

**Final Report  
UMTRI-97-20**

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16. Abstract  The primary objective of the shipbuilding research library, commonly known as the National Shipbuilding Research and Documentation Center (NSRDC), located at the University of Michigan Transportation Research Institute (UMTRI), is to support the U.S. shipbuilding, ship repair, and related industries in becoming and remaining competitive in the world market by: <ul style="list-style-type: none"> <li>• maintaining a repository of information on advanced ship production technologies and methods;</li> <li>• providing ready access to this information and technology</li> <li>• actively promoting and facilitating innovation in shipbuilding and repair through the identification, development, application, and communication of new technologies and methods</li> </ul>			
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## I. INTRODUCTION

The primary objective of the shipbuilding research library, commonly known as the National Shipbuilding Research and Documentation Center (NSRDC), located at the University of Michigan Transportation Research Institute (UMTRI), is to support the U.S. shipbuilding, ship repair, and related industries in becoming and remaining competitive in the world market by:

- maintaining a repository of information on advanced ship production technologies and methods
- providing ready access to this information and technology
- actively promoting and facilitating innovation in shipbuilding and repair through the identification, development, application, and communication of new technologies and methods

In meeting these tasks, the Documentation Center receives and processes hundreds of requests annually for shipbuilding-related research documents and educational audiovisual material. Requests come from both domestic and foreign shipbuilders and related companies, organizations, and individuals. Numerous inquiries for research information are handled each year over the phone and by e-mail. Appendix B is a list of the groups and individuals that have requested Documentation Center materials during this contract period.

Because of its past and present support of the shipbuilding and repair industries, the Documentation Center is viewed by many domestic shipbuilders as being a vital element of the U.S. shipbuilding infrastructure. Also, at least one foreign shipbuilder has credited the NSRDC as playing a key role in its country's successful efforts to become competitive in the world shipbuilding market.

The NSRDC was created in the mid-1980s to house research reports, technical papers, symposia proceedings, and audiovisual materials related to shipbuilding technology and methodology. In 1989, The University of Michigan contracted with Carderock Division, Naval Surface Warfare Center (Contract #NOO167-89-0065) to fund the library under the auspices of the National Shipbuilding Research Program (NSRP). In support of the NSRP, the Documentation Center has, in addition to operating the libraries, been responsible for developing and managing the technical program of the annual NSRP Ship Production Symposia since 1987 (except for 1989 and 1996), providing editorial support to the Society of Naval Architects and Marine Engineers (SNAME) for the *Journal of Ship Production*, and writing, desktop publishing, and distributing a newsletter on NSRP research and activities.

Outside of the scope of Documentation Center contracts, NSRDC staff members have also developed and taught several NSRP short courses and workshops on subjects including accuracy control, standards and metrification, ship design for production, and quality function deployment/concurrent product development. Because of their combined knowledge of shipbuilding processes, methods, facilities, and related technologies, NSRDC staff members have also been employed in research and analysis of naval and commercial ship-acquisition-and-construction programs. NSRDC staff members have provided technical support for two phases of the mid-term sealift ship research program, in which a simulated shipyard was defined and used as a point of reference for NAVSEA and the participating domestic private yards regarding production engineering, construction schedules, and the effects of process and technology improvement.

## **II. WORK ACCOMPLISHED**

Following is a detailed statement of work for each task identified as part of the overall NSRDC scope of work.

**1. Technology Transfer.** UMTRI-MSD has staffed, managed, and operated a program of technology transfer for the benefit of the shipbuilding and ship repair community, and promoted the understanding and acceptance of productivity-enhancing technologies and methods throughout the industry. This activity included the identification and acquisition of information relevant to the shipbuilding and repair industries. Sources of this information included, but were not limited to, ARPA MARITECH, NSRP, SNAME, NAVSEA, Navy Mantech research programs and Centers of Excellence, NIST, MarAd, and foreign shipbuilders and research organizations. This was done through literature searches and through attendance of Documentation Center personnel, within the given budget limitations, at selected symposia, seminars, education and training programs, NSRP Panel meetings, and MARITECH program activities that were considered relevant to industry competitiveness. All important shipbuilding-related information obtained was made available to the shipbuilding community through the Documentation Center's libraries and newsletter.

A list of all travel associated with the transfer of technology during this contract period is located in appendix A.

**2. Publications Library.** UMTRI-MSD is the central repository for all research publications of interest to the U.S. shipbuilding and repair industries, including research reports that have been acquired through the technology-transfer task described above. UMTRI-MSD has responded to industry requests for paper and microfiche copies of these publications. At the present time there are over 450 documents in the library, several of which are symposia proceedings that contain hundreds of technical papers. Surplus copies of

documents have been distributed upon request free of charge to shipyards and others in the marine industry; documents requiring duplication from masters have been distributed upon request for nominal duplication and shipping charges.

To make the Publications Library information more accessible and up-to-date for users in the shipbuilding industry, the library's index was put into an electronic database for distribution on floppy disk. Complete bibliographic information for all publications was entered into a database. Each distributed disk copy included a software engine that allowed users to easily search the database without having to purchase their own software. Title, author, publication date, keywords, document ordering number, and a complete abstract was entered for each document, and all fields are searchable. Copies of the database were made available on floppy disk for computers running Windows® and Macintosh® operating systems.

**3. Audio Visual Library.** UMTRI-MSD is the central repository for all Audio Visual Material Available for Shipyard Training (AVMAST) on topics that are pertinent in today's ship design and production market, including audiovisual material that has been acquired through the technology-transfer task described above. At the present time there are over 600 audiovisual modules in the library covering all aspects of ship production, from accuracy control to zone outfitting. The videotapes are loaned to shipyards and others in the marine industry at a nominal charge covering handling and mailing.

To make the AVMAST Library information more accessible and up-to-date for users in the shipbuilding industry, the library's index was put into an electronic database for distribution on floppy disk. Complete bibliographic information for all audiovisual materials was entered into a database. Each distributed disk copy included a software engine that allowed users to easily search the database without having to purchase their own software. Title, author, publication date, keywords, module ordering number, and a complete abstract was entered for each module, and all fields were searchable. Copies of the database were made available on floppy disk for computers running Windows® and Macintosh® operating systems.

The costs associated with the initial creation of the electronic indexes for both the Publications library and the audio-visual library was a one-time-only cost resulting in considerable ongoing cost savings over annual hard-copy index publication and distribution. Previous costs associated with publication and distribution of 2,000 hard-copy indexes have been approximately \$30,000 annually, while the costs of copying and distributing 2,000 electronic indexes on floppy disk was only about \$5,500.

**4. NSRP Newsletter.** NSRDC staff members continue to produce and distribute the quarterly NSRP Newsletter. This newsletter is in paper form and has been distributed by mail to nearly 5,000 people associated with the NSRP, either through participation in research panels or symposia, or through ordering documents and audiovisual material from the libraries. Each newsletter contained a calendar of upcoming industry-related meetings, symposia, and events, abstracts of recently-released NSRP research reports, listings of new additions to the Publications and Audiovisual Libraries, and featured articles on specific NSRP research projects, research panel activities, and other events of interest to the shipbuilding industry. The newsletters produced under this contract can be found in appendix C.

### III. CONTRACT MANAGEMENT

**1. Quarterly Progress Reports.** UMTRI-MSD has submitted quarterly progress reports to ARPA with appropriate background information as was required. The sponsor was given updates of the progress achieved and problems encountered or anticipated, and how they impacted NSRDC in meeting the identified objectives and accomplishing the identified tasks.

**2. Industry Briefing on NSRDC Activities.** This briefing was given to the NSRP Executive Control Board members and other important industry and governmental representatives chosen by ARPA in May 1996. The briefing was held for the purpose of identifying for industry all NSRDC activities performed during the past year and soliciting input from industry representatives on NSRDC ongoing and future activities.

As a result of this briefing the *National Shipbuilding Research Documentation Center (NSRDC) Report of Technology Projects by NSTC Survey Topic*<sup>1</sup> was produced.

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<sup>1</sup> Richard C. Moore "National Shipbuilding Research Documentation Center (NSRDC) Report of Technology Projects by NSTC Survey Topics," June 1996.

#### **IV. CONCLUSIONS**

The NSRDC has played and continues to play an important part in the introduction of new technologies within the U.S. shipbuilding industry. The UMTRI-MSD staff has established an extensive technology repository and transfer system, which is increasing in scope and continually becoming better. The content of the NSRDC libraries is being kept up to date in all relevant industry areas. The accessibility of the NSRDC libraries is also continually being improved.





# APPENDIX A



## TRAVEL ASSOCIATED WITH TECHNOLOGY TRANSFER

1/22-28/95 Richard Moore traveled to Seattle WA to attend the 1995 Ship Production Symposium, to visit Boeing Inc.

1/23-28/95 Albert Horsmon traveled to Seattle WA to attend the Ship Production Panel 6 meeting.

2/21-23/95 Albert Horsmon traveled to New Orleans LA to attend a Gulf Coast Technology Center workshop.

2/28-3/2/95 Richard Moore traveled to Mobile AL to attend Ship Production Panels 4 and 7 meetings.

4/19-22/95 Pamela Cohen traveled to Beaumont TX to chair a Ship Production Panel 9 meeting.

5/7-12/95 Richard Moore traveled to Washington DC to attend an ECB meeting as project director of the NSRDC.

6/10-15/95 Pamela Cohen traveled to Linthicum Heights MD to attend the 4th Annual Human Resources Workshop.

8/12-12/95 Richard Moore traveled to New Orleans LA to attend the ECB meeting as project director of the NSRDC.

8/11-12/95 Pamela Cohen traveled to New Orleans LA to attend the ECB meeting as Chairperson of Ship Production Panel 9.

9/5-8/95 Pamela Cohen traveled to New Orleans VA to attend the Ship Production Panel 5 meeting, and a meeting of the Maritime Advisory Committee on Occupational Safety and Health.

9/29-10/5/95 Richard Moore traveled to Washington DC to attend the Annual SNAME meeting.

10/2-4/95 Albert Horsmon traveled to Washington DC to attend a proposal meeting at NSWC-CD.

10/3-8/95 Thomas Lamb traveled to Washington DC to present a paper at the SNAME Annual Meeting.

10/18-31/95 Richard Moore traveled to San Diego, CA to attend a Ship Production Panel 4 meeting.

10/26-27/95- Albert Horsmon traveled to Marinette, WI to attend a Local Section SNAME meeting.

11/5-10/95 Mark Spicknall traveled to Beaumont TX to attend a workshop on SIMPLE+ software.

# APPENDIX B



## NSRP Publications and Microfiche Library Statistics December 1, 1994 through June 30, 1996

NSRP #	Document Title	# of Request
#0005, paper #17	Apprentice - A Portable Welding Robot for the Shipbuilding ...	1
#0006, paper #10	AUTOKON's New Structural Design Capabilities...	1
#0006, paper #12	Network Scheduling of Shipyard Production...	2
#0006, paper #13	Planning and Ship Outfitting Production Control at Newport News	1
#0002, paper #1	Practical Shipbuilding Research and Development	2
#0003, paper #7	Considerations for an Automated Pipe Fabrication Facility	1
#0005, paper #1	Reducing Production Man-Hours Through Design Office...	1
#0005, paper #4	MAPS-GP (Graphic Piping) Present and Future Capability	1
#0005, paper #5	New SRS N/C Software Systems Development	1
#0005, paper #7	Computer-Aided Design Systems Applied to Ship Piping Design	1
#0005, paper #18	Improving Shipbuilding Productivity Through the Use of Standards	2
#0006, paper #2	The Shipbuilding Technology Transfer Program	1
#0006, paper #7	The Avondale Pipe Shop - Hardware and Software Status	1
#0006, paper #12	Network Scheduling of Shipyard Production, Engineering,...	1
#0006, paper #14	An Integrated Interactive Plate Nesting and Manufacturing...	1
#0006, paper #22	Increased Shipbuilding Productivity through Production Engineering	2
#0007, paper #4	Fitness for Purpose - A New Look at Weld Defect Acceptance...	1
#0007, paper #17	QC Circles for Improving Quality and Productivity	1
#0007, paper #19	The Avondale Pipe Shop - Preparing for Production	1
#0007, paper #24	Implementing IHI Technology at Avondale	1
#0008, paper #10	A National Coalition for the Shipbuilding Technology Program	1
#0008, paper #21	Planning and Scheduling Ship Construction Subject to Limited ...	1
#0008, paper #24	A Case Study Using Models in the Shipbuilding Industry	1
#0008, paper #27	Productivity: Management's Bonus (!) or Failure (???)	1
#0008, paper #28	U.S. Shipbuilding Standards Program - Long-Range Plan	1
#0009, paper #7	So You Want to Use Engineering Models	1
#0009, paper #11	Rapid Development of Production Schedules with Standard...	1
#0009, paper #19	Improving Shipyard Productivity by Subcontracting Material...	1
#0009, paper #24	MAPLIS - An On-Line Materials Resource Planning System...	1
#0010, paper #2	Productivity Rediscovered	1
#0010, paper #3	Cost Concepts and Productivity	1
#0010, paper #4	Enhancing Production Management Control through Performance...	1
#0010, paper #7	Rationalization of Shipyard Information Flows for Improved...	1
#0010, paper #9	Post-Processors for the Ship Hull Characteristics Program...	1
#0010, paper #12	Increase of Productivity by Automated Prefabrication of Pipe Spools	2
#0010, paper #14	Behavior Modification or Worker Participation?...	1
#0010, paper #17	Applications of Computer-Aided Engineering to Ship Systems...	1
#0011	Facilities and Industrial Engineering - Volume I, Report	1
#0012	Facilities and Industrial Engineering - Volume II, Appendices	1
#0014	Special Report - Accuracy Control Planning for IHI Construction	1
#0016	Cost Accounting - Final Report	1
#0020	Standards - Volume I and Report	1
#0025	Quality Assurance System	1
#0026	Quality Assurance - Volume I, Final Report	1
#0027	Quality Assurance - Volume II, Appendices	1
#0028	Planning and Production Control - Executive Summary	1
#0029	Planning and Production Control - Volume I, Final Report	1
#0030	Planning and Production Control - Volume II, Appendices	1
#0031	Frame Spacing, Alternate Shapes for Longitudinal, and Wider...	2
#0032	Improved Fabrication Primer for Protection of Steel	1

#0037	Shipbuilding Alignment with Lasers	1
#0039	One Side Welding - Flux Development and Study of Multiple Arc...	1
#0040	Development of Extended Length Continuous Wire Feed System	1
#0041	Development of a Portable AC/DC Welding Power Supply Module	1
#0043	NDT - Low Cost Alternatives to Film Radiography	1
#0046	Propulsion Plant Feasibility Study Report...	1
#0047	Propulsion Plant Feasibility Study Report - Subtask III,...	2
#0048	Toughness Evaluation of Electroslag and Electroslag Weldments	1
#0049	Executive Summary - Propulsion Plant Standards Feasibility Study	1
#0050	Ship Producibility Task S-1 - Propulsion Plant Standards...	1
#0052	Final Report - Propulsion Plant Standards Feasibility Study	1
#0053	Ship Producibility as it Relates to Series Production (Vol. I)	1
#0055	Advanced Pipe Technology - Interim Report	1
#0056	Study for the Improvement of Motivation in the Shipbuilding...	1
#0057	Standard Structural Arrangements	1
#0058	Photogrammetry in Shipbuilding	1
#0059	Executive Summary - Feasibility of Shipbuilding Standards	1
#0060	Fiberglass Reinforced Piping for Shipboard Systems	1
#0061	Castine Report S-15 Project - Shipbuilding Standards	1
#0062	Development of an All Position Automatic Welding Machine	2
#0064	Catalog of Existing Small Tools for Surface Preparation...	2
#0065	Advanced Pipe Technology - Executive Summary	1
#0069	Rectangular Vent Duct Standards	1
#0072, Vol. I	High Metal Deposition Welding	1
#0072, Vol. 2	High Metal Deposition Welding	1
#0074	Feasibility Study of Semi-Automatic Pipe Handling...	1
#0076	A Manual on Planning and Production Control for Shipyard Use	1
#0077	Feasibility Study on Development of an Economical System...	1
#0080	Dynamic Tear Test Correlation with Explosion Bulge Test...	1
#0081	Technology Survey of Major U.S. Shipyards	1
#0084	Photogrammetry in Shipbuilding - Measuring a Complex Casting	1
#0085	Applications of Plasma Arc to Bevel Cutting	1
#0086	Mechanized Gas Metal Arc Welding of Light Plate	2
#0087	Interim Report on Subtask III - Foreign Shipbuilding Standards	1
#0089	Interim Report on Subtask II - Industrial Standards in...	1
#0090	Special Structural Shapes - Factors Affecting Usage in U.S.....	3
#0092 Vol. I	Marine Coating Performance for Different Ship Areas	1
#0092 Vol. II	Marine Coating Performance for Different Ship Areas	1
#0096	Outfit Planning	5
#0097	Training Courses for Blasters and Painters and Student ...	1
#0098	Improved Tank Testing Methods	1
#0103	MOST Work Management Manual - Panel Line	1
#0107	Weld Defect Tolerance Study	2
#0110	Ceramic Weld Backing Evaluation	1
#0117	Product Work Breakdown Structure	5
#0119	Copper-Nickel Hull Sheathing Study	1
#0122	Shipbuilding Design/Production Integration Workshop	2
#0123	MOST Work Management Manual - Pipe Fabrication Shop	1
#0124	Photogrammetric Dimensioning of Ships' Engine-Room Models	1
#0126	Navy Weld Defect Tolerance Study	1
#0127	Determination of Volume Solids of Paints and Coatings...	1
#0128	Long-Range Facilities Plan	3
#0129	The Feasibility of Calcite Deposition in Ballast Tanks ...	2
#0130	Procedural Handbook - Surface Preparation and Coating ...	1
#0134	Evaluation of Water Borne Coatings for Marine Use	2



#0139	Manufacturing Technology for Shipbuilding - Moldloft,...	1
#0141	FY-82 Labor Standards Program - Pipe Fabrication and Blast....	1
#0142	Long Range Plan for Peterson Builders, Inc.	1
#0143	Process Analysis via Accuracy Control	3
#0144	Recommended U.S. Shipbuilding Standards Program Long...	1
#0146	Shipyard Data Application Program Panel Line Schedule...	1
#0147	Pipe-Piece Family Manufacturing	5
#0148	Design/Production Integration	2
#0149	MOST Work Management Manual - Blast and Coat on Platen...	1
#0150	MOST Work Management Manual - Plate Shop	1
#0153	Long Range Facilities Planning - Executive Summary and Vols. I-V	1
#0155	Survey of Existing and Promising New Methods...	2
#0158	Cathodic Protection/Partial Coatings Versus...	1
#0159	Industrial Engineering Applications in the U.S. Shipbuilding...	1
#0160	Consensus QA/QC Acceptance Standards	1
#0162	A Descriptive Overview of Japanese Shipbuilding...	4
#0163	Line Heating	5
#0164	Product Work Breakdown Structure - Revised	6
#0165	Avondale Shipyards, Inc. - Long Range Facilities Plan	2
#0168	Visual Reference Standards for Weld Surface Conditions - Phase I	1
#0169	Integrated Hull Construction, Outfitting, and Painting...	4
#0170	Social Technologies in Shipbuilding Workshop Proceedings	2
#0171	The Effects of Edge Preparation Standard - Phase I	4
#0174	Feasibility Study for the Commercialization of U.S. Navy...	3
#0175	Work Management Manual - In-Shop Blast and Paint	1
#0176	Surface Preparation - A Comparative Analysis of Existing...	2
#0177	Zone Painting Method	1
#0179	Design for Zone Outfitting	6
#0180	The Status of Skilled Trades Training in U.S. Shipyards	2
#0181	A Directory of Skilled Trades Training Courses and Training ...	3
#0182	Unimation "Apprentice" Welding Robot for Shipyard Application	1
#0184	Out-Of-Position Welding of 5000 Series Aluminum Alloys...	2
#0187	An Investigation of Possible Ways to Enhance Title Deposition...	1
#0188	Mineral Slag Abrasive Survey and Specification	2
#0189	Final Report - Back-Up Data for Temporary Staging for Shipyards	1
#0191	Evaluation of Rust Compatible Primers for Marine Applications	4
#0192	Curricular Needs of Shipyard Professionals	1
#0194	Shipyard Design and Planning for a Zone Orientated Painting...	2
#0195	Study of Fitting and Fairing Aids of U.S. Shipyards	2
#0196	Pre-Contract Negotiation of Technical Matters	3
#0197	Software Tools for Shipbuilding Productivity	1
#0198	Evaluation of Two Multi-Shipyard Cooperative Apprentices...	2
#0200	Ship Producibility as it Relates to Series Production ...	1
#0201	Ship Producibility as it Relates to Series Production...	1
#0204	The Effect of Edge Preparation on Coating Life - Phase Two	4
#0205	Cathodic Protection/Partial Coatings Versus Complete...	1
#0207	Dynamic Corrosion Testing "Copperlok" Coating System	2
#0209	Higher Strength Steels Specially Processed for High Heat Input...	2
#0210	Product Oriented Material Management	2
#0211	Evaluation of an Automatic Seam Tracking/Adaptive...	3
#0212	Computerized Application of Standards	2
#0213	Shipyard Organization and Management Development	2
#0214	Process Analysis via Accuracy Control - Revised	5
#0216	Human Resource Innovation in Shipbuilding and Ship Repair...	2
#0218	Evaluation of the Effectiveness of Wet Blast...	6

#0219	Engineering for Ship Production	2
#0222	Application of Labor Standards for Scheduling, Production...	3
#0224	European Craft Training - A Trip Report	2
#0225	Manufacturing Technology for Shipbuilding - Project Condensation	2
#0226, paper #8	Pipe Fabrication to Support Modern Ship Construction Methodology	1
#0226, paper #10	The Use of Statistical Methods in Dimensional Process Control	1
#0226, paper #11	Theodore Roosevelt (CVN 71) Construction Schedule Compression	2
#0226, paper #13	Engineering Management for Zone Construction of Ships	2
#0226, paper #15	Islands of Automation in Shipbuilding	3
#0226, paper #18	Standardization from Marine Equipment Suppliers Perspective	2
#0226, paper #19	Making the Right Connection - Piping Systems, Past, Present,...	2
#0226, paper #20	Marine Industry Standards of the U.S. and the World	1
#0226, paper #21	The Naval Ship Design/Production Interface	2
#0227	The Economics of Shipyard Painting - Phase I (Of Three Phases)	3
#0228	Marine Coating Performance - A Six Year Report	1
#0229	Painting On-Block - The Zone Painting Method Advantage	1
#0230	Pipe Storage and Movement Study	1
#0231	Report on Moving Personnel and Light Material Onto a Ship...	1
#0235	Labor Standards Application Program - Blast and Paint...	1
#0236	Design for Production Manual (3 Vols.)	6
#0238	Flexible Production Scheduling System	4
#0239	U.S. Shipbuilding Accuracy - Phase I	5
#0240	Product Oriented Safety and Health Management	1
#0245	Methods Engineering Workshop for the Shipbuilding Industry	2
#0248	Overcoating of Inorganic Zinc Primers for Underwater Service ...	2
#0249	Analytical Quality Circles	1
#0254	Decentralizing Statistical Accuracy Control Responsibility...	1
#0255	Product Work Classification and Coding	3
#0256	Computer-Assisted Methodology for the Determination...	1
#0258	Specification-Driven Pipe Detail Design	3
#0260	Flexible Production Indices	5
#0262	Evaluation of High Strength Steels Produced by Advanced...	2
#0264	Multi-Skilled Self-Managing Work Teams in a Zone...	3
#0266	Computer-Aided Process Planning for Shipyards	4
#0270	Adaptation of Japanese Prefabrication Priming Procedure...	2
#0272	Prototype Mineral Abrasive Reclaimer - Shipyard Operation	1
#0273, paper #7	The Streamlining of Navy Procurement Specifications	1
#0273, paper #10	An Analysis of Shipyard Painting Cost	2
#0273, paper #11	Adaptation of Japanese Prefabrication Priming Procedure	1
#0273, paper #13	Reduced Fillet Weld Sizes for Navy Ships	1
#0273, paper #19	The Establishment of Shipbuilding Construction Tolerances	1
#0274	Shipyard Engineering and Planning Organizations	1
#0275	Work Planning for Shipyard Surface Preparation..	1
#0277	Improved Planning and Shop Loading in Shipyard Production Shops	1
#0279	Analysis of Current Manpower Estimating and Control Procedures	2
#0281, paper #4	The Use of Computer Simulation of Merged Variation...	1
#0281, paper #7	The Application of Intelligent Robotic Systems and Lasers for...	1
#0281, paper #15	Soviet Technique for Estimating Post-Welded Deflection - Case ...	1
#0281, paper #31	A Study of the Construction Planning and Manpower Schedules...	1
#0281, paper #32	Multi-Skilled Self-Managing Work Teams in a Zone...	3
#0282	Employee Involvement and Work Redesign in U.S. Shipbuilding...	1
#0283	Problem Solving Teams in Shipbuilding	4
#0285	Interface Impacts System to Zone Transition	1
#0286	Zone-Oriented Drawings for Life Cycle Management	3
#0288	Marine Coatings Performance - Ten Year Report	3

