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EDUCATION AND TRAINING

January 5, 1999
NSRP 0519
N9-95-2

# THE NATIONAL SHIPBUILDING RESEARCH PROGRAM

## Implementation of Past NSRP Research Through Education and Training

U.S. DEPARTMENT OF THE NAVY
CARDEROCK DIVISION,
NAVAL SURFACE WARFARE CENTER

in cooperation with
National Steel and Shipbuilding Company
San Diego, California

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**Final Report**

# Implementation Of Past NSRP Research Through Education and Training

**Prepared for**

**National Shipbuilding Research Program**

**SP-9 Education and Training Panel**

**Prepared by**

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**July 1998**

Task SP 9-95-2

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The effort to determine which past NSRP research to implement requires the assistance of several shipyards and shipbuilding-related educational facilities. The NSRP Documentation Center at the University of Michigan Transportation Research Institute was very helpful in providing requested NSRP library data. We are very appreciative to shipbuilders from Atlantic Marine, Bath Iron Works, Electric Boat Corporation, Ingalls Shipbuilding, Inc., NASSCO, Newport News Shipbuilding, and Norfolk Naval Shipyard, educators from the University of Michigan Transportation Research Institute and the U. S. Merchant Marine Academy, and NSRP Panel Chairs, who provided their assistance by responding to our surveys.

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We would like to thank those shipbuilders from Bath Iron Works, NASSCO, Newport News Shipbuilding, and Norfolk Naval Shipyard who participated in the workshops.

The National Shipbuilding Research Program, Education and Training Panel (SP-9) funded this project. The SP-9 Panel is one of the Ship Production Committee panels of the Society of Naval Architects and Marine Engineers, which were established with the purpose of improving U.S. shipbuilding performance.

# EXECUTIVE SUMMARY

The "Implementation of Past NSRP Research through Education and Training" project was proposed in 1994 and funded as a 1995 NSRP project (SP 9-95-2). The concept was to analyze existing NSRP research and determine important areas where education and training could enhance implementation. The initial implementation involved development of two workshops and could be followed by additional educational and training projects, contingent upon this project's results and future funding. This final report details the results of the analysis, how the workshops were developed and presented, and the workshop outcomes.

The objectives of this project are as follows:

- Identify important areas of existing NSRP research for which education and training can significantly facilitate the implementation of research results in U.S. shipyards.
- Develop and present two short courses, including related instructional materials, at four locations in support of the implementation of two NSRP research areas deemed important but not yet widely and/or successfully implemented at U.S. shipyards.
- Lay the foundation for additional courses to be developed and presented in support of NSRP research implementation in other important subject areas.

The six primary technical requirements were:

- Identify the most important NSRP panel research.
- Survey major U.S. shipyards to determine the extent to which the research identified as most important has been implemented.
- Determine to what degree education and training would facilitate research implementation and establish recommendations.
- Present findings to SP-9 panel and select two areas for course development.
- Develop short courses on two identified research subjects.
- Present the two courses.
- Recommend additional research subjects for course development and presentation.

The findings (Appendices A through F) and selection by SP-9 panel resulted in the following projects for implementation:

(1) 0334, Recommendations on the Use of Interactive Instruction for Training Shipyard Trade Skills
(2) 0345/0418, Environment & Hazardous Waste
(3) 0437, Metrication in U.S. Shipbuilding
(4) 0339, Design & Planning Manual for Cost Effective Welding
(5) 0435/0436/0454, Concurrent Engineering.

Two workshops, "Use of Interactive Multimedia for Training Shipyard Trade Skills," and "Environmental Compliance Inspection Checklist and Hazardous Waste Minimization," were developed and presented at four major shipyards.

This project required the efforts of many shipbuilders and educators in order to accomplish its objectives. The results of the analysis reflect one of NSRP's many valuable functions in its overall mission to promote and enhance the U.S. shipbuilding industry. The intent of the project was not to point out how NSRP panels have performed or which panels are doing more valuable research than others are; and the data provided should not be interpreted in this manner. The analysis only identifies areas where the research was not implemented but either should be implemented, re-implemented, or was implemented at only a few shipyards.

The list of 19 candidates from the first survey, the 21 candidates from the second survey, and the final five selected projects for project implementation should be considered by the Panel Chairs as candidates for future NSRP-funded implementation projects. Also, each listed project should be reviewed by shipyards to determine if they are currently implementing them or whether implementation would add value. By building on the groundwork provided by this report, the U.S. shipbuilding industry should be able to capitalize on the research represented by past NSRP projects.

The value of this project in the promotion of training for U.S. shipyards can be realized in the delivery of computer-based training (CBT) for the purpose of training shipbuilding skills. In the "Introduction to Arc Stud Welding" CBT (part of the workshop, "Use of interactive Multimedia for training Shipyard Trade Skills"), an operator can become familiar with the process and be instructed on the equipment's "how-to" before actually operating the equipment. CBT cannot replace hands-on training but can reduce the learning curve and the material costs involved with familiarizing a trainee with equipment and process operation.

Through its participation in this valuable project, Newport News Shipbuilding and the NSRP community harvested the following benefits:

- Re-familiarization with important research material for review to supplement current implementation projects and to initiate new innovative implementation projects.
- Non-competitive interaction with major shipyards to promote industry objectives.
- Increased communication among the training and research organizations of participating shipyards.
- Increased commitment to the development of easily tailorable/updateable, timely, portable, cost-effective, CBT/ICW for corporate training, and sharing this knowledge with other shipyards.

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## 1.0 Introduction to the Project

The "Implementation of Past NSRP Research through Education and Training" project was proposed in 1994 and funded as a 1995 NSRP project (SP 9-95-2). The concept was to analyze existing NSRP research and determine important areas where education and training could enhance implementation. The initial implementation involved development of two workshops and could be followed by additional educational and training projects, contingent upon this project's results and future funding. This final report details the results of the analysis, how the workshops were developed and presented, and the workshop outcomes.

## 2.0 Purpose

The objectives of this NSRP Project are as follows:

- Identify important areas of existing NSRP research for which education and training can significantly facilitate the implementation of research results in U.S. shipyards.
- Develop and present two short courses, including related instructional materials, at four locations in support of the implementation of two NSRP research areas deemed important but not yet widely and/or successfully implemented at U.S. shipyards.
- Lay the foundation for additional courses to be developed and presented in support of NSRP research implementation in other important subject areas.

## 3.0 General Approach

The six primary technical requirements for the project were:

- Identify the most important NSRP panel research.
- Survey major U.S. shipyards to determine the extent to which the research identified as most important has been implemented.
- Determine to what degree education and training would facilitate research implementation and establish recommendations.
- Present findings to SP-9 panel and select two areas for course development.
- Develop short courses on two identified research subjects.
- Present the two courses.
- Recommend additional research subjects for course development and presentation.

The Research Implementation Project, SP 9-95-2, consisted of six tasks. This section will outline each of the tasks and discuss Newport News Shipbuilding's technical approach.

## 4.0 Identify the Most Important NSRP Panel Research

Newport News Shipbuilding (NNS) performed a needs assessment to cull the approximately 400 project reports to the 10 or 20 most requested and most important research areas. NNS researched existing panel studies and NSRP Documentation Center records to itemize and categorize the project reports completed to date. The first

step of the needs assessment involved the ranking of projects in their order of importance based on the recent "Benefit Analysis of SPC Panel Reports," as well as results from Project N4-94-5, "Develop Methods to Implement Results of Past NRSP Projects." The second step involved the examination of Documentation Center records to determine the "most requested" studies.

During the first step, a benefit rating scale was utilized to determine the more important reports. The benefit rating scale was from 1 to 9, with a 9 rating meaning "most beneficial." The benefit ratings were provided from NSRP report “Benefit Analysis of SPC Panel Reports” and Project N4-94-5, “Develop Methods to Implement Results of Past NSRP Projects.” The initial list eliminated those reports with a benefit rating of less than 5. This initial list's 75 reports are grouped below by panels:

| NSRP Panel | Number of Reports |
|---|---|
| SP-1 | 15 |
| SP-3 | 11 |
| SP-4 | 5 |
| SP-5 | 7 |
| SP-6 | 2 |
| SP-7 | 22 |
| SP-8 | 9 |
| SP-9 | 4 |

The top four panels with the largest number of high benefit-rated reports were SP-7, SP-1, SP-3, and SP-8. (See Appendix A, Table 2 for a listing of reports by benefit rating.)

The second step analyzed the number of reports requested from the NSRP Documentation Center to determine which reports were in greatest demand. The number of reports reflects data from 1989 through 1996, excluding 1994. Thirty-two reports were identified with more than 5 requests during the six-year research period. The identified reports also added 3 reports with less than a 5 benefit rating, and 7 recent reports with no benefit rating. The breakdown by panels is as follows:

| NSRP Panel | Number of Reports |
|---|---|
| SP-1 | 5 |
| SP-3 | 6 |
| SP-4 | 11 |
| SP-5 | 4 |
| SP-6 | 0 |
| SP-7 | 1 |
| SP-8 | 0 |
| SP-9 | 5 |

The top five panels based on the number of requested reports from the Documentation Center were SP-4, SP-3, SP-1, and SP-9. (See Appendix A, Table 3 for a listing of reports by number requested from the Documentation Center.)

From this list of 32 reports, the top 19 candidates were selected for a survey questionnaire whose goal was to identify the 5 most important/significant reports. The next section discusses the survey results. The top 19 candidates are identified in Appendix A, Table 1, while the cumulative numbers by panels are:

| **NSRP Panel** | **Number of Reports** |
|---|---|
| SP-1 | 3 |
| SP-3 | 3 |
| SP-4 | 9 |
| SP-5 | 0 |
| SP-6 | 0 |
| SP-7 | 0 |
| SP-8 | 0 |
| SP-9 | 4 |

As seen above, Panel SP-4 had a significant number of candidate reports, while four panels were not represented.

## 5.0 Determine Which Research Identified Has Been Implemented

The third step of the needs assessment required the identification of discrepancies between anticipated performance (research implementation) and actual performance. Newport News Shipbuilding prepared and conducted a survey of the following shipbuilders: Atlantic Marine, Bath Iron Works, Electric Boat Corporation, Ingalls Shipbuilding, Inc., NASSCO, Newport News Shipbuilding, and Norfolk Naval Shipyard.

The survey was also sent to the University of Michigan Transportation Research Institute and the U. S. Merchant Marine Academy. A sample survey is provided in Appendix B with the actual responses accumulated in Appendix C.

The survey was developed to prioritize needs and thereby reduce the subjectivity of the survey. The survey collected the following types of information:

- Shipyard statements about perceived research importance and relative ranking
- Shipyard statements about the cost to implement versus the cost to ignore
- Length of time a particular need has persisted
- Percentage of shipyards identifying the need
- Length of time required to implement the need
- Usefulness of remediation for those shipyards describing partial implementation.

The survey determined which shipyards had implemented the research and the degree to which implementation has been successful and effective. The survey was a crucial means of involving other shipyards in the outcome of the needs assessment and the success of the entire project. Analysis of the responses resulted in the following five candidates:

- 0334, Recommendations on the Use of Interactive Instruction for Training Shipyard Trade Skills
- 0345, Environmental Compliance Inspection Checklist for Shipbuilding Facilities
- 0219, Engineering for Ship Production
- 0398, Producibility Evaluation Criteria - Cost Estimating Computer Programs - Manual
- 0418, Hazardous Waste Minimization Guide for Shipyards.

## 6.0 Determine to What Degree Education and Training Would Facilitate Research Implementation

Following subsequent research into the five candidates, Newport News Shipbuilding recommended the two subjects below for the maximum potential benefit to NSRP. These two subjects were identified as having potential audiences at other shipyards beyond the ones surveyed, and were within NNS' capability and expertise for developing training:

(1) 0334. This was the most requested project and could be a winner in terms of demonstrating to shipyards the benefit of computer-based training (CBT) to reduce training costs and increase retention.
(2) 0345/0418. These two projects touch on the same general material and were considered a "hot" subject.

NNS presented the results of the survey and our recommendation to the SP-9 Panel. The SP-9 Panel felt that the 19 candidates identified for the survey did not provide equal representation by all the NSRP panels and requested NNS survey the NSRP Panel Chairs for their input. With the University of Michigan Transportation Research

Institute assistance, each NSRP Panel Chair was surveyed to determine how to prioritize NSRP's implementation efforts. Each Panel Chair received the survey (Appendix D) and a listing of their projects with each associated abstract. The survey's intent was also to identify projects that have been implemented, need to be implemented, need additional research, or should be archived. Besides addressing the two subjects for this project, the results also can be utilized to identify those priority projects recommended to SP-9 for future implementation.

