THE NATIONAL SHIPBUILDING RESEARCH PROGRAM

Proceedings of the IREAPS Technical Symposium

Paper No. 28: Standardization and Integration of Shipyard Processes and Procedures

U.S. DEPARTMENT OF THE NAVY CARDEROCK DIVISION, NAVAL SURFACE WARFARE CENTER
### The National Shipbuilding Research Program, Proceedings of the IREAPS Technical Symposium Paper No. 28: Standardization and Integration of Shipyard Processes and Procedures

**5a. CONTRACT NUMBER**

**5b. GRANT NUMBER**

**5c. PROGRAM ELEMENT NUMBER**

**6. AUTHOR(S)**

**5d. PROJECT NUMBER**

**5e. TASK NUMBER**

**5f. WORK UNIT NUMBER**

**7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)**

Naval Surface Warfare Center CD Code 2230 - Design Integration Tools Building 192 Room 128-9500 MacArthur Blvd Bethesda, MD 20817-5700

**8. PERFORMING ORGANIZATION REPORT NUMBER**

**9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)**

**10. SPONSOR/MONITOR’S ACRONYM(S)**

**11. SPONSOR/MONITOR’S REPORT NUMBER(S)**

**12. DISTRIBUTION/AVAILABILITY STATEMENT**

Approved for public release, distribution unlimited

**13. SUPPLEMENTARY NOTES**

**14. ABSTRACT**

**15. SUBJECT TERMS**

**16. SECURITY CLASSIFICATION OF:**

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**17. LIMITATION OF ABSTRACT**

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**18. NUMBER OF PAGES**

22

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ABSTRACT

NAVSEA's ongoing efforts to improve, standardize and integrate shipyard process instructions are outlined. This plan, will combine the best features of various DOD, Navy and Private programs including for example: (1) the navy technical information presentation programs, (2) DOD computer aided time standards, (3) NAPSYD/Ordinance Station EM&S automated support (NEAS), (4) the Carnegie Mellon/US Navy CARL VINSON CUN 70 ZOG program, (5) shipboard nontactical ADP system (SNAP), (6) NAVSHIPYD Norfolk - work planning and control systems - PROMPT, and (7) technical repair standards (TRS) program. Specific aspects of these programs will be discussed including computer aided authoring, group technology, and common vocabularies, and a status report of these efforts as well as future plans will be provided.
OBJECTIVES

I STANDARDIZE & AUTOMATE PROCESSES & PROCEDURES FOR SHIPYARD WORK

I INCORPORATE BEST FEATURES OF EXISTING & FUTURE AUTOMATED DATA INPUT, STORAGE & RETRIEVAL PROGRAMS

SHIPYARD PROCESS INSTRUCTION

• AN AID FOR THE MECHANIC THAT GIVES HIM CONFIDENCE IN THE FACT THAT HE IS DOING A JOB CORRECTLY AT A REASONABLE RATE AND UTILIZING THE RIGHT TOOLS AND MATERIAL.

• A LOGICAL COLLECTION OF BOTH OPTIONAL AND MANDATORY TECHNICAL INFORMATION AND GUIDANCE FOR PERFORMING WORK, SUCH AS OVERHAULING A PUMP, WELDING A SEAM, FABRICATING A JOINTER BULKHEAD.

• A FRAMEWORK THAT A SHIPYARD SHOULD BE ABLE TO USE TO ORGANIZE ITS WORKFORCE, FACILITIES, EQUIPMENT, AND MATERIAL IN AN EFFICIENT MANNER FOR A PARTICULAR TASK.

• A LOGICAL FRAMEWORK FOR PRODUCTIVITY IMPROVEMENTS.
GOALS

• COMMON FORMAT FOR PROCESSES, PROCEDURES, ALTERATIONS, ETC.