#0290	Writing Shipyard Reports	1
#0291	Tracking System for Automatic Welding...	2
#0292	Evaluation of the Benefits of HSLA Steels	1
#0293	The Information Flow Requirements for Integrating Schedules...	3
#0294	Automated Painting of Small Parts	2
#0295	Development of Standard Procedures for Shipboard Paint Inspection	2
#0296	Product Oriented Workforce	3
#0297	Evaluation of the Fillet Weld Shear Strength of Flux Cored...	2
#0298, paper #2A	System Strategy Teams - A Participative Management Adaptation	1
#0298, paper #4B	Infusing Producibility Into Advanced Submarine Design	1
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#0298, paper #11B	Applying Group Technology (GT) to Increase Productivity in a...	1
#0299	Flame Bending of Pipe for Alignment Control	1
#0300	Advanced Measurement Techniques for U.S. Shipbuilding	8
#0301	Employee Involvement/Safety	2
#0302	The Economics of Shipyard Painting - Phase II, Bid Stage...	4
#0305	Simulation Models for Development of Optimal Material...	2
#0309	Impact of VOC Regulation on Shipbuilding and Ship Repair	1
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#310, paper #21	Information System Models - As a Tool for Shipyard Planning...	1
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#0316	The Economics of Shipyard Painting - Phase III	3
#0318	A Survey - The Principal Elements of Safety Program...	4
#0319	Investigation of the Application of Computer-Aided...	4
#0320, paper #1B-1	Shipyard Modeling - Approach to Obtain Comprehensive...	1
#0320, paper #2A-2	Task Definition as a Route to Effective Production of Modern...	1
#0320, paper #2B-1	Total Quality Management (TQM) for Survival	1
#0320, paper #3B-1	Shipyard Skills - Tracking System	2
#0320, paper #4A-1	Cost Effective Planning and Control	2
#0320, paper #4B1	Solving SARA Compliance with Computerized Hazardous ...	1
#0320, paper #4B2	Hazardous Waste Minimization Program at Philadelphia Naval...	1
#0320, paper #7A1	Development of Design and Fabrication Method of Thin...	1
#0320, paper #7B2	Photogrammetry, Shipcheck of USS Constellation (CV64)...	1
#0320, paper #8A-1	In Search of a Level Playing Field - The Shipbuilders Council...	2
#0320, paper #8B-2	An Assessment of Opinions on Producibility Within...	1
#0323	Information Required from Planning Yards to Support Zone Logic	1
#0327	Hazardous Materials Tracking System	2
#0328	Methods Improvement Workshop for the Shipbuilding Industry	1
#0329	The Effect of Substrate Contaminants on the Life of Epoxy ...	8
#0330	1990 Clean Air Act Impact on Shipyard Painting Operation	6
#331	National Workshop on Human Resource Innovations...	3
#0332	Evaluation of New Surface Preparation and Coating...	4
#0333	The Definition of a Shipyard's Engineering Requirements	6
#0334	Recommendations on the Use of Interactive Instruction for ...	4
#0335	The National Shipbuilding Research Program...	34
#0336	Practical Guide for Flame Bending of Pipe	3
#0337	Employee Involvement - White Collar Work Force	1
#0339	Design and Planning Manual for Cost Effective Welding	2

#0340, paper #IIA1	A Return to Merchant Ship Construction - The International ...	2
#0340, paper #IIA2	Breaking the Chains of Tradition and Fantasy...	1
#0340, paper #IVA1	Future Role of Quality in Shipbuilding - Reducing the Odds	2
#0340, paper #IVA2	Management of Technological Change and Quality in Ship...	3
#0340, paper #IVB3	Recent MIT Research on Residual Stresses and Distortion in...	1
#0340, paper #VB1	A Data Model for the Integration of the Pre-commissioning Life...	1
#0340, paper #VIB1	Modeling for Ship Design and Production	1
#0340, paper #VIA1	Stochastic Expert Choice in Ship Production Project Management	1
#0340, paper #VIIB2	Productive Method and System to Control Dimensional...	2
#0340, paper #IXA2	Life Cycle Design for Marine Vehicles	1
#0340, paper #IXA2	Life Cycle Design for Marine Vehicles	1
#0341	Procedure Handbook for Shipboard Thermal Sprayed Coating...	1
#343	Evaluation of Hitachi Zosen Portable Welding Robotics	1
#0342	Hazardous Materials Tracking Systems - Scanning Module	2
#0344	Marine Industry Standards Planning Workshop	2
#0345	Environmental Compliance Inspection Checklist...	11
#0346	Application of PC-Based Project Management in an Integrated...	4
#0347	Implementation Guide for Approaching Shop Floor Control	2
#0349	Balloting of Hull and Mechanical Standards	2
#0350	Staging Systems for Ships During New Construction and Repair	3
#0351	Survey of Programs Designed to Improve Employee Morale...	3
#0353	Guidelines for the Development of Best Management Practices...	2
#0354	Standard Practice for the Selection and Application of Marine...	3
#0358	Navy Document Conversion Program Project - Pipe Flanges	1
#0359	The Effect of Substrate Contaminants on the Life of Epoxy ...	1
#0361	Computerized Compendium of Standards	6
#0362	Providing Administrative Support to the U.S. Technical...	1
#0364	Welding Research for Shipbuilding - The SP-7 Panel Program...	1
#0365	Determination of Particulate and Dust Concentration During...	2
#0366	Master Plan For Environmental Education	4
#0367	Reference Material for Use During a Workshop on Improved...	1
#0368	Pulse Purge for Consumable Insert Welds	1
#0369	Evaluation of New Surface Preparation and Coating Repair...	9
#0370	Employee Involvement - White-Collar Work Force - Phase II	1
#0371	North American Shipbuilding Accuracy - Phase II	5
#0372	Acceptability of the Toxic Substances Control Act to Shipyard...	2
#0373	Assessment of Computer Aids in Shipyards	9
#0374	Workshops on Improved Planning and Shop Loading in Shipyard...	1
#0375	Identification of Non-Value-Added Tasks in Shipbuilding	2
#0376	An Analysis of Air Pollution Control Technologies	3
#0377	Environmental Symposium	7
#0378	Solvent Recycling for Shipyards	2
#0379	A Purchasing Agent's Guide to Buying Paints and Coatings	5
#0380	Design and Implementation of Self-Directed Work Teams in a...	1
#0382	Introduction to Production Processes and Facilities in the Steel...	4
#0383, paper #3B-1	Can U.S. Shipbuilders Become Competitive in the International...	2
#0383, paper #3B3	Self Assessment of Advanced Shipbuilding Technology...	1
#0383, paper #4B2	Defining the Shipyard's Engineering Requirements	1
#0383, paper #5B1	NIDDESC - Enabling Product Data Exchange for Marine Industry	1
#0383, paper #5B2	NIDDESC-IGES Developments - Today's Solution	1
#0383, paper #6A1	Building on the Success in the Standardization of the U.S. Navy	1
#0383, paper #6A2	The Shift to Formalized Shipbuilding Standards	1
#0383, paper #6B2	Considerations for Earlier Design for Production	1
#0383, paper #6B3	Integrated Design Packages-The Link Between Manufacturing...	1
#0383, paper #7A1	An Approach to a New Ship Production System Based on...	1

#0383, paper #7B2	Evaluating the Producibility of Ship Design Alternatives	2
#0383, paper #7B3	Shipbuilding Performance Measurement in Unstable Conditions	2
#0383, paper #9B1	Standardized Designs Within a Shipyard - Basing Decisions on...	1
#0384	Producibility Assessment of the General Specifications for...	4
#0385	Integration and Implementation of an Advanced Measurement...	3
#386	Increasing Air Compressor Productivity While Reducing...	1
#0387	Feasibility Study: Tank Blasting Using Recoverable Steel Grit	3
#0388	Identification of Producibility Inhibitors in Standard...	1
#0389	Performance Measurement in Production and Support Areas of a...	7
#0390	Benefit Analysis of SPC Panel SP-1 Projects and Evaluation of...	1
#0391	Benefit Analysis of SPC Panel SP-3 Projects and Evaluation of...	1
#0392	Benefit Analysis of SPC Panel SP-4 Projects and...	3
#0393	Benefit Analysis of SPC Panel SP-5 Projects and Evaluation of...	1
#0394	Benefit Analysis of SPC Panel SP-8 Projects and Evaluation of...	1
#0395	Line Heating Operating Manual	14
#0396	Short Course on Quality Function Deployment	10
#0397	Weld Shrinkage Study	10
#0398	Producibility Evaluation Criteria - Cost Estimating...	21
#0399	Metrication of U.S. Shipbuilding - The Challenges and the ...	3
#0400	Benefit Analysis of SPC Panel SP-2 Projects and Evaluation...	2
#0401	Benefit Analysis of SPC Panel SP-6 Projects and Evaluation of...	2
#0402	Benefit Analysis of SPC Panel SP-9 Projects and Evaluation of...	3
#0403	Surface Preparation and Coating Bid Estimating Transfer Study	5
#0404	Educational Awareness Material on the NSRP - Final Report	1
#0405	Development of Producibility Evaluation Criteria	25
#0406	Build Strategy Development	19
#0407	Advanced Cutting Technology	11
#0408, paper #2	Production Integration Via Solids Modeling	1
#0408, paper #3	Design/Production Integration	2
#0408, paper #4	Integrated Ship Design and Its Role in Enhancing Ship Production	1
#0408, paper #5	On the Job Training in Line Heating in Astilleros Españoles...	2
#0408, paper #11	Computer-Integrated Manufacturing in Small Shipyards - A U.S....	1
#0408, paper #13	An Engineering Product Model Based on STEP Protocols	1
#0408, paper #15	A Plan for Identifying A More Producible Structure for Tankers	1
#0408, paper #17	Naval Ship Affordability Through Machinery Modularity	1
#0409	Report on Limitations of Computerized Lofting for Shell Plate ...	7
#0412	Surface Preparation and Coating Handbook	7
#0413	Benefit Analysis of SPC Panel SP-7 Projects and...	2
#0414	Define and Standardize Procedures for Certification of Weld...	9
#0416	A Demonstration of Interactive Instruction for Training...	3
#0418	Hazardous Waste Minimization Guide for Shipyards	18
#0421	Shell Plate Definition Guide for Ship Designers	8
#0422	Transfer Efficiency Requirements	4
#0423	Product Development Study - A Key to World Class...	15
#0424	NIDDESC STEP Application Protocol - Piping	1
#0425	NIDDESC STEP Application Protocol - Electrical Cableway	1
#0426	NIDDESC STEP Application Protocol - HVAC	1
#0427	NIDDESC STEP Application Protocol - Configuration...	2
#0428	NIDDESC STEP Application Protocol - Outfit and Furnishings	1
#0429	NIDDESC STEP Application Protocol - Ship Structure	1
#0432	Phase II: EMATS Inspection of Welds; Phase Analysis; Eddy...	1
#0433	Portable Pipe Laser Beam Cutting/Welding System	1
#0434	Requirements and Assessments for Global Shipbuilding...	20
#0435	Concurrent Engineering - Primer and User's Guide...	27
#0436	Concurrent Engineering - Application	24

#0438	Evaluation of U.S. and International Marine Engineering ...	1
#0439, paper #1	Technology Survey of U.S. Shipyards -1994	5
#0439, paper #2	Technology Development: A European Experience	1
#0439, paper #3	Economics and Management of American Shipbuilding- and ...	2
#0439, paper #5	Producibility of Double Hull Tankers	1
#0439, paper #6	Build Strategy Development	1
#0439, paper #7	Generic Build strategy - A Preliminary Design Experience	1
#0439, paper #8	Development of Integrated Shipyard Pipe Production Facility	1
#0439, paper #9	Standard Outfit Package Units in the LPD 17 Ship Design:...	1
#0439, paper #10	Robot Technology in the Shipyard Production Environment	2
#0439, paper #11	Shipbuilding Robotics and Economics	1
#0439, paper #13	3-D Computerized Measuring Systems for Increased Accuracy...	1
#0439, paper #15	The Netherlands' Shipbuilding Industry: Own Solutions to...	1
#0439, paper #18	Analysis of Competitiveness in Commercial Shipbuilding	1
#0439, paper #19	Experiences of Introducing ISO 9000 and Total Quality...	1
#0439, paper #20	The Product Model as a Central Information Source in a...	2
#0439, paper #21	The Influence of Integrated CAD/CAM Systems on Engineering...	2
#0439, paper #22	Past and Present Concepts of Learning: Implications for U.S....	1
#0439, paper #23	Concurrent Engineering: Application and Implementation for...	2
#0439, paper #26	Marketing Strategy for Merchant Shipbuilders	1
#0439, paper #27	Increasing U.S. Shipbuilding Profitability and Competitiveness	1
#0439, paper #28	A Production Control System Based on Earned Value Concepts	1
#0439, paper #29	A Comparative Study of U.S. and Foreign Naval Acquisition...	1
#0440	Improved Techniques for Scheduling Shipyard Work...	1
#0441	Evaluation of Toxic Air Emissions	6
#0443	US Shipbuilding International Market Study	15
#0444	Title V Permit Certification Requirement	6
#0445	Historical Overview of Efforts to Reduce VOC Emissions...	5
#0447	The Effectiveness of Power Tool Cleaning as an Alternative ...	4
#0448	Basic Elements of Occupational Safety and Health Programs ...	5
#0450	Investigate Methods of Improving Production Throughput in...	1
#0451	Evaluation of Coatings Applied on Less Than Ideal Surfaces	13
#0452	Filtration of Runoff From Pressure Washing Vessel...	3
#0454	Concurrent Engineering Implementation in a Shipyard	4
#0455	Simultaneous 3-Edge Cleaning Methods and Tooling Evaluation	1
#0456	Standards Database Maintenance	2
#0457	Characterizing Shipyard Welding Emissions and Associated...	1
#0460	Fourth National Workshop on Human Resource Innovation in...	1
#0463	Impact of Recent and Anticipated Changes in Airborne Emission...	1
#0464	Thermal Spray Manual	1
	Bibliography Catalog	8
	Avmast Catalog	15
	<b>Catalog On Disk</b>	<b>603</b>
	<b>TOTAL DOCUMENTS REQUESTED</b>	<b>1625</b>

## The National Shipbuilding Research Program Publications and Microfiche Library 1994 Statistics

The following information is for the period December 1, 1994 through June 30, 1996

3M	1	Crowley American, Inc.	1
AAF International	1	CrystalGrit Inc.	1
ABS Americas Government Services Unit	1	Dakota Creek Industries Inc	1
Advanced Management Catalyst Inc.	1	Delft University of Technology	1
Advanced Marine	2	Dept. of National Defense	1
Alabama Shipyard	3	Dept. of Transportation and Public Works	1
Amadis Inc.	1	Department of Transportation, MARAD	1
AME	1	Designers & Planners	8
American Marine Corp	2	Devoe Coating Company	1
American Overseas Book Co. Inc.	2	DOT- MARAD	1
Angle Inc.	1	EBO-FACHLITERATUR	1
Arrow Technologies	1	Economic Conversion Project	1
Associated Naval Architects	1	Edison Welding Institute	5
Association of Independent Mgmt & Maritime Services	1	Embassy of Australia	1
Atlantic Dry Dock Corp	1	Empresa Nacional Bazan	1
Atlantic Marine	6	Fisher Maritime	1
Australian Marine Technologies Pty. Ltd.	1	Fishing Vessel Owners Marine Ways	1
Australian Maritime College	1	Florida Atlantic Univeristy	1
Avondale Industries	3	Foss Shipyard	2
Babcock & Wilcox	9	Garcia Consulting, Inc.	1
Bath Iron Works	6	General Dynamics - Electric Boat	1
Bender Shipbuilding	8	George Washington University	1
Bernier & Associates	1	Gibbs and Cox Inc.	1
Bludworth Bond Shipyard Inc.	3	Gilbert & Associates	1
Bollinger Shipyard	2	Global Associates	1
Bombardier Moter Corporation of America	1	Guido Perla & Assoc. Inc.	1
BP America	1	GCRMTC	1
CACI Inc.	1	Heflin & Williams Inc.	1
Calhoon MEBA Engineering School	1	Herbert Engineering	1
Cambridge Scientific Abstracts	1	Heriot-Watt University	1
Campbell Scientific	1	Hobart Institute of Welding Technology	1
Cannon Sline	1	Hub Grosswendt Corrosion Solutions	1
Cardo Light Corporation	1	Hughes Aircraft Co.	1
Cardo Light Corporation	1	IBEW	2
Care Of Tommy Cauthen	1	IDA	1
Carlow International	1	Indumar Products	1
Casrm Inc.	1	Industrial Analysis Support Off. (DCMD-N)	1
Caterpillar Inc.	1	Inexa	1
CBI Services	1	Ingalls Shipbuilding	3
CDI Marine	1	Institute of Defense Analysis	4
Cliff Cross Company	1	Intergraph	3
Colton & Company	1	Iowa DOD	1
Concurrent Technologies	6	ISF	1
Conoco Inc.	1	Jeffboat	1
Continental Maritime of San Diego Inc.	1	JJ McMullen Assoc.	4
Corrosion Control Division	1	KAPL	2
Croffield Products	1	KCS Power Technology Center	1
		Keel Design Corporation	1

Keppel Marine	3	Orincon Corp	3
Koninklijke Schelde Groep	1	Patten Boggs, L.L.P.	1
Korea Institute of Machinery & Metals	1	Pearl Harbor Naval Shipyard	1
KRANENDONK Factory automation BV	1	Penn State University	1
Kvaerner Masa Marine Inc.	2	Peterson Builders Inc.	3
Lehrstuhl fur Schiffbau, Konstruktion und Statik	1	Petrochem Marine Consultants Inc.	1
Limitorque Corporation	1	Pioneer Marine Procurement Corp	1
Long Beach Naval Shipyard	1	PMC	1
M.Rosneblatt & Son, Inc.	16	Power Systems Group	2
Malaysia Shipyard	1	PRC	1
Managing Change Associates	1	Professional Boatbuilder Magazine	1
Mar Com Inc.	1	Progressive Products, Inc	1
MARAD	4	Protecol Inc	2
Marine Hydraulics International, Inc.	1	Protective Coating Technology, Inc	1
Marine Industries N.W. Inc.	1	Puget Sound Naval Shipyard	2
Marine Institute	1	Purvis Systems	1
Marine Reporter	1	Quest Intergrated	1
Marinette Marine	1	Saint John Shipbuilding	4
Maritech Program Office	1	San Francisco DryDocks	2
Maritime Contractors	4	Science Applications International Corp.	1
Maritime Preservation	2	SeaLift Inc.	1
Materials Science and Technology Division	1	Seaworthy Electrical Systems	1
MAVCO Inc.	1	SENESCO	1
McDermott Inc.	7	Shipbuilders Council of America	1
McKenna & Cuneo	1	Shipbuilding Tech. Res. Institute	1
Mercury Marine	1	Sigma Coatings USA BV	1
Metro Machine	3	Simon Fraser University	1
MIL Davie Inc.	4	Skipasmidastodin hf., Shipyard	1
Miller-Howard Consulting Group	1	Sonalysts	1
Milton Business Center	1	Southwest Marine	1
MIT	5	Spar Associates Inc.	1
MMC Compliance Engineering, Inc.	1	Sponge - Jet Inc	2
Morton International	1	Steimle Associates	1
MSC - Central Technical Activity	1	Structural Group Loft and Material	1
Munters Moisture Control	1	Studio Zerouno Srl	1
National Steel & Shipbuilding Co.	9	Sulit Engineering	1
National Defense University	1	SupShip - Charleston	1
National Education Association	1	Supship, Usn	1
Naval Aviation Depot	2	Textron Marine & Land Systems	1
Naval Sea Systems Command	1	The Bass Group	2
Naval Surface Warfare Center - CD	11	The Lincoln Electric Company	1
Naval Undersea Warfare Detachment	1	Thomas & Betts	1
Autec		Todd Pacific Shipyard	5
NAVSEA	3	Transfiel Defence Systems	2
NAVSHIPSO	2	Trinity Marine Group	1
Newport News Shipbuilding	6	UMBC	1
NFK Engineering	3	United Brotherhood of Carpenters	1
NLB Corp	1	Universitat Rostock	1
NORSHIP Co.	1	University of Hawaii at Manoa	1
Norwegian Marine Technology Research Group	1	University of New Orleans	7
Ocean City Research	2	University of Washington	1
Office of Naval Research Europe	1	University of Strathclyde	1
Old Dominion University	2	USCG Yard	1
		Vastar Resources	1
		Victaulic Co. of America	3



Visitech	1
Wachovia Bank	1
Weinhaus and Dobson	1
Welding Insitute of Canada	1
WesTech Gear Corp.	1
Weston	1
Wholesale Book Distributors	1
Win/Win Strategies	1
Worker Center	1

**TOTAL DOCUMENTS REQUESTED: 1625**  
**Companies and Individuals Requesting: 451**



**AVMAST Statistics**  
**December 1, 1994 through June 30, 1996**

<b>AVMAST#</b>	<b>Title</b>	<b>LOAN</b>
DE 2	Why Productivity Increases as Quality Improves	1
DE 6	Uses of Control Charts	1
<b>DEMING SUBTOTAL</b>		<b>2</b>
ED 6	Avondale Semi-Automated Pipe Shop	1
ED 7	Applying Metrication to the U.S. Shipbuilding Industry	1
ED 14	Outfit Planning	1
ED 18	Statistical Techniques for Quality and Productivity...1	2
ED 19	Statistical Techniques for Quality and Productivity...2	2
ED 20	Statistical Techniques for Quality and Productivity...3	2
ED 21	Statistical Techniques for Quality and Productivity...4	2
ED 24	Basic Naval Architecture - Ship Types and Ship Systems - 1	1
ED 25	Basic Naval Architecture - Ship Types and Ship Systems - 2	1
ED 27	Basic Naval Architecture - Nomenclature - 2	1
ED 29	Basic Naval Architecture - Dimension, Form and Flotation - 1	1
ED 65	Basic Naval Architecture - Shipbuilding Methods - 1	1
ED 66	Basic Naval Architecture - Shipbuilding Methods - 2	1
ED 68	Just In Time - Hewlett Packard	1
ED 75	Introduction to Lineheating and Flame Bending	2
ED 90	National Shipbuilding Research Program - An Overview	1
ED 91	Quality Function Deployment - Unit 1 - Introduction to QFD	2
ED 92	Quality Function Deployment - Unit 2 - The House of Quality	1
ED 93	Quality Function Deployment - Unit 3 - The Voice of the ...	1
ED 94	Quality Function Deployment - Unit 4 - The Phases of QFD	1
ED 95	Quality Function Deployment - Unit 5 - Case History...	1
ED 97	Applying Metrication to the U.S. Shipbuilding Industry	1
ED 98	From Shipyard to Ship Factory	4
<b>EDUCATION SUBTOTAL</b>		<b>32</b>
PR 1	Skill and Sophistication	1
PR	Tokyo Maru	1
PR 9	This is Newport News	1
PR 24	Introduction to NASSCO	1
<b>PUBLIC RELATIONS SUBTOTAL</b>		<b>4</b>
TR 8	Methods of Surface Preparation	1
TR 11	Methods of Paint Application	1
TR 12	Conventional and Airless Spray Equipment	1
TR 13	Proper Spraying Techniques and Safety Procedures	2
<b>TRAINING SUBTOTAL</b>		<b>5</b>
USN 9	Babbit Sleeve Bearings	1
USN 18	Pouring Speltered Sockets	1
USN 19	Stuffing Tubes	1
USN 38	Repairing Gate Valves (Non-Nuclear)	1
USN 42	Crane Safety	1
USN 45	Hull Insulation Fire Precautions (1984)	1
USN 48	Basic Handtools--Metal Cutting Tools (1985)	1