Newport News Shipbuilding collected and analyzed the surveys to again select the best possible projects for implementation. (For survey responses, see Appendix E.) The results of the survey analysis (Appendix F) identified 21 projects for implementation:

| NSRP Panel | Number of Reports |
|---|---|
| SP-1 | 2 |
| SP-3 | 2 |
| SP-4 | 0 |
| SP-5 | 1 |
| SP-6 | 1 |
| SP-7 | 3 |
| SP-8 | 10 |
| SP-9 | 2 |

Several of the projects were combined and 15 topics outlined in Appendix F were presented to the SP-9 Panel for selection. The selection process involved a presentation and discussion of Appendix F followed by a vote by the panel members present at the meeting. The initial vote involved selection and ranking of five projects by each panel member. This process narrowed the selection to eight:

- 0345/0418, Environment & Hazardous Waste (SP-1)
- 0437, Metrication in U.S. Shipbuilding (SP-6)
- 0299/0366, Flame Bending of Pipe (SP-7)
- 0339, Design & Planning Manual for Cost Effective Welding (SP-7)
- 0247/0276/0304, Industrial Engineering (SP-8)
- 0389, Performance Measurement in Production and Support Areas of a Shipyard (SP-8)
- 0435/0436/0454, Concurrent Engineering (SP-8)
- 0334, Recommendations on the Use of Interactive Instruction for Training Shipyard Trade Skills (SP-9)

After additional discussion, each panel member selected and rated five projects from the group of eight, resulting in these five selections in rank order:

(1) 0334, Recommendations on the Use of Interactive Instruction for Training Shipyard Trade Skills

(2) 0345/0418, Environment & Hazardous Waste
(3) 0437, Metrication in U.S. Shipbuilding
(4) 0339, Design & Planning Manual for Cost Effective Welding
(5) 0435/0436/0454, Concurrent Engineering.
When developing the workshop from Project 0334 on the use of interactive instruction, the panel requested the Stud Welding course from earlier Project 0416 be utilized as the “how-to” model.

## 7.0 Develop Two Workshops

The two workshops were titled "Use of Interactive Multimedia for Training Shipyard Trade Skills," and "Environmental Compliance Inspection Checklist and Hazardous Waste Minimization." Newport News Shipbuilding developed an instructor guide, trainee guide, courseware presentation materials, and computer-based training (CBT) courseware for each workshop. Each two-day workshop was divided into 14 hours of workshop activities and 2 hours of CBT. The CBT was developed as stand-alone, Level-1 interactive courseware (ICW) but was utilized in the workshop for summary and review.

The courseware presentation materials were developed in Microsoft PowerPoint and presented using the presenter's laptop computer and the host facility' digital projection system. The presentation materials mimicked the instructor and trainee guides so the participants knew what areas were being discussed during the workshop.

All workshop materials were developed and delivered in digital media to enable individual shipyards to use and modify them. Even the CBT modules could be modified by inserting new graphics and videos using the same named files. Providing digital media allows the shipyards and the panel greater flexibility in the future. The shipyards and panel now have the option of re-creating the same workshops at a considerable cost savings over the original presentation budgets. Furthermore, the courseware would be available for other uses as determined by the shipyards and panel.

Thus, the core of the workshop "lives" well beyond the conclusion of the workshops, thereby leveraging the impact of the project and increasing its probability of success by promoting the "real" goal of the project research implementation at major U.S. shipyards. Workshops centered on multimedia applications such as CBT both improve the training mechanism and facilitate an increased number of enhanced workshops. Multimedia-centered workshops cut presentation duration and labor hours in half, and markedly simplify presentation logistics.

## 7.1 Use of Interactive Multimedia for Training Shipyard Trade Skills Workshop

NSRP SP-9 Panel determined that the "Use of Interactive Multimedia for Training Shipyard Trade Skills" workshop should be based on past NSRP Project 0334, “Recommendations on the Use of Interactive Instruction for Training Shipyard Trade

Skills." The workshop goal was to familiarize shipyard owners and operators in the use of interactive multimedia for training shipyard trade skills. The learning objectives for the workshop were:

- Demonstrate new interactive multimedia technologies available for shipyard trade training and how these technologies can be applied.
- Demonstrate to shipyard training department personnel the use and benefits of interactive multimedia for training trade skills.
- Demonstrate how interactive multimedia can be used for both tutorial and simulation lessons.
- Demonstrate the ease and low cost with which interactive multimedia can be developed and produced in-house.
- Provide experience in the development of interactive multimedia courseware.

As evident by the success stories in many educational and training journals, the use of interactive multimedia represents a cost savings over traditional training methods. Interactive multimedia has proven itself through increased comprehension and sustained retention of learned skills while reducing overall training time and life cycle training costs. This workshop will assist shipyards in developing interactive multimedia training for their employees.

## 7.2 Environmental Compliance Inspection Checklist and Hazardous Waste Minimization Workshop

With public concern over environmental issues and the need for shipyards to effectively manage their environmental programs, the NSRP SP-9 Panel determined past NSRP Projects 0345, "Environmental Compliance Inspection Checklist for Shipbuilding Facilities," and 0418, "Hazardous Waste Minimization Guide for Shipyards," should be merged into one workshop. The workshop was called "Environmental Compliance Inspection Checklist and Hazardous Waste Minimization." The workshop goal was to assist shipyard owners and operations in complying with numerous federal environmental regulations, develop general guidelines and procedures for reducing the quantity and toxicity of hazardous waste produced by shipbuilding and repair-related production activities, provide a means to assist shipyards in environmental compliance pre-inspections, and provide an insight into shipyard-related environmental issues for new employees or for cross-training employees who will be responsible for environmental issues. The learning objectives were:

- State the importance of environmental compliance inspection checklists.
- Describe the major environmental compliance inspection checklists.
- State the importance of hazardous waste minimization.
- Describe hazardous waste minimization program.
- Describe the basic categories for waste minimization.
- Identify waste minimization and educational resources.

An effective environmental program can improve a shipyard's profitability through reduced workmen's compensation claims, minimized material waste (both hazardous

and non-hazardous), and reduced environmental liability claims. To achieve a strong environmental management program, a shipyard's corporate culture must reflect an understanding of environmental issues, a company-wide commitment to environmental compliance, regular internal environmental audits, and preparedness to address environmental violations. This workshop will assist shipyards in assessing environmental compliance and provide training for shipyard employees unfamiliar with environmental regulations and compliance.

## 8.0 Present Two Workshops

Newport News Shipbuilding conducted the workshops at Newport News Shipbuilding, NASSCO, Bath Iron Works, and Norfolk Naval Shipyard. The "Use of Interactive Multimedia for Training Shipyard Trade Skills" workshop was attended by training developers and instructors. The workshop was well received but most felt their shipyards needed to upgrade company training areas to include multimedia computer systems in order to utilize this training. Most left the workshop wanting to enhance training in their shipyards through the use of interactive multimedia. (For actual workshop evaluations and comments, see Appendix G.)

The "Environmental Compliance Inspection Checklist and Hazardous Waste Minimization" workshop was attended by shipyard environmentalists, shipyard personnel being cross-trained in the environmental department, and instructors who develop environmental training materials. The shipyard environmentalists in the workshop were present to expound upon the information presented and provide other workshop participants specific information pertaining to their shipyard and locality. The workshop also provided some cross-training for environmentalists who usually specialize in a single area of expertise, such as water, air, or hazardous waste. The environmentalists found the workshop lacking and not beneficial. But the other participants went away with an enhanced awareness of environmental issues, and the variety of regulations and permits required for the shipbuilding industry. Prior to the workshop, most non-environmentalists had no concept of the number of environmental issues involved in building and repairing ships. (For actual workshop evaluations and comments, see Appendix G.)

## 9.0 Project Conclusions and Recommendations

This project required the efforts of many shipbuilders and educators in order to accomplish its objectives. The results of the analysis reflect one of NSRP's many valuable functions in its overall mission to promote and enhance the U.S. shipbuilding industry. The intent of the project was not to point out how NSRP panels have performed or which panels are doing more valuable research than others are; and the data provided should not be interpreted in this manner. The analysis only identifies areas where the research was not implemented but either should be implemented, re-implemented, or was implemented at only a few shipyards.

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The value of this project in the promotion of training for U.S. shipyards can be realized in the delivery of computer-based training (CBT) for the purpose of training shipbuilding skills. In the "Introduction to Arc Stud Welding" CBT (part of the workshop, "Use of interactive Multimedia for training Shipyard Trade Skills"), an operator can become familiar with the process and be instructed on the equipment's "how-to" before actually operating the equipment. CBT cannot replace hands-on training but can reduce the learning curve and the material costs involved with familiarizing a trainee with equipment and process operation.

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- Non-competitive interaction with major shipyards to promote industry objectives.
- Increased communication among the training and research organizations of participating shipyards.
- Increased commitment to the development of easily tailorable/updateable, timely, portable, cost-effective, CBT/ICW for corporate training, and sharing this knowledge with other shipyards.

# References


1. Recommendations on the Use of Interactive Instruction for Training Shipyard Trade Skills, NSRP 0334, June 1991.

2. A Demonstration of Interactive Instruction for Training Shipyard Trade Skills, NSRP 0416, Sept. 1993.

3. U.S. Navy Interactive Courseware (ICW) Style Guide, Chief of Naval Education and Training, Nov. 1992.

4. Matlack, Ralph E. and Matlack, Edward R., “Implementing Interactive Multimedia Training,” Journal of Ship Production, Vol. 11, No. 4, Nov. 1995 pp 264-268.

5. Hazardous Waste Minimization Guide for Shipyards, NSRP 0418, January 1994.

6. Environmental Compliance Inspection Checklist for Shipbuilding Facilities, NSRP 0345, April 1992.

# APPENDIX A

## Results of Needs Assessment

## Results of Needs Assessment

The following NSRP reports (Table 1) were preliminarily selected as the top 19 research projects. The methodology used to narrow the field from 400+ candidates to the 19 was based on a review of the various benefit studies conducted in 1993 and the NSRP Documentation Center records dating back to 1989. The list of 19 candidates reflects those subjects of the most interest, most requested and most important research areas to the center's clientele. (See Appendix B for the 19 project candidates' titles and abstracts.)

Each table provides the NSRP report number, the sponsoring SP panel, the benefit rating and number of requests from the NSRP Documentation Center. The Benefit Rating comes from NSRP report "Benefit Analysis of SPC Panel Reports" and Project N4-94-5 "Develop Methods to Implement Results of Past NSRP Projects." The number of projects analyzed for benefit rating concluded with NSRP report 0356. The Number Requested reflects the number of requests for NSRP documents from the NSRP Documentation Center from 1989 through 1996, excluding 1994.

Table 2 provides a listing of reports sorted by Benefit Rating. Table 3 reflects reports sorted by Number Requested, and Table 4 is sorted by SP Panel, Number Requested, and Benefit Rating. The shaded reports in each table reflects the ones selected for the 19 candidates.

**Table 1 List of 19 Top Research Projects**

| NSRP Report | SP Panel | Benefit | Number Requested |
|---|---|---|---|
| 0219 | SP-9 | 4 | 19 |
| 0290 | SP-9 | 3 | 20 |
| 0300 | SP-4 | 7 | 11 |
| 0312 | SP-3 | 8 | 11 |
| 0319 | SP-4 | 3 | 21 |
| 0323 | SP-4 | 5 | 10 |
| 0329 | SP-3 | 5 | 30 |
| 0333 | SP-4 | 6 | 10 |
| 0334 | SP-9 | 6 | 31 |
| 0341 | SP-3 | 7 | 19 |
| 0345 | SP-1 | 8 | 21 |
| 0350 | SP-1 | 8 | 9 |
| 0396 | SP-9 | * | 10 |
| 0397 | SP-4 | * | 9 |
| 0398 | SP-4 | * | 18 |
| 0405 | SP-4 | * | 20 |
| 0406 | SP-4 | * | 15 |
| 0409 | SP-4 | * | 11 |
| 0418 | SP-1 | * | 14 |

* The number of projects analyzed for benefit rating concluded with NSRP report 0356.

## Table 2 Reports Sorted by Benefit Rating

This table is sorted by benefit rating. The shaded reports are the ones selected for the 19 candidates.

| NSRP Report | SP Panel | Benefit | Number Requested |
|---|---|---|---|
| 0236 | SP-4 | 9 | 8 |
| 0330 | SP-1 | 9 | 8 |
| 0168 | SP-7 | 9 | 4 |
| 0301 | SP-5 | 9 | 4 |
| 0339 | SP-7 | 9 | 4 |
| 0220 | SP-7 | 9 | 1 |
| 0345 | SP-1 | 8 | 21 |
| 0312 | SP-3 | 8 | 11 |
| 0350 | SP-1 | 8 | 9 |
| 0283 | SP-5 | 8 | 7 |
| 0318 | SP-5 | 8 | 7 |
| 0332 | SP-3 | 8 | 7 |
| 0307 | SP-3 | 8 | 2 |
| 0338 | SP-7 | 8 | 1 |
| 0241 | SP-7 | 8 | 0 |
| 0341 | SP-3 | 7 | 19 |
| 0300 | SP-4 | 7 | 11 |
| 0264 | SP-5 | 7 | 7 |
| 0295 | SP-3 | 7 | 6 |
| 0331 | SP-5 | 7 | 5 |
| 0110 | SP-7 | 7 | 4 |
| 0309 | SP-3 | 7 | 4 |
| 0336 | SP-7 | 7 | 4 |
| 0297 | SP-7 | 7 | 3 |
| 0316 | SP-3 | 7 | 3 |
| 0342 | SP-1 | 7 | 3 |
| 0276 | SP-8 | 7 | 2 |
| 0299 | SP-7 | 7 | 2 |
| 0269 | SP-9 | 7 | 1 |
| 0334 | SP-9 | 6 | 31 |
| 0333 | SP-4 | 6 | 10 |
| 0313 | SP-3 | 6 | 7 |
| 0289 | SP-9 | 6 | 5 |
| 0315 | SP-1 | 6 | 5 |
| 0077 | SP-1 | 6 | 4 |
| 0292 | SP-7 | 6 | 4 |
| 0055 | SP-8 | 6 | 3 |