• ONE PRINT OUT YIELDS ALL INFORMATION NEEDED TO PERFORM THE JOB AND NO UNNECESSARY INFORMATION

• ABILITY TO EXTRACT WORKSHEET THAT CONTAINS ALL DATA COLLECTION TAG OUT, SAFETY, ETC. REQUIREMENTS

• ELIMINATE CODES & VAGUE ACRONYMS & PRINT INFORMATION IN CLEAR TEXT

• INFORMATION RECORDED IN ONLY ONE LOCATION

• ALL DATA NEEDED ON THE SUBJECT PRINTS OUT ON ONE INQUIRY

DESIRED RESULTS

• EASY TO USE

• INCREASED EFFICIENCY BY STANDARDIZING OPERATIONS

• ADAPTABLE TO PLANNING, ESTIMATING, BUDGETING, TRAINING, ETC.

• INTERFACE WITH OTHER SYSTEMS:
  • SPECIFICATIONS & STANDARDS
  • SUPPLY
  • 3M
  • QUALITY ASSURANCE
  • TRAINING
  • FACILITIES, TOOLS, SHIYARD MODERNIZATION, MILCON ETC.
SHIPYARD PROCESSES

SHIPYARD PROCESSES INCLUDE SPECIFIC
EQUIPMENT, COMPONENT, MODULE OR SYSTEM
FABRICATION, OVERHAUL, REPAIR MAINTENANCE,
MODIFICATION AND TEST PROCEDURES

THESE PROCEDURES CAN BE BROKEN DOWN INTO
GENERIC PROCESSES SUCH AS PAINTING, WELDING,
SILVER BRAZING, PIPEBENDING, ETC.

PROCESS & PROCEDURE INSTRUCTION

<table>
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<th>PERSONNEL REQUIREMENTS</th>
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<td>SAFETY, TAGOUT</td>
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## PROCESS & PROCEDURE
### STANDARDIZATION TEAM

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<tr>
<td>SEA 07Z/07OZ</td>
<td>SEA 070 STAFF</td>
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<tr>
<td>COORDINATOR</td>
<td>NEAS PROJECT MANAGER</td>
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<th>MR RON SHARBAUGH</th>
<th>MR HARRY DASHIELL</th>
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<tr>
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<th>JOHN HARTIGAN</th>
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<td>DTMB</td>
<td>SEA 072</td>
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<tr>
<td>NTIPS PROJECT MANAGER</td>
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<th>MR VIC BURNETT</th>
<th>CAPT JAY WHEELER</th>
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<tr>
<td>NAVSEA</td>
<td>SEA 07D</td>
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<tr>
<td>SPECIFICATIONS &amp; STANDARDS</td>
<td>SUPPLY/MATERIAL</td>
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</table>
"HERE, FINALLY, IS A BOOK THAT EXPLAINS, IN FUNDAMENTAL TERMS, WHY PRODUCTIVITY IN JAPAN IS SO MUCH HIGHER... In the years ahead, common use of the term 'Theory Z' will attest to the significant contribution of this important work."

Arjay Miller, Director, Ford Motor Company

"The Buick assembly plant in Flint, Michigan, used the Theory Z approach... Within two years, the plant had become the most efficient General Motors facility."

Time

"Theory Z concentrates on the organizational and behavioral side of management. One of the central tenets is that the traditional adversarial relationship between American management and workers is badly outdated."

The New York Times

"A hot new plan to revitalize corporate America."

The Los Angeles Times

"Powerful answers for American firms struggling with high employee turnover, low morale, and falling productivity."

Dallas Times-Herald

"Combines the best of the American and the Japanese business styles."

Akio Morita, Chairman, SONY Corporation

"Theory Z has to do with important matters—productivity, the welfare of corporations and their employees, and, by extension, the competitiveness of the national economy."