USN 92	Basic Tools and Portable Power Tools - Measuring Tools	1
USN 93	Boiler Components I and II (1986)	1
USN 94	Hand Operated Sheet Metal Machines - Metal Cutting...	1
USN 102	How To Hand Fit Antenna Mast Bearings (1986)	1
USN 103	Supervisory Awareness Pendant Controlled Cranes (1986)	1
USN 105	Multi-Purpose Cranes (1986)	1
USN 112	Load Testing of Portal Cranes	1
USN 117	Welding Trade Theory IV - Fuels and Other Gases	1
USN 151	Pipefitter - Precision Measuring for Pipe Fit-up, Part I	1
USN 172	Pouring Babbitt Sleeve Bearings (Parts I and II)	2
USN 178	Shipfitter - Work Procedures - Structural Layout Terminology	1
USN 179	Pipefitting - Sketching for Pipe Bending	1
USN 181	Insulator - Portable Insulation - Addressing the Template	1
USN 193	Balanced Doors - Parts I and II	1
USN 207	Turbine Technology Part I - Introduction, Disassembly...	1
USN 208	Turbine Technology Part II - Reassembly	1
USN 209	Structural Blueprint Reading (Revised)	1
USN 211	An Introduction to the Sheetmetal Trade	1
USN 230	Pipefitter - Pipebending 1 and 2, Introduction to Bending...	2
USN 236	Insulator - Insulation Prefabrication Center	1
USN 245	Rigger - Calculating Volume/Estimating Weight	1
USN 263	Pipefitter, Preparing Pipe for Welding	2
USN 278	Pipefitter - Interpreting a Piping Modification Blueprint	1
USN 279	Rigger - Inspection and Maintenance of Synthetic Fiber Rope	1
USN 289	Shipfitter - Introduction to the Shipfitter Trade	1
USN 290	Shipfitter - Crane Overload Protection	1
USN 292	Rigger - Maintenance and Inspection of Wire Rope	1
USN 321	Sheetmetal - Delivering the Goods	2
USN 327	Protection of Insulation to Prevent Rework	1
USN 334	Rigging - Safe Rigging Practices I	1
USN 375	Rigging - Stiff Leg Derrick	1
USN 410	Pipefitter - Templating and Targeting	1
USN 418	Crane Testing Category II - Bridge Cranes, and Category ...	1
<b>NAVY SUBTOTAL</b>		<b>44</b>
<b>TOTAL MODULES RENTED</b>		<b>87</b>

## The National Shipbuilding Research Program's Audio Visual Material 1994 Statistics

The following information is for the period December 1, 1994 through June 30, 1996.

Atlantic Marine	3
Bath Iron Works	1
Bethlehem Steel Corp	1
Bunch & Associates	1
Cascade General	1
Collier, Shannon, Rill, & Scott	1
Designers & Planners	2
Fort & Schlefer, Attorneys at Law	1
Institute for Defense Analysis	1
National Steel and Shipbuilding Co.	2
Newport News Shipbuilding	3
South West Marine Inc.	7
Terrebonne Vo-Tech High School	1
Todd Pacific Shipyards Corporation	1

**TOTAL MODULES REQUESTED: 87**

**Total Requests: 29**



# APPENDIX C





# NSRP NEWS

NATIONAL SHIPBUILDING RESEARCH PROGRAM

U.S. Navy  
Advanced Research Projects Agency  
U.S. Department of Defense and  
The University of Michigan

MARCH 1995  
VOL. 9 NO. 1

## Concurrent Engineering

Concurrent Engineering, or Integrated Product and Process Development, has become a hot topic in U.S. manufacturing over the past decade. As a result of interest expressed by U.S. shipbuilders, the NSRP funded a project through SP-8, the Industrial Engineering Panel: *Concurrent Engineering Application and Implementation*. The project's purpose was to develop and present an overview of concurrent engineering for the U.S. shipbuilding industry and to apply a concurrent engineering approach to a real shipbuilding project in a U.S. shipyard.

Concurrent Engineering:

- is based on the notion that a design problem should be understood from the perspective of the intended market before it is solved; in other words, product and process development are customer-focused;
- integrates product and process development through the use of cross-functional teams;
- assures that team members and their respective organizations have equal power and input in product and process development;
- provides a structured approach that facilitates the generation and organization of ideas, the development of teams, and the creation and

execution of product and process development plans; and

- has been credited with significantly reducing product and process development time and cost in a variety of industries.

Two interim project deliverables from the SP-8 project are now available through the Documentation Center. The first is **NSRP 0435, *Concurrent Engineering: Primer and User's Guide For Shipbuilding***, which is intended to provide an overview of the concurrent engineering approach. The second is **NSRP 0436, *Concurrent Engineering: Application***, which is an interim report on the introduction of concurrent engineering at Bath Iron Works. BIW intends to use the concurrent engineering approach in the development of a commercial ship. A workshop describing progress to date is planned for June 1995. (See announcement on page 10.)

Another useful Documentation Center publication related to concurrent engineering is **NSRP 0396, *Short Course on Quality Function Deployment for the U.S. Shipbuilding Industry***. QFD is one of the core tools used in many concurrent engineering approaches to interpret and deploy the "voice of the customer." This report contains an instructor's manual, user's manual, masters for course

overheads, and four instructional video tapes.

*As a result of interest expressed by U.S. shipbuilders, the NSRP funded a project through SP-8, the Industrial Engineering Panel. . .*

In addition to these three publications, the Documentation Center also has available **NSRP 0423, *Product Development Study: Sequential Development, Simultaneous Engineering, and Simultaneous Development***. This report resulted from a detailed study of product development methods employed by automobile manufacturers around the world, and concludes that the use of a concurrent product development approach is fundamental to becoming or remaining competitive in modern manufacturing. The report provides comparative data that shows how the use of concurrent approaches to product and process development can reduce related costs by up to 65% and reduce product and process development time significantly.

To obtain any of these publications, contact the Documentation Center, Marine Systems Division, University of Michigan Transportation Research Institute, 2901 Baxter Road, Ann Arbor MI 48109-2150; phone (313)763-2465; e-mail rktuttle@umich.edu.

*Details inside this issue. . .*

### Upcoming Workshops:

#### **A Learning Experience Workshop on Implementation of Concurrent Engineering in Shipbuilding**

Portland, Maine

June 7-9, 1995

see page 10

#### **Human Resource Innovation: The Key to a Competitive World Class American Shipbuilding Industry**

Linthicum Heights, Maryland

June 13-15, 1995

see page 14

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## **Ship Production Committee Panel Meeting Calendar**

### **SP-1 Facilities and Environmental Effects**

- June 1995 (tentative)  
Jacksonville, Florida  
Contact: *Michael Chee*  
(619)544-7778

### **SP-3 Surface Preparation and Coating**

- April 20-21, 1995  
Washington, D.C.  
Contact: *Kay Freeman*  
(601)935-3919

### **SP-4 Design/Production Integration**

- June 5-6, 1995  
Bath, Maine  
Contact: *Ronn Besselièvre*  
(601)935-2440

### **SP-5 Human Resource Innovations**

- April 6-7, 1995  
Washington, D.C.  
Contact: *Charles F. Rupy*  
(203)433-3724

### **SP-6 Marine Industry Standards**

- April 3-4, 1995  
New Orleans, Louisiana
- July 1995 (tentative)
- October 1995 (tentative)  
Contact: *Stephen E. Laskey*  
(207)442-1117

### **SP-7 Welding**

- February 28 - March 2, 1995  
Mobile, Alabama  
Contact: *Lee Kvidahl*  
(601)935-3564

### **SP-8 Industrial Engineering**

- June 5-6, 1995  
Bath, Maine
- June 7-9, 1995  
Concurrent Engineering Workshop  
Bath, Maine
- October 1995 (tentative)  
San Diego, California  
Contact: *Rex A. Wallen*  
(804)380-3513

### **SP-9 Education and Training**

- April 20-21, 1995  
Beaumont, Texas  
Contact: *Pamela B. Cohen*  
(313)936-1051

## **It's Time to Renew Your Subscription to NSRP News!**

To receive the NSRP News, complete the form on the back page, detach it, and mail it to the address provided.

**PLEASE NOTE: EVEN IF  
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Subscription requests or renewals can also be made electronically by sending e-mail to:

[NSRP.News@um.cc.umich.edu](mailto:NSRP.News@um.cc.umich.edu).



**NSRP NEWS** is a quarterly newsletter designed to inform its readers about current events and new technology important to the United States shipbuilding and repair industry. We welcome your suggestions for feature articles, conferences, course offerings, etc. Please let us know if we have your correct name and address; we would also appreciate your suggestions for names to add to our mailing list. You may use the return address on the newsletter label, call us at (313)763-2465, or send e-mail to [pbcohen@umich.edu](mailto:pbcohen@umich.edu)

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# Documentation Center .....

The primary goal of the National Shipbuilding Research and Documentation Center, located at the University of Michigan Transportation Research Institute, is to support U.S. shipbuilding, ship repair, and related industries in becoming and remaining competitive in the world market by:

- maintaining a repository of information on advanced ship production technologies and methods,
- providing ready access to this information and technology, and
- actively facilitating innovation in shipbuilding and repair through the regular identification and communication of new technologies and methods.

In order to meet these objectives, the Documentation Center has in the past been specifically tasked to:

- maintain a document and microfiche library for NSRP and other shipbuilding-related research,
- maintain a library of audiovisual materials related to shipbuilding research,
- produce and distribute a quarterly newsletter targeted to the NSRP membership,
- provide editorial and technical support for the annual SNAME Ship Production Symposia, and
- provide editorial and administrative support for SNAME's *Journal of Ship Production*.

In meeting these objectives, the Documentation Center receives and processes hundreds of requests annually for shipbuilding-related research documents and educational audiovisual materials from both domestic and foreign shipbuilders, related companies, organizations, and individuals. Because of its past and present support of the shipbuilding and repair industries, the Documentation Center is viewed by many domestic shipbuilders as a vital element of the U.S. shipbuilding infrastructure.

## Back in Business

Due to significant funding interruptions and delays over the past three years, the Documentation Center has had to reduce some of its regular activities to focus on filling requests for documents. Recently, however, the Documentation Center has received funding from the ARPA MARITECH program for the year of December 1, 1994 through November 30, 1995. This means the Center will once again be producing up-to-date catalogues of its library documents, audio-visual materials, and regular quarterly newsletters.

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*In order to better serve our customers, plans are underway to increase Documentation Center activities, and make access easier for industry members.*

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In order to better serve our customers, plans are underway to increase Documentation Center activities and make access easier for industry members. In addition to serving as a repository and distributor of NSRP reports, library holdings will be expanded to include items such as journals and reference books. The newsletter will be expanded to 16 pages to accommodate more announcements about activities of interest to the industry. The newsletter mailing list will be updated (see subscription coupon on back page), and targeted to include leaders from all aspects of the maritime industry.

Prices for Documentation Center materials remain unchanged. Audio-visual materials from the AVMAST library can be borrowed for only \$15 per module to cover shipping and handling. Extra copies of all NSRP reports received from Program Management are distributed free of charge. If photo-

copies are required, customers are charged only \$0.20 per page, plus shipping and handling. Any copyright fees required for journal articles and portions of published books will also be charged to the customer. In order to facilitate payment, the Documentation Center is now accepting Visa®, MasterCard®, and American Express®.

## and On-Line!

Catalogues for the Publications and AVMAST libraries will soon be developed in electronic format for distribution on floppy disk. Electronic format bibliographies will cost less than paper bibliographies to update, reproduce and distribute, and will greatly facilitate information searches by subject and key word. The catalogues will be available for both PCs running Windows™ and Macintosh® platforms — watch the newsletter for release dates.

The Documentation Center will also be working closely with the NSnet project to take advantage of Internet technologies. Customers will be able to search the Center's catalogues on-line using World Wide Web tools. Eventually, it will be possible to download NSRP reports directly from the Internet.

These changes are being made to make the Documentation Center more useful to you. If the National Shipbuilding Research Program feels the Documentation Center is an appropriate venue, future projects could include activities like providing industry access to standards databases and marketing information. If you have any suggestions for improving the Center's services, please provide your ideas to both us and the Executive Control Board of the NSRP.

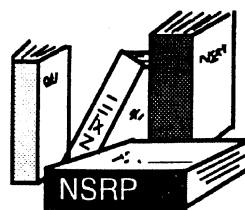
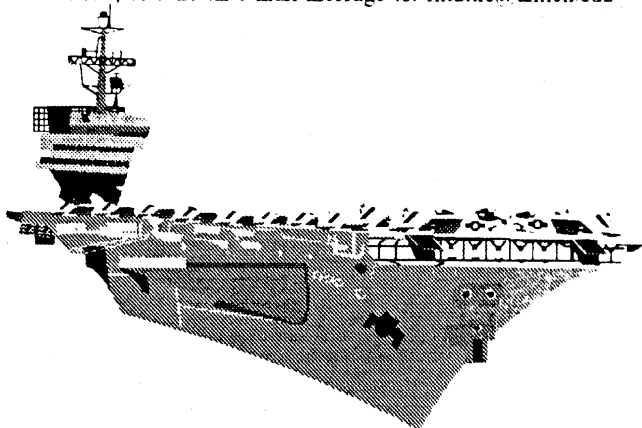
# Your Shipbuilding Library

**The National Shipbuilding Research and Documentation Center** at the University of Michigan Transportation Research Institute is your source for all shipbuilding research information. Included are all reports produced by the NSRP since its beginning in 1973, SNAME Ship Production Symposia papers, and a variety of technical and nontechnical shipbuilding information from other sources. The National Shipbuilding Research and Documentation Center is comprised of two libraries which are continually being updated with the latest research and informational material.

**The Publications Library** has over 400 written documents (Symposia proceedings, books, research reports, papers, etc.), in both microfiche and hard copy formats. Documents from the Publications Library can be purchased in either of these formats for the cost of duplication and shipping. The annually updated *Bibliography of Publications* lists all available documents topically and provides brief abstracts for each entry.

**The AVMAST Library** (AudioVisual Material Available for Shipyard Training) has more than 500 films, video tapes, slides, and other materials in its holdings. All AVMAST library materials can be borrowed by persons in the shipbuilding/repair industry or the Navy for a minimal shipping and handling fee. The *Catalogue of AudioVisual Material Available for Shipyard Training* is published annually and lists all films, video tapes, and other materials topically. It also provides a brief abstract for each training module. (Copies of some AVMAST tapes can be purchased. Complete information is available in the AVMAST Catalogue.)

**For More Information** on document or module content, or to receive a catalogue or order form, please call the Documentation Center Coordinator at (313)763-2465; write to the Documentation Center, Marine Systems Division, University of Michigan Transportation Research Institute, 2901 Baxter Road, Ann Arbor MI 48109-2150; or send an e-mail message to: rktuttle@umich.edu



## Recent Additions to the Publications Library

### NSRP 0389

Title: Performance Measurement in Production and Support Areas of a Shipyard  
Author: Peterson Builders, Inc.  
Date: September 1993  
Abstract: The objective of this project was to identify successful methods of performance measurement presently used in shipyards and other industries. Activity-based performance measurement methods in the areas of surface preparation and coating and material control were used at Peterson Builders, Inc., to develop a generic methodology for implementing new performance measurement methods in U.S. shipyards. (110 p.)

### NSRP Benefit Analysis Project

These tasks investigated the benefits derived from the projects sponsored by SNAME Ship Production Committee Panels under the National Shipbuilding Research Program. The purpose of these surveys was to determine the types of projects that have been most beneficial, to determine the types of projects that are most likely to be beneficial in the future, and to determine how the direction of the panels might be improved. All reports were authored by Robinson-Page-McDonough and Associates, Inc., and were published from October to December of 1993.

**NSRP 0390:** Benefit Analysis of SPC Panel SP-1 Projects and Evaluation of SPC Panel SP-1 Management and Administration. (75 p.)

**NSRP 0400:** Benefit Analysis of SPC Panel SP-2 Projects and Evaluation of SPC Panel SP-2 Management and Administration. (Panel SP-2 on Outfitting and Production Aids is no longer active.) (70 p. approx.)

**NSRP 0391:** Benefit Analysis of SPC Panel SP-3 Projects and Evaluation of SPC Panel SP-3 Management and Administration. (70 p. approx.)

**NSRP 0392:** Benefit Analysis of SPC Panel SP-4 Projects and Evaluation of SPC Panel SP-4 Management and Administration. (70 p. approx.)

**NSRP 0393:** Benefit Analysis of SPC Panel SP-5 Projects and Evaluation of SPC Panel SP-5 Management and Administration. (70 p. approx.)

**NSRP 0401:** Benefit Analysis of SPC Panel SP-6 Projects and Evaluation of SPC Panel SP-6 Management and Administration. (70 p. approx.)

**NSRP 0413:** Benefit Analysis of SPC Panel SP-7 Projects and Evaluation of SPC Panel SP-7 Management and Administration. (75 p.)

**NSRP 0394:** Benefit Analysis of SPC Panel SP-8 Projects and Evaluation of SPC Panel SP-8 Management and Administration. (70 p. approx.)

**NSRP 0402:** Benefit Analysis of SPC Panel SP-9 Projects and Evaluation of SPC Panel SP-9 Management and Administration. (70 p. approx.)

**NSRP 0415:** Benefit Analysis of SPC Panel SP-10 Projects. (Panel SP-10 on Flexible Automation is no longer active.) (290 p.)

### NSRP 0395

Title: Line Heating Operating Manual  
Author: Astilleros Espanoles  
Date: April 1992  
Abstract: The information provided in this manual will facilitate the training of steel

*continued on page 5*

fabrication shop foremen and operators on the techniques required to achieve accurate forming operations. It will help minimize labor-hours spent on adjusting inaccurately formed parts, as well as eliminate distortions resulting from locked-in stresses. The manual provides forming criteria for different degrees of curvature through the use of heat only, or through the combination of heating and mechanical means. Specific process sequences for different types of plates are included. (106 p.)

**NSRP 0396**

Title: Short Course on Quality Function Deployment for the U.S. Shipbuilding Industry  
 Author: Howard M. Bunch and Mark H. Spicknall, University of Michigan  
 Date: November 1993  
 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 U.S.

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.)

**NSRP 0397**

Title: Weld Shrinkage Study  
 Author: National Steel and Shipbuilding Company  
 Date: December 1993  
 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.)

**NSRP 0398**

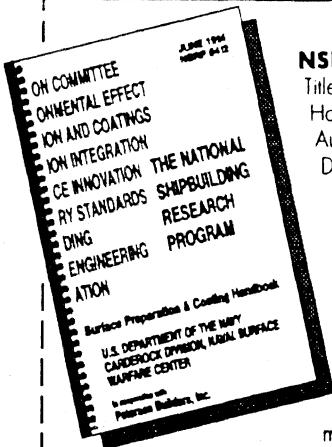
Title: Producibility Evaluation Criteria - Cost Estimating Computer Programs - Manual  
 Author: Wilkins Enterprise, Inc.  
 Date: December 1993  
 Abstract: This manual describes the use of a number of computer programs that have been developed for evaluating the producibility and desirability of different 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.)

**NSRP 0399**

Title: Metrication of U.S. Shipbuilding - The Challenges and the Opportunities  
 Author: Peterson Builders, Inc.  
 Date: October 1993  
 Abstract: This report presents major findings of a study on the issues affecting the introduction of metric practices throughout the U.S. shipbuilding industry. The study determined how the industry's markets, supplies, and operations would be affected by the external influences driving not only shipbuilding, but the entire national industrial base toward the metric system of weights and measures. The report identifies the forces which make conversion to metric usage necessary or desirable, identifies cultural and operational impediments to the conversion process, and proposes pragmatic recommendations for dealing with the major issues at both the individual shipyard and industry levels. The video "Applying Metrication to the U.S. Shipbuilding Industry" was produced as part of this project; it is available from the AVMAST Library (ED 97). (240 p.)

*continued on page 6*

**Please Take Note**



**NSRP 0412**

Title: Surface Preparation and Coating Handbook  
 Author: Steel Structures Painting Council  
 Date: June 1994

Abstract: This handbook provides an overview of basic information on many aspects of the industrial applications of surface preparation and coating in the shipbuilding and repair industry. Topics covered include surface preparation standards, common coatings for both Navy and commercial work

materials, tools, methods, work environment, housekeeping, troubleshooting, safety, and fire prevention, and environmental issues. The handbook also contains contact information for regulatory bodies that deal with such topics as standards and health and safety regulations.

**Due to the special format of this handbook, all orders are being handled directly through the printer: PIP Printing, 368 Jefferson Street, Sturgeon Bay, WI 54235; (414)743-7370/voice, (414)743-4633/fax.**

The cost will be \$9.75 each, plus \$7.50 for each order for shipping and handling. The printer must receive orders for at least 200 copies to be able to produce the manual at this price

Qty.	Price Each	Total
Surface Preparation Manual(s)	\$9.75	
	Sub Total	
	S/H	\$7.50
	TOTAL	

Name \_\_\_\_\_

Company: \_\_\_\_\_

Shipping Address: \_\_\_\_\_

Telephone: \_\_\_\_\_

Fax: \_\_\_\_\_

I am paying by:  Check  Credit Card (Mastercard or VISA)

Credit Card #: \_\_\_\_\_

Exp. Date: \_\_\_\_\_

Authorized Signature: \_\_\_\_\_

*Mail or fax this form to PIP Printing*

## Publications Library Additions

*continued from page 5*

### NSRP 0403

Title: Surface Preparation and Coating Bid Estimating Transfer Study

Author: Insight Industries, Inc.  
Date: December 1993

Abstract: The objective of this project was to transfer the technologies learned from earlier studies that analyzed the detailed costs associated with surface preparation and coating application. The transfer of the bid estimating program was tested at three shipyards of dissimilar makeup. Private new construction and repair, and public shipbuilding were targeted in order to provide a thorough test environment for the software. Although the original bid estimating system was developed at Peterson Builders, Inc., this report shows that other shipyards can implement this detailed cost collection system that supports daily activities as well as bid stage estimating. A demonstration version of the software is provided on disk for use on a DOS-based machine. (203 p.)

### NSRP 0404

Title: Educational Awareness Material on the NSRP - Final Report

Author: Karla Karinen and Pamela B. Cohen, University of Michigan

Date: December 1993

Abstract: This project was initiated to increase the awareness of the shipbuilding industry and others to the results of National Shipbuilding Research Program (NSRP) research. It has expanded the network of people in industry and government who are accessing and applying NSRP research. The two primary project deliverables, an NSRP brochure and video, continue to be available from the Documentation Center for promotional use. The brochure is available in limited quantities; the video order reference is ED 90. (8 p.)

### NSRP 0405

Title: Development of Producibility Evaluation Criteria  
Author: Wilkins Enterprise, Inc.  
Date: December 1993

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.)