| NSRP Report | SP Panel | Benefit | Number Requested |
|---|---|---|---|
| 0302 | SP-3 | 6 | 3 |
| 0314 | SP-7 | 6 | 3 |
| 0337 | SP-5 | 6 | 3 |
| 0166 | SP-7 | 6 | 2 |
| 0195 | SP-7 | 6 | 2 |
| 0252 | SP-5 | 6 | 2 |
| 0275 | SP-3 | 6 | 2 |
| 0065 | SP-8 | 6 | 1 |
| 0237 | SP-1 | 6 | 1 |
| 0245 | SP-8 | 6 | 1 |
| 0326 | SP-7 | 6 | 1 |
| 0054 | SP-7 | 6 | 0 |
| 0136 | SP-8 | 6 | 0 |
| 0329 | SP-3 | 5 | 30 |
| 0323 | SP-4 | 5 | 10 |
| 0255 | SP-4 | 5 | 7 |
| 0343 | SP-7 | 5 | 6 |
| 0203 | SP-1 | 5 | 4 |
| 0291 | SP-7 | 5 | 3 |
| 0057 | SP-6 | 5 | 2 |
| 0128 | SP-1 | 5 | 2 |
| 0224 | SP-9 | 5 | 2 |
| 0231 | SP-1 | 5 | 2 |
| 0304 | SP-8 | 5 | 2 |
| 0135 | SP-1 | 5 | 1 |
| 0153 | SP-1 | 5 | 1 |
| 0165 | SP-1 | 5 | 1 |
| 0190 | SP-1 | 5 | 1 |
| 0247 | SP-8 | 5 | 1 |
| 0317 | SP-1 | 5 | 1 |
| 0344 | SP-6 | 5 | 1 |
| 0040 | SP-7 | 5 | 0 |
| 0041 | SP-7 | 5 | 0 |
| 0086 | SP-7 | 5 | 0 |
| 0215 | SP-7 | 5 | 0 |
| 0232 | SP-8 | 5 | 0 |
| 0242 | SP-8 | 5 | 0 |
| 0261 | SP-7 | 5 | 0 |
| 0219 | SP-9 | 4 | 19 |
| 0319 | SP-4 | 3 | 21 |
| 0290 | SP-9 | 3 | 20 |
| 0405 | SP-4 | * | 20 |

| NSRP Report | SP Panel | Benefit | Number Requested |
|---|---|---|---|
| 0398 | SP-4 | * | 18 |
| 0406 | SP-4 | * | 15 |
| 0418 | SP-1 | * | 14 |
| 0409 | SP-4 | * | 11 |
| 0396 | SP-9 | * | 10 |
| 0397 | SP-4 | * | 9 |

* The number of projects analyzed for benefit rating concluded with NSRP report 0356.

## Table 3 Reports Sorted by Number Requested

This table is sorted by number requested. The shaded reports are the ones selected for the 19 candidates.

| NSRP Report | SP Panel | Benefit | Number Requested |
|---|---|---|---|
| 0334 | SP-9 | 6 | 31 |
| 0329 | SP-3 | 5 | 30 |
| 0345 | SP-1 | 8 | 21 |
| 0319 | SP-4 | 3 | 21 |
| 0290 | SP-9 | 3 | 20 |
| 0405 | SP-4 | * | 20 |
| 0341 | SP-3 | 7 | 19 |
| 0219 | SP-9 | 4 | 19 |
| 0398 | SP-4 | * | 18 |
| 0406 | SP-4 | * | 15 |
| 0418 | SP-1 | * | 14 |
| 0312 | SP-3 | 8 | 11 |
| 0300 | SP-4 | 7 | 11 |
| 0409 | SP-4 | * | 11 |
| 0333 | SP-4 | 6 | 10 |
| 0323 | SP-4 | 5 | 10 |
| 0396 | SP-9 | * | 10 |
| 0350 | SP-1 | 8 | 9 |
| 0397 | SP-4 | * | 9 |
| 0236 | SP-4 | 9 | 8 |
| 0330 | SP-1 | 9 | 8 |
| 0283 | SP-5 | 8 | 7 |
| 0318 | SP-5 | 8 | 7 |
| 0332 | SP-3 | 8 | 7 |
| 0264 | SP-5 | 7 | 7 |
| 0313 | SP-3 | 6 | 7 |
| 0255 | SP-4 | 5 | 7 |
| 0295 | SP-3 | 7 | 6 |
| 0343 | SP-7 | 5 | 6 |
| 0331 | SP-5 | 7 | 5 |
| 0289 | SP-9 | 6 | 5 |
| 0315 | SP-1 | 6 | 5 |
| 0168 | SP-7 | 9 | 4 |
| 0301 | SP-5 | 9 | 4 |
| 0339 | SP-7 | 9 | 4 |
| 0110 | SP-7 | 7 | 4 |

| NSRP Report | SP Panel | Benefit | Number Requested |
|---|---|---|---|
| 0309 | SP-3 | 7 | 4 |
| 0336 | SP-7 | 7 | 4 |
| 0077 | SP-1 | 6 | 4 |
| 0292 | SP-7 | 6 | 4 |
| 0203 | SP-1 | 5 | 4 |
| 0297 | SP-7 | 7 | 3 |
| 0316 | SP-3 | 7 | 3 |
| 0342 | SP-1 | 7 | 3 |
| 0055 | SP-8 | 6 | 3 |
| 0302 | SP-3 | 6 | 3 |
| 0314 | SP-7 | 6 | 3 |
| 0337 | SP-5 | 6 | 3 |
| 0291 | SP-7 | 5 | 3 |
| 0307 | SP-3 | 8 | 2 |
| 0276 | SP-8 | 7 | 2 |
| 0299 | SP-7 | 7 | 2 |
| 0166 | SP-7 | 6 | 2 |
| 0195 | SP-7 | 6 | 2 |
| 0252 | SP-5 | 6 | 2 |
| 0275 | SP-3 | 6 | 2 |
| 0057 | SP-6 | 5 | 2 |
| 0128 | SP-1 | 5 | 2 |
| 0224 | SP-9 | 5 | 2 |
| 0231 | SP-1 | 5 | 2 |
| 0304 | SP-8 | 5 | 2 |
| 0220 | SP-7 | 9 | 1 |
| 0338 | SP-7 | 8 | 1 |
| 0269 | SP-9 | 7 | 1 |
| 0065 | SP-8 | 6 | 1 |
| 0237 | SP-1 | 6 | 1 |
| 0245 | SP-8 | 6 | 1 |
| 0326 | SP-7 | 6 | 1 |
| 0135 | SP-1 | 5 | 1 |
| 0153 | SP-1 | 5 | 1 |
| 0165 | SP-1 | 5 | 1 |
| 0190 | SP-1 | 5 | 1 |
| 0247 | SP-8 | 5 | 1 |
| 0317 | SP-1 | 5 | 1 |
| 0344 | SP-6 | 5 | 1 |
| 0241 | SP-7 | 8 | 0 |
| 0054 | SP-7 | 6 | 0 |
| 0136 | SP-8 | 6 | 0 |

| NSRP Report | SP Panel | Benefit | Number Requested |
|---|---|---|---|
| 0040 | SP-7 | 5 | 0 |
| 0041 | SP-7 | 5 | 0 |
| 0086 | SP-7 | 5 | 0 |
| 0215 | SP-7 | 5 | 0 |
| 0232 | SP-8 | 5 | 0 |
| 0242 | SP-8 | 5 | 0 |
| 0261 | SP-7 | 5 | 0 |

* The number of projects analyzed for benefit rating concluded with NSRP report 0356.

## Table 4 Reports Sorted by SP Panel, Number Requested, and Benefit Rating

This table is sorted by SP Panel, number requested, and benefit rating. The shaded reports are the ones selected for the 19 candidates.

| NSRP Report | SP Panel | Benefit | Number Requested |
|---|---|---|---|
| 0345 | SP-1 | 8 | 21 |
| 0418 | SP-1 | * | 14 |
| 0350 | SP-1 | 8 | 9 |
| 0330 | SP-1 | 9 | 8 |
| 0315 | SP-1 | 6 | 5 |
| 0077 | SP-1 | 6 | 4 |
| 0203 | SP-1 | 5 | 4 |
| 0342 | SP-1 | 7 | 3 |
| 0128 | SP-1 | 5 | 2 |
| 0231 | SP-1 | 5 | 2 |
| 0237 | SP-1 | 6 | 1 |
| 0135 | SP-1 | 5 | 1 |
| 0153 | SP-1 | 5 | 1 |
| 0165 | SP-1 | 5 | 1 |
| 0190 | SP-1 | 5 | 1 |
| 0317 | SP-1 | 5 | 1 |
| 0329 | SP-3 | 5 | 30 |
| 0341 | SP-3 | 7 | 19 |
| 0312 | SP-3 | 8 | 11 |
| 0332 | SP-3 | 8 | 7 |
| 0313 | SP-3 | 6 | 7 |
| 0295 | SP-3 | 7 | 6 |
| 0309 | SP-3 | 7 | 4 |
| 0316 | SP-3 | 7 | 3 |
| 0302 | SP-3 | 6 | 3 |
| 0307 | SP-3 | 8 | 2 |
| 0275 | SP-3 | 6 | 2 |
| 0319 | SP-4 | 3 | 21 |
| 0405 | SP-4 | * | 20 |
| 0398 | SP-4 | * | 18 |
| 0406 | SP-4 | * | 15 |
| 0300 | SP-4 | 7 | 11 |
| 0409 | SP-4 | * | 11 |
| 0333 | SP-4 | 6 | 10 |
| 0323 | SP-4 | 5 | 10 |
| 0397 | SP-4 | * | 9 |

| NSRP Report | SP Panel | Benefit | Number Requested |
|---|---|---|---|
| 0236 | SP-4 | 9 | 8 |
| 0255 | SP-4 | 5 | 7 |
| 0283 | SP-5 | 8 | 7 |
| 0318 | SP-5 | 8 | 7 |
| 0264 | SP-5 | 7 | 7 |
| 0331 | SP-5 | 7 | 5 |
| 0301 | SP-5 | 9 | 4 |
| 0337 | SP-5 | 6 | 3 |
| 0252 | SP-5 | 6 | 2 |
| 0057 | SP-6 | 5 | 2 |
| 0344 | SP-6 | 5 | 1 |
| 0343 | SP-7 | 5 | 6 |
| 0168 | SP-7 | 9 | 4 |
| 0339 | SP-7 | 9 | 4 |
| 0110 | SP-7 | 7 | 4 |
| 0336 | SP-7 | 7 | 4 |
| 0292 | SP-7 | 6 | 4 |
| 0297 | SP-7 | 7 | 3 |
| 0314 | SP-7 | 6 | 3 |
| 0291 | SP-7 | 5 | 3 |
| 0299 | SP-7 | 7 | 2 |
| 0166 | SP-7 | 6 | 2 |
| 0195 | SP-7 | 6 | 2 |
| 0220 | SP-7 | 9 | 1 |
| 0338 | SP-7 | 8 | 1 |
| 0326 | SP-7 | 6 | 1 |
| 0241 | SP-7 | 8 | 0 |
| 0054 | SP-7 | 6 | 0 |
| 0040 | SP-7 | 5 | 0 |
| 0041 | SP-7 | 5 | 0 |
| 0086 | SP-7 | 5 | 0 |
| 0215 | SP-7 | 5 | 0 |
| 0261 | SP-7 | 5 | 0 |
| 0055 | SP-8 | 6 | 3 |
| 0276 | SP-8 | 7 | 2 |
| 0304 | SP-8 | 5 | 2 |
| 0065 | SP-8 | 6 | 1 |
| 0245 | SP-8 | 6 | 1 |
| 0247 | SP-8 | 5 | 1 |
| 0136 | SP-8 | 6 | 0 |
| 0232 | SP-8 | 5 | 0 |
| 0242 | SP-8 | 5 | 0 |

| NSRP Report | SP Panel | Benefit | Number Requested |
|---|---|---|---|
| 0334 | SP-9 | 6 | 31 |
| 0290 | SP-9 | 3 | 20 |
| 0219 | SP-9 | 4 | 19 |
| 0396 | SP-9 | * | 10 |
| 0289 | SP-9 | 6 | 5 |
| 0224 | SP-9 | 5 | 2 |
| 0269 | SP-9 | 7 | 1 |

* The number of projects analyzed for benefit rating concluded with NSRP report 0356.

