improper step performance on task performance
- p. Personnel hazards
- q. Audience career orientation
- r. Number of individuals who perform a task

10.4 The following general rules should be helpful in generating specific rules. The rules that follow apply across systems. The task analyst and the training specialist must create system-specific rules by identifying classes of system tasks that possess the named attributes.

Two sets of rules are presented here--one for tasks that belong in the training program; the other for tasks that should be described in MIAs. Classes of system tasks that have attributes falling under rules in both sets should be allocated to both training and performance aids.

10.5 Put in training:

- a. Tasks that are not very easy to learn on the job.
- b. Tasks that are hard to communicate with words.
- c. Tasks that need a great deal of practice for acceptable performance to be established.
- d. Tasks where there is little room for error.
- e. Tasks where consequences of error are serious.
- f. Tasks that do not take exorbitant sums of money to train.
- g. Tasks which are performed frequently on the job.
- h. Tasks in which the required speed or response rate does not permit referring to a manual.
- i. Tasks performed by a large proportion of the individuals in a given specialty.

10.6 Put in Job Performance Aids:

- a. Tasks usually performed in a fixed sequence.
- b. Behavior sequences that are long and complex.
- c. Tasks that are rarely performed.
- d. Tasks that involve readings and tolerances.
- e. Tasks that can be mentally rehearsed before the need to perform them arises.
- f. Tasks that are aided by the presence of illustrations.
- g. Tasks that utilize reference information, such as tables, graphs, flow charts, and schematics.
- h. Tasks with branching step structures.

10.7 The data sources to be used in creating Head/Book Trade-off Ground Rules are the total set of system-descriptive and task-descriptive documentation that the task analyst has been able to gather. In addition, a great deal of useful information and insight will be obtained from participation in the Analogous Audience Assessment (AR-XX, paragraph 3.2.2.6).

DATA ITEM DESCRIPTION		2 IDENTIFICATION NO(S)	
		AGENCY	NUMBER
1 TITLE Task Identification Matrix (TIM) Annotated for Head/Book Trade-off (HBTO)			UDI-M-XXX4
3 DESCRIPTION PURPOSE		4 APPROVAL DATE	
<p>3.1 The TIM Annotated for Head/Book Trade-off is a deliverable intermediate product generated by the contractor during the performance-aid task analysis. The annotated TIM results from applying the Head/Book Trade-off Ground Rules to the Preliminary Task Identification Matrix (PTIM). The annotated TIM indicates which maintenance tasks are to be covered by performance aids, by training, or both.</p>		5 OFFICE OF PRIMARY RESPONSIBILITY	
7 APPLICATION INTERRELATIONSHIP		6 DDC REQUIRED	
<p>7.1 This DID describes data required by AR-XX, paragraph 3.2.2.9.</p>		8 APPROVAL LIMITATION	
		9 REFERENCES (Mandatory as cited in block 10)	
		MCSL NUMBER(S)	
10 PREPARATION INSTRUCTIONS			
<p>10.1 Unless otherwise indicated herein, documents cited in this block of the issue in effect on the date of invitation for bids or requests for proposals/quotations, form a part of this Data Item Description to the extent specified herein.</p> <p>10.2 Preparation of the Preliminary Task Identification Matrix (UDI-M-XXX1) requires that level-of-maintenance decisions be recorded in the upper-left portion of the matrix cells. The head/book trade-off decisions should be recorded in the lower-right portion of the same matrix cells. This is done by the contractor with the assistance of a Navy representative. The entries that are possible are the following:</p> <ul style="list-style-type: none"> -- - (dash) no maintenance task of this type is performed on the hardware item. H - performance of this task shall not be described in detail in the MIA. B - performance of this task shall be described in the performance aid and it shall not be one of the specific behavioral objectives for training. 			

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