### NSRP 0406

Title: Build Strategy Development

Author: Thomas Lamb  
Date: February 1994

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 U.S. shipyards and three foreign shipyards participated in the project; a "notional" U.S. shipyard was then created for build strategy development. Fleet oiler and container ships were used as examples. (382 p.)

### NSRP 0407

Title: Advanced Cutting Technology  
Author: Ingalls Shipbuilding, Inc.  
Date: February 1994

Abstract: Four metal cutting processes were compared for cutting thin aluminum and steel plates: plasma arc, oxy-acetylene, laser, and water jet. The objective was to determine which process would provide high productivity and cost effectiveness while minimizing distortion — a major problem in lightweight, welded ship structures. Photogrammetry was used to measure the magnitude of distortion on the cut pieces of aluminum and steel. Quality impact of the processes on the cut edges and base metals was measured by metallography. Scanning electron microscopy was used to determine roughness of the cut edges. Plasma cutting was found to be most effective. (73 p.)

### NSRP 0408

Title: NSRP (National Shipbuilding Research Program) 1993 Ship Production Symposium Proceedings  
Author: Symposium Participants

Date: November 1993

Abstract: This NSRP report contains 25 papers presented at the 1993 National Shipbuilding Research Programs Ship Production Symposium on November 1-4, 1993, in Williamsburg, Virginia. The theme of the symposium was "Keys to Successful Shipbuilding - Quality, Productivity and Delivery." These proceedings are available as individual papers only.

### NSRP 0409

Title: Report on Limitations of Computerized Lofting for Shell Plate Development  
Author: Thomas Lamb, Textron Marine Systems  
Date: March 1994

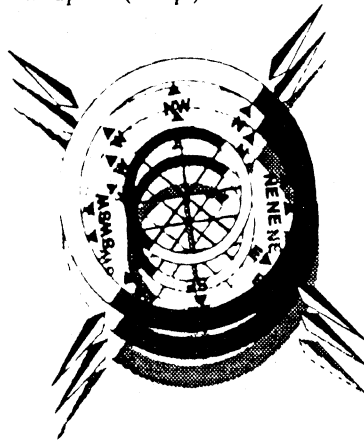
Abstract: This project was undertaken to determine if a shipbuilder's goal of cutting all plates "neat" is achievable through the use of computer-aided lofting (CAL) programs. Six shell development software programs are investigated, tested, and compared. Project conclusions include the fact that most 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 loftsmen. 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.)

### NSRP 0410

Title: The Annual Report of the National Shipbuilding Research Program

Author: National Shipbuilding Research Program  
Date: 1991

Abstract: This first published annual report of the National Shipbuilding Research Program (NSRP) was distributed in support of the program's mission: To assist the U.S. shipbuilding and repair industry to achieve and maintain global competitiveness with respect to quality, time, cost, and customer satisfaction. The NSRP organization, program operations, and current research projects are described. (12 p.)



*continued on page 7*

**NSRP 0411**

Title: The Annual Report of the National Shipbuilding Research Program

Author: National Shipbuilding Research Program

Date: 1992

Abstract: This second published annual report of the National Shipbuilding Research Program (NSRP) was distributed to help publicize the program throughout the U.S. shipbuilding, ship repair, and marine supplier industries. The NSRP organization, and current research projects are described. A description of the National Shipbuilding Initiatives is also given. (19 p.)

**NSRP 0412**

Title: Surface Preparation and Coating Handbook

Author: Steel Structures Painting Council

Date: June 1994

Abstract: This handbook provides an overview of basic information on many aspects of the industrial applications of surface preparation and coating in the shipbuilding and repair industry. Topics covered include surface preparation standards, common coatings for both Navy and commercial work, materials, tools, methods, work environment, housekeeping, troubleshooting, safety and fire prevention, and environmental issues. The handbook also contains contact information for regulatory bodies that deal with such topics as health and safety regulations and standards. (NOTE: Due to the special format of this handbook please see coupon on page 5 for pricing and ordering information.)

**NSRP 0414**

Title: Define and Standardize Procedures for Certification of Weld-Thru Primers

Author: National Steel and Shipbuilding Company

Date: June 1993

Abstract: This project successfully developed, through testing, a recommended certification procedure for weld-thru primers. While the testing performed doesn't determine a totally satisfactory weld-thru primer, it does identify three promising coatings. Useful data was collected from the fourteen primer coatings that were involved. (75 p.)

**NSRP 0416**

Title: A Demonstration of Interactive Instruction for Training Shipyard Trade Skills

Author: Ship Analytics, Inc.

Date: September 1993

Abstract: Interactive instruction evokes the active involvement of the trainee in his or her own computer-controlled, audio visual instruction. Through a desk top personal computer, the instruction exchanges information with the trainee on a personal basis; processes the trainee's responses to generate appropriate rewards or remediation; and measures, evaluates, and documents the trainee's learning performance. The interactive lesson entitled "Fundamentals of Arc Stud Welding," 1) demonstrates the capabilities and benefits of interactive instruction for training shipyard skilled trade tasks, 2) shows how interactive multimedia can be used for both tutorial and simulation instruction, 3) illustrates the ease with which interactive courseware can be developed by shipyards, and 4) provides an interactive lesson for instructing the fundamentals of arc stud welding. The development process and contents of the interactive lesson are thoroughly described in the report. (120 p.)

**NSRP 0418**

Title: Hazardous Waste Minimization Guide for Shipyards

Author: National Steel and Shipbuilding Company

Date: January 1994

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.)

**NSRP 0419**

Title: The Effectiveness of Power Tool Cleaning as an Alternative to Abrasive Blasting

Author: John W. Peart

Date: March 1994

Abstract: The objectives of this research were to: 1) review the state-of-the-art of power tool cleaning methods, 2) evaluate the surfaces they produce and their effect upon the performance and usability of ship coating systems, and 3) compare ship production costs using these methods with those of abrasive blasting. The potential

use of power tools in the production of the Fast Combat Support Ship (AOE-6) was studied as part of the research effort. Comparative production costs were based upon the ship's production plan, and coating performance testing was performed on its specified corrosion control systems. (75 p.)



## Recent Additions to the AVMAST Library

*The current format and length of AVMAST modules are listed [in brackets] after the description of the module. Most modules can be converted to another format if necessary.*

**USN 401**

Title: Shipfitter - Vestibule Training for Shipyards

Description: This video tape shows an apprentice shipfitter vestibule training program that has been used at Norfolk Naval Shipyard.

This program was designed to help students apply the knowledge they learned in the classroom under controlled conditions. The vestibule training allows them to get hands-on shop and waterfront practice. Comments concerning this program are invited and should be sent to Norfolk Naval Shipyard, Shipyard Instructional Design Center, Code 1170 Library, Portsmouth, VA 23709-5000. [3/4" UMATC...11 min.]

**USN 402**

Title: Oxygen Cleanliness Part 2, Component Cleaning Processes

Description: This video tape describes the procedures that should be followed when cleaning parts and components that will be used in oxygen systems. The tape shows how components are cleaned, analyzed, dried, packaged, and stored. See USN 399 for more information on oxygen cleanliness. [3/4" UMATC...27 min.]

**USN 403**

Title: Insulator - Insulation Inspection Criteria Manual

Description: This manual is intended to be used as a reference during the inspection of insulation on nuclear piping systems. The manual consists of photographs of pipe insulation, and explains why the condition shown is acceptable or unacceptable. (Inspection Manual Only)



# 1995 Ship Production Symposium

*"Commercial Competitiveness for Small and Large North American Shipyards"*

The 1995 Ship Production Symposium, held January 25-27, 1995, in Seattle, Washington, was a tremendous success. The planning committee was pleasantly surprised by a turn-out of 330 registrants — which was 60% higher than expected. People felt this was due partly to six out of eight Ship Production Committee Panels meeting early in the week and partly to the new workshops and panel discussions that provided both a less formal venue than the regular technical papers and a forum for smaller shipbuilders. Workshop topics included: Regulatory Reform and Standards, Environmental Compliance, Marine Composites, Aluminum Ship



Charles E. Kyle of the Boeing Commercial Airplane Group gave the dinner address. His discussion described how much more important human issues were to implementing concurrent engineering in his organization than technical issues.

and Boatbuilding, Stud Mounting of Outfitting Components, PC-Based Software for Marine Manufacturing, and 3D Coordinate Measuring Systems.

The Symposium began with a plenary session on the effect of international competitive pressures on business plans. Don Smith of the University of

Michigan's Office for the Study of Automotive Transportation gave a presentation on the increased competitiveness of the U.S. automotive industry, and Richard Storch of the University of Washington, John Clark of A & P Appledore International, and Thomas Lamb of Textron Marine and Land Systems, presented their paper, *Technology Survey of U.S. Shipyards - 1994*. These presentations were followed by a discussion by U.S. shipbuilding executives on approaches to improving business effectiveness. W. Greg Criddle Jr. of Newport News Shipbuilding, Joseph Fortin of Bath Iron Works Corporation, Stephen Maguire of Avondale Industries, Inc., Donald Spanninga of National Steel and Shipbuilding Company, and Simon Quarrell of KPMG Peat Marwick participated in the discussion.

Authors of technical papers, like Symposium registrants, were from all over the world. There were twenty-nine papers in all, on topics such as build strategy, robot technology, and concurrent engineering. The theme of the Symposium,

"Commercial Competitiveness for Small and Large North American Shipyards," was addressed by authors from the U.S., Great



Hideo Hirokoshi of IHI Marine Technology, Inc. accepting the Elmer L. Hann award on behalf of his colleagues, Kohji Honda and Noriyuki Tabushi. Their paper, "The Design of Longitudinal Beam Layout on a Curved Shell Based on the Production-Oriented Design Concept," was deemed to be the best paper presented at the 1993 Ship Production Symposium. Edward Clendenning presented the award.

Britain, Spain, Portugal, and The Netherlands.

The closing session was moderated by David Donohue, Chairman of the Ship Production Committee. This plenary session featured a report by Robert Schaffran of ARPA's Maritime Systems Technology Program Office, and included presentations from U.S. shipbuilding executives on MARITECH-focused development projects. Participants were Rick Thorpe of Kvaerner Masa, Joseph Fortin of

## ICCAS 94 Proceedings

During the 1995 Ship Production Symposium, reference was made to the *ICCAS 94 Proceedings (International Conference on Computer Applications in Shipbuilding held September 5-9, 1994, in Bremen, Germany)*. Information on these books may be obtained from the publisher, Rasmusson AB, fax: +46 40 19 46 46.



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*The planning committee was pleasantly surprised by a turn out of 330 registrants - which was 60% higher than expected.*

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Bath Iron Works Corporation, Camilla Dibarra of Todd Pacific Shipyards Corporation, William Haskins, Jr. of Newport News Shipbuilding, and Robert O'Neill of AWSC.

Many thanks go to the authors and panel participants whose contributions assured the successful outcome of the Symposium.

The 1995 Symposium was sponsored by the Ship Production Committee and hosted by the Pacific Northwest Section of The Society of Naval Architects and Marine Engineers.



*The 1995 Ship Production Symposium Steering Committee included Jon Gribskov, Pamela Cohen, Miles Webb, Joyce Clendenning, Edward Clendenning, Kenneth Lane, and Annette Grimm. Not pictured are Richard Moore, Louis Chirillo, Albert Horsmon, Jr., Stephen Hulsizer, Peter Noble, Richard Storch, Alan Winkley, Robert Van Slyke, Emlyn Jones, and Douglas Wolff.*

## Scenes from the Symposium



National Shipbuilding Research Program, SP-8 Presents:

# Toward World Class New Product Development

*A Learning Experience  
Workshop on Implementation of  
Concurrent Engineering in Shipbuilding*

**June 7 - 9, 1995  
Sheraton Tara Hotel  
Portland, Maine**

**Sponsored by:  
SNAME Ship  
Production Committee Panel  
SP-8 on Industrial Engineering**

## Workshop Objective:

The objective of the workshop is to give attendees a participative learning experience covering the meaning of Concurrent Engineering (CE), lessons learned by other industries, and an actual shipyard implementation.

The workshop will offer attendees a full description of the project findings and presentations by CE specialists from the aerospace industry, academia/research, and a prominent consultant.

Case studies will be used to provide an actual learning experience solving real problems developed during the implementation. Emphasis will be placed on cross functional teaming and groupwork. A pre-workshop package will be sent to all registrants with preparation assignments.

## Who Should Attend:

To gain the most from the workshop, it is recommended that each company send representatives from departments such as marketing, engineering, material, planning, and production. By the end of the workshop, attendees will be able to determine if CE can help their organization, and, if so, what to do next.

## Registration Information:

The registration fee is \$140 for one, \$135 each for two, \$130 each for three, and \$125 each for four or more. Registration closes May 19, 1995. To register, complete the form at right. For more information, please call Thomas Lamb, Workshop Coordinator, (504)245-6780. Room reservations should be made directly with the hotel by calling (207)775-6161 by May 8, 1995. Please mention the NSRP SP-8 Workshop when making your reservation.

To register for the Learning Experience Workshop on Implementation of Concurrent Engineering in Shipbuilding, please complete the form below by May 19, 1995, and send with check payable to **CE Workshop:**

Thomas Lamb, Workshop Coordinator  
805 Cross Gates Blvd.  
Slidell, LA 70461  
(504)245-6780/voice  
(504)245-6748/fax

Name (as you would like it to appear on your name tag): \_\_\_\_\_

\_\_\_\_\_

Company: \_\_\_\_\_

\_\_\_\_\_

Position: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

City: \_\_\_\_\_

State: \_\_\_\_\_

Zip: \_\_\_\_\_

Phone: \_\_\_\_\_

If part of a group of attendees, please indicate your preference:

- Participate as a company team
- Participate in a cross-company team

Please indicate if you have a copy of the CE Project Report and CE Primer/User's Guide:

Yes  No

# NSRP Panel Activities

## SP-3

SURFACE PREPARATION AND COATING

Panel SP-3, Surface Preparation and Coating, met recently in Seattle, Washington, to select projects for FY-96 shipbuilding research and development. The projects selected by the panel will be presented to the Executive Control Board in May 1995. FY-96 funding is expected to be available after October 1995.

The proposed projects are:

- 3-96-1: Develop Visual Standards for Hydroblasting of Steel
- 3-96-2: New Surface Preparation and Coating Repair Techniques in Ballast Tanks, Phase IV
- 3-96-3: Retention of Preconstruction Primer into the Coating System in Tanks
- 3-96-4: Productivity Study of Ultra-High Pressure Hydroblasting for Removal of Coatings
- 3-96-5: Develop Portable Lighting for Shipbuilding Surface Preparation and Coating
- 3-96-6: Certification and Environmental Training Program for Shipyard Painter and Blaster Using Computer Aided Instruction
- 3-96-7: A Study of the Flow and Handling of Abrasive Through a Shipyard
- 3-96-8: Feasibility Study of Robotic Painting in Shipyards

The panel is overseeing six active projects:

- N3-90-1: Coatings Applied on Less than Ideal Surfaces (Scheduled completion — August 1995)
- N3-90-2: Quality Program for U.S. Shipyard Surface Preparation and Coating (Scheduled completion — Second quarter 1995)
- N3-93-1: New Surface Preparation & Coating Repair Techniques in Ballast Tanks (Scheduled completion April 1996)
- N3-93-6: Reduced Volume of Spent Abrasives in Open Air Blasting (Scheduled completion — September 1996)
- N3-94-1: Methods to Control Hazardous Airborne Dust (Scheduled completion — May 1997)
- N3-94-2: Abrasive Recycling/Containment Systems for Shipyard Applications (Scheduled completion — March 1996)

There are ten projects approved for funding and currently in the contracting process:

- N3-92-4: Reclamation, Disposal & Recycling in Shipyards
- N3-93-3: Performance & Environmental Acceptability of Surface Preparation Cleaners
- N3-94-4: Compliant Paint Handling and Application Options
- N3-94-6: Tank Blasting with Recoverable Steel Grit, Phase II
- N3-95-1: Containment System for Aerial Platforms
- N3-95-2: Improved Methods for Coating Removal in Bilges
- N3-95-3: Evaluation of Water Thinned Preconstruction Primers Containing No Metal Pigments
- N3-95-5: Cost Effective Total Enclosure System for Surface Preparation and Coating in Dry Docks
- N3-95-6: Surface Tolerant Coatings for Damp or Wet Surfaces
- N3-95-7: User's Guide to Selection of Blasting Abrasives

Any qualified person wishing to volunteer services as a technical advisor for one of the projects may contact Kay Freeman, Panel Chairman, (601)935-3919/voice or (601)935-2952/fax.

The NSRP program is intended to benefit the U.S. Shipbuilding industry. Participation by shipbuilders and their representatives on every level of panel activity helps assure that mission is fulfilled.

The next regular panel meeting will be held April 20-21, 1995, at the Ramada Hotel - Tysons Corner, Falls Church, VA.

## SP-4

DESIGN PRODUCTION INTEGRATION

Panel SP-4, Design/Production Integration, has recently started five projects, most of which should be completed and their findings made available to NSRP participants within the next year.

Project N4-93-1, *U.S. Shipbuilding International Market Study*, being performed by A&P Appledore International, will identify high-demand commercial market sectors, market requirements for these sectors in terms of price, schedule, and product performance, and then based on this data, recommend a general strategy for U.S. shipyards to reenter commercial markets. The technical approach involves a fleet profile analysis, worldwide shipbuilding capacity analysis, competition and utilization analysis by sector, demand analysis, and identification of opportunities for U.S. shipyards. One interesting task will involve evaluating the profitability of different ship types based upon market price per compensated gross ton (CGT) — or in other words, dollars earned versus level of effort expended to build. This project started in November 1994 and is expected to be complete May-June 1995.

Project N4-93-6, *Develop a Common Sense Design Manual for Producibility of Hull Foundations*, is being performed by VIBTECH Inc. A basic problem in current foundation design practice is the established roles of the draftsman and designer. Typically, the draftsman develops a new foundation design based upon a similar design on previous ships; after which, the engineer validates and approves the design. Because the final drawing has been done and budget expended, the engineer typically makes few, if any changes, particularly for producibility reasons. This project will evaluate the necessary restructuring of this drafting and engineering approach, as well as establish effective approaches to improving foundation producibility. Specific foundation producibility/standardization principles and examples will be provided for typical design situations. Approaches to improving producibility will include simplifying foundation designs by reducing the number of parts, bolt chocks, brackets and backup requirements, and considering manufacturing methods. This guidance will be incorporated into a user-friendly "design manual" for draftsmen and engineers. This project should be completed by the end of this year.

Project N4-94-1, *Evaluate Shipbuilding CAD/CAM Systems*, being performed by National Steel & Shipbuilding Company, will carry out a systematic review and analysis of three or more state-of-the-art shipbuilding CAD/CAM systems, report on their characteristics, establish the requirements of key characteristics which positively impact U.S. shipyard productivity, and prepare systems specifications from which these characteristics could be implemented in existing or future systems in use in U.S. yards. In carrying out this effort, NASSCO will involve the Marine Systems Division of the University of Michigan Transportation Research Institute (Mr. Dick Moore and division staff, supported by Mr. Thomas Lamb), Proteus Engineering (Mr. Jonathan Ross and staff), CYBO Robots, and up to four additional U.S. shipyards that will participate in the analysis of CAD/CAM system capabilities and requirements definition. The approach is to evaluate shipbuilders' use of CAD/CAM/CIM systems, rather than vendor specifications of specific CAD/CAM software. The project will be conducted in three distinct phases: 1) initial methodology and requirements identification, and shipyard evaluations; 2) finalization of U.S. shipbuilding CAD/CAM/CIM requirements; and 3) development of necessary specifications. It is expected that the project will be completed 18-24 months from the start date.

Project N4-94-3, *Convert NIDDESC Standards to ISO Standards*, being performed by Newport News Shipbuilding, involves working with the European Maritime project to have the U.S.-developed NIDDESC application protocols (digital data exchange standards for ship structure, molded form, piping, HVAC, electrical, arrangements, outfit & furnishings, and library parts) approved as world

continued on page 12

## SP-4 continued from page 11...

standards by the International Standards Organization (ISO). Prior to this project, several of the protocols were submitted to Maritime, but have been changed through influence by participants such as Lloyds and the Japanese shipbuilders. Consequently, some of the project's effort will be focused upon encouraging Maritime to revise the standards to match the NIDDESC definitions. The biggest disagreement currently surrounds the definition for structure. This project was funded in October 1994 as year one of a three-year commitment to support the full ISO shipbuilding data transfer standard development.

Project N4-94-5, *Develop Methods to Implement the Results of Past NSRP Projects*, being performed by Bernier & Associates, Inc., is just one of many NSRP initiatives currently in work to improve the efficiency and effectiveness of the program. This project involves three phases: (1) a broad assessment of the industry's awareness of the NSRP; (2) an assessment of the barriers to the implementation of projects, and (3) the development of innovative solutions to the obstacles and cost of implementing those solutions. The data collection effort will include the participation of many U.S. shipyards. This project should be complete by January-February 1996.

Anyone wanting information concerning these projects may contact Ronn Besselièvre, Chairman of Panel SP-4, at (601)935-2440/voice or (601)935-5223/fax.

## SP-5 HUMAN RESOURCE INNOVATIONS

Panel SP-5, Human Resource Innovations, has recently been successful in convincing the Department of Labor to establish a safety and health advisory committee specifically for our industry. The SP-5 panel solicited the endorsement of labor, Shipbuilders Council of America, and the American Waterways

Shipyards Conference, and issued a letter to DOL Secretary, Robert Reich, recommending the establishment of the committee. The Secretary agreed with this request and on February 8, the "Maritime Advisory Committee for Occupational Safety and Health" (MACOSH) was entered in the federal register and became law. SP-5 panel members, Ms. Kathie Chumley from Atlantic Marine Inc. and Mr. William "Chico" McGill of the International Brotherhood of Electrical Workers and Vice Chairman of SP-5, were the key individuals responsible for this success. According to Mr. Chuck Rupy, panel chairman, "This is an important step to improve the competitive posture of our industry. By working with our government agencies, we can bring about positive changes to help the U.S. shipbuilding revitalization process."

On February 9, SP-5 was invited by Mr. Joseph Byrne to make a presentation to MARAD in their Washington D.C. office, regarding the past and present initiatives of the panel. Mr. Byrne is a member of the NSRP Executive Control Board. Mr. Rupy and Mr. Dan Seidman, a MARAD panel member, represented the panel. Many MARAD executives attended the presentation and subsequent discussion. This 90 minute session touched on many of the key NSRP subject areas with specific emphasis on the program's quantifiable contributions to our industry. According to Mr. Rupy, "This was a very positive two-way session. I was impressed by the corporate knowledge of the MARAD attendees and the cooperative attitude and suggestions to improve the NSRP program's contribution to our industry. While it was agreed that the revitalization process must be industry-driven, MARAD intends to take an active role in the process. I expect many positive results through planned actions between SP-5 and MARAD as a result of this meeting." Mr. Byrne expressed a request that each NSRP panel make a similar visit to the MARAD office as the opportunity arises.

A significant key event for the Human Resource Innovation panel is their National Workshop in June (see the announcement on page 13). This is not intended to be just "another workshop." According

## SP-5 continued

to Mr. McGill and Mr. Rupy, "This workshop will form a steppingstone for a number of labor-management actions subsequent to the event. An end-product from this workshop will be a consensus-developed action plan that will be followed-up in the weeks and months after the workshop." A number of significant human resource related topics will be addressed; but a specific focus will be placed on the required mandatory actions for improvement in labor/management cooperation. A detailed agenda for the workshop will be issued in the near future. Workshop attendees should be committed to the post workshop change process.