# APPENDIX B

## First Sample Survey:
## Implementation Of Past NSRP Research
## Through Education and Training

IMPLEMENTATION OF PAST NSRP RESEARCH
THROUGH EDUCATION AND TRAINING
SURVEY

## GENERAL

1. **The list of NSRP projects (Page B-4 below) is shown in order of importance based on the empirical data collected. Identify (in order of most to least) those (any or all) of importance to your organization.**

2. **Of the NSRP projects listed, which has a broad range of applicability to all shipyards?**

3. **List any past NSRP projects not appearing on the list which have significant importance to your organization.**

4. **Other research has shown that shipyards are looking for results they can put to use. In your opinion, would a standardized training/education program make a difference on implementation of an NSRP project at your organization?**

5. **Publicity and workshops to disseminate NSRP project results are two strategies recommended to improve project implementation. In your opinion, would a standardized training/education program on "how-to" have a similar effect in disseminating the results?**

## FULL OR PARTIAL IMPLEMENTATION

6. **Of the NSRP projects listed, which, if any, have been fully implemented at your site?**

7. **Of the NSRP projects implemented at your site, which projects were considered a success?**

8. **Of the NSRP projects implemented at your site, which were considered to have a significant cost benefit (cost to ignore outweighs the cost to implement)?**

9. **Of the NSRP projects where successful implementation took place, what were the key factors that contributed to the success?**

10. **Would a training/education program have improved the results?**

11. **What was the length of time required to implement the project?**

12. **Of projects implemented in the past, would remediation be useful?**

13. **Describe to what degree implementation was successful.**

14. **If implementation was partial, what could have been done to make implementation complete?**

15. **Before implementation, how long did the particular need exist?**

**NON-IMPLEMENTATION**

16. **Of the NSRP projects listed, although never implemented, which would be of significant value to your organization?**

17. **Would a training/education program have made a difference whether implementation was possible? If yes, at what level? (Management/Trades/Other: explain)**

18. **Of the NSRP projects where an unsuccessful attempt to implement took place, to what were the key factors which prevented successful implementation?**

19. **Would a training/education program have changed the outcome?**

## Candidate Abstracts

### 1. NSRP #0334/PANEL #SP-9

Author: Richard B. Cooper, for Ship Analytics, Inc.
Title: Recommendations on the Use of Interactive Instruction for Training Shipyard Trade Skills
Abstract: This is an overview of interactive instruction, including its applications and cost-effectiveness; (1) describes the characteristics of shipyard trade training; (2) identifies commercial interactive courseware applicable to trade training; (3) discusses the potential use of authoring systems by shipyards; (4) provides guidance for the integration of interactive instruction into existing shipyard training programs; and (5) concludes with detailed recommendations for the development of a two-lesson demonstration of interactive instruction for trade training to be presented to shipyard management and training personnel. (31 p.)

### 2. NSRP #0329/PANEL #SP-3

Author: Dr. Gerald C. Soltz
Title: The Effect of Substrate Contaminants on the Life of Epoxy Coating Submerged in Sea Water
Abstract: The purpose of this project was to study the effects that contaminants, commonly occurring in the marine environment, have on epoxy coating systems. Three standard ballast tank coatings plus a clear epoxy coating were tested. Three chemicals and various size blasting grit particles were used as contaminants. Sea salt and sodium chloride were found to be much more detrimental to epoxy coatings, than was ferrous sulfate or the grit particles. (160 p.)

### 3. NSRP #0319/PANEL #SP-4

Author: H. L. Young and M. R. Gluse
Title: Investigation of the Application of Computer-Aided Process Planning to Ship Modernization, Overhaul and Repair
Abstract: The purpose of this study is to investigate and evaluate the use of Computer-Aided Process Planning, the extension of Group Technology concepts, to ship repair and modernization. Industry experience has demonstrated that when computer-aided process planning is applied to a zone- based, product oriented work structure, significant cost savings can be realized. (75 p.)

## 4. NSRP #0345/PANEL #SP-1

Author: John Martin and John L. Wittenborn
Title: Environmental Compliance Inspection Checklist for Shipbuilding Facilities
Abstract: This checklist was developed to assist shipyards in determining their level of environmental compliance with federal regulatory requirements. The checklist addresses the full range of processes and operations found in the shipbuilding industry, and the environmental regulations that apply to them. The checklist was prepared using current available environmental checklists and published literature sources on environmental auditing. A draft checklist was reviewed by various representative shipyards to assure that all shipyard processes were covered. (126 p.)

## 5. NSRP #0290/PANEL #SP-9

Author: J. C. Mathes and Dwight W. Stevenson
Title: Writing Shipyard Reports
Abstract: Written communication is extremely important in increasing shipyard efficiency. However, written communication can reduce productivity because reports take time to write and to read. Writing Shipyard Reports is intended to help shipyard managers, engineers, and other professionals to write and prepare reports in a more efficient manner. This manual is divided into two sections. The first section is a text for use with an in-house course in report writing; the second section is reference information for use in writing reports--checklists, guidelines, and sample reports. This manual was written after extensive interviews with shipyard managers, engineers, and other professionals and specifically addresses their concerns. An accompanying Training Instructor's Guide provides a framework for training instructors in U.S. shipyards to use in developing a course to improve the written communication skills of shipyard professionals. (61 p.)

## 6. NSRP #0405/PANEL #SP-4

Author: Wilkins Enterprise, Inc.
Title: Development of Producibility Evaluation Criteria
Abstract: The objective of this project was to provide a mutually acceptable technique for use by the Navy and industry in evaluating the construction cost of competing ship designs and design features based on the work content rather than on weight. The technique is intended for application in any stage of design; designers in both early and detail stages of design can effectively assess the producibility of design features being

considered. See NSRP 0398 for computer software instructions for estimating labor-hours and construction costs. (97 p.)

**7. NSRP #0219/PANEL #SP-9**

Author: Thomas Lamb, for The University of Michigan
Title: Engineering for Ship Production
Abstract: This publication represents a consolidation of the views of an experienced shipbuilder on the principles of advanced ship production technology. The application of the design-for-production technique is described and illustrated through examples. The concept that ship designers should develop all design for production is essential. Once the best production-oriented designs are developed, it is necessary to transmit the design information to the various departments in the shipyard that use the information. Improvements to existing shipyard methods are presented. The book was developed from the author's 1978 SNAME paper, "Engineering for Modern Shipyards," and University of Washington lectures on Ship Production Technology. (465 p.)

**8. NSRP #0341/PANEL #SP-3**

Author: Roger Snyder, Larry Shul and Les Hansen
Title: Procedure Handbook for Shipboard Thermal Sprayed Coating Applications
Abstract: This handbook is intended to guide a shipyard that is preparing to establish a first time thermal spray program that is in accordance with current U. S. Navy requirements. The second is to assist shipyards that are currently involved in an active thermal spray program by providing information and data that can be used to analyze and reassess their current methods, thus leading to potential improvements or cost savings. (191p.)

**9. NSRP #0398/PANEL #SP-4**

Author: Wilkins Enterprise, Inc.
Title: Producibility Evaluation Criteria - Cost Estimating Computer Programs - Manual
Abstract: This manual describes the use of a number of computer programs that have been developed for evaluating the producibility and desirability of different ship design alternatives. These general computer programs can help to determine the cost of construction of a ship or portion of a ship, or for determining which of several design alternatives would be the least expensive to build. A DOS-based computer disk with the program is

available on request. Development of the computer programs is described in NSRP 0405. (100 p.)

**10. NSRP #0406/PANEL #SP-4**

Author: Thomas Lamb
Title: Build Strategy Development
Abstract: The objective of this project was to develop a generic build strategy and guide for future ship construction programs. The report defines a build strategy as an agreed design, engineering, material management, production and testing plan prepared before work starts, to identify and integrate all necessary processes. The use of a build strategy approach ensures that crucial communication between relevant departments is identified early enough to have a significant influence on final costs. Five US shipyards and three foreign yards participated in the project; a ""notional"" US shipyard was then created for build strategy development. Fleet oiler and container ships were used as examples. (382 p.)

**11. NSRP #0418/PANEL #SP-1**

Author: National Steel and Shipbuilding Company
Title: Hazardous Waste Minimization Guide for Shipyards
Abstract: This project developed a guide and procedures for reducing the quantity and toxicity of the hazardous waste produced by shipbuilding and repair-related production activities. The basic categories used in each chapter to define the techniques of waste minimization are: improved operation management, material substitution, process substitution, recycling, and treatment. The guide is organized by the various types of manufacturing and operations (i.e., painting and coating, blasting, etc.), and identifies the types of waste or materials affected. All chapters have been organized to give an introduction to the manufacturing processes, so that the guide can be easily used by both trained and first-time users. (100 p.)

**12. NSRP #0300/PANEL #SP-4**

Author: National Steel and Shipbuilding Company
Title: Advanced Measurement Techniques for U.S. Shipbuilding
Abstract: Modern shipbuilders have embraced the concept of modular construction and are realizing the gains in productivity associated with these methods. Further gains in productivity can be achieved if these modules can be built and erected ""neat,"" that is, without the traditional excess material normally trimmed at erection. Construction of ""neat"" hull block requires

rigid control of accuracy throughout the production cycle. Interim product from the fabrication of parts through the erection of hull block, must be carefully measured to strict tolerances to assure minimal rework. (125 p.)

**13. NSRP #0312/PANEL #SP-3**

Author: National Steel and Shipbuilding Company
Title: Evaluation of New Surface Preparation and Coating Repair Techniques in Ballast Tanks
Abstract: Ship ballast tanks present special problems as concerns corrosion control. In addition, ballast tanks are one of the most costly areas in which to apply coatings in both new ship construction and ship maintenance. Being subjected to intermittent wet and dry cycles of aerated sea water places extreme demands on corrosion control methods. Harsh service environments are coupled with necessarily complex tank geometries, especially in Navy combatants with difficult accessibility. The SP-3 Panel of SNAME recognized these problems and formulated a series of research and development projects to investigate alternate, cost effective corrosion control solutions. (35 p.)

**14. NSRP #0409/PANEL #SP-4**

Author: Thomas Lamb, Textron Marine Systems
Title: Report on Limitations of Computerized Lofting for Shell Plate Development
Abstract: This project was undertaken to determine if a shipbuilder’s goal of cutting all plates "neat" is achievable through the use of computer-aided lofting (CAL) programs. Six shell development software programs are investigated, tested, and compared. Project conclusions include the fact that most improvements to shell development systems have concentrated on computer technology, rather than new accuracy techniques in plate development. The successful use of the CAL systems is highly dependent on the user's skill level and experience as a shipbuilding loftsman. The shell development systems operate well within normal shipbuilding tolerances. The development of the same plate by different CAL systems is not consistent, although shipbuilders are most concerned with consistency within a single system. It is also noted that shell development problems are viewed differently by shipbuilders and the CAL developers. Project recommendations include a study of forming methods and the application of accuracy control to improve shell plate forming accuracy and consistency, and a study of ways to apply advanced measuring techniques to shell development. A comparison of actual shell plates is also suggested. (175 p.)

## 15. NSRP #0323/PANEL #SP-4

Author: Richard Storch and L. D. Chirillo
Title: Information Required from Planning Yards to Support Zone Logic
Abstract: This report has gathered information from planning yards on how to support zone logic. It recommends ways to improve the manufacturing system and how to develop generic strategies per ship class. Also discussed are the importance of establishing production engineering in planning yards and institute zone oriented design stages and the implementation of product oriented material management. The study recognizes planning yard activities as part of the manufacturing system. (93 p.)

## 16. NSRP #0333/PANEL #SP-4

Author: James Wilkins
Title: The Definition of a Shipyard's Engineering Requirements to be Met by a Design Agent
Abstract: This report provides a generic listing of the requirements for a shipyard's engineering support contract. The generic list of requirements was developed in conjunction with eight shipyards and five design agents. The report details the goals, approach, and conclusions of the study. (41 p.)

## 17. NSRP #0396/PANEL #SP-9

Author: Howard M. Bunch and Mark H. Spicknall, University of Michigan
Title: Short Course on Quality Function Deployment for the U.S. Shipbuilding Industry
Abstract: Quality Function Deployment (QFD) is a powerful tool for customer-driven product and process development and organizational planning. This report provides all of the textual course material and overhead slides necessary for the presentation of basic QFD training courses targeted specifically to the US shipbuilding environment. The QFD User's Manual, the QFD Instructor's Manual, and masters of overhead slides associated with the QFD course are included as appendices. This material is intended to be used in conjunction with five videotapes produced by Technicomp, Inc., which can be rented from the AVMAST Library (ED 91-95). (250 p.)

## 18. NSRP #0350/PANEL #SP-1

Author: J. Frank Santoyo
Title: Staging Systems for Ships During New Construction and Repair
Abstract: Present scaffolding methods used by most shipyards are costly and, in general inefficient. The need to develop innovative scaffolding methods and to use state- of-the-art scaffolding systems and equipment is imperative. This report concentrates on scaffolding systems devoted primarily to exterior hulls and the use of other equipment utilized to make this operation more cost efficient. This area of shipbuilding could have significant impact in reducing costs, a necessary reduction in order for the American commercial market to expect to become competitive in the world-wide market place. (40 p.)

## 19. NSRP #0397/PANEL #SP-4

Author: National Steel and Shipbuilding Company
Title: Weld Shrinkage Study
Abstract: Inherent in the ship hull construction during assembly of interim products is weld shrinkage. Modern shipbuilders, employing new construction building techniques, are attempting to eliminate the rework associated with the addition of excess material designed to compensate for shrinkage. The objective of this study was to determine weld shrinkage factors for three interim processes in hull block construction. The process of deriving shrinkage factors are identified, from the development of check sheets, to establishing checking procedures, data gathering, and the statistical analysis of data. Shrinkage data collection methodology and statistical analysis is provided with the shrinkage factors derived for each stage of fabrication. (100 p.)

# APPENDIX C

## Responses by Major Shipyards to First Survey

The methodology used to narrow the field from 400+ candidates to 19 was based on a review of the various benefit studies conducted in 1993 and the NSRP Documentation Center records going back to 1989. The list of 19 candidates, Appendix A, clearly indicates those subjects of the most interest to the center's clientele. The study then proceeded with a survey questionnaire with the goal of identifying the five most important/significant projects for review by the panel.