Fortune
LESSONS FROM THEORY Z

TRUST

PRODUCTIVITY

SUBTLETY

INTIMACY

LIFE & WORK

PRODUCTIVITY
MORALE
SUCCESS

TRUST, SUBTLETY, INTIMACY, ENTHUSIASM, SHARING, REALIZATION

DECREASING →
## RELATED EFFORTS AND INITIATIVES

This plan interfaces with and draws on other ongoing initiatives:

- Technical repairs standards (TRS)
- Naval technical information presentation program (NTIPP) – Provides format computer-aided authoring
- DoD computer-aided time standards (CATS) – Provides search by word, library of estimated time by process
- Society of Naval Architects & Marine Engineers (SNAME) Ship Production Committee
- MARAD’s initiatives — Most significant new usage for both studies & automatic must at BW issue of work
- Manufacturing-shipbuilding technology (MTST) program – 1IM EBDIV CAD CAM
- Shipbuilding standards program
- Carnegie Mellon-ZoF-USCAR program CVN 70 – Human computer interface
- Shipboard non-tactical ADP program (SNAP) – Honeywell has contract
- Naval aviation logistics data analysis (NALDA)
- Naval aviation logistics command management information system (NLMCOMIS) – Willow Grove
- Naval shipyard/ordinance station engineered methods and standards automated support system

## SPECIFIC EQUIPMENT OVERHAUL AND REPAIR PROCEDURES

Technical repair standard (TRS) is the top level document:

- NAVSEA INSTR 4160.2 promulgated program
- NAVSHIPYD Norfolk coordinating preparation efforts of naval shipyards
- Applicable to public & private yards
- Will be non-deviation (ND)-when invoked for class B overhaul
- Will include I & V points
- Will be the primary NAVSEA document for conducting class B overhauls of machinery

Other procedures are expected to evolve into TRSs:

- Methods and standards, uniform methods and standards, engineered methods & standards
- Technical overhaul procedures (TOPs)
- Standard items (SI’s)
- Class standard work items (CSWs)
- MRCs
NTIPS COMPUTER—BASED AUTHERING SYSTEM

- TASK LIST
- TASKS FOR TRAINING NOMENCLATURE LIST
- STANDARD INFORMATION
- VERB LIST
- FAMILIAR WORDS
- WARNINGS/CAUTIONS
- BOILER PLATE
- SOURCE DATA
- PARTS ILLUSTRATIONS
- SCHEMATICS
- WIRING
- FUNCTIONAL DIAGRAMS
- MFR. INFO.

- HARD COPY PROOFS
- AND INTERIM DELIVERIES
- DIGITIZED TEXT & GRAPHICS
- ELECTRONIC DELIVERY PROGRAMS
- ON-LINE VALIDATION
NTIPS COMPUTER—BASED AUTHORING SYSTEM

1. PROMPTED INTERACTIVE DATA ENTRY
2. ON-LINE EDITING (FOR TEXT AND GRAPHICS)
3. PROJECT MANAGEMENT AND INDEXING
4. AUTOMATED QUALITY INSPECTION
5. AUTOMATED OUTPUT Formatting
6. ACCESS AND SECURITY CONTROL
7. INTERACTIVE COMMUNICATIONS
8. ON-LINE USER TRAINING AND SUPPORT
9. ACCESS TO FLEXIBLE AUTHORING TOOLS

PROCESS INSTRUCTION VARIABLES

UNDER NTIPPS, NAVY TECHNICAL INFORMATION PRESENTATION PROGRAM, PROCESS INSTRUCTION VARIABLES ARE:

• CONTENT
• FORMAT
• STYLE
• MEDIUM
CONTENT CONSIDERATIONS

ACCOMPLISHMENT OF SYSTEM-RELATED TASKS REQUIRES INFORMATION OF ONLY FOUR GENERAL TYPES:

1. DESCRIPTIVE — TELLING HOW A GIVEN PART OF A SYSTEM WORKS.
2. PROCEDURAL — TELLING A TECHNICIAN HOW TO DISASSEMBLE A GIVEN COMPONENT OR REPAIR AN IDENTIFIED FAULT.
3. TROUBLESHOOTING — TELLING A TECHNICIAN HOW TO LOCATE THE SOURCE OF A MALFUNCTION.
4. PARTS DESCRIPTION — ILLUSTRATED PARTS BREAKDOWN (IPB) PARTS CATALOGUES, LISTS.