## SP-6 MARINE INDUSTRY STANDARDS

Panel SP-6, Marine Industry Standards, continues to be strongly influenced by the American shipbuilding industry's direction to establish internationally acceptable standards for procurement and processes. Active SP-6 projects, *Evaluation of U.S. and International Marine Engineering Standards* and *World*

*Class U.S. Shipbuilding Standards* are important to this effort as they (1) establish the criteria for approval of foreign materials and components for use on U.S. flag vessels and, (2) establish a program that identifies, evaluates, develops, and maintains a set of commercial standards applicable to the U.S. shipbuilding and repair industry. FY-96 project abstracts maintain the focus with subjects that include; *Book of U.S. Commercial Shipbuilding Standards for International Market*; *Ship Designers Handbook*, *Cross-Reference of Requirements and Information Sources*; *Input and Participation in Standards-Writing/Publishing Organizations*, and *Vendors Furnished Information (VFI) Development Guidelines*. There are nine proposed project abstracts in all, six of which require a rewrite for final review and prioritization at the next SP-6 meeting. The meeting, scheduled for April 4-5, 1995, is being hosted by McDermott Shipbuilding, Inc., and their SP-6 representative, Mr. Dan Timmons. Final preparations will take place at the meeting to assist the presentation of projects to the NSRP's ECB in May by the new SP-6 chair, Mr. Steve Laskey of Bath Iron Works. The contributions of the former chair, Mr. John Malone of NASSCO, will be missed by the panel participants. We all wish John well in his new responsibilities and welcome Mr. Walter Devine as NASSCO's representative to SP-6.

There has been an encouraging trend of increased representation of shipyards at SP-6 meetings. Increased participation by U.S. shipbuilding and ship repair company representatives enhances all aspects of SP-6's activities. The presence of federal agency representatives and assignment of Mr. Mike Pursley as a full-time panel member from MARAD is considered very beneficial to the efforts of SP-6. Increased participation in SP-6 activities by industry representatives strengthens the panel's ability to accomplish its primary objective — establishing consensus U.S. marine industry standards that will be technically acceptable to the international community and economically sensible for the world market. The importance of such standards is recognized as pivotal by American shipbuilders in their efforts to enter the global shipbuilding arena. Continued support of the activities of the U.S. TAG to ISO TC-8 by the SP-6 panel will substantially improve American shipbuilders' ability to compete globally. The SP-6 panel is committed to expending its energies on efforts that will aid and fortify the U.S. shipbuilding industry as it moves into the 21<sup>st</sup> century.

*Panel SP-5: Fourth National Workshop on...*

# **Human Resource Innovation: The Key to a Competitive World Class American Shipbuilding Industry**

**June 13-15, 1995**

**Masters, Mates and Pilots'  
Maritime Institute of  
Technology and Graduate  
Studies (MITAGS)**

**Linthicum Heights,  
Maryland**

## **Overview:**

This workshop is directed to members of labor and management who expect to play a role in planning and executing the changes which will ensure the future of their respective firm or labor union. The days of adversarial labor/management relationships are coming to an end; the era of mutual benefit cooperation is at hand. Human resource professionals from government and academia who have expert visions and experience to share, or who have a need to better understand the dynamics of an emerging world class competitor, are also encouraged to take advantage of this unusual opportunity.

Presenters will include representatives of shipbuilding management and labor, the federal government, and academia. Workshop and break-out sessions will provide a unique opportunity for interaction among shipbuilding peers and the

experts to explore the process of becoming a world class shipbuilding labor and management team.

In addition, there will be planned sessions on subjects of immediate concern to human resource professionals such as:

- mutual interest bargaining,
- gainsharing,
- the proposed OSHA ergonomics standards, and
- innovative ADA accommodations.

Representatives from the following organizations are expected to participate: large and small shipyards, shipbuilding labor unions, universities, naval shipyards, and the Departments of Labor, Commerce, Transportation, and Defense.

## **Registration Information:**

The fee for advanced registration is \$189. For registrations after June 2, 1995, the fee is \$229. Hotel-like accommodations are available at MITAGS at a cost of \$109 per day which includes

all meals. For additional information or to register, please call: Frank Long, Workshop Project Manager, (610)865-1588, or Chuck Rupy, Chairman, NSRP Panel SP-5, (203)433-3724.

**CALL FOR PAPERS • CALL FOR PAPERS •**

# Ship Production **SYMPOSIUM** & *Exhibition*



**"Improving International Shipbuilding Competitiveness"**

**San Diego, California  
January 31 – February 2, 1996**

Sponsored by The Ship Production Committee and  
hosted by the San Diego Section of the Society of  
Naval Architects and Marine Engineers

*Plans are underway for the 1996 Ship Production Symposium. The program will include technical papers on a variety of topics, as well as panel discussions, case studies, and workshops. New this year, three separate venues will be offered focusing on executive, technical, and repair issues.*

Authors are invited to submit abstracts for papers related to the theme "Improving International Shipbuilding Competitiveness" by May 26, 1995. Suggested topics include:

**Executive Issues:**

- U.S. Shipbuilding International Market Study
- Ship Construction and Financing
- MARITECH Development Projects
- Ship Builder/Supplier Partnerships
- Benchmarking
- Rationalization of Shipbuilding Organization
- TQM in U.S. Shipbuilding
- Military Sealift Design and Production Improvements
- Midterm Sealift Technology Development Program

**Repair Issues:**

- Long-Term Phase Maintenance Contracts
- Rapid Deployment Repair
- Engine Maintenance and Data Transfer
- Ship Maintenance and Repair Networks

**Technical Issues:**

- Production Engineering
- Concurrent Engineering
- Rationalized Approach to Shipbuilding Standards
- CIM
- Automated Manufacturing Systems
- Welding
- Accuracy Control
- Shipyard Modernization Planning
- Employee Training Development in the 90's
- Environmental Compliance in the 90's
- Improvements in Marine Coatings
- Predictive Maintenance in the Shipyard

**Please send abstracts by May 26, 1995 to:**

**Mr. Peter Jaquith  
MS 04-A**

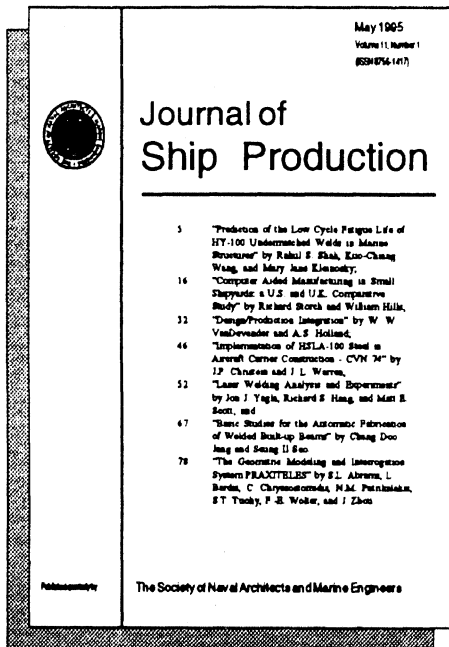
**National Steel & Shipbuilding Company  
PO Box 85278**

**San Diego, California 92186-5278  
(619)544-8448/fax**

# Journal of Ship Production

The Journal of Ship Production is a professional journal dedicated to ship production and to publishing the results of technical research relevant to shipyard professionals. For subscription information contact: SNAME, 601 Pavonia Ave., Jersey City, NJ 07306. Following are the contents of the May 1995 issue of the Journal:

- "Prediction of the Low Cycle Fatigue Life of HY-100 Undermatched Welds in Marine Structures" by Rahul S. Shah, Kuo-Chiang Wang, and Mary Jane Kleinosky;
- "Computer Aided Manufacturing in Small Shipyards: a U.S. and U.K. Comparative Study" by Richard Storch and William Hills;
- "Design/Production Integration" by W. W. VanDevender and A.S. Holland;
- "Implementation of HSLA-100 Steel in Aircraft Carrier Construction - CVN 74" by J.P. Christein and J. L. Warren;
- "Laser Welding Analysis and Experiments" by Jon J. Yagla, Richard S. Haag, and Matt E. Scott;
- "Basic Studies for the Automatic Fabrication of Welded Built-up Beams" by Chang Doo Jang and Seung Il Seo;
- "The Geometric Modeling and Interrogation System PRAXITELES" by S.L. Abrams, L. Bardis, C. Chrysostomidis, N.M. Patrikalakis, S.T. Tuohy, F.-E. Wolter, and J. Zhou.

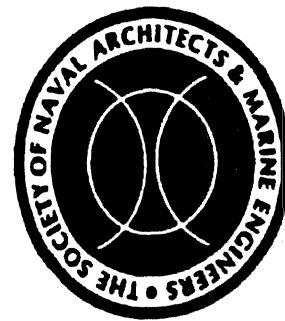


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Regents of the University:  
Deane Baker, Paul W. Brown, Laurence B. Deitch, Shirley M. McFee, Rebecca McGowan, Philip H. Power, Nellie M. Varner, James L. Waters, and James J. Duderstadt, *ex officio*.

SNAME Gulf Section Annual Meeting...

## State of the Art in Shipbuilding CAD/CAM/CIM



May 12, 1995  
New Orleans Hilton  
Poydras @ the River  
New Orleans, Louisiana

### Overview:

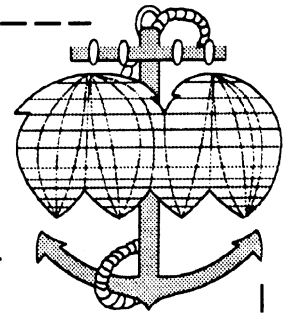
The growing interest by U.S. shipyards in entering the global commercial shipbuilding market invites comparison of U.S. practices with shipbuilders in Japan and Europe. Foreign design and engineering practices, design for production, construction processes, and approaches to shorten design and build cycles are all being closely examined.

The Gulf area is the major concentration of U.S. shipbuilding, both small and large, and it is appropriate that it take the lead in implementing the best available processes and tools. With this in mind, a full-day presentation of papers by international and national leaders in the development and use of the latest CAD/CAM/CIM technology will be offered to bring members and guests up-to-date in this important technology. Paper authors are from Denmark, Spain, Sweden, the U.K., and the U.S.

### Meeting Registration:

Reservations should be made by calling Mr. Farrel Latour at (504)733-4871/voice or (504)734-1880/fax. Advanced reservations are requested by April 28, 1995. As meeting room space is limited and an excellent attendance is anticipated for this important international meeting, reservations will be handled on a first-come availability basis. Registrants will receive a copy of all papers presented at the meeting. Room reservations should be made by calling the hotel directly at 1-800-HILTONS or (504)584-3999 by April 12, 1995. Please mention the SNAME Gulf Section meeting when calling.

# It's Time to Renew Your Subscription to NSRP News!



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MARINE SYSTEMS DIVISION  
The University of Michigan  
Transportation Research Institute  
2901 Baxter Road  
Ann Arbor, MI 48109-2150

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## NSRP NEWS

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### SHIP PRODUCTION COMMITTEE

Active NSRP Panels:

- Facilities & Environmental Effects (SP-1)
- Surface Preparation and Coatings (SP-3)
- Design/Production Integration (SP-4)
- Human Resource Innovations (SP-5)
- Marine Industry Standards (SP-6)
- Welding (SP-7)
- Industrial Engineering (SP-8)
- Education & Training (SP-9)

*See page 2 for panel contact.*



# NSRP NEWS

NATIONAL SHIPBUILDING RESEARCH PROGRAM

U.S. Navy  
Advanced Research Projects Agency  
U.S. Department of Defense and  
The University of Michigan

JULY 1995  
VOL. 9 NO. 2

## Ed Mortimer Named ECB Chairman

Ed Mortimer was recently named Chairman of the Executive Control Board (ECB) of the National Shipbuilding Research Program (NSRP). Mr. Mortimer is Corporate Vice President and Manager of the Shipyards Division of Avondale Industries, Inc. Prior to becoming the Manager of the Shipyards Division, Mr. Mortimer served as Corporate Vice President of Program and Contract Management, and as Program Manager of the LSD 44-48 contract. He has over 36 years experience in the shipbuilding industry. He has 29 years experience as an Engineering Duty Naval Officer in naval ship design and construction of a variety of ships and craft, ranging



ECB Chairman, Ed Mortimer is Corporate Vice President and Manager of the Shipyards Division of Avondale Industries, Inc.

from USMC amphibians to special mission ships; these include landing craft, LCAC, MCM, a variety of T-ships, AO, AOE, AD, and AS. His assignments have included tours as Supervisor of Shipbuilding, Executive

Assistant to COMNAVSEA, and twice as a NAVSEA Program Manager (SHAPM), and he retired as Captain, USN. He is a graduate of the US Naval Academy with a BS degree in Naval Engineering, and is a graduate of the Navy's postgraduate program. He also carries a BS in Marine Engineering and an MS in Naval Architecture from the Webb Institute of Naval Architecture. ■



ECB Vice Chair, Donald Spanninga, is Senior Vice President of Operations, National Steel and Shipbuilding Company

## Donald Spanninga Named ECB Vice Chair

Named as the ECB's new Vice Chair, Donald Spanninga is Senior Vice President of Operations at National Steel and Shipbuilding Company. He reports directly to the President and CEO and is responsible for all shipyard operations and for the operation of supporting departments. He is a member of NASSCO's board of directors.

Mr. Spanninga has an undergraduate degree and MBA from Michigan State University. He has worked in the computer manufacturing, retail and food industries prior to joining NASSCO in 1977. Mr. Spanninga has

*continued on page 2*

### A Message from Ed Mortimer...

*Firstly, let me say that I am somewhat overwhelmed at relieving Dave Donohue as Chairman of the ECB. Dave has provided dedicated leadership to the ECB for six years, and his shoes will be difficult to fill. In this endeavor, I do solicit your continued professional support as we traverse a time of significant change in the shipbuilding industry. If we work together, we surely can attain the goals for which we will continue to strive.*

*While I have some basic ideas of directions in which I would like to proceed, I do not want to preempt the forthcoming planning meeting. In simplistic terms, several of my objectives are to:*

- a. Enhance the prestige of the NSRP through improved

*continued on page 2*

## A Message from Ed Mortimer (cont'd)

overall industry awareness. This will be supported by emphasizing that the NSRP is the only remaining body at which all major shipyards and supporting infrastructure are represented by senior officials of the participating companies.

- b. Improve relationships and communications among the ECB and the various panels and their representatives.
- c. Establish a more structured method of operation.
- d. Work to accelerate project funding.

With regard to the (strategic) planning session, I regret that we are unable to accommodate the early date and will, instead, meet on August 11 & 12 in New Orleans, to wrap up by 4 p.m. on the 12th. Dale Rome has made arrangements for rooms at Le Pavillon Hotel, 833 Poydras Street. Call (504)581-3111 or (800)535-9095 and note that you are with NSRP. I see this particular gathering as more one to formalize our method of operation, to address certain procedural, membership and similar issues, as well as to lay the groundwork for an honest "strategic" planning session late in the year. This, I believe, will allow more time to put together realistic plans for the next five years or so. Details on the August meeting will be provided shortly.

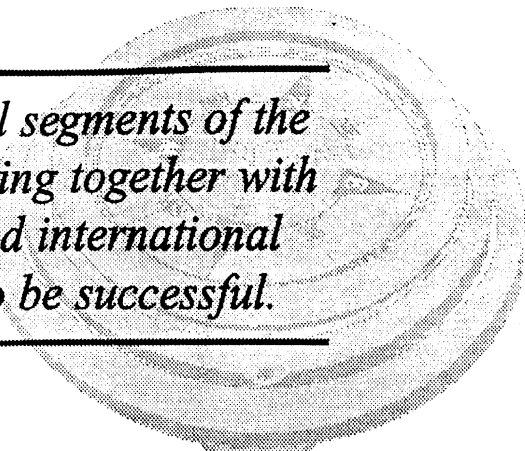


## Donald Spanninga

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over 20 years experience in manufacturing control, production, engineering, purchasing, accounting, information systems, and planning. Since 1985 he has had responsibility for operations at NASSCO, which includes production, repair, planning, engineering, and support services. Mr. Spanninga has long been active with various industry organizations including SNAME, the Ship Production Committee, and NSRP.

Mr. Spanninga's vision is to make the NSRP program the foremost leader in providing technologies and technology transfer in the United States. According to Mr. Spanninga, it will take all segments of the industry working together with domestic and international resources to be successful. The NSRP has the active involvement of the industry necessary to assure the U.S. industry is internationally competitive. ■



*It will take all segments of the  
industry working together with  
domestic and international  
resources to be successful.*

## Ship Production Committee Panel Meeting Calendar

### SP-1 Facilities and Environmental Effects

- October 18-20, 1995  
San Diego, California  
Contact: Michael Chee  
(619)544-7778

### SP-3 Surface Preparation and Coating

- October 16-17, 1995  
San Diego, California  
October 17, joint meeting with SP-1  
Contact: Kay Freeman  
(601)935-3919

### SP-4 Design/Production Integration

- October 18-19, 1995  
San Diego, California  
Contact: Ronn Besselièvre  
(601)935-2440

### SP-5 Human Resource Innovations

- September 5-6, 1995  
New Orleans, Louisiana  
Contact: Charles F. Rupy  
(203)433-3724

### SP-6 Marine Industry Standards

- October 3-4, 1995  
Norfolk, Virginia  
Contact: Stephen E. Laskey  
(207)442-1117

### SP-7 Welding

- August 22-23, 1995  
Golden, Colorado  
Contact: Lee Kvidahl  
(601)935-3564

### SP-8 Industrial Engineering

- October 26-27, 1995  
San Diego, California  
Contact: Massood Gaskari  
(619)544-3447

### SP-9 Education and Training

- September 14-15, 1995  
Newport News, Virginia  
Contact: Pamela B. Cohen  
(313)936-1051

# ECB Selects FY96 Research Projects

Proposals from the eight active National Shipbuilding Research Program (NSRP) Ship Production Committee (SPC) panels were presented to the Executive Control Board (ECB) May 8-9, 1995, in Crystal City, Virginia. Below is a list of projects selected by the ECB to be funded in FY96, in order of the proposing SPC panel. This information was provided by the NSRP Program Manager's office.

PROJECT	\$ VALUE	PROJECT TITLE
N1-96-2	\$100,000	Follow the Development and Analyze the Impact of the Federal Guidelines for Bay Sediment Management
N1-96-3	\$120,000	Follow the Development and Analyze the Impact of the Federal Guidelines for Metal Products and Machinery
N1-96-4	\$250,000	Environmental Studies and Testing (Phase IV)
N1-96-5	\$190,000	Trailer Mounted Water Recovery and Reuse System
N1-96-6	\$385,000	Automated Process Application in Steel Fabrication and Sub-Assembly Facilities
N1-96-7	\$105,000	Stormwater Collection, Treatment Recycling and Reuse in a Shipyard
N1-96-8	\$290,000	Open Area Painting - Overspray Containment
N3-96-1	\$30,000	Develop Visual Standards for Hydroblasting of Steel
N3-96-2	\$100,000	New Surface Preparation and Coating Repair Techniques in Ballast Tanks, Phase IV
N3-96-3	\$235,000	Retention of Preconstruction Primer in Tank Coating Systems
N3-96-4	\$100,000	Productivity Study of Hydroblast Removal of Coatings
N3-96-5	\$250,000	Develop Portable Lighting for Shipbuilding Surface Preparation and Coating
N4-96-1	\$200,000	Activity Analysis for a World Class Design Model
N4-96-7	\$250,000	Convert NIDDESC Standards to ISO Standards - Phase II
N5-96-1	\$50,000	Human Resource Post Workshop Action Plan Follow-Up
N5-96-3	\$20,000	NSRP (SP-5) Worker's Compensation Workshop
N6-96-1	\$101,000	Ship Designer's Handbook - Cross Reference of Requirements
N6-96-2	\$203,000	Vendor Furnished Information (VFI) Development Guide
N7-96-1	\$200,000	Development of Electromagnetic Acoustic Transducers (EMATS) for Surface Volumetric Inspection of Welds
N7-96-3	\$300,000	Carbon Equivalent (Pcm) Limits for Thick Carbon and Low Alloy Steels
N7-96-4	\$200,000	Structural Detail Evaluation
N7-96-9	\$150,000	Develop Compliance Methods to Meet New Welding Fumes Regulations
N8-96-3	\$307,000	Application of Industrial Engineering Techniques to Reduce Worker Compensation and Environmental Costs
N9-96-1a	\$122,000	Assist U S Shipyards to Develop and Maintain Skilled Trades Workers Part A Determine Skill Competencies and Requirements for Trades Training
N9-96-1b	\$50,000	Assist U S Shipyards to Develop and Maintain Skilled Trades Workers Part B Establish Availability of Curriculum for Trades Training
N9-96-1c	\$88,000	Assist U S Shipyards to Develop and Maintain Skilled Trades Workers Part C Develop a Multi-Skilled Training Program for the Future
N9-96-2	\$100,000	Structured On-The-Job Training
N9-96-3	\$40,000	Economics and Application of Training Media Selection

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# ARPA Selects MARITECH Program Participants



PROCESS & PRODUCT  
IMPROVEMENT  
TECHNOLOGY  
PROJECTS  
(BAA #94-44)

The Department of Defense's Advanced Research Projects Agency (ARPA) recently announced the selection of 24 new projects for negotiation as a result of the FY95 MARITECH competition. The 24 projects include efforts in (1) advanced shipyard process

being implemented in the shipbuilding industry will result in long-term effects that:

- preserve the shipbuilding industrial infrastructure for future mobilization contingencies; e.g., shipways, skilled artisans, and marine supplier base;

*The program's total impact will amount to at least \$440 million to improve the competitiveness of the U.S. shipbuilding industry*

- ensure affordable Navy ship construction with world class, Navy applicable shipbuilding processes and technologies; and

- facilitate the U.S. shipbuilding

industry's reentrance into the burgeoning international commercial market during a period of reduced Jones Act and Navy construction.

and shipboard product technology development, and (2) near-term ship design and construction technology application.

Now in its second year, the five-year MARITECH Program is a federal effort to develop and apply advanced technology to improve the competitiveness of the U.S. shipbuilding industry, and thereby preserve the capability for Navy ship construction. MARITECH is matching industry investment with federal funds on a competitive basis to develop and implement technologies and advanced processes for the competitive design, marketing, construction, and support of ships. MARITECH-developed technologies and processes for merchant marine requirements will be applied to Navy combatants, resulting in improved ship performance and more affordable ship acquisition for the U.S. military. MARITECH-developed technologies and processes now

MARITECH is managed by ARPA in consultation with the Maritime Administration and the Navy's Office of Naval Research. Over the five-year program, the anticipated total government funding is \$220 million. Because all government funding is at least matched by participants, the program's total impact will amount to at least \$440 million to improve the competitiveness of the U.S. shipbuilding industry. For more information, please call (703)695-0192 (media), (703)697-3189 (press release copies), (703)697-5737 (public/industry). ■

## *Application of Adaptive Control to SWATH and SLICE Ships*

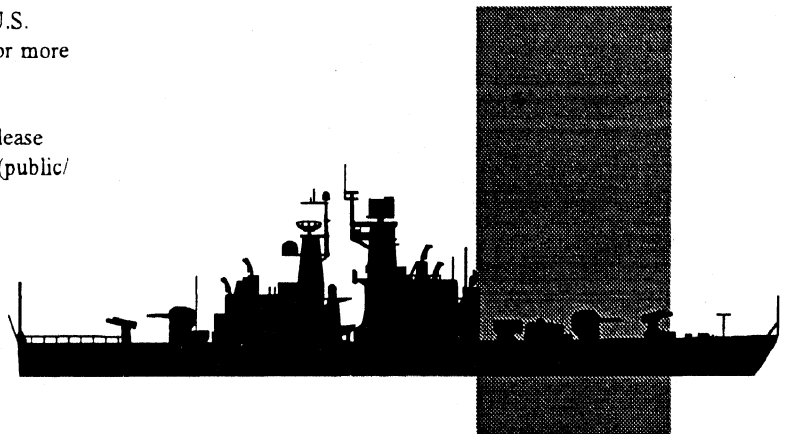
Lockheed Missiles and Space Company, Inc. of Sunnyvale, California proposes a 16-month project for the development of an adaptive controller that will greatly enhance the performance of conventional SWATH and the more advanced SLICE vessels. The use of Lockheed's Advanced Dynamically Adaptive Performance Technology (ADAPT) will result in a control system with self defining, self tuning, and graceful degradation features. The project consortium includes Pacific Marine of Honolulu, Hawaii.