The sample questionnaire (Appendix B) was sent to Newport News Shipbuilding, Ingalls Shipbuilding, Inc., NASSCO, Norfolk Naval Shipyard, Bath Iron Works, Electric Boat Corporation, Atlantic Marine, University of Michigan Transportation Research Institute, and U.S. Merchant Marine Academy. The responses are grouped by question, as shown in this appendix, for performing analysis to narrow the potential candidates to five projects. The analysis resulted in the following five candidates:

- 0334, Recommendations on the Use of Interactive Instruction for Training Shipyard Trade Skills
- 0345, Environmental Compliance Inspection Checklist for Shipbuilding Facilities
- 0219, Engineering for Ship Production
- 0398, Producibility Evaluation Criteria - Cost Estimating Computer Programs - Manual
- 0418, Hazardous Waste Minimization Guide for Shipyards.

## Responses:

GENERAL

**1. The list of NSRP projects (See Appendix B) is shown in order of importance based on the empirical data collected. Identify, (in order of most to least) those (any or all) of importance to your organization.**

They are all of importance to some degree.

Weld shrinkage (#19) [#0397], Producibility Evaluation Criteria - Cost Estimating Computer Programs - Manual (#9) [#0398], Environmental Compliance Inspection Checklist (#4) [0345]

They all could be of value. However, the ones with the most immediate importance would be 0329, 0341, 0312, 0345, 0418, 0319.

The following projects have been important: 0345, 0219, 0341, 0406, 0418, 0300, 0409, 0350, 0397, and 0334.

18 [0350], 14 [0409], 9 [0398], 1 [0334]

A number of the subject areas are important and are/have been addressed at our yard but not connected to NSRP projects.

0405, 0398, 0300, 0409, and 0397

**2. Of the NSRP projects listed, which, has a broad range of applicability to all shipyards?**

NSRP # 0334,0329, 0345, 0405, 0219, 0406, 0418, 0409, 0350, 0397

#3 [#0319]

All of them

The three SP-1 Projects [0345, 0418,and 0350]; Advanced Measurement [0300]; Surface Preparation & Coatings [0312]

All projects applicable to major shipyards, however, some shipyards have more need than others based on their current status.

1[0334], 3 [0319], 4 [0345], 5 [0290], 7[0219], 11[0418] and 13[0312]

0405, 0398, 0300, 0409, and 0397

**3. List any past NSRP projects not appearing on the list which have significant importance to your organization.**

NSRP # 0341, 0398, 0300, 0312, 0323, 0333

Concurrent Engineering

Design & Planning Manual for Cost Effective Welding NSRP #0339 (textbook for our welding training classes); Accuracy Control NSRP # ? Feb 1982 Revised August 1985: Environmental Studies & Testing; PM-10 Study

0283 Problem Solving Teams in Shipbuilding; 0301 SP-5 Safety Action Team Project; 0459 SP-5 Workers Compensation Survey; 0448 Basic Elements of Safety & Health Programs

**4. Other research has shown that shipyards are looking for results they can put to use. In your opinion, would a standardized training/education program make a difference on implementation of an NSRP project at your organization?**

Probably not. It is hard to envision a “standardized” training program for all NSRP projects. Training for different projects is often best approached in different ways. Also, not all projects require training/education.

Yes [There were several just Yes answers]

Yes! As I don’t know of any SP-3 projects being implemented.

Yes, but not for every project, some may be (by nature) unimplementable.

No

**5. Publicity and workshops to disseminate NSRP project results are two strategies recommended to improve project implementation. In your opinion, would a standardized training/education program on "how-to" have a similar effect in disseminating the results?**

Yes, but not necessarily standardized. Publicity should not simply emphasize that projects have been completed, but should emphasize their implementation and payback. For example, incorporate implementation articles in NSRP News. Most project reports should also have a "how-to" section to assist implementation.

Yes [There were several just Yes answers]

No

**FULL OR PARTIAL IMPLEMENTATION**

**6. Of the NSRP projects listed, which, if any, have been fully implemented at your site?**

Fully implemented include NSRP #0300 and #0329

Numbers 1 [#0334] and 3 [#0319].

Not sure.

Can't say for sure - most would/could have been partially implemented. Most will not give credit to someone else for a good ideas.

Our yard has to my knowledge been ahead of NSRP in project implementation. It takes so long for NSRP project funding, etc. that we usually cannot wait for the NSRP results.

None

**7. Of the NSRP projects implemented at your site, which projects were considered a success?**

NSRP #0300 and 0329 were a success. Other projects partially implemented and also considered a success include NSRP # 0406, 0397.

#3 [#0319], #1 [0334] partially

Environmental Studies & Testing;  PM-10 Study

In the area which I participated, our yard has not implemented a specific project. The benefits have been the exchange of info and knowledge gained from meetings and tours at other shipyards.

SP-5 Union Driven Safety Action Teams

**8. Of the NSRP projects implemented at your site, which were considered to have a significant cost benefit (cost to ignore outweighs the cost to implement)?**

Overall cost benefit was attained in projects NSRP #0300, 0406, and 0397 (how else could they be considered a success.

#1 [0334]  and #3 [#0319]

Accuracy control

Environmental Studies & Testing;  and PM-10 Study

SP-5 Union Driven Safety Action Teams

**9. Of the NSRP projects where successful implementation took place, what were the key factors that contributed to the success?**

Management commitment to the implementation and belief that a true cost/benefit existed. Demonstrated (proven) implementation at other yards as part of or adjunct to the project.

Management commitment to improvement in those areas which provided exposure.

A champion - someone who would drive implementation.

We were in desperate need of the information.

Project leader is “well connected” to the company’s “Top Management.”

**10. Would a training/education program have improved the results?**

Yes to the first [0300] and third [0397], no to the second [0406]

Possibly, particularly with project #1 [0334].

Yes

Cost/benefit emphasis

Probably not for these two instances [Environmental Studies & Testing; and PM-10 Study].

No

**11. What was the length of time required to implement the project?**

Generally 2 years for each, although none are totally complete (still in work).

I was not personally involved in the development but it varied from project to project; approx. 6 months. Project #3 [0319] is still in process.

Various

[For our projects,]The project deliverables did not need to be implemented. They were answers/relief to regulatory issues.

1 month

**12. Of projects implemented in the past, would remediation be useful?**

Very doubtful

Possibly

No!

No

**13. Describe to what degree implementation was successful.**

On a scale of 1-100 for each of the 3 listed [0300, 0406, 0397], respectively; 95%, 80%, 80%.

Implementation of the above two projects (not listed on Enclosure #1) was very successful. Partial implementation of those listed in #1 was not very successful.

Project had an immediate result of reducing recordable injuries.

**14. If implementation was partial, what could have been done to make implementation complete?**

Trial implementations as part of the projects, detailed and extensive.

In my opinion, the NSRP research and development projects are to be used as tools to assist shipyards with the implementation of their specific projects within their specific environment. To that extent, what is mostly needed is an exposure to their development & their availabilities as tools.

By making some one in the organization responsible for implementation.

Implementation was partial because some of the items did not pertain to our yard or because our yard was at a level above what

"Buy-in" by Top Management.

**15. Before implementation, how long did the particular need exist?**

The needs have always existed.

Always

Each issue was different - average time is probably 1-2 years.

Many years

## NON-IMPLEMENTATION

**16. Of the NSRP projects listed, although never implemented, which would be of significant value to your organization?**

NSRP #0405, 0334, 0329, 0345, 0219, 0418, 0409, and 0350.\

I believe most are valuable. Again, it is the exposure & the availability to these projects that is the key to success.
The only two environmental projects listed were partially implemented. I'm unsure of the implementation status of the other projects.

14 [0409]

Once again, many of the subject areas have been addressed, but not as part of an NSRP project.

**17. Would a training/education program have made a difference whether implementation was possible? If yes, at what level? (Management/Trades/Other: explain)**

All of the following projects would have benefited from training at the level of "implementor" rather than management; 0405, 0219, 0418 and 0409. In my opinion, training would not be necessary ( and not an issue as far as implementation.)

Yes, it must be done at the working level which is to be determined by project subject.

Yes, Some brief overview for management (say a video) - Trades Training as appropriate.

Unable to answer. Status of other projects are unknown.

Yes, it takes a combination of timing, budgets, and upper management support plus a perceived need by the trades.

No

**18. Of the NSRP projects where an unsuccessful attempt to implement took place, to what were the key factors which prevented successful implementation?**

Lack of clear objectives, steps for properly implementation, management buy-in of concept, cost/benefit analysis support.

None that I am aware of!

Unable to answer.

Not aware of this at our yard.

No attempts were made.

**19. Would a training/education program have changed the outcome?**

In some cases, yes.

Publicity/training/education programs are needed as inertia is hard to overcome at our yard. We promote the NSRP work, however it doesn't seem to get to the trades where it is needed.

I think so.

Unable to answer.

-No-

# APPENDIX D

## Second Sample Survey:

## Identification of Past NSRP Research Implementation

This survey was developed to assist in updating the NSRP database to identify projects that have been implemented, need to be implemented, need additional research, or should be archived. The survey was sent to the NSRP Panel Chairs along with a packet containing abstracts of each panel's projects to assist in the identification. The packets are not provided in this report.

The survey below requested information in tabular form on: (1) project number, (2) type project, (3) abstract ok/revise, (4) business need, (5) target audience, (6) implemented yes/where, (7) related projects #, (8) recommendation, (9) implementation priority, and (10) comments. The following provides an explanation of each category:

**(1) Project Number** Number of NSRP project

**(2) Type Project:**

A. Regulatory Compliance
B. Technology Evaluation
C. How to Manual
D. Inspection Standard
E. Human Resources
F. Surveys
G. Proceedings
H. Training Material
I. Other (list).

**(3) Abstract OK/Revise:** If abstract needs revision, please advise and return any suggestions with this survey.

**(4) Business Need:**

1. Reduce cost
2. Improve capability to implement new production technology
3. Producibility via engineering and design standards
4. Reduce safety & environmental hazards
5. Improve ship production education and training
6. Cut design to delivery time
7. Improve construction quality
8. Improve quality of working life
9. Other (list).

**(5) Target Audience:**

a. Design/Engineering
b. Manufacturing/Materials
c. Production
d. Life Cycle Support
e. Human Resources
f. Top Management
g. Middle Management
h. Other (list).

**(6) Implemented Yes/Where:** If this project has already been implemented, tell us where and when, and who we can contact to find out more about how it was implemented.

**(7) Related Project #** Similar projects.

**(8) Recommendation:**

(1) Archive
(2) Obsolete
(3) Not suitable for implementation (why?)
(4) Current Project (to be completed mm/yy)
(5) Ongoing Issue (needs additional research)
(6) Needs to be Implemented (Send information and comment on how to implement the project.)

**(9) Implement Priority:** To NSRP (use A-1,2,3 etc.)
To your shipyard (use B-1,2,3, etc.)
Ease of Implementation (use C-1,2,3,etc.)

**(10) Comments** Any additional comments

# NSRP Project Review
# SP - ____

SEP - 96

| 1<br>Project # | 2<br>Type | 3<br>Abstract OK / Revise | 4<br>Business Need | 5<br>Target Audience | 6<br>Implemented Yes / Where | 7<br>Related Projects # | 8<br>Recommendation | 9<br>Implement Priority | 10<br>Comments |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
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| | | | | | | | | | |

**(2) Project Type - (insert letter)**
A. Regulatory Compliance
B. Technology Evaluation
C. How to Manual
D. Inspection Standard
E. Human Resources
F. Surveys
G. Proceedings
H. Training Materials
I. Other _____

**(3) Abstract OK/Revise**
(If abstract needs revision, please advise and return any suggestions with this survey)

**(4) Business Need**
1. Reduce Cost
2. Imrpove capability to implement new production technology.
3. Producibility via engineering and design standards
4. Reduce safety & environmental hazards
5. Improve ship production education and training
6. Cut design to delivery time
7. Improve construction quality
8. Improve quality of working life
9. Other _____

**(5) Target Audience**
a. Design/Engineering
b. Manufacturing/Materials
c. Production
d. Life Cycle Support
e. Human Resources
f. Top Management
g. Middle Management
h. Other _____

**(6) Implemented**
(If this project has already been implemented, tell us where and when , and who we can contact to find out more about how it was implemented.)

**(8) Recommendation**
(1) Archive
(2) Obsolete
(3) Not suitable for implementation (why?)
(4) Current Project (to be completed mm/yy)
(5) Ongoing Issue (needs additional research)
(6) Needs to be implemeted !!!!

**(9) Implement Priority**
To NSRP, (use A-1,2,3,etc)
To your shipyard, (use B-1,2,3,etc.)
Ease of Implementation, (use C-1,2,3,etc.)

Please send us the abstract and comment on how to implement the project. What tasks should be implemented?
Where in the shipyard?
What resources are needed?
When is the best time?

How should it be done?
Workshop _____
Procedure ____
Handbook ____
Video _____
Other _____

# APPENDIX E

## Response by NSRP Panel Chairs to Second Survey

This survey was developed to assist in updating the NSRP database to identify projects that have been implemented, need to be implemented, need additional research, or should be archived. The sample survey (Appendix D) were sent to the NSRP Panel Chairs along with a packet containing abstracts of each panels projects to assist in the identification. The packets are not provided in this report. Below are the numbers of projects for each panel:

| Panel | Number of Projects |
|---|---|
| SP-1 | 49 |
| SP-3 | 70 |
| SP-4 | 40 |
| SP-5 | 20 |
| SP-6 | 38 |
| SP-7 | 62 |
| SP-8 | 72 |
| SP-9 | 17 |

**Responses:**

Panel Chairs for SP-1 and SP-4 did not respond in time for the October 1996 panel meeting. See the sample survey (Appendix D) for explanation of columns and codes. (See below each table for column 10 (Comments) explanation.)