MANY TASKS WILL REQUIRE SOME CONTRIBUTION OF SEVERAL OF THESE TYPES. FOR EACH INFORMATION TYPE, SPECIFIC FORMAT AND STYLE GUIDANCE SHOULD BE PROVIDED.

FORMAT CONSIDERATIONS

ALL INFORMATION REQUIRED TO PERFORM A TASK SHOULD BE INCORPORATED IN THE SAME SECTION.

- USE TEXT/GRAPHICS MODULES. RELATED TEST AND GRAPHICS MUST BE IMMEDIATELY ADJACENT TO OR INSCRIBED ON THE GRAPHICS.
- TROUBLESHOOTING IS A SPECIAL CASE, REQUIRING LOGIC TREES OR THEIR EQUIVALENT. PROVIDE ALL LOGIC CHAINS AND IMPLICIT DECISION POINTS.
- ELIMINATE ERRORS THROUGH VALIDATION, REPEATED CHECKING AND INSTANT FEEDBACK OF CORRECTED DATA.
- BE SURE PROCEDURES, EQUIPMENT, TOOLS, TEST EQUIPMENT & FACILITIES CALLED OUT ARE/CAN BE MADE AVAILABLE AT THE MAINTENANCE LEVEL INVOLVED.
- PROVIDE FOR WORKSHEET WITH THE MINIMUM INFORMATION REQUIRED TO COMPLETE THE TASK.
- BREAK DOWN INTO LOGICAL TASKS AND SUBTASKS.
STYLE CONSIDERATIONS

• CALL A GIVEN PART, TOOL, OR ACTION ALWAYS BY THE SAME NAME.

• WRITE THE ENTIRE PROCESS INSTRUCTION USING A CONTROLLED VOCABULARY; I.E., USE ONLY THOSE WORDS ON A PREDETERMINED LIST. NOTE: THE NTIPP OFFICE HAS DEVELOPED A CONTROLLED VOCABULARY MADE UP OF:
  1. A BASIC VOCABULARY
  2. A SPECIALIZED VOCABULARY
  3. A SYSTEM-UNIQUE VOCABULARY

• USE SIMPLE SENTENCES ONLY; NO COMPLEX OR COMPOUND SENTENCES. SAMPLE: REMOVE THE FACEPLATE USING A SCREWDRIVER.

(NOTE THAT A COMPUTER CAN BE PROGRAMMED TO CHECK FOR COMPLIANCE WITH THE ABOVE RULES.

• USE QUALITY PRINTING, COMPETENT DRAWING STYLE, ETC.

MEDIUM CONSIDERATIONS

BEST MEDIUM FOR EACH APPLICATION MUST BE ASCERTAINED IN ADVANCE

ELECTRONIC PRESENTATION IS AVAILABLE NOW

COMPUTER DISPLAYED TECHNICAL INFORMATION

• CAN BE VERY INTERACTIVE ON USER-FRIENDLY HARDWARE
• AMENABLE TO LOCAL TAILORING
• APPLICABLE TO BOTH TRAINING AND JOB EXECUTION

MICROFILM USES

• LOOK UP INSTRUCTIONS ON A RELATIVELY INFREQUENT BASIS

MOTION PICTURES – SUITABLE FOR SOME TYPES OF TRAINING

HARD COPY EXAMPLE: CIRCUIT DIAGRAMS
RELATED EFFORTS AND INITIATIVES (CONT)