## *Panel Line Welding*

McDermott, Inc./Babcock & Wilcox of Arlington, Virginia proposes a 24-month project that will implement the Programmable Automated Welding Systems (PAWS) for panel line welding. This system provides (1) multiple sensory input to orient, locate, and adapt to weld joint location and gap width; (2) control of the welding path, including path optimization, and (3) welding process control, including control of all parameters. PAWS integrates and fuses the required subcomponents to effectively automate the welding process in shipbuilding. The project consortium includes A & P Appledore International of the United Kingdom; CIM Systems of Lynchburg, Virginia; Ogden Engineering Corporation of Schererville, Indiana; Staubli of Italy; and Ishikawajima Harima Industries Co., Ltd. of Japan.

## *SWATH High Speed Ferry*

SWATH International of Calverton, Maryland proposes a 15-month project that will achieve significant improvements in the structural efficiency of its high-speed SWATH ferry designs. They will subject their existing super 4000 class ferry design to an innovative structural optimization analysis. The goal of the project is to develop a lightweight producible structural design that markedly increases the payload weight capacity of this design. The project will use the computer program Optistrut to perform this analysis and will also use Hypermesh and GENESIS. engineering tools. The project consortium includes Altair Engineering, Inc. of Dearborn, Michigan and Bollinger Shipyard of Lockport, Louisiana.



### ***Advanced Material Technology***

The University of California, San Diego proposes a 24-month project that will (1) demonstrate that a class of Advanced Composite materials and fabrication technologies developed within the U.S. defense and civilian industries can be converted, further developed, and applied in a cost-effective manner to design and construct novel ships and ship structures; (2) implement such developments, leading to the design, construction, and customer delivery of novel ships and high-value ship structures; and (3) capitalize on the current competitive U.S. position in advanced materials technology to enhance the international posture of the U.S. shipbuilding industry. The project consortium includes the U.S. Coast Guard of Washington, D.C.; the National Steel and Shipbuilding Company of San Diego, California; SWATH Ocean Systems of National City, California; Trans-Science Corporation of La Jolla, California; Giannotti Maine Services, Inc. of Ventura, California; TPI, Inc. of Warren, Rhode Island; Structural Composites, Inc. of Annapolis, Maryland; Harley Boat Company of Bartow, Florida; and Designers and Planners, Inc. of Arlington, Virginia.

### ***Design of the Stern Factory***

McDermott Shipbuilding, Inc. of St. Rose, Louisiana, proposes an 18-month project to develop a specialized facility for the construction of sterns. McDermott has reorganized as an agile/virtual corporation, with marketing, engineering, procurement, and project management functions but without a traditional waterfront shipyard operation. They will procure the construction of designs in modular fashion from traditional and non-traditional marine suppliers, developing a specialization to build and deliver stern sections of medium to large vessels and designing these sections with constructability in mind. The project consortium includes Intergraph Corporation of Huntsville, Alabama; The University of Michigan Transportation Research Institute of Ann Arbor, Michigan; Man B&W Diesel of New York, New York; McDermott Shipyards of Amelia, Louisiana; and Babcock & Wilcox of Arlington, Virginia.

### ***Automated Welding of Structural Beam Erection Joints***

CYBO Robots, Inc. of Indianapolis, Indiana, proposes a 30-month project for the development of a system to combine components from the Portable Shipbuilding Robotics system, developed under Technology Reinvestment Project (TRP) DTMA91-94-H-00019, with new developments in dumping and strategies in adaptive welding. The development process planned for this welding system will enable quick implementation to meet the unique automation needs of U.S. shipyards. This proposal demonstrates that automated welding of structural beam erection joints will provide major reduction in labor costs, improve ship quality, and have a significant impact on improving the global manufacturing competitiveness of the United States. The project consortium includes Bath Iron Works of Bath, Maine; the National Steel and Shipbuilding Company of San Diego, California; Avondale Industries, Inc. of New Orleans, Louisiana; Edison Welding Institute of Columbus, Ohio; and ARM Automation, Inc. of Austin, Texas.

### ***High Power Waterjet Propulsor***

Bird-Johnson, Inc. of Walpole, Massachusetts proposes an 18-month project to develop an advanced cost-competitive, high-powered waterjet design and manufacturing capability. With the participation of Atlantic Applied Research Company (AARC), the waterjet design will reinvest technology developed under military programs for advanced pumps to ensure a major technical advance over existing waterjet designs. The capability to provide high-power, improved performance waterjet propulsion systems at a competitive price, integrated with their innovative high performance vessel designs, will assist the U.S. shipbuilders in (1) rapidly penetrating the developing world market, (2) responding to the need for marketing, installation, and service support, and (3) providing a domestic source for this type of propulsion plant for U.S. Navy needs. The project consortium includes General Electric Company of Lynn, Massachusetts; Mercer Management Consulting, Inc. of Lexington, Massachusetts; and Band-Lavis and Associates of Severna Park, Maryland.

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*Now in its second year, the five-year MARITECH Program is a federal effort to develop and apply advanced technology to improve the competitiveness of the U.S. shipbuilding industry and thereby preserve the capability for Navy ship construction.*

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### ***Test Plan American Underpressure System***

MH Systems, Inc. of San Diego, California proposes a 12-month project to validate the effectiveness of the American Underpressure System (AUPS), an innovative system that can be fitted to oil tankers to prevent losses of cargo to the environment in the event of ship collision or grounding. The AUPS, if successful, will eliminate or reduce the loss of tanker cargo in the event of grounding or collision by imposing a negative pressure above the cargo in each tank. The project consortium includes West Coast Shipping Co. of Los Angeles, California; Bethship of Port Arthur, Texas; and the Naval R&D Laboratory of San Diego, California.

### ***ISIT Platform***

Marine Management Systems, Inc. of Stamford, Connecticut proposes an 18-month project that will enable U.S. shipbuilders to leverage advances in information technology; provide owners and ship operators with an innovative, integrated solution to their information management needs; achieve lower operating costs for ships; and provide a competitive advantage for U.S. shipbuilders. This will be accomplished through the development of a standard shipboard data management platform, leveraging the state-of-the-art information technology that will be incorporated by the U.S. shipyards in new ship designs being offered in the international market. The project consortium includes Sperry Marine, Inc. of Charlottesville, Virginia; GE Marine Systems of Harahan, Louisiana; ABS Marine Services, Inc. of Houston, Texas; M. Rosenblatt & Son, Inc. of New York, New York; Radix System, Inc. of Rockville, Maryland; and Ultima East of Canada.

### ***Composite Ship Superstructures***

Structural Composites, Inc. of West Melbourne, Florida proposes a 48-month project for the development of a composite ship superstructure system. The approach is to mass produce simple elements, using existing commercial cost competitive technologies, that can quickly and easily be joined to produce a variety of structural configurations. The proposed system comprises FRP angles, bonding plates, and flat sandwich panels. It is based on the systems involving FRP sandwich panels and steel framing tested by the U.S. Navy Integrated Technology Deckhouse Program. FRP framing eliminates potential problems with corrosion, different thermal expansion coefficients, thermal conductivity, and fastening of the panels to the frame. The project consortium includes Glasforms, Inc. of San Jose, California; the U.S. Coast Guard of Washington, D.C.; the Naval Sea Systems Command of Washington, D.C.; FRP Technologies of Jacksonville, Florida; CompSys of West Melbourne, Florida; ABS of New Orleans, Louisiana; the Naval Surface Warfare Center, Carderock Division of Bethesda, Maryland; Interplastic Corporation of Saint Paul, Minnesota; Ingalls Shipbuilding of Pascagoula, Mississippi; Reichhold Corporation of Research Triangle Park, North Carolina; Baltex Corporation of Northvale, New Jersey; Bedford Reinforced Plastics of Bedford, Pennsylvania; Advanced Textiles Inc. of Pittsburgh, Pennsylvania; Owens Corning Fiberglass of Seguin, Texas; and Fiber-Tech Industries, Inc. of Spokane, Washington.

*continued on page 6*



**PROCESS & PRODUCT  
IMPROVEMENT  
TECHNOLOGY PROJECTS  
(BAA #94-44)**

continued from page 5

***STEP-ship Product Model***

Intergraph Corporation of Huntsville, Alabama proposes a 36-month project to develop a U.S. marine industry prototype product model that will facilitate the implementation of product model data architectures by U.S. shipyards and CAD system developers, and to write the software necessary to implement a neutral file transfer capability between the project models at U.S. shipyards. A major component of this effort will be the implementation of a product model at each shipyard where the full intelligence of the product is represented. This includes not only the geometric representations but also the attribute and relationship data for the total life cycle of the products. The project consortium includes Bath Iron Works of Bath, Maine; General Dynamics, Electric Boat Division of Groton, Connecticut; Ingalls Shipbuilding of Pascagoula, Mississippi; Newport News Shipbuilding of Newport News, Virginia; and Advanced Management Catalyst, Inc. of Wiscasset, Maine.

***Vessel Optimization and Safety System (VOSS)***

Sperry Marine Inc. of Charlottesville, Virginia proposes a 24-month project to develop a vessel optimization and safety system that will measurably decrease voyage costs and reduce the risk of vessel and cargo damage and loss. The risk of environmental damage is reduced as the risk of vessel damage is reduced. This will be accomplished by establishing a vessel safe operating envelope that optimizes the balance between schedule and operating efficiency while meeting all necessary and prudent safety and environmental requirements. The project consortium includes Ocean Systems, Inc. of Oakland, California.

***SMARTBRIDGE***

Martin Marietta of Syracuse, New York proposes an 18-month project to develop, integrate, and demonstrate an affordable and reliable system that can accommodate a combination of upgraded and new sensors (radar, infrared, electro-optical); a navigation display, evaluable as a fully compliant Electronic Chart Display and Information System (ECDIS); an integrated sensor display; and an automated advisory/decision aid for piloting and navigation. Open architecture database structures, local area network technology, and communications protocols will be included to support system functionality and additional growth. The project consortium includes Rensselaer Polytechnic Institute of Cazenovia, New York; the National Oceanographic and Atmospheric Administration of Rockville, Maryland; and Chevron of San Francisco, California.

***Focused Technology Development Project for a New LNG Containment System***

Marinex International of Hoboken, New Jersey, proposes a 12-month project to develop a new LNG containment system that incorporates the benefits of each of the existing LNG technologies while eliminating the drawbacks and affording substantial opportunities to reduce both construction and operating costs. The design will be based upon the use of plates to form an essentially rectangular shaped tank with rounded corners and edges. The tanks will be externally stiffened with girders connected through thermal break means to the inner hull structure of the basic vessel. Means have been devised to allow for thermal expansion and contraction while providing support and stability of the cargo tank system within the vessel hull. The project consortium includes General Electric Company of Washington, D.C.; Metro Machine Corporation, Inc. of Norfolk, Virginia; and Energy Transportation Group of New York, New York.

***Process Tools for Shipyard Construction, Conversion, and Repair***

CTA Inc. of Englewood, Colorado proposes a 36-month project to apply process improvement and instructional technology emerging from the Focus: HOPE and ARPA Agile Manufacturing programs to shipyard construction, conversion, and repair. Areas to be addressed by their proposed testbeds are (1) a legacy of process knowledge from modeling how shipyards build and repair ships; (2) proof of concept for process technology by evaluating the deployment of process tools; (3) metrics to provide measures of shipyard efficiency and establish a correlation to profitability; (4) multimedia training and performance support systems to transfer skills and experience; and (5) a forum for shipyard technology exchange. The project consortium includes Honolulu Shipyards, Inc. of Honolulu, Hawaii. ■



**NEAR-TERM  
TECHNOLOGY  
APPLICATIONS  
PROJECTS  
(BAA #95-02)**

***City Slicker***

Peterson Builders, Inc. of Sturgeon Bay, Wisconsin proposes an 18-month project to develop an environmentally sensitive, cost effective ferry that is particularly well suited to urban services and can compete in all sectors of the ferry market worldwide. The 30-meter City Slicker fast ferry, of all aluminum construction, is conceived to be flexible enough to operate on a variety of routes, with alternative layouts to accommodate 100 to 135 passengers. It is a development of the successful FBM-designed "Thames" class riverbus. Speeds of up to 30 knots may be obtained from twin marine diesel engines. Peterson Builders, Inc. propose to establish a process-oriented assembly line for the construction of this class of fast ferries. The project consortium includes Spirit Cruises, Inc. of Norfolk, Virginia and FBM Marine Group of the United Kingdom.

***Reefer 21***

Bender Shipbuilding and Repair, Inc. of Mobile, Alabama proposes an 18-month project to develop a wholly new design for a cost effective small ship that can compete in all sectors of the reefer market worldwide. The Reefer 21 will be a state-of-the-art design for a self-sustaining reefer ship with a capacity of about 200,000 cubic feet. The design will accommodate all kinds of temperature-sensitive cargoes — fully frozen, chilled, and cooled. The ship will be self sustaining and will handle cargo in cartons, on pallets, or in containers of up to 40 feet. The unique feature of the refrigeration system is that it controls the mix of oxygen and carbon dioxide in each of the six cargo compartments, using a computerized system that continuously monitors humidity and air mixture. The project consortium includes Colton & Company of Arlington, Virginia; Columbia Group, Inc. of Seattle, Washington; and Nordvest Consultants of Norway.



### **Fast Ferry Market Penetration**

Nichols Brothers Boat Builders, Inc. of Freeland, Washington proposes a 12-month project centered around Incat's designs for larger car/passenger ferries and more operational fast car/passenger ferries. Ferry industry trends indicate strong immediate market demand for competitively priced and reliably sourced large ferries. Nichols needs to obtain the expertise and systems to train their crews and engineers to implement significantly improved methods of production. This requires introducing a fully integrated design, procurement, and production methodology that requires 3-D CAD/CAM integration to automatically sequence procurement and cutting of numerically controlled (NC) tapes into a reorganized method and sequence of zone outfit logic technology production. It requires bringing NC cutting of metals in house. The project consortium includes Gladding Hearn Shipbuilders of Somerset, Massachusetts and Incat Designs of Sydney, Australia.

### **Midfoil SWAS Ship Design**

Pacific Marine of Honolulu, Hawaii proposes a 12-month project. They will produce a family of three advanced concept designs (80-, 160-, and 250-ton displacement) for a midfoil SWAS and a contract design, including styling, for the 80-ton vessel. Designs will be based on results from model tests already funded by a CEROS grant to be completed in April 1995. Each concept design will address specific market niches already being identified under a MARITECH project funded in May 1994 and scheduled for completion in March 1995. In addition, Pacific Marine will develop kit ship construction techniques that will allow the midfoil SWAS vessel to be prefabricated in modules. Most high-technology, high-value, high-dollar components will be included in three key models prefabricated only in the U.S. Pacific Marine will also design, build, and test a 30-foot manned test model of the Midfoil SWAS hull to confirm CEROS-funded model basin tests and develop and begin implementation of a marketing plan based on continuing market research, advertising, and publicity of the Midfoil SWAS concept. The project consortium includes Nichols Brothers Boat Builders of Freeland, Washington; Westport Shipyards of Westport, Washington; and Art Anderson Associates of Seattle, Washington.

### **Handy Sized 27,000 DWT Bulk Vessels**

Alabama Shipyard, Inc. of Mobile, Alabama proposes a 16-month project to produce a 27,000 DWT bulk carrier. This design has already been proven by MHI, which has delivered seven of these vessels and has another four under construction. Alabama Shipyard's technical approach includes a build strategy that will reduce construction costs by series production in a facility that is being modernized to improve its efficiency. In January 1995, Alabama Shipyard signed a letter-of-intent with TRITEA to build four of the ships that are the focus of this project. The design of the bulk carriers is current state of the art for ships of this type and does not involve any unproven concepts. The project consortium includes Mitsubishi Heavy Industries of Japan and TRITEA Maritime, Ltd. of Greece.

### **LNG Carrier**

Newport News Shipbuilding of Newport News, Virginia proposes an 18-month project for the successful integration of a market-driven contract design development process, construction-oriented detail design procedures, and a low-cost series production build strategy for an LNG carrier. This project will develop a highly producible, market-oriented LNG ship design. Newport News Shipbuilding will leverage major planned and ongoing upgrades to computer-aided engineering, design, and fabrication facilities. They will conduct a rigorous market analysis; once this is completed, they will produce a contract-level design using design-for-production principles in a format consistent with a computer model. This project will produce a state-of-the-art ship design that can be offered to prospective owners at a competitive price and delivery schedule. The project consortium includes Exxon Company of Houston, Texas; Ishikawajima Harima Heavy Industries Co., Ltd. of Japan; and Shell International Shipping of the United Kingdom.

### **Large Fast Ferry Technical Development**

Halter Marine, Inc. of Gulfport, Mississippi proposes a 32-month project to design, model test, and build up to four large, fast aluminum passenger ferries for operation on routes identified as profitable in Europe. Their high-technology, high capacity, environmentally friendly passenger/vehicle ferry will be designed and built using aluminum construction with gas turbine engines. It will carry 2,000 people and 450 vehicles competitively at high speed. Additional market research will be aimed at identifying service areas worldwide with potential applications for the design series. The overall target is to develop a series of designs of varying capacity that can be specified and ordered in a manner similar to that of the Boeing capacity in the airline industry. The project consortium includes Bank of Tokyo Financial Corporation of Boston, Massachusetts; V. Ships (USA) Inc. of New York, New York; Band Lavis and Associates of Severna Park, Maryland; Derrick Offshore of the United Kingdom; and Fry Design and Research of Australia.

### **Shallow Draft - Self Loading/Unloading Cargo Ship Design**

Vibtech, Inc. of North Kingstown, Rhode Island proposes an 18-month project that calls for (1) a cargo ship design developed by an innovative systems approach that meets ship owner/operator needs; (2) ship's systems technology that optimizes operating flexibility and costs; (3) a cutting-edge modular manufacturing and assembly technology to reduce build time and cost; (4) a technologically agile workforce dedicated to competitive productivity; (5) a customer, designer, and builder integrated process to design for manufacture and assembly; and (6) an innovative marketing strategy combining financing, risk management, crew training, life cycle operating cost, ship repair, overhaul, and resale and disposal factors. The project consortium includes South Eastern New England Shipbuilding Corporation (SENESCO) of North Kingstown, Rhode Island; Rhode Island Technology Transfer Center of North Kingstown, Rhode Island; the AFL/CIO Metal Trades Department of Washington, D.C.; Kvaerner Masa Marine, Inc. of Annapolis, Maryland; and the Naval Surface Warfare Center, Carderock Division of Bethesda, Maryland.

### **High-Speed Monohull Contract Design Project**

Bath Iron Works of Bath, Maine proposes a 15-month project that is an extension of their current High-Speed Monohull Focused Development Project. This phase two step will advance work carried out under phase one, currently underway. The major goal of the proposed project is to complete a full contract design package with the intent of signing a shipbuilding contract. The High-Speed Monohull will be the cornerstone of a high-speed sea transportation and cargo movement system envisioned to meet the growing needs for fast, reliable movement of ocean cargo. Phase two is the deployment of commercial shipbuilding processes and technologies within the shipyard. During this phase, the Executable Shipbuilding Plans developed under phase one will be implemented to increase productivity and reduce the cost of existing Navy ship construction programs, and to support construction of commercial ships at globally competitive prices. The project consortium includes General Electric Company of Schenectady, New York; American Automar of Washington, D.C.; and Kvaerner Masa Marine of Annapolis, Maryland. ■



# NSnet: The Communications Tool of the Future

Created in 1993 as part of ARPA's MARITECH program, NSnet is envisioned to be the catalyst for moving the U.S. maritime community towards electronic communications and electronic commerce. Electronic commerce is a broad term describing business activities which are conducted electronically, and that are already widely used in manufacturing industries such as aerospace and automotive. Activities that in years past had to be performed by hand, in person, or by mail can now be taken care of remotely, automatically, and electronically. You may already be familiar with some of the tools of electronic commerce: direct deposit, electronic funds transfers, ATMs, faxes, and modems. NSnet will be a key tool for the maritime industry to use when entering the international commercial — and electronic — marketplace.

## The Paperless Office

Imagine an American shipyard marketing manager during a typical "day at the office" in the future: Laptop computer in hand, he arrives at a Greek owner/operator's private yacht just in time for an afternoon tour along the Aegean. Instead of carrying around stacks of design plans and schematics, he hooks up his laptop to the shipyard's design database via NSnet and the Internet. If the customer wants any changes in the design, the engineers back at the yard can make the modifications on-line. Meanwhile, the proposed changes can be sent off to classification societies, to ensure the modifications conform to code, and to suppliers, so they can check their inventories for the necessary parts. Once the proposed changes are approved by all parties, an on-line call is made to financiers, credit is tentatively approved, and a deal is made — quickly, electronically, and via NSnet.

While this vision is several years away, NSnet has made great progress since the project first began. Visits to shipyards and demonstrations at maritime events have helped the industry become more familiar with electronic communications and exposed people to the potential uses of electronic commerce. Community members are realizing that improving industry-wide

communication will accelerate technology transfer, facilitate more cost-effective construction of ships, and improve the ability of U.S. shipyards to compete in the international commercial marketplace.

Progress has also been made in the technical arena. The "Kit," which provides industry members with free access to electronic e-mail via a store-and-forward system, now has a seamless gateway to Internet e-mail. Electronic conferences on admiralty law, tankers and oil, environmental, dry cargo, manufacturing, personnel, finance, and excess materials have been added to the already-existing forums provided for the NSRP panels. These improvements have resulted in increased traffic on the conferences, including the exchange of more and more useful information. In addition to industry announcements and conference listings, recent postings have included some of the following business-related requests:

- "We would be interested in hearing from shipyards... for the construction and financing of a LPG newbuilding of 14,000 cbm (8,000 ton dwt)."
- "...I have potential foreign customers ready to solicit this offer on larger ships."
- "We are interested in issuing a solicitation for prefabrication of marine ventilation for shipboard installation."
- "Steel salvage sale bids are being accepted for the following material..."

For more information about the NSnet electronic discussion groups, send an e-mail message to <info@nsnet.com.>

<<http://www.nsnet.com>>

Perhaps the most exciting change made to NSnet is its presence on the World Wide Web. Also referred to as the WWW, the Web is an Internet tool that combines text, graphics, and electronic "hypertext" links to other information sources on one computer screen or "page." The aim of the NSnet "home" page is to gather all shipbuilding- and maritime-related information available on the WWW in one place, so that industry members won't have to spend their time "surfing" the entire Internet to find valuable

information. Links currently exist for things like the NSRP Documentation Center abstracts, MARITECH BAAs, research at the Corrosion & Protection Centre in Manchester, England, and the National Institute of Standards and Technology. Negotiations are underway to provide information from Lloyd's and the Thomas Register to the NSnet community.

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*The aim of the NSnet "home" page is to gather all shipbuilding- and maritime-related information available on the WWW in one place, so that industry members won't have to spend their time "surfing" the entire Internet to find valuable information.*

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The NSnet home page (located at <<http://www.nsnet.com>>) is currently undergoing major changes in its organization. Main information categories will include research and development, shipbuilding, maritime, government, banking and finance, general news and information, and market analysis. Reaction to the Web site has been overwhelmingly positive. More than 12,000 people from 34 different countries "visited" the home page in the first four months of its presence on the WWW, and many of these have sent back enthusiastic comments. In short, NSnet has already made progress in its goal to electronically link the maritime industry worldwide.