## Table 1 SP-3 Response

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| 0316 | Tracking System | OK | 1 | C | Not Known | 0403 | 6 | | C1 |
| 0379 | C | OK | 1 | B | Not Known | | 6 | | C2 |

C1 - Workshop

C2- Workshop/Implementation manual

## Table 2 SP-5 Response

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| 0056 | E | Ok | 1,2,7,8 | h** | ? | 0351 | 2 | 0 | C1 |
| 0252 | E | Ok | 1,2,4,6 | a,b,c | most yards | 0264/0283/ 0301/0380 | 4 | *** | ** |
| 0254 | D | Ok | 7 | a,b,c | many yards | none | 1 | A5,B4, C5 | none |
| 0263 | E | Ok | 1,6,8 | All | ? | none | 6 | A2,B3, C6 | C2 |
| 0264 | Production | Ok | 1,2,6 | b,f,g | ? | 0283 | 1 | n/a | none |
| 0265 | E | Ok | 1,4,8 | c,f,g | many yards | 0301 | 1 | n/a | C3 |
| 0282 | E | Ok | 1,2,5,6,7 | c,f,g | many yards | 0283 | 1 | n/a | C3 |
| 0283 | E | Ok | 1,2,5,6,7 | c,f,g | many yards | 0282 | 1 | n/a | C3 |
| 0296 | E | Ok | 1,2,5,6,7 | c,f,g | many yards | 0283 | 1 | n/a | C3 |
| 0301 | E | Ok | 1,4,8 | c,f,g | many yards | 0265 | 1 | n/a | C3 |
| 0318 | E | Ok | 1,4,8 | c,f,g | n/a | 0301 | 1 | n/a | C4 |
| 0331 | E | Ok | 1,4,8 | c,f,g | n/a | 0460 | 1 | n/a | C5 |
| 0337 | E | Ok | 1,2,5,6,7 | c,f,g | many yards | 0283 | 1 | n/a | C1 |
| 0351 | E | Ok | 1,2,7,8 | h** | ? | 0056 | 2 | 0 | C1 |
| 0370 | E | Ok | 1,2,5,6,7 | c,f,g | many yards | 0283/0337 | 1 | n/a | C1 |
| 0380 | Production | Ok | 1,2,6 | b,f,g | many yards | 0264/0283 | 1 | n/a | none |
| 0393 | * | | | | | | | | |
| 0448 | E | Ok | 1,4,8 | c,f,g | n/a | 0318 | 1 | n/a | C4 |
| 0459 | E | Ok | 1,4,8 | c,f,g | n/a | none | 1 | n/a | C5 |
| 0460 | E | Ok | 1,4,8 | c,f,g | n/a | 0331/0460 | 1 | n/a | C5 |

* Not Applicable to goal of this study
** Mid management and below, both salary and hourly
*** Many yards are doing this type of effort on a daily basis
C1 - Scrap
C2 - Dust this project off
C3 - Working
C4 - MACOSH is using this
C5 - Good activity

## Table 3 SP-6 Response

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| 0456 | I | OK | 1 | a | | 0361 | 5 | A5,C5 | C1 |
| 0438 | A | OK | 1 | a,b | | | 3 | | C2 |
| 0437 | H | OK | 9 | f | | 6-94-1 | 6 | A2,B1, C3 | C3 |
| SP-6 Tactical Plan | I | OK | 9 | f | | | 6 | A1,C10 | C4 |
| 6-94-1 | I | OK | 1 | a | | | 4 | A3,B5, C5 | C5 |
| 6-93-2 | I | OK | 1,6 | a,f | | | 5 | A1,B2, C5 | C6 |
| 6-95-1 | D | OK | 1,7 | c | | | 4 | | C7 |
| 6-95-3 | B,C | OK | 1,6 | a,f | | | 4 | | C8 |
| 6-95-2 | B | OK | 1,8,7 | a | | | 4 | | C9 |
| 6-96-1 | A | OK | 1 | a | | | 4 | | C10 |
| 6-96-2 | I | OK | 1 | a,b | | | 4 | | C11 |
| 6-97-1 | D | OK | 1,7 | a,c | | | 4 | | C12 |
| 6-97-2 | C | OK | 1,6 | a | | | 4 | | C12 |

C1 - Project Type: Other. Standards cross-reference; Comment: Compendiums of information are highly useful, but to be more useful, including cross-reference information and equivalency data would be beneficial. This would be a very labor-intensive undertaking.

C2 - Recommendation: Not suitable for implementation. This project successfully identified a method to accomplish technical component comparison between international standards and current U.S. standards. The reason the project should not be implemented is because the U.S. Coast Guard did not agree with the developed methodology and refused to participate for a number of reasons, funding being the major item. SP-6 has involved ABS and the methodology was validated by ABS in test case analysis. Without U.S.C.G. participation and approval, implementation is not possible. SP-6 has included accomplishing approval for the methodology in follow on projects 6-94-1 and FY98 proposed project.

C3 - Business need: To become conversant with the international language of SI, U.S. shipbuilders have major cultural issues to overcome. Shipyard workers require training in the metric system, with which most are totally unfamiliar. The business need is to understand and integrate the common language of international commerce to enhance competitive capability.

C4 - Project Type: Other. Although this project was not a formal NSRP project, it was requested by the ECB that the Panel Chair prepare such a document to describe past, current, and future plans for the SP-6 Panel; Target Audience: The tactical

plan was intended for the ECB, top shipbuilding industry participants, and shipyard management.

C5 - Project Type: Other. Competitive Enhancement; Recommendation: Current project scheduled to be completed 96-10-23.

C6 - Project Type: Other. Updates 1992 master plan to keep pace with the changing environment of worldwide marine standards; Recommendation: Ongoing issue. The Masterplan, the SP-6 tactical plan and most of the current SP-6 projects are all contributing to increasing the knowledge and familiarity of U.S. shipbuilders with the international marketplace requirements. There will be no end to this research until the U.S. is the world leader in commercial ship construction.

C7 - Recommendation: Current project. Turned on in June, 1996 and no timetable has yet been proposed to the T.O.C.

C8 - Recommendation: Current project scheduled to be completed 97-03.

C9 - Recommendation: Current project. Was transferred to the GCRMTC and just recently funded. No project timetable has been established or T.O.C. been assigned. Probably will occur at Oct [1996] meeting.

C10 - Recommendation: Current project. Awaiting funding. No timetable or T.O.C. has been established.

C11 -Project Type: Other. Supplier community and shipyard communication technology update project; Recommendation: Current project. Was transferred to the GCRMTC and just recently funded. No project timetable has been established or T.O.C. been assigned. Probably will occur at Oct [1996] meeting.

C12 -Recommendation: Current Project. This project was approved by ECB in May 1996 and the Engineering Panel Program Manager is awaiting Proposals. Proposals will not be solicited until funds are available.

## Table 4 SP-7 Response

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| 0297 | B | OK | 2 | a | Ingalls | | 1 | | |
| 0299 | B | R | 2 | b | Puget Sound | 0336 | 6 | ? | C1 |
| 0314 | B | OK | 2 | b | | | 1 | | |
| 0326 | B | OK | 2 | b | | | 1 | | |
| 0336 | C | OK | 2 | c | Puget Sound | 0229 | 6 | ? | C2 |
| 0338 | D | OK | 7 | c | | 0168, 0220 | 1 | | |
| 0339 | C | OK | 5 | a | Puget Sound, Newport News | | 6 | | |
| 0343 | B | OK | 2 | b | | | 5 | | |
| 0363 | B | OK | 2 | b | | | 1 | | |
| 0364 | I | OK | 5 | a,b,g | | | 1 | | |

C1 - Puget Sound is author. Workshop (Hands on training of craft)
C2 - Workshop (Hands on training of craft)

## Table 5 SP-8 Response

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| 0053 | C | OK | 1 | c | ? | | 1 | | |
| 0055 | B | OK | 2 | c | ? | 0065 | 1 | | |
| 0065 | B | OK | 2 | c | ? | 0055 | 1 | | |
| 0066 | G | OK | 6 | a | ? | 0067 | 1 | | |
| 0067 | G | OK | 6 | a | ? | 0066 | 1 | | |
| 0068 | C | OK | 1 | b | ? | 0070,0076 | 1 | | |
| 0070 | C | OK | 1 | b | ? | 0068,0076 | 1 | | |
| 0073 | G | OK | 2 | b | ? | | 2 | | |
| 0076 | C | OK | 5 | g | ? | 0068,0070 | 1 | | C1 |
| 0101 | C | OK | 5 | b | ? | | 1 | | C1 |
| 0102 | C | OK | 5 | b | ? | | 1 | | C1 |
| 0103 | C | OK | 5 | b | ? | | 1 | | C1 |
| 0104 | C | OK | 5 | b | ? | | 1 | | C1 |
| 0111 | C | OK | 5 | b | ? | | 1 | | C1 |
| 0115 | C | OK | 5 | b | ? | | 1 | | C1 |
| 0120 | C | OK | 5 | b | ? | | 1 | | C1 |
| 0123 | C | OK | 5 | b | ? | | 1 | | C1 |
| 0125 | C | OK | 5 | b | ? | | 1 | | C1 |
| 0136 | G | OK | 5 | b | ? | 0073-0245 | 1 | | C2 |
| 0141 | C | OK | 2 | c | ? | 0073-0245 | 1 | | C2 |
| 0146 | C | OK | 5 | c | ? | 0073-0245 | 1 | | C2 |
| 0149 | C | OK | 5 | c | ? | 0073-0245 | 1 | | C2 |
| 0150 | C | OK | 5 | c | ? | 0073-0245 | 1 | | C2 |
| 0151 | C | OK | 5 | c | ? | 0073-0245 | 1 | | C2 |
| 0152 | C | OK | 5 | c | ? | 0073-0245 | 1 | | C2 |
| 0154 | C | OK | 5 | c | ? | 0073-0245 | 1 | | C2 |
| 0157 | B | OK | 3 | c | ? | | 1 | | |
| 0159 | G | OK | 5 | g | ? | | 1 | | C3 |
| 0172 | C | OK | 5 | c | ? | | 1 | | |
| 0175 | C | OK | 5 | c | ? | | 1 | | |
| 0186 | C | OK | 5 | g | ? | 0146 | 1 | | |
| 0189 | C | OK | 5 | c | ? | 0186 | 1 | | |
| 0199 | C | OK | 5 | g | ? | 0076 | 1 | | |
| 0200 | C | OK | 1 | a | ? | 0053 | 1 | | |
| 0201 | C | OK | 1 | c | ? | 0053, 0200 | 1 | | |
| 0221 | C | OK | 5 | g | ? | 0186, 0146 | 1 | | |
| 0222 | C | OK | 5 | g | ? | 0221,0186, 0146 | 1 | | |
| 0232 | C | OK | 5 | c | ? | | 1 | | C4 |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| 0233 | C | OK | 2 | b | ? | 0141,0221, 0222 | 1 | | |
| 0242 | C | OK | 2 | b | ? | 0141, 0221, 0222, 0233 | 1 | | |
| 0243 | C | OK | 5 | b | ? | | 1 | | C5 |
| 0244 | C | OK | 5 | c | ? | | 1 | | |
| 0245 | C | OK | 5 | c | ? | | 1 | | |
| 0247 | C | OK | 5 | b | ? | 0276 | 6 | A3,C3 | C6 |
| 0256 | C | OK | 5 | b | ? | | 1 | | |
| 0271 | C | OK | 2,7 | b | ? | | 6 | | |
| 0276 | C | OK | 5 | b | ? | 0247 | 6 | A3, C3 | C7 |
| 0277 | C | OK | 5 | b | ? | | 1 | | |
| 0278 | C | OK | 5 | b | ? | | 1 | | |
| 0279 | F | OK | 1 | g | ? | | 1 | | |
| 0284 | C | OK | 5 | b | ? | | 1 | | |
| 0304 | C | OK | 5 | b | ? | 0247, 0276 | 6 | A3,C3 | C7 |
| 0305 | B | OK | 2 | c | ? | | 6 | A2,B2, C3 | C8 |
| 0321 | G | OK | 5 | g | ? | | 1 | | |
| 0325 | C | OK | 5 | g | ? | 0076-0125 | 1 | | C9 |
| 0328 | C,G | OK | 5 | g | ? | | 1 | | |
| 0346 | C | OK | 9 | g | ? | | 1 | | |
| 0347 | C | OK | 1 | c | ? | | 6 | A4,B4, C4 | |
| 0348 | C | OK | 9 | g | ? | | 1 | | |
| 0356 | G | OK | 5 | b,g | ? | | 1 | | C10 |
| 0374 | G | OK | 5 | b | ? | | 1 | | C11 |
| 0375 | G | OK | 1 | b | ? | | 1 | | |
| 0389 | C | OK | 1 | b | | | 6 | A5,B5, C5 | C7 |
| 0394 | F | OK | 5 | g | | | 1 | | |
| 0435 | C | OK | 6 | a | | 0436 | 6 | A1,B1, C1 | C12 |
| 0436 | C | OK | 6 | a | | 0435 | 6 | A1,B1, C1 | C12 |
| 0440 | G | OK | 9 | g | | | 1 | | |
| 0450 | C | OK | 1 | g | | | 1 | | |
| 0454 | C | OK | 6 | a | | 0435, 0436 | 6 | A1,B1, C1 | C13 |

C1 - Projects 0076, 0101, 0102, 0103, 0104, 0111, 0115, 0120, 0123, and 0125 are all related.