- LOGISTICS MANAGEMENT INSTITUTE STUDIES TO EXPLOIT NEW INFORMATION TECHNOLOGY
- NALC 05 — WORKLOAD CONTROL SYSTEM (WCS)
- DOVER AIR FORCE BASE — 436TH MILITARY AIR WING AUTOMATED MAINTENANCE SYSTEM
- NAVSHIPPYD MARE ISLAND — NAVSEA MATERIAL INVENTORY, STORAGE AND TRACKING SYSTEM (SEA MIST)
- NAVSHIPPYD NORFOLK — WORK PLANNING & CONTROL (PROMPT)
- NATIONAL ACADEMY OF SCIENCE — STUDY OF NAVY ADP NEEDS
- ALL ACTIVITIES — REVISIONS AND UPDATES OF ALMOST ALL MIS AND ADP SYSTEMS

RELATED EFFORTS AND INITIATIVES (CONT)

- SHIPYARD SKILL TRAINING PROGRAM
- NAVSEA SPECIFICATION UPGRADE PROGRAM
- MODIFIED OVERHAUL PLANNING PROCESS (MOPP)
- SSMSO — SSBN + SSN
- PERA EFFORTS
- DDIP, SDIP, SORT
- EBDIV MANUFACTURING TECHNOLOGY CAD–CAM PROJECT
- LONG BEACH TOTAL INTEGRATED CAD CAM SYSTEM
- MARE ISLAND CAD PROJECTS
- AFLC INTEGRATED COMPUTER AIDED MANUFACTURING PROJECTS
- DEERS
- NAVMAT
- CLASS STANDARD WORK ITEMS
### 1. Assign Responsibility for Specific Process to Each Naval Shipyard

(Below assignments are the same as those for the Skills Training Program).

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<thead>
<tr>
<th>Shipyard</th>
<th>Navsea Technical Manual</th>
<th>Navsea Code</th>
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2. DESIGNATE OTHER SHIP YARDS FOR COGNIZANCE OVER OTHER SPECIFIC AREAS:
   - SUPPLY
   - PLANNING
   - ESTIMATING
   - SCHEDULING
   - WORKLOADING
   - PROGRESSING
   - TESTING

3. DETERMINE STANDARD FORMAT AND SPECIFICATION FOR PROCESSES INCLUDING IN PARTICULAR USEFULNESS BY ALL WORKERS, ADAPTABILITY TO WORD PROCESSING AND AUTOMATED DATA PROCESSING SYSTEMS, SIMPLICITY, UNIFORMITY, THE AVOIDANCE OF DUPLICATION AND INTEGRATION WITH OTHER SYSTEMS (MT; 3M, OA, NDE, ETC.).

4. TRIAL RUN COMBINATION OF BEST FEATURES OF NTIPS, CATS, PROMPT, SKILLS TRAINING PROGRAM UTILIZING BEST AVAILABLE ADP SYSTEMS FOR REACHING CONSENSUS ON BEST SYSTEM.

5. UTILIZE TRADE SKILLS WORK SHOP: TO PROMULGATE AND REFINE SKILLS TRAINING AND STANDARD PROCESSES.
6. CONTINUE TO DEVELOP AN EVOLUTIONARY PLAN THAT REFINES THE FOLLOWING ASPECTS:
7. INTEGRATE INTO A TOTAL INFORMATION AND DECISION SUPPORT SYSTEM:

NEED
INVENTORY, PERFORMANCE REQUIREMENTS & DESCRIPTION,
LOCATION, DESIGN LIFE,
DESIGN MTBF

WHAT?
WHY?
WHEN?
HOW?

HAVE
INVENTORY, DESCRIPTION, STATUS,
LOCATION, HISTORY,
MAINTENANCE & MODIFICATION PLANS

THINGS
- CLASS OF SHIPS/FACILITIES
- SPECIFIC HULL
- SYSTEM
- ASSEMBLIES
- COMPONENTS
- PARTS
- CONSUMABLES

PEOPLE
- SERVICE
- SYSCOM
- SHIPYARD
- GROUP
- SHOP
- WORK CENTER
- INDIVIDUAL
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