## NSnet is Industry-Driven

The stage is now set for further development of NSnet to better serve the maritime community and to demonstrate conclusively the value of electronic commerce in improving U.S. competitiveness. The maritime industry guides and directs NSnet's development to ensure its usefulness. If you are interested in providing input to the growth of NSnet, please contact Andrew Dallas, the Project Director, at:

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4301 N. Fairfax Drive  
Suite #700  
Arlington, VA 22203  
Phone: (703) 516-6000  
Fax: (703) 516-6065  
E-mail: <[adallas@ibm.net](mailto:adallas@ibm.net)> ■



## Your Shipbuilding Library

The National Shipbuilding Research and Documentation Center at the University of Michigan Transportation Research Institute is your source for all shipbuilding research information. Included are all reports produced by the NSRP since its beginning in 1973, SNAME Ship Production Symposia papers, and a variety of technical and nontechnical shipbuilding information from other sources. The National Shipbuilding Research and Documentation Center is comprised of two libraries which are continually being updated with the latest research and informational material.

The Publications Library has over 400 written documents (Symposia proceedings, books, research reports, papers, etc.), in both microfiche and hard copy formats. Documents from the Publications Library can be purchased in either of these formats for the cost of duplication and shipping. The annually updated *Bibliography of Publications* lists all available documents topically and provides brief abstracts for each entry.

The AVMAST Library (AudioVisual Material Available for Shipyard Training) has more than 500 films, video tapes, slides, and other materials in its holdings. All AVMAST library materials can be borrowed by persons in the shipbuilding/repair industry or the Navy for a minimal shipping and handling fee. The *Catalogue of Audio Visual Material Available for Shipyard Training* is published annually and lists all films, video tapes, and other materials topically. It also provides a brief abstract for each training module. (Copies of some AVMAST tapes can be purchased. Complete information is available in the AVMAST Catalogue.)

For More Information on document or module content, or to receive a catalogue or order form, please call the Documentation Center Coordinator at (313)763-2465; write to the Documentation Center, Marine Systems Division, University of Michigan Transportation Research Institute, 2901 Baxter Road, Ann Arbor MI 48109-2150; or send an e-mail message to: rktuttle@umich.edu ■



## Recent Additions to the Publications Library

NSRP 0420

TITLE: Application of Scheduling Program to Data and Configuration Management Deliverables

AUTHOR: James R. Wilkins, Jr., Wilkins Enterprise, Inc.

DATE: May 1994

ABSTRACT: This report is an extension of work performed earlier for Ingalls Shipbuilding Division of Litton Industries and reported in NSRP Report 0293. It provides instructions for the use of the relational data base program, R:Base 4.5, developed in earlier work to provide a shipyard with integrated schedules for developing drawings and ordering equipment

necessary for a shipbuilding program. Topics covered include: starting up, initial system-related data entry, updating system-related data, producing schedule reports and updates, and system management. (88 p.)

NSRP 0421

TITLE: Shell Plate Definition Guide for Ship Designers

AUTHOR: Thomas Lamb, Textron Marine Systems

DATE: May 1994

ABSTRACT: This report provides ship designers and planners with technically acceptable approaches to reduce shell plate development,



## Recent Additions to the AVMAST Library

The current format and length of AVMAST modules are listed [in brackets] after the description of the module. Most modules can be converted to another format if necessary.

ED 99

Hannover Trade Fair 3-7 April 1995

The Hannover Industrial Trade Fair, held April 3-7, 1995, in Hannover, Germany, is the largest industrial trade fair in the world. Over 400,000 people attended the 1995 event. This videotape was made by Dr. Jack Simon, Associate Director of Manufacturing Science & Technology, Office of Naval Research - Europe. The video highlights the demonstrations of the capabilities of the Fraunhofer Institutes to work together on "rapid prototyping." [VHS...100 min.]

PR 32

Hyundai Heavy Industries Co., Ltd.

This promotional video gives an overview of Hyundai Heavy Industries Co., Ltd. (HHI), which is dedicated to building Korea's heavy industry. The company's shipbuilding division is described; HHI has delivered over 600 vessels to more than 30 different countries. In addition to shipbuilding, HHI is involved in engines and machinery, industrial plants, offshore engineering, construction, electrical equipment, and construction equipment. [VHS...20 min.] ■

forming and erection problems. Producibility improvement concepts are introduced that have high cost reduction and a potentially small adverse impact on the operational efficiency of the ship. This is accomplished by describing several problems and providing some ideas on how to avoid them or, at least, reduce their adverse impact. Topics include curvature definition and indicators, lines development and producibility, and shell plate definition.

statistical analysis from a test utilizing this method are also presented.

NSRP 0422

TITLE: Transfer Efficiency Requirements

AUTHOR: Amega Engineering

DATE: June 1994

ABSTRACT: This report delivers the results of a project to investigate transfer efficiency (TE) in painting from a shipbuilding and repair point of view and to test for TE performance relative to the same. A testing method is developed and presented which permits any yard to evaluate TE for specific practices, objectives, and problem solutions relative to their own conditions. Sample data and

NSRP 0423

TITLE: Product Development Study - A Key to World Class Manufacture of Automotive Bodies

AUTHOR: Industrial Development Division, University of Michigan

DATE: July 1991

ABSTRACT: This report provides a comparison of the engineering practices currently employed by several auto makers. Competitive advantages of simultaneous development in the areas of production cost, quality, and time savings are discussed in relation to the sequential development methods and simultaneous engineering practices of the less successful auto makers. Support structure required for the successful implementation of simultaneous development is also discussed. ■

# NSRP Panel Activities



## SP-1 FACILITIES AND ENVIRONMENTAL EFFECTS

In January, SP-1, Facilities and Environmental Effects, held its meeting in Seattle, Washington and finalized the projects that were to be submitted to the Executive Control Board (ECB) for funding in FY96. The panel submitted nine projects and the following seven were approved by the ECB:

N1-96-2	\$100,000	<i>Follow the Development and Analyze the Impact of the Federal Guidelines for Bay Sediment Management</i>
N1-96-3	\$120,000	<i>Follow the Development and Analyze the Impact of the Federal Guidelines for Metal Products and Machinery</i>
N1-96-4	\$250,000	<i>Environmental Studies and Testing (Phase IV)</i>
N1-96-5	\$190,000	<i>Trailer Mounted Water Recovery and Reuse System</i>
N1-96-6	\$385,000	<i>Automated Process Application in Steel Fabrication and Sub-Assembly Facilities</i>
N1-96-7	\$105,000	<i>Stormwater Collection, Treatment Recycling and Reuse in a Shipyard</i>
N1-96-8	\$290,000	<i>Open Area Painting - Overspray Containment</i>

At the May meeting in Jacksonville, Florida, an update was provided on each of SP-1's nine active projects.

*Evaluation of Toxic Air Emissions*, N1-92-1, is 95% complete and the final report is now in publication and should be available from the NSRP library late summer or early fall.

N1-92-2, the third phase of *Environmental Studies and Testing*, got under way the first of the year. There are four active subtasks: Subtask 6, EPCRA Section 313 (Form R) Reporting Consistency; Subtask 7, Title V Permit Certification Requirements; Subtask 8, Common Sense Initiative Study for the Shipbuilding Industry; and Subtask 9, Development of Comments on Proposed Rule MP&M, Phase I.

*Development & Implementation of Environmental Seminar for Shipyard Managers*, N1-92-3, has just gotten off the ground. John Wittenborn of Collier, Shannon, Rill, and Scott is the project manager. This project will acquaint shipyard executives and managers with the scope of environmental requirements affecting shipyard operations, with particular emphasis upon the regulatory and policy issues involved in planning and conducting environmental restoration. The seminar is tentatively set to be held in Washington D.C. in September 1995.

NASSCO is performing N1-93-1, *The Study of the Treatment, Recycling, and Disposal of Spent Abrasive*. This project, which is on schedule and approximately 12% complete, will analyze and

determine the most cost effective options available to shipyards for the treatment, recycling, and disposal of spent abrasive; particularly mineral slags. The project will identify the different types of technology available for the treatment of spent abrasive, and testing will be performed to determine the effectiveness of the reused abrasive. Options for recycling and disposal of the spent abrasive and any methods available to process the hazardous components will be evaluated.

N1-93-3, *Waste Water Treatment Technology Survey*, is being performed by Bath Iron Works. This project is currently in contracting. The project's objective is to review the currently available waste water treatment systems that can effectively remove hydrocarbons from an oily water mixture without the need to transport and/or store the waste water prior to discharge. The selected waste water technologies will be evaluated on their technical soundness, reliability, and cost effectiveness in the removal of oil from fuel compensating ballast tanks when a ship is being overhauled at a shipyard. This technology will be required to meet current and possible future discharge limits under the Clean Water Act.

*Title V Permit for Shipyards: Strategy Guide for Development of General Permit*, N1-94-1, is being performed by Southwest Marine (SWM) and is 14% complete. The project's objective is to assist shipyards with the upcoming Title V permitting process, and to inform the shipyards of Title V federal operating permit procedures and show them how the industry should interact with the process.

N1-94-2, *Environmental Training Module - Phase I*, is being performed by NASSCO and SWM. This project is 25% complete and will provide training modules covering environmental topics that affect shipyards which perform new construction and repair operations.

NASSCO is performing *Development of Shipbuilding and Repair Air BMP*, N1-94-4. The project is on schedule and is 20% complete. The objectives of the project are: (1) perform shipyard surveys of characteristic criteria pollutant and HAPs emitting processes; (2) evaluate control techniques and options to minimize uncontrolled air emissions; and (3) establish standardized air quality BMPs for the shipbuilding and repair industry.

*Solid Waste Segregation and Recycling*, N1-94-5, is being performed by SWM. Work on this project has just begun. The objective of the project is to research and identify methods and equipment to effectively segregate, minimize, and recycle shipyard waste materials. Through this effort, shipyards will reduce the cost of their waste disposal.

The SP-1 fall meeting will be held the week of October 16-20 and will be hosted by National Steel and Shipbuilding Company. ■

## SP-3

SURFACE  
PREPARATION  
AND COATING

NSRP's Executive Control Board (ECB) approved five of the projects proposed by Panel SP-3, Surface Preparation and Coating, for funding in FY96. The projects are:

N3-96-1	\$30,000	<i>Develop Visual Standards for Hydroblasting of Steel</i>
N3-96-2	\$100,000	<i>New Surface Preparation and Coating Repair Techniques in Ballast Tanks, Phase IV</i>
N3-96-3	\$235,000	<i>Retention of Preconstruction Primer in Tank Coating Systems</i>
N3-96-4	\$100,000	<i>Productivity Study of Hydroblast Removal of Coatings</i>
N3-96-5	\$250,000	<i>Develop Portable Lighting for Shipbuilding Surface Preparation and Coating</i>

SP-3 is currently working on six projects and is expecting funding to be released for FY94 and FY95 projects as soon as the contracting work can be completed.

SP-3 is planning its next meeting for October 16-17, 1995 with a joint meeting of SP-1 and SP-3 the evening of October 17. The panels are meeting in San Diego at the Humphrey's Half Moon Inn and Suites. ■

## SP-4

DESIGN  
PRODUCTION  
INTEGRATION

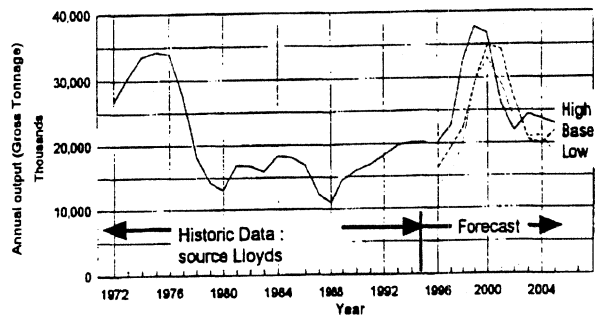
SP-4, Design/Production Integration, has been progressing well on the five projects started in November 1994. One of these projects, N4-93-1, *U.S. Shipbuilding International Market Study*, has just recently been completed. This project was performed by A&P Appledore International, and a final presentation was given

to SP-4 by Mr. Paul Stott, the project's principal investigator, at a recent meeting at Bath Iron Works in Bath, Maine. In the project, an international shipbuilding demand forecast was developed for the ten-year period from 1996 to 2005. This forecast involved a high degree of detail including a review of 58 separate categories of ship size and type. In general, results of this forecast showed a marked increase in demand over the first half of the forecast period peaking in the years 1999-2001 — driven primarily by tanker replacement — and then falling off thereafter (see figure).

At the same time, analysis showed that shipbuilding capacity is likely to be sufficient to meet this demand. Prices are forecast to rise by up to 40% above current levels and then fall after the peak demand period. However, there are likely to be exceptions to these price increases where local effects take over, such as the current very low price levels of container ships. Also, this price forecast depends on restraint on further capacity expansion.

Particular emphasis was placed on identifying market sectors with potential for penetration by U.S. shipyards. Included within the analysis of a variety of demand and competitive conditions was consideration for price, product life cycle, legislative pressures, fleet nationality, and domestic ordering preferences. Strong recommendations for U.S. shipyards were made in two specific size ranges each for the Tanker, General Cargo, LNG, and Passenger ship market sectors. Recommendations with reservations were made for specific size ranges in Tanker, Bulk Carrier, Reefer, and Cargo Ro-Ro market sectors. Anyone interested in obtaining a copy of this report may call the NSRP Publications Coordinator at (313)763-2465.

## Past & Future Annual Demand



A second SP-4 project that is near completion is 4-94-1, *Develop a Common Sense Design Manual for the Producibility of Hull Foundations*. This project is being performed by VIBTECH, Inc. A detailed presentation on this project was also provided at the last SP-4 meeting at Bath Iron Works. A survey of U.S. shipyards performed at the beginning of this project found a number of common design and production problems with foundations including late VFI, lack of standards, lack of time for production considerations, too many piece parts, over design for shock requirements, inappropriate back up structure, and others. This input, combined with statistics available within VIBTECH's database on typical equipment types, sizes, and weights have been used to develop a family of 27 standard frame, truss, and grillage type foundations. Example applications of these foundation types with description of material, fabrication and installation savings will be provided in the report. Step-by-step procedures for draftsmen and engineers that maximize the use to these producibility recommendations will also be included. This project is expected to be complete by June/July 1995.

The other three SP-4 projects currently in work include N4-94-1, *Evaluate Shipbuilding CAD/CAM Systems* being performed by National Steel and Shipbuilding Company; N4-93-3 *Convert NIDDESC Standards to ISO Standards* being performed by Newport News Shipbuilding; and N4-94-5, *Develop Methods to Implement the Results of Past NSRP Projects* being performed by Bernier & Associates, Inc. Each of these projects should be complete (phase I only of N4-94-1) by the end of this year. Those interested in these projects and/or participating with SP-4, Design/Production Integration, should contact Ronn E. Besselievre at (601)935-2440. ■

## SP-5

HUMAN  
RESOURCE  
INNOVATIONS

SP-5, Human Resource Innovations, recently hosted a three-day industry conference at the Maritime Institute of Technology and Graduate Studies in Linthicum Heights, Maryland. The conference, which was held on June 13-15, featured key shipbuilding/ship repair personnel from government, labor, management, as well as aerospace and other manufacturing companies. The conference theme was "Human Resource Innovation - The Key to a Competitive, World-Class American Shipbuilding Industry." Panel Chairman, Chuck Rupy, and Vice Chairman, William McGill opened the conference by stating, "This conference is an important event; but what really matters is what we take from this conference and implement in our organizations."

continued on page 12

# NSRP

## Panel Activities



continued from page 11

Some of the key conference presenters were RADM John Claman, USN (Ret) formerly the Deputy Commander, NAVSEA; Taylor Jones, Director, Office of Maritime Labor, Training and Safety of MarAd; Jack Barry, International President, International Brotherhood of Electrical Workers; John Meese, President, Metal Trades Department, AFL-CIO; Henry Schomber, Chief Engineer, Build/Design, Product and Process Integration, The Boeing Company; and Robert O'Neill, Vice President of Manufacturing, of American Waterways Shipyard Conference. A total of eighteen presenters addressed the attendees, and there was a high degree of audience participation.

The conference stressed the importance of what it takes to achieve the maximum benefit of a team approach. Teams might include employees and management, as well as private industry and government organizations. Concrete examples of how to blend new technology and employee empowerment into the productivity equation were given. The attendees agreed that our industry's success depends heavily on how well we blend these two elements of our business.

Many follow-up actions were captured at this conference, which will now be pursued by SP-5 for implementation. An NSRP project has been approved to facilitate this activity. The written and verbal feedback from the attendees concluded that this conference was well presented and will contribute to helping our industry become more competitive in the global market.

One of the initiatives of the panel has been the resurrection of the old SESAC (Shipyard Employment Standards Advisory Committee) to the newly formed Maritime Advisory Committee for Occupational Safety and Health (MACOSH). In order to accommodate Panel members who are interested in participating on this new committee, we have scheduled both meetings for the first week of September, in New Orleans. The next SP-5 meeting will be held on September 5-6, 1995, and the MACOSH meeting will take place on September 7-8, 1995. ■

### SP-6

MARINE  
INDUSTRY  
STANDARDS

SP-6, Marine Industry Standards, received approval for two of its FY96 program projects at the May 1995 Executive Control Board (ECB) meeting. The two projects are N6-96-1, *Ship Designers Handbook - Cross Reference of Requirements* and N6-96-2 *Vendor Furnished Information (VFI) Development Guidelines*. The

ECB announced that a strategic planning meeting is scheduled for the middle of July or August in New Orleans, Louisiana, and that the panel chairs are invited to attend. This prompted the SP-6 panel chairman to include a strategic planning agenda item on the schedule for the panel's June 27-28 meeting at Electric Boat's facility in Groton, Connecticut. The incoming chairman of the ECB, Mr. Ed Mortimer of Avondale Shipyards, was requested to attend and participate in the panel's planning sessions. Mr. Mortimer's attendance will assist SP-6 in determining its direction for future project proposals and other endeavors.

SP-6 will receive a final report on project N6 94-3, *Marine Standards Liaison*, at the next meeting. The liaison project is intended to identify and coordinate the efforts of a number of organizations that operate in the marine standards forum on a national level. These include the National Maritime Education and Resource Center; The University of Michigan's Transportation Research Institute, Marine Systems Division; and the Gulf Coast Region Maritime Technology Centers, among others. The Marine Standards Liaison Project will identify areas that require focus that have not been addressed by the efforts of the aforementioned organizations. These include providing the industry with a training center for standards, producing a periodic standards publication, and establishing a single source central clearing house for information and initiatives relative to marine standards. A recommended plan of action to accomplish the project's objectives will be presented to the panel for discussion and finalization.

The next SP-6 meeting is tentatively scheduled for October 3-4, 1995 in the Norfolk area at Newport News Shipbuilding. The SP-6 contact is Steve Laskey, (207)442-1117, at Bath Iron Works Corp., MS7110, 700 Washington Street, Bath, Maine, 04530. ■

### SP-7

WELDING

Two projects have recently been initiated by SP-7, Welding. The first, *Welding Through Paint Primer*, will evaluate two pre-construction primers and develop a corresponding flux cored welding consumable that will allow the welding of primed plate while meeting the required weld quality and mechanical properties.

The second project is entitled *Ultra Portable Power Supply/Wire Feed*, and its objective is to develop and evaluate an ultra portable inverter type power supply and wire feeder combination that is capable of gas metal arc and shielded metal arc welding.

At the last Executive Control Board (ECB) meeting, six new projects were approved for funding.

- *Development of Electromagnetic Acoustic Transducers (EMATS) for Surface/Volumetric Inspection of Welds*. This project will continue the development of EMAT technology to provide an alternate non-destructive test method for inspecting welds.
- *Carbon Equivalent (Pcm) Limits for Thick Carbon and Low Alloy Steel*. This project will develop a relationship between the material chemistry and the propensity for cracking to determine the preheating requirements for thick ship steels.
- *Structural Detail Evaluation*. This project will develop guidelines for structural welding accessibility and producibility.
- *Develop Accessories for Semi-Automatic Welding Process*. The project will determine likely candidates of tooling to assist in mechanizing semi-automatic welding processes.
- *Auto-Feed Stud Gun for Insulation Pins*. This project will develop a lightweight stud welding gun having automatic stud feeding with interchangeable handles, not requiring a ferrule, that is compatible with an inverter power supply.
- *Develop Compliance Methods to Meet New Welding Fumes Regulations*. This project will assess the compliance methods necessary to meet new OSHA airborne emission requirements in cutting, grinding, and welding operations on high alloy steels and high nickel alloys. ■

## SP-8

INDUSTRIAL  
ENGINEERING

SP-8, Industrial Engineering, met June 5-6 at Bath Iron Works, in Bath, Maine. The meeting was held jointly with SP-4, Design/Production Integration. The panels met separately on June 5 and then jointly on June 6. The focus of the joint meeting was on concurrent engineering. The

Concurrent Engineering Workshop was held June 7-9 in Portland, Maine.

SP-8 has four active projects:

- *Concurrent Engineering - Implementation*
- *Impact of Metrics on Material/Inventory Control*
- *Industrial Engineering Methods Workshops (Please note: preliminary information on these workshops appears in the box below)*
- *Improved Production Throughput*

The panel has recently completed three projects:

- *Improved Techniques for Scheduling Shipyard Work*
- *Non-Value Added Tasks*
- *Performance Measurement*

Rex Wallen, current SP-8 panel chairman, will be stepping down as of the October meeting to be held at the NASSCO shipyard in San Diego, California. Massood Gaskari of NASSCO is planning to replace Mr. Wallen as chairman. Mr. Gaskari is currently team leader of the Manufacturing Engineering Department at NASSCO and has 14 years experience in facilities and construction management, including five years with NASSCO. He attended the University of Colorado at Boulder and is a registered professional engineer. ■

## SP-9

EDUCATION  
AND TRAINING

The NSRP's Executive Control Board (ECB) approved all five of the projects proposed by SP-9, Education and Training, for funding in FY96. These projects focus on concrete ways to make skilled trades workers better prepared to take on commercial work. In the years to come, the panel will focus on other topics, such as

ways to improve the training and education of engineers and management. The FY96 projects are:

N9-96-1a	\$122,000	<i>Assist U S Shipyards to Develop and Maintain Skilled Trades Workers Part A Determine Skill Competencies and Requirements for Trades Training</i>
N9-96-1b	\$50,000	<i>Assist U S Shipyards to Develop and Maintain Skilled Trades Workers Part B Establish Availability of Curriculum for Trades Training</i>
N9-96-1c	\$88,000	<i>Assist U S Shipyards to Develop and Maintain Skilled Trades Workers Part C Develop a Multi-Skilled Training Program for the Future</i>
N9-96-2	\$100,000	<i>Structured On-The-Job Training</i>
N9-96-3	\$40,000	<i>Economics and Application of Training Media Selection</i>

SP-9 members have agreed to require as a part of new projects supported by the panel some proof of benefits/results. This might be in the form of a workshop, demonstration, or an implementation

plan undertaken by the contract winner as part of the project deliverables. With this requirement in mind, suggestions for such proof were included in these project abstracts. These projects set an example for what the panel hopes will become a required element of all NSRP projects—a targeted plan for improvement that demands tangible results.

Panel membership is also investigating ways to better carry out its Charter, which states that SP-9 will:

*... plan, oversee the performance of, and facilitate the implementation of the result of research and development projects to advance shipbuilding processes and methodologies.*

We are providing ideas and recommendations on how the Panel can better support the NSRP to the recently-named ECB Subcommittee on Panel Structure. We are confident that this re-focusing on cooperation between Panels will help SP-9, and all NSRP Panels, become leading forces in revitalizing the U.S. shipbuilding industry.