C2 - These projects are similar & related in the way they document work management for various stages of production.

C3 - This project is a compilation of several past projects.
C4 - Related to all other projects dealing with work management.
C5 - This project relates to several past projects dealing with cost + labor standards.
C6 - Provide workshops for IE's of various yards.
C7 - Provide workshops.
C8 - Workshop & graphical modeling.
C9 - Related to several past projects.
C10 -Related to 0157, 0199, 0277, 0278, 0325, and 0335.
C11 - Related to 0367, 0347, and 0328.
C12 -Highest implementation priority.
C13 -Combine workshops with 0435 & 0436. A workshop has already been given, but more workshops maybe beneficial.

## Table 6 SP-9 Response

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| 0170 | G,E | OK | 8 | e,f | | | 1 | | C1 |
| 0180 | F | OK | 5 | e,b,c | | 0181 | 2 | | |
| 0181 | F | OK | 5 | e,b,c | | 0180 | 2 | | |
| 0192 | F,H | OK | 5 | e,f,a | | | 5 | | |
| 0198 | F,H,B | OK | 5 | e,b,c | | 0224 | 5 | | |
| 0216 | G,E | OK | 8 | e,f,g | | | 1 | | C2 |
| 0219 | C,H | OK | 3 | a, general | yes | | 5 | | C3 |
| 0223 | C,E,H | OK | 7 | f | yes | | 9 | | C4 |
| 0224 | F,H | OK | 5 | f,b,c | | 0198 | 9 | | C4 |
| 0225 | B,C | OK | 2 | a,f | | | 9 | | C4 |
| 0269 | H | OK | 5 | a | yes | | 6 | | C5 |
| 0289 | H | Update | 5 | general | yes | | | | C4 |
| 0290 | H,C | OK | 1 | general e,f,g | | | 1 | | C6 |
| 0334 | B,H | OK | 5 | e | yes | 0416 | 5,6 | | C7 |
| 0396 | H | OK | 1 | f | yes | | | | C4 |
| 0402 | | | | | | | | | n/a |
| 0416 | H | OK | 5 | e | yes | | | | C8 |

C1 - Good model of proceedings presentation
C2 - Good model.
C3 - Advertise
C4 - Recommendation: Valid Data; Comment: Leave on Shelf.
C5 - Short condensation of naval architecture training/introduction
C6 - Poor quality
C7 - Ongoing issue
C8 - Recommendation: valid data; Comment: hardware/software is outdated, no need to continue distribution.

# APPENDIX F

## Analysis of Second Survey

This is the analysis of the responses to the second survey sent to the NSRP Panel Chairs. The sample survey is shown in Appendix D and the responses by the Panel Chairs are in Appendix E. Even though Panel Chairs for SP-1 and SP-4 did not respond in time for the October 1996 panel meeting, NNS inserted the two combined SP-1 projects selected as a top candidate from the first survey into the pool of second survey candidates.

The following information was provided to the SP-9 Panel at the October, 1996 panel meeting to select the top five candidates for workshop development. The information provided included the benefit rating or value from the initial analysis, implementation priorities from the Panel Chairs and comments and issues from all the research obtained.

NSRP 0345 / 0418

## Environment & Hazardous Waste

Background

- **NSRP 0345: Environmental Compliance Inspection Checklist for Shipbuilding Facilities**
  - SP-1, April 1992
  - Assists Shipyards in Determining Level of Compliance with Federal Regulatory Requirements
  - Links Processes & Operations to Environmental Regulation
- **NSRP 0418: Hazardous Waste Minimization Guide for Shipyards**
  - SP-1, January 1994
  - Reduce Quantity & Toxicity of Waste
    - Improved Operation Management
    - Material & Process Substitution
    - Recycling
    - Treatment

Advantages

- Provides Shipyards Demonstrated Ability to Comply With and Implement Requirements for Government Contracts
- High Visibility Issue
- Survey Benefit Value = 8
- NNS Expertise

Disadvantages

- Some Shipyards Subject to State Regulations

NSRP 0263

## Gainsharing - Employee Involvement in a Shipyard/Assembly Yard

Background
- SP-5, June 1987
- Improve Productivity Through Group Sharing of Gains
- Increase Blue Collar Productivity by Giving Workers a Voice in Decision-Making Affecting Their Work
- Provide a Model Productivity-Enhancing Employee Involvement Activity
- Provide Successful Option to Industries Hesitant to Change Management Styles

Advantages
- NSRP Implement Priority = 2
- Cut Design-to-Delivery Time
- Improve Quality of Working Life
- Reduce Costs

Disadvantages
- Implementation Ease = 6
- Survey Benefit Value = 4
- NNS Expertise
- Implement Priority to Chairman's Yard = 3

NSRP 0437

## Metrication in U.S. Shipbuilding

Background
- SP-6, February 1995
- Programmed Training Course in the Metric System for Shipbuilding
- Practical Applications with Implementation Expected in Near Future
- For Use by Engineering, Manufacturing & Support Trades

Advantages
- NSRP Implement Priority = 2
- Implement Priority to Chairman's Yard = 1
- Implementation Ease = 3
- International Commerce Based on Metrics
- Workers Unfamiliar w/ Metrics
- Cultural Issues to Overcome
- Navy Requires Metrics
- NNS Expertise

Disadvantages

- Cultural Issues to Overcome
- Domestic Raw Materials Not Metric
- Some Yards Already There
- Most Valuable As Just-in-Time Training Only

NSRP 0435 / 0436 / 0454

**Concurrent Engineering**

Background

- **NSRP 0435: Concurrent Engineering - Primer & User s Guide for Shipbuilding**
  - SP-8, January 1995
  - Philosophy of CE
  - Benefits of CE
  - How to Implement
  - Application of Teams & Computers to CE
- **NSRP 0436: Concurrent Engineering Application**
  - SP-8, January 1995
  - Responses to Shipbuilding CE Questionnaires
- **NSRP 0454: Concurrent Engineering Implementation in a Shipyard**
  - SP-8, November 1995
  - Describes Pilot CE Implementation on Vehicle Carrier Designs
  - Powerful Force for Cost Reduction

Advantages

- NSRP Implement Priority = 1
- Implement Priority to Chairman's Yard = 1
- Implementation Ease = 1
- Cut Design to Delivery Time
- Integrated Product Development Process Basic to Future DOD Contracts (LPD17)
- NNS Expertise

Disadvantages

- Change Upper Management Mindset
- Availability of Targeted Audience for Training

NSRP 0247 / 0276 / 0304

**Industrial Engineering**

Background

- **NSRP 0247: Problem Solving & Training Guide for Shipyard Industrial Engineers**
  - SP-8, 1986

- Organizes or Codifies Information to Relate Problems to Assistance Source
  - Sources include Indexes, Bibliography, Training Guide, Curriculum
- **NSRP 0276: Basic Principles of Industrial Engineering**
  - SP-8, October 1987
  - Benefits, Function & Techniques Used by IEs
  - Problem Recognition & Identification, Work Sampling, & Operational Analysis
  - Importance of Communication & Effective How-To
- **NSRP 0304: Optimal Use of Industrial Engineering Techniques in Shipyards**
  - SP-8, August 1989
  - Identifies Specific IE Techniques Being Applied

Advantages
- NSRP Implement Priority = 3
- Implementation Ease = 3
- Improves Ship Production Education & Training
- Survey Benefit Value = 7
- IE Techniques Valuable
- Shipbuilding-Specific IE Training Programs Important

Disadvantages
- NNS Expertise
- Some Shipyards Already There/ Most At Least Working On Projects

NSRP 0305

**Simulation Models for Development of Optimal Material Handling - Phase I, Storage and Distribution**

Background
- SP-8, September 1989
- Initial Phase of Two-Part Study
- Investigation of Software Alternatives
- Presents Choices and Rationale

Advantages
- NSRP Implement Priority = 2
- Implement Priority to Chairman's Yard = 2
- Implementation Ease = 3
- Improves Capability to Implement New Production Technology
- Generically Important to Shipbuilding Industry

Disadvantages
- Each Shipyard's Simulation Models Unique
- Requires Individualized Training Approach
- Requires Highly Sophisticated Expertise
- Survey Benefit Value = 0

NSRP 0389

**Performance Measurement in Production and Support Areas of a Shipyard**

Background
- SP-8, September 1993
- Identifies Successful Methods Used
- Generic Methodology Based on Measurement Methods in Areas of Surface Preparation & Coating and Material Control

Advantages
- Essential for Shipyard's Operations/Success
- Reduces Costs

Disadvantages
- Implementation Ease = 5
- NSRP Implement Priority = 5
- Implement Priority to Chairman's Yard = 5
- Each Shipyard Has Unique Performance Tools In Place, Based on Business Strategy

NSRP 0271

**Quality Defects Measurement and Control System**

Background
- SP-8, March 1987
- Computer Software Package
- Aids in Reducing Defects & Material Discrepancies
- Identifies Significant Error Causes
- Monitors Corrective Actions

Advantages
- Improve Capability to Implement New Production Technology
- Improve Construction Quality
- NNS Expertise

Disadvantages
- Defect Measurement System Already In Place for Govt Customers
- Unique Systems at Each Shipyard
- Survey Benefit Value = 1
- No Implementation Priorities Indicated

NSRP 0347

**Implementation Guide for Approaching Shop Floor Control**

Background
- SP-8, June 1992
- Detailed Approach
- Guidelines for Information to Monitor & Control Production Activities
- Difficult to Use COTs Production Control Software

Advantages
- Reduces Costs
- Good Area for Training

Disadvantages
- Each Shipyard's Systems Unique
- System Interfaces Too Complex for Singular Training Approach
- Survey Benefit Value = 3
- NSRP Implement Priority = 4
- Implement Priority to Chairman's Yard = 4
- Implementation Ease = 4

NSRP 0299 / 0336

**Flame Bending of Pipe**

Background
- **NSRP 0299: Flame Bending of Pipe for Alignment Control**
  - SP-7, 1990
  - Application of Flame Straightening to Precision Alignment of Piping
  - Reduces Residual Stresses for Pipe Alignment Prior to Welding or Bolting
- **NSRP 0336: Practical Guide for Flame Bending of Pipe**
  - SP-7, 1991
  - Guide for Training and Procedural Development
  - Implementation with Minimal Costs and Risk of Errors

Advantages
- Improve Capability to Implement New Production Technology
- Survey Benefit Value = 7
- NNS Expertise

Disadvantages
- Follow-On Training Needs to be Shipyard-Specific
- Dated Technology (Replaced by Cold Bending Process)
- Not Cost-Effective
- No Implementation Priorities Indicated on Survey

NSRP 0339

**Design & Planning Manual for Cost Effective Welding**

Background
- SP-7, 1991
- Select Readily Weldable Materials and Provide Suitable Weldments
- Approach for Reviewing and Accepting Fabricator Work
- Info - Welding Design, Metallurgy, Processes & Nondestructive Testing

Advantages
- Improve Capability to Improve New Production Technology
- NNS Expertise

Disadvantages
- Follow-On Training Needs to be Shipyard-Specific
- No Implementation Priorities Indicated on Survey

NSRP 0316

**The Economics of Shipyard Painting - Phase III**

Background
- SP-3, October 1990
- Provides Supervision Cost Performance Information
- Identifies Cost Variances at Early Stage to Avoid Cost Overruns
- Areas Investigated Include: Lost Time, Abnormal Conditions, Hotwork Identification

Advantages
- Reduces Costs
- Survey Benefit Value = 7

Disadvantages
- Difficult to Implement as Training
- Data Base
- No Implementation Priorities Indicated

NSRP 0379

## A Purchasing Agent s Guide to Buying Paints & Coatings

Background

- SP-3, March 1993
- Overview of Coatings as a Commodity
- Identifies Departments Impacted by Coatings Selection Process
- Increases Purchasing's Understanding of Coatings

Advantages

- Reduces Costs

Disadvantages

- Difficult to Implement as Training
- Contractual Restraints Specific to Shipyard
- No Implementation Priorities Indicated on Survey

NSRP 0269

## Basic Naval Architecture - Instructor Guide and Problem Set

Background

- SP-9, January 1989
- Teaching Resource for Basic Naval Architecture Course
- Consists of 45 Videotapes
- Suggested Lesson Plans, Problems & Solutions

Advantages

- Improve Ship Production Education & Training
- NNS Expertise
- Survey Benefit Value = 7

Disadvantages

- Low Implementation Priority

NSRP 0334

## Recommendations on the Use of Interactive Instruction for Training Shipyard Trade Skills

Background

- SP-9, June 1991
- Overview of Interactive Instruction
- Identifies Commercial Interactive Courseware
- Potential Use of Authoring Systems

Advantages

- Most Requested Project from NSRP Library
- Aid in Understanding Computer-Based Training Technology
- Easily Designed & Taught
- NNS Expertise
- Survey Benefit Value = 6

Disadvantages

- Not Every Shipyard Develops Training Internally
- 9-95-3 Could Be Used for This Effort
- Training Requires One Computer Per Student

# APPENDIX G

## Workshop and CBT Evaluations

WORKSHOP and CBT EVALUATIONS

Below are the workshop and CBT evaluations, which were provided to each trainee. They were asked to circle the number that best represents your evaluation of each item and to place any written comments in the comment section at the end of the worksheet. Each evaluation discloses the total responses received and the mean score for each item.

## Use of Interactive Multimedia for Training

## Shipyard Trade Skills Workshop

**1. Was the workshop well organized and presented in a logical manner?**

| **Rating** | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|
| | Strongly Agree | | Agree | | Strongly Disagree |
| **Responses** | **5** | **9** | **7** | **0** | **0** |

Total Responses = 21
Mean = 3.90

**2. Were the workshop materials (training aids, student guide, etc) adequate?**

| **Rating** | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|
| | Strongly Agree | | Agree | | Strongly Disagree |
| **Responses** | **3** | **8** | **5** | **4** | **1** |

Total Responses = 21
Mean = 3.38

**3. Was the workshop length adequate considering the amount of subject matter?**

| **Rating** | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|
| | Strongly Agree | | Agree | | Strongly Disagree |
| **Responses** | **4** | **4** | **12** | **1** | **0** |

Total Responses = 21
Mean = 3.52

**4. The workshop was useful in assisting me in the performance of my job?**

| **Rating** | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|
| | Strongly Agree | | Agree | | Strongly Disagree |
| **Responses** | **2** | **7** | **7** | **3** | **0** |

Total Responses = 19
Mean = 3.42

**5. What was the <u>most</u> beneficial portion of the workshop?**

It was all beneficial for building and explaining CBT. The most beneficial for me was the storyboard portion.

The effects of color on a presentation. What exactly went into a CBT.

Lesson 3 [The interactive Multimedia Instruction Development Process]

General "Big Picture" of what goes into creating a multimedia presentation.

Being able to see how multimedia would be able to help us with our training.

Interactive workbook. Easy to follow the instructor. Prevented mind from wondering. Kept focused.

Explaining the process of developing CBT materials.

Understand what CBT is and how to setup.

The very technical aspects - info that may help you troubleshoot problems.

Understanding how the CBT is developed/setup between storyboards.

All of the workshop for me, since I didn't have any of the knowledge about how to setup or design CBT.

Provided a process to develop CBT courses. A logical sequence and good tips.

Storyboarding

Lays ground work for creating CBT.

Helped me understand the "mechanics" of CBT.

Seeing of actual products - I.E. content, way it works, etc.

Demos & examples of How

Branched discussions of options, considerations, constraints, possible uses, etc.

Awareness as to the potential and present usage of CBT.

Visuals/examples

The perspective of what is needed to produce a CBT program.

**6. What was the least beneficial portion of the workshop?**

Filling in the blanks in the workbook. One was so concerned with filling in the blanks that I was not listening to the rest of what was being said.

N/A [- several]

Specific computer requirements - detailed level of information which is constantly changing.

Could not identify or relate to subject matter at first. You should play a few minutes of your CBT class first as an intro. (As you finally did!)

This workshop should have been attended by all people at [my shipyard] involved with CBT development, not primarily training coordinators.

Moved a bit slow.

The inability to run actual CBT program due to hardware problems. Also classroom environment with lighting affected display of material.

The actual CBT could not be presented properly [at my shipyard].

Lengthly discussion on how its done… I.E. development aspects.

Fill-in-the blank workbooks.

The overview of organization of training materials, instructional technique, color selection, etc.

The large amount of time dedicated to the "how to" development of a program, rather than current usage and possibilities.

Filling in the blanks in the workbook was quite distracting. My focus was on the blanks versus what was being said.

Graphic formats.

**Other comments:**

This gives a very good look at the development of CBT and steps necessary to get there.

Was every impressed with content, material was well presented. Although there were some minor areas that require a closer look overall it was excellent. Strongly recommend this training as high level training for management personnel.

Course was very informative!

The course presupposed the trainee is well versed in computers CBT "jargon." Now I won't throw away my "Training" monthly magazines!

Would be great to see a comparison of different authoring programs.

The CBT cannot be used at this time due to the lack of technology at [my shipyard]. Our 386 & 486 computers do not have CD-ROMs, speakers, sound cards, etc.

The equipment that was supplied by [my shipyard] for the instructor to use should have been better for more effective workshop. The instructor performance & knowledge was excellent.

I thought on the whole course provided food for thought. The only issue I have is that before [my shipyard] trek into this type of development we must have the system and materials and training to accomplish.
Student guides are well put together, organized & concise. Given good conditions more actual examples of CBT be provided during the course. Instructor was well versed in subject matter and did an excellent job given the circumstances.

The computer generated presentation was presented by using an overhead & projection panel. This presentation was projected on the wall. If all the lights are out it is ok. With lights on, (need lights on to fill in blanks of handout) you could barely see the presentation on the wall. [My shipyard] needs to look into the purchase of different computers & projectors. The instructor had his own projector that made an excellent presentation.

Workbook is a bit juvenile, esp. when you have to write in the same response numerous time as was page 48.

A variety of delivery styles would help.

Wanted more practical examples/usage in the shipbuilding industry, less technical how to.

# Use of Interactive Multimedia for Training

## Shipyard Trade Skills CBT

**1. Was the CBT well organized and presented in a logical manner?**

| **Rating** | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|
| | Strongly Agree | | Agree | | Strongly Disagree |
| **Responses** | **7** | **5** | **2** | **0** | **0** |

Total Responses = 14
Mean = 4.36

**2. Was the detail of the CBT materials covered adequately?**

| **Rating** | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|
| | Strongly Agree | | Agree | | Strongly Disagree |
| **Responses** | **5** | **6** | **3** | **0** | **0** |

Total Responses = 14
Mean = 4.14

**3. Was the CBT length adequate considering the amount of subject matter?**

| **Rating** | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|
| | Strongly Agree | | Agree | | Strongly Disagree |
| **Responses** | **4** | **6** | **4** | **0** | **0** |

Total Responses = 14
Mean = 4.00

**4. The CBT was useful in assisting me in the performance of my job?**

| **Rating** | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|
| | Strongly Agree | | Agree | | Strongly Disagree |
| **Responses** | **3** | **5** | **4** | **1** | **0** |

Total Responses = 13
Mean = 3.77

**5. What was the <u>most</u> beneficial portion of the CBT?**

Self paced format

Application of audio verses textual use of testing

Showed a number of different aspects that can be used with CBT.

It's always beneficial to have a voice in conjunction with the video.

Much more practical than I thought.

Understanding what CBT is and how to adapt it to [my shipyard].

Being able to go through a complete lesson plan clearly & without help.

Actually, statically operation of stud welding equipment.

Presentation of the demo material.

First exposure, would need more time to adequately answer this question.

The video demonstration of adjustment techniques, and explanation of correct chart usage for parameters, etc.

The instructor's knowledge of the subject. The package wasn't as strong without his insight.

**6. What was the <u>least</u> beneficial portion of the CBT?**

Slow pace of response times - subpar audio & video quality

N/A

Occasionally I got lost in getting back to my starting point if I got a wrong answer. Instead of selecting "Menu" to get back, one should just select "Back" to back track.

Recommend all questions have 4 answers, and answers of all the above, none of the above be eliminated.

Written material that would be just as useful in hardcopy

**Other comments:**

Need to ensure level of expertise of trainees is accurate for the training to be most effective.

Evaluated as it applied to CBT applications used in this course of instruction.

Suggested addition: A session in which participants have an actual "mini" program to develop where more of a hands on approach to the tools.

# Environmental Compliance Inspection Checklist and Hazardous Waste Minimization Workshop

**1. Was the workshop well organized and presented in a logical manner?**

| **Rating** | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|
| | Strongly Agree | | Agree | | Strongly Disagree |
| **Responses** | **1** | **3** | **7** | **0** | **0** |

Total Responses = 11
Mean =3.45

**2. Was the workshop materials (training aids, student guide, etc adequate?**

| **Rating** | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|
| | Strongly Agree | | Agree | | Strongly Disagree |
| **Responses** | **1** | **3** | **7** | **0** | **0** |

Total Responses = 11
Mean = 3.45

**3. Was the workshop length adequate considering the amount of subject matter?**

| **Rating** | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|
| | Strongly Agree | | Agree | | Strongly Disagree |
| **Responses** | **0** | **5** | **4** | **2** | **0** |

Total Responses = 11
Mean = 3.27

**4. The workshop was useful in assisting me in the performance of my job?**

| **Rating** | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|
| | Strongly Agree | | Agree | | Strongly Disagree |
| **Responses** | **0** | **3** | **2** | **4** | **1** |

Total Responses = 10
Mean = 2.70

**5. What was the <u>most</u> beneficial portion of the workshop?**

The interaction of the class members.

Covering the scope of the breadth of the regulations. Reminder of key regulating provisions and criteria.

General overview of "things to consider" for a facility.

Cross-training: learning about Env. Reqmts outside my area of expertise.

Basic and easily understood.

Checklists.

The CBT portion

MSDS

The course itself. I was not aware that so many permits and actions are required to do everyday work.

The CBT program was excellent. Concise easy to follow. Can be used as overview to Env awareness for all employees.

**6. What was the <u>least</u> beneficial portion of the workshop?**

The concept of a checklist as a training tool.

PCB management probably overly focused on transformers, may need to incorporate info on other materials (felt gaskets, paint, etc.)

The checklists.

Length of session.

Could be pared down somewhat.

Word for word review of each checklist.

Hazardous waste compliance inspection checklists

The compliance checklist is really targeting environmental engineers and higher level managers. Should not be directed to mechanics. Too deep of an area.

**Other comments:**

A checklist has some merit when used properly. The concept of a checklist as a training tool needs to have some further help from the instructor. For this tool to be effective for people with limited environmental experience the instructor has to have that experience or at least be able to answer some basic questions. An individual who has worked in environmental for some time does not need to attend the training. He would/could benefit from the checklist as it may provide a tool to help him think about his shipyard and their environmental program.

Place more focus on the criteria for hazardous waste - Listing & characteristic wastes. Place more focus on Oil Pollution Act (OPA). Consider adding the self-audit policy and the inspection emphasis that make-up the EPA auditing policy established in 1986. When soliciting this compliance checklist to other entities, I suggest you claim where applicable that this compliance list was established from the perspective of a non-storage hazardous waste facility. And that there are regulations and exemptions which are process and industry specific in many cases (CWA, CAA, Haz. Waste Regulations, etc.)

Technical detail may not be sufficient for level of audience. This may cause more questions then trainer is able to answer.

(1)If the purpose of the checklists will be to perform audits, then I believe they are inadequate. I don't know the scope of the regs that are being audited. I don't have confidence that all air regs, for example, are included. The checklists should refer me to the proper response, i.e., through regulatory citations for each item, and all proper answers get a "Y". The checklists can't be completed in a reasonable amount (< 1week) time by one person, maybe even a few persons. I think the details vary from question to question (list all air emissions vs. is yard contemplating modifications to sources). If the end result "desired" is awareness, then forget the detail. If the end result desired is compliance, then a lot more must be added. (2)If the purpose is to increase awareness, then they should be generalized, so that management (non-environmental) can understand. (i.e. there's too much detail) (3)I'm confused as to who the target audience is here; maybe it's the yard w/o an environmental dept. But the person using the lists will have to be an environmental professional.

The contents of the workshop is very useful. The workshop itself, unfortunately, didn't serve much benefits.

# Environmental Compliance Inspection Checklist and Hazardous Waste Minimization CBT

**1. Was the CBT well organized and presented in a logical manner?**

| **Rating** | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|
| | Strongly Agree | | Agree | | Strongly Disagree |
| **Responses** | **2** | **3** | **2** | **0** | **0** |

Total Responses = 7
Mean = 4.0

**2. Was the detail of the CBT materials covered adequately?**

| **Rating** | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|
| | Strongly Agree | | Agree | | Strongly Disagree |
| **Responses** | **2** | **1** | **3** | **1** | **0** |

Total Responses = 7
Mean = 3.57

**3. Was the CBT length adequate considering the amount of subject matter?**

| **Rating** | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|
| | Strongly Agree | | Agree | | Strongly Disagree |
| **Responses** | **1** | **2** | **3** | **1** | **0** |

Total Responses = 7
Mean = 3.43

**4. The CBT was useful in assisting me in the performance of my job?**

| **Rating** | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|
| | Strongly Agree | | Agree | | Strongly Disagree |
| **Responses** | **0** | **3** | **4** | **0** | **0** |

Total Responses = 7
Mean = 3.43

**5. What was the <u>most</u> beneficial portion of the CBT?**

It was all very beneficial!

It was a solid (general) presentation

The availability of CBT.

Very clear to the material presented.

Prioritizing waste management methods

**6. What was the <u>least</u> beneficial portion of the CBT?**

The "decision trees" didn't show me where I was in the outline. At times, the picture made me think I was at the top level when I wasn't. Don't refer to source reduction when you mean waste minimization. Source reduction is near the top of the hierarchy remember, and does not include the recycling/disposal options; however waste min does include all four options.

More detailed information related to operations will be more beneficial.

The self tests.

**Other comments:**

Very well done! It is also very useful! MSDS info can be used throughout the entire yard.

MSDS section was <u>good</u>. Waste minimization section will be good for management (Engineering Managers especially). Could be a little more job specific (i.e. major hazardous waste generators.)

CBT seems adequate for persons just familiarizing themselves with waste minimization. Good outline for start.

Needs more extensive contents review for the accuracy of the contents. Questions asked should be directed more toward testing of understanding/knowledge of the subject discussed. Some pictures presented are not relevant to the subject discussed.

More practical or operation related material would be more useful to [my shipyard] group.