SP-9 currently has three active projects:

- *Videotapes on Advanced Ship Production for Presentation to Shipyard Trade Skills*
- *Short Courses for the Training of Shipyard Management and Workers \**
- *Training for Implementing Zone Technology in the Repair and Overhaul Environment \**

\* *Note: a tentative schedule for the presentation of courses for these two projects is included on page 14. ■*

## Industrial Engineering Workshops

*BMS & Associates, Inc. will conduct three no-fee two-day regional workshops as part of an NSRP project being sponsored by SP-8. The workshops will take place in September and October 1995; final presentation dates will be available by August 15, 1995. For more information, contact Barry Schram at (619)552-1413.*

*Proposed topics and locations follow:*

*Workshop Sites:*

- *New Orleans, Louisiana - Gulf Coast Regional Maritime Technology Center (GCRMTC).*
- *Norfolk, Virginia - Site to be determined.*
- *San Diego, California - Site to be determined.*
- *Pascagoula, Mississippi - Ingalls Shipbuilding ("Dry Run Workshop" held July 13-14, 1995)*

*Workshop Topics: Specific Shipyard Applications*

- *"Expanded Stud Gun Utilization" - NASSCO*
- *"Application of Theodolites and Photogrammetry" - GCRMTC*
- *"Process Improvement of the Manufacture of Flexible High Pressure Hose" - Ingalls*
- *"Methods Applied for Design of Steel Assembly Workstations in Europe" - First Marine International, Ltd.*

*It is currently planned to hold site visits, and to have site organization-related presentations.*

# Regional Short Courses on Shipbuilding & Ship Repair

The University of Michigan Transportation Institute (UMTRI) will conduct five short courses as part of two NSRP projects being sponsored by SP-9:

- Short Courses for the Training of Shipyard Management and Workers, and
- Training for Implementing Zone Technology in the Repair and Overhaul Environment.

Notices will soon be sent to shipyards in the designated areas requesting an indication of interest, level of planned attendance, preferred venues, and willingness to provide space to hold the courses. For further information, please contact Thomas Lamb or Mark Spicknall at 313-763-2465, Fax 313-936-1081.

The tentative schedule follows:

## Quality Function Deployment

September 7-8, 1995	Gulf Area
September 21-22, 1995	East Coast Area A
October 5-6, 1995	West Coast
Nov. 30-Dec. 1, 1995	East Coast Area B

## Design for Production

October 25-27, 1995	East Coast Area A
November 8-10, 1995	East Coast Area B
November 21-22, 1995	West Coast
December 13-15, 1995	Gulf Area

## Modern Commercial Ship Production

October 11-13, 1995	Gulf Area
November 1-3, 1995	West Coast Area
November 15-17, 1995	East Coast Area B
December 13-15, 1995	East Coast Area A

## Zone Technology Implementation to Ship Repair and Overhaul

October 18-20, 1995	Gulf Area
December 6-8, 1995	East Coast Area A
January 10-12, 1996	West Coast
January 23-25, 1996	East Coast Area B

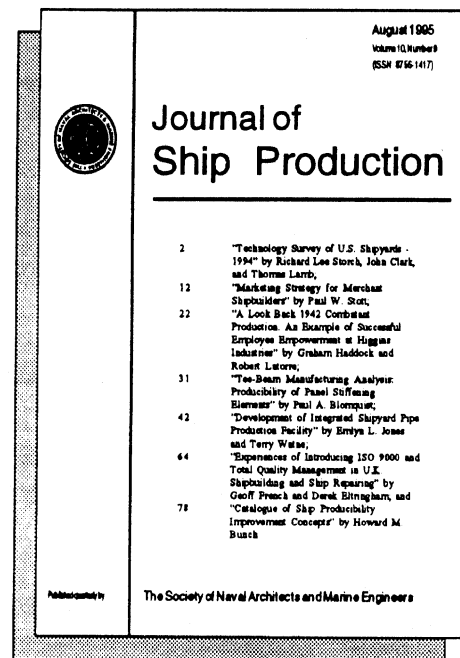
## Advanced Technology

January 4-5, 1996	East Coast Area A
January 18-19, 1996	East Coast Area B
February 1-2, 1996	Gulf Area
February 15-16, 1996	West Coast

# Journal of Ship Production

The Journal of Ship Production is a professional journal dedicated to ship production and to publishing the results of technical research relevant to shipyard professionals. For subscription information contact: SNAME, 601 Pavonia Ave., Jersey City, NJ 07306. Following are the contents of the August 1995 issue of the Journal:

- "Technology Survey of U.S. Shipyards - 1994" by Richard Lee Storch, John Clark, and Thomas Lamb;
- "Marketing Strategy for Merchant Shipbuilders" by Paul W. Stott;
- "A Look Back 1942 Combatant Production. An Example of Successful Employee Empowerment at Higgins Industries" by Graham Haddock and Robert Latorre;
- "Tee-Beam Manufacturing Analysis: Producibility of Panel Stiffening Elements" by Paul A. Blomquist;
- "Development of Integrated Shipyard Pipe Production Facility" by Emlyn L. Jones and Terry Watne;
- "Experiences of Introducing ISO 9000 and Total Quality Management in U.K. Shipbuilding and Ship Repairing" by Geoff French and Derek Eltringham; and
- "Catalogue of Ship Producibility Improvement Concepts" by Howard M. Bunch.



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# Ship Production **SYMPOSIUM** & *Exhibition*



**"International Commercial Competitiveness  
in the Year 2000 and Fleet Support & Maintenance"**

**La Jolla, California  
February 12-16, 1996  
Hyatt Regency**

Sponsored by The Ship Production Committee and  
hosted by the San Diego Section of the Society of Naval  
Architects and Marine Engineers

*Plans are underway for the 1996 Ship Production Symposium. The program will include technical papers on a variety of topics, as well as panel discussions, case studies, and workshops. New this year, three separate venues will be offered focusing on executive, technical, and repair issues.*

**Executive Issues:**

- U.S. Shipbuilding International Market Study
- Ship Construction and Financing
- MARITECH Development Projects
- Ship Builder/Supplier Partnerships
- Benchmarking
- Rationalization of Shipbuilding Organization
- TQM in U.S. Shipbuilding
- Military Sealift Design and Production Improvements
- Midterm Sealift Technology Development Program

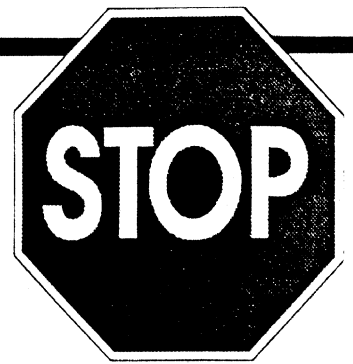
**Repair Issues:**

- Long-Term Phase Maintenance Contracts
- Rapid Deployment Repair
- Engine Maintenance and Data Transfer
- Ship Maintenance and Repair Networks

**Technical Issues:**

- Production Engineering
- Concurrent Engineering
- Rationalized Approach to Shipbuilding Standards
- CIM
- Automated Manufacturing Systems
- Welding
- Accuracy Control
- Shipyard Modernization Planning
- Employee Training Development in the 90's
- Environmental Compliance in the 90's
- Improvements in Marine Coatings
- Predictive Maintenance in the Shipyard

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## NSRP NEWS

MARINE SYSTEMS DIVISION  
The University of Michigan  
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# NSRP

NATIONAL SHIPBUILDING RESEARCH PROGRAM

U.S. Navy  
Advanced Research Projects Agency  
U.S. Department of Defense and  
The University of Michigan

DECEMBER 1995  
VOL. 9 NO. 3

**San Diego, California**  
**February 14-16, 1996**  
**Hyatt Regency**

Sponsored by The Ship Production Committee and  
hosted by the San Diego Section of the Society of  
Naval Architects and Marine Engineers

## 1996 Ship Production **SYMPOSIUM** & *Exhibition*

**“International Commercial  
Competitiveness in the Year 2000 and  
Fleet Support & Maintenance”**

### **Program Overview**

The 1996 Ship Production Symposium is especially intended for executive management, technical management, and ship conversion and maintenance personnel.

Exhibitors representing state-of-the-art ship production, conversion and maintenance technology, facilities and plant equipment, and CAD/CAM/CIM and automated manufacturing will be on hand. Forty to fifty exhibits will be on general view including operating robotics and automatic manufacturing equipment. In addition, CAD systems and equipment will be presented in a low-light exhibition space to allow these facilities to be viewed under the best possible conditions. More information begins on page 6.

**Publications Library**

**& AVMAST Library**

**Catalogues**

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Electronic Format!**

**Request your copy today!**

***Find out more on page 15***

## Ship Production Committee Panel Meeting Calendar

### SP-1 Facilities and Environmental Effects

- March 6-8, 1996  
Denver, Colorado  
Contact: Michael Chee  
(619)544-7778

### SP-3 Surface Preparation and Coating

- March 6-8, 1996  
Denver, Colorado  
Contact: Kay Freeman  
(601)935-3919

### SP-4 Design/Production Integration

- March 6-7, 1996  
Newport News, Virginia  
Contact: Ronn Besselievre  
(601)935-2440

### SP-5 Human Resource Innovations

- December 7-8, 1995  
Jacksonville, Florida  
Contact: Charles F. Rupy  
(203)433-3724

### SP-6 Marine Industry Standards

- February 12-13, 1996  
San Diego (La Jolla), California  
Contact: Stephen E. Laskey  
(207)442-1117

### SP-7 Welding

- February 28-29, 1996  
Florence, South Carolina  
Contact: Lee Kvidahl  
(601)935-3564

### SP-8 Industrial Engineering

- February 12-13, 1996  
San Diego (La Jolla), California  
Contact: Massood Gaskari  
(619)544-3447

### SP-9 Education and Training

- February 19-20, 1996  
San Diego, California  
Contact: Pamela B. Cohen  
(313)936-1051

## NSRP Program Management Change

Mr. David E. Little has been recently assigned as the U.S. Navy Program Manager for the NSRP. The NSRP Navy program management function has been transferred to the Naval Sea System Command (NAVSEA) headquarters in Crystal City, Virginia, and resides in the newly established NAVSEA Code 91R under the Surface Ship Directorate.

Mr. Little is a graduate of Webb Institute of Naval Architecture and more recently, the Industrial College of the Armed Forces. He has worked in both private industry and government service, at the Military Sealift Command, and for the last eight years, at NAVSEA headquarters in ship acquisition.

"We recognize the value (to the Navy) of the overall NSRP objectives and appreciate the benefits of NSRP being an industry driven program, with the Navy as a participant. The move of the program management function to headquarters can

be a very positive move in establishing a higher level of Navy management attention and application of resources, be they funding or people, as appropriate. As a customer, the Navy sees the movement of the shipbuilding industry toward 'World Class' performance as essential to solving its own long-term issues in ship construction and repair."

"This is going to be my full-time job and I'd like to be part of the solution rather than part of the problem. Although it may take some time to come up to speed, I intend to communicate openly and work at all levels of the program to try to help it function smoothly and efficiently, keeping the overall objectives in mind. I'm open to any questions or suggestions as to how I can help."

Mr. Joe Novak will be working with Mr. Little at NAVSEA. Both can be reached at (703)602-9176/9. Mr. Little's e-mail on INTERNET is little\_dave@hq.navsea.navy.mil.■

## ECB Holds Strategic Planning Meeting for NSRP

The NSRP Executive Control Board (ECB), Program Managers and Program Chairs met August 11-12 in New Orleans to review some of the operations of the National Shipbuilding Research Program (NSRP). Perhaps the most significant event of the meeting was a challenge to the shipbuilding community from Robert Schaffran of ARPA's MARITECH program

*Provide industry leadership in defining the future technology goals of the MARITECH program*

With three years left to run, and a budget of \$50M per year, it is clear that the MARITECH program can have a major influence in helping revitalize U.S. shipyards

In order for the NSRP to play a significant role in determining future MARITECH research programs, it will be necessary for the ECB to

- Develop a technology development and implementation plan that reflects a

consensus of the shipyards committed to becoming competitive in the world commercial shipbuilding market.

- Obtain agreement from the CEOs of these shipyards that they support the plan and that they designate their ECB member to represent them in the implementation of the plan.
- Possibly reorganize the ECB/Panel structure to carry out the plan.

The majority of the August meeting centered around identification of major technology topics to be pursued by the NSRP. After several brainstorming sessions and discussions to clarify ideas, three major thrust areas were developed:

- Integration of Design/Engineering with Planning, Procurement and Production.
- Process Modeling
- Improved Business Practices

Details of these follow.

While it is expected that further refinement of the Thrust Areas and NSRP goals will take place in the months to come, the ECB

*continued on page 14*

NSRP provides valuable resources. . .

# How to Locate Shipbuilding Benchmarking Information

**B**enchmarking the capabilities of major foreign shipbuilders and other industries versus the capabilities of U.S. shipbuilders has been one of the primary objectives of the domestic industry and the NSRP for several years.

In January 1979 the NSRP released a report, *Technology Survey of Major U.S. Shipyards*, (NSRP 0081) that examined on a relative basis the detailed capabilities of both domestic and foreign yards in the general areas of steel work production, outfit production and stores, layout and material handling, amenities, design, drafting, production engineering, lofting, on-board construction, installation and testing, and organization and operating systems.

An updated version of this benchmarking study, *Requirements and Assessments For Global Shipbuilding Competitiveness*, (NSRP 0434) was published by the NSRP in October, 1994. This study was produced

jointly by Dr. Richard Storch, Mr. Tom Lamb, and A & P Appledore, and involved extensive on-site surveys of five U.S. yards, four EC yards, and one Japanese yard. While this study showed that U.S. yards had improved substantially since the 1979 study, it also showed that on average foreign yards had improved slightly more, widening the technology and capability gap.

In addition to these major studies, there is currently underway an NSRP benchmarking study of CAD/CAM/CIM system capabilities in foreign and domestic shipyards. Extensive site evaluations are being carried out in both EC and Japanese yards as part of this project. A future-oriented CAD/CAM/CIM system specification should be available in the fall of 1996.

In addition to this NSRP work, there have been several Ship Production Symposium papers published in the proceedings over the years that describe relative foreign and

domestic technologies and capabilities in detail. Following is a list of some of the documents and reports currently in the NSRP Library that contain valuable information relative to foreign and domestic shipbuilding capabilities that can be used for benchmarking purposes.

- NSRP 0002 Paper #1  
*Practical Shipbuilding Research and Development*
- NSRP 0002 Paper #13  
*Automation and Productivity in Discrete Part Manufacturing*
- NSRP 0003 Paper #6  
*Hierarchical Application of Computers for an Automated Pipe Shop*
- NSRP 0005 Paper #1  
*Reducing Production Man-Hours Through Design Office Procedures: Structural Designer-Fabricator Relationship*
- NSRP 0005 Paper #18  
*Improving Shipbuilding Productivity Through the Use of Standards*
- NSRP 0006 Paper #2  
*The Shipbuilding Technology Transfer Program*
- NSRP 0006 Paper #3  
*Navy Manufacturing Technology Program*
- NSRP 0006 Paper #12  
*Network Scheduling of Shipyards Production, Engineering, and Material Procurement*
- NSRP 0006 Paper #14  
*An Interactive Plate Nesting and Manufacturing Planning System*
- NSRP 0006 Paper #22  
*Increased Shipbuilding Productivity through Production Engineering*
- NSRP 0007 Paper #17  
*QC Circles for Improving Quality and Productivity*
- NSRP 0007 Paper #23  
*Japanese Technology That Could Improve U.S. Shipbuilding Productivity*
- NSRP 0008 Paper #15  
*Productivity Navy Style*
- NSRP 0008 Paper #21  
*Planning and Scheduling Ship Construction Subject to Limited Resources*
- NSRP 0008 Paper #27  
*Productivity: Management's Bonus(!) or Failure(???)*

## YOUR SHIPBUILDING LIBRARY

The National Shipbuilding Research and Documentation Center of the University of Michigan Transportation Research Institute is your source for all shipbuilding research information. Included are all reports produced by the NSRP since its beginning in 1973, SNAME Ship Production Symposia papers, and a variety of technical and nontechnical shipbuilding information from other sources. The National Shipbuilding Research and Documentation Center is comprised of two libraries which are continually updated with the latest research and informational material.

The Publications Library has over 400 written documents, symposia proceedings, books, research reports, papers, etc., in both microfiche and hard copy format. Documents from the Publications Library can be purchased in either of these formats for quick access, duplication and shipping. The annually updated *Bibliography of Publications* lists all available documents topically and provides brief abstracts for each entry.

The AVMAST Library (AudioVisual Material Available for Shipyard Training) has more than 500 films, videotapes, slides, and other materials in its collection. AVMAST library materials can be borrowed by persons in the shipyard or the U.S. Navy for a minimal shipping and handling fee. The *Catalogue of AudioVisual Material Available for Shipyard Training* is published annually and lists all AVMAST materials and other materials topically. It also provides a brief abstract for each material. Copies of some AVMAST tapes can be purchased. Complete information is available in the AVMAST Catalogue.

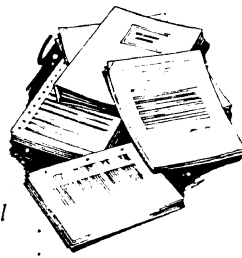
New Library Catalogues are now available on-line for use on the Internet. The Catalogues can also be accessed on the World Wide Web at <http://www.lib.umich.edu/shipbuilding>. For more information, please call the Documentation Center at (313) 5763-2465; write to the Documentation Center, Marine Systems Division, UMTRI, 2901 Baxter Road, Ann Arbor MI 48109-2150; or send an e-mail message to [doccenter@umich.edu](mailto:doccenter@umich.edu) ■

continued on next page

## Benchmarking...

continued from previous page

- NSRP 0009 Paper #5  
*Small Shipyard Productivity Increases Through Integrated Manpower, Schedule and Material Control*
- NSRP 0013 - 0030  
*Levingston Studies of IHI Processes*
- NSRP 0081  
*Technology Survey of Major U.S. Shipyards*
- NSRP 0094  
*Survey of Japanese Shipyards*
- NSRP 0100  
*Project Report - Stimulating the U.S. Shipbuilding Industry to Improve Productivity*
- NSRP 0107  
*Weld Defect Tolerance Study*
- NSRP 0109  
*Japanese Technology that Could Help U.S. Shipbuilding*
- NSRP 0126  
*Navy Weld Defect Tolerance Study*
- NSRP 0157  
*Scheduling Standards Pilot Project Summary Report*
- NSRP 0158  
*Cathodic Protection/Partial Coatings vs. Complete Coatings in Tanks*
- NSRP 0185  
*A Survey of CAD/CAM Technology Applications in U.S. Shipbuilding*
- NSRP 0198  
*Evaluation of Two Multi-Shipyard Cooperative Apprentice Training Programs*
- NSRP 0199  
*A Primer on an Approach to Planning and Production Control in a Smaller Shipyard*
- NSRP 0205  
*Cathodic Protection/Partial Coatings vs. Complete Coatings in Tanks - A Project Update*
- NSRP 0206  
*Slew Cranes In Shipyards*
- NSRP 0228  
*Marine Coatings Performance - A Six Year Report*
- NSRP 0239  
*U.S. Shipbuilding - Phase I*
- NSRP 0251  
*Tower Cranes In Shipyards*
- NSRP 0280  
*Cathodic Protection/Partial Coatings vs. Complete Coatings in Tanks - Five Year Report*
- NSRP 0288  
*Marine Coatings Performance - Ten Year Report*
- NSRP 0312  
*Evaluation of New Surface Preparation and Coating Repair Techniques in Ballast Tanks*
- NSRP 0318  
*A Survey - The Principal Elements of Safety Program of Nine Major American Shipyards*
- NSRP 0351  
*Survey of Programs Designed to Improve Employee Morale In Seven Major American Shipyards*
- NSRP 0369  
*Evaluation of New Surface Preparation and Coating Repair Techniques in Ballast Tanks - Final Report*
- NSRP 0371  
*North American Shipbuilding Accuracy - Phase II*
- NSRP 0397  
*Weld Shrinkage Study*
- NSRP 0434  
*Requirements and Assessments For Global Shipbuilding Competitiveness* ■



## Recent Additions to the Publications Library

### NSRP 0424

TITLE: NIDDESC STEP Application Protocol - Piping  
AUTHOR: The NIDDESC Working Group  
ABSTRACT: The NIDDESC (Navy-Industry Digital Data Exchange Standards Committee) was formed in 1987 to pursue the development of reliable mechanisms for the exchange of data describing products between dissimilar product definition systems. The purpose of this document is to specify the content and format of data, describing piping systems and attached components, to be exchanged between different product definition systems for use in a defined set of applications. This work will support the exchange of piping product information between organizations with a common need for such data. (220 p.)

### NSRP 0425

TITLE: NIDDESC STEP Application Protocol - Electrical Cableway  
AUTHOR: The NIDDESC Working Group  
ABSTRACT: This document specifies the format and content of data, describing electrical cableway systems and attached components, to be exchanged between different product definition systems for use in a defined set of applications. The purpose of this application protocol (AP) is to support the exchange of electrical cableway information between organizations with a common need for that data. (241 p.)

### NSRP 0426

TITLE: NIDDESC STEP Application Protocol - HVAC  
AUTHOR: The NIDDESC Working Group  
ABSTRACT: This document specifies the format and content of data describing HVAC systems and attached components. (212 p.)

### NSRP 0427

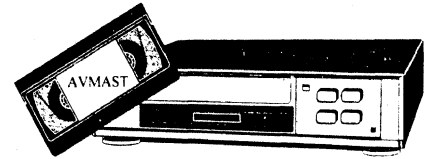
TITLE: NIDDESC STEP Application Protocol - Configuration Management Model  
AUTHOR: The NIDDESC Working Group  
ABSTRACT: This report introduces the NIDDESC Configuration Management Model. The model is intended to provide the information structures necessary to support the exchange of ship configuration status accounting data between enterprises. It includes control of change to the product items and interrelationships contained in the product model, and supports the entire life cycle; design construction, operation and maintenance. The model provides information structures for product versioning, hull applicability, product approval, product promotion, and product structuring, and is intended as a common template for NIDDESC Application Protocols. (92 p.)

### NSRP 0428

TITLE: NIDDESC STEP Application Protocol - Outfit and Furnishings  
AUTHOR: The NIDDESC Working Group  
ABSTRACT: This document specifies the content and format of data describing outfit and furnishing systems and attached components and equipment. This data is to be exchanged between dissimilar product definition systems for use in a defined set of applications. The purpose of such a specification, or application protocol (AP), is to support the exchange of outfit and furnishing information between organizations with a common need for the data. (184 p.)

### NSRP 0429

TITLE: NIDDESC STEP Application Protocol - Ship Structure  
AUTHOR: The NIDDESC Working Group  
ABSTRACT: This International Standard specifies the structures for the exchange of three-dimensional product definition data and its configuration status for Naval ship structural systems. It has been subdivided onto eight units of functionality 1) ship geometry, 2) hull product structure, 3) structural plate parts, 4) structural stiffener parts, 5) structural openings, 6) structural connections/joints, 7) internal subdivisions, and 8) standard parts, and has been developed to support the shipbuilding activities and applications associated with the early stages of design and manufacturing. (761 p.) ■



## Recent Additions to the AVMAST Library

### USN 404: Cable/Cableways, Banding

These materials concern the procedures that must be followed when banding ship's electrical cable. They have been revised to reflect 1991 changes in the NAVSEA Electric Plant Installation Standard Methods Manual (Instructor Guide and Student Guide).

### USN 405: Respirator Control and Issue

This tape concerns the control and issue of respirators by tool room attendants. It also outlines procedures for the selection, storage, and identification of respirators for everyday and emergency uses (Instructor Guide, Student Guide, and Job Performance Aid). [3/4" UMATIC...16 min.]

### USN 406: Electrical - Cable/Cableways, Stuffing Tubes

This package shows procedures that must be followed during the installation of packing and stuffing tubes. Components, uses, and proper packing methods are discussed. The materials have been revised to reflect 1991 changes in the NAVSEA Electric Plant Installation Standard Methods Manual (Instructor Guide and Student Guide). [3/4" UMATIC...17 min.] ■

# Call For Papers

## 1997 Ship Production SYMPOSIUM

New Orleans, Louisiana March 13-15, 1997

### International Competitiveness by 2000 — A Progress Report

Hosted by the Gulf Section  
and Sponsored by the Ship  
Production Committee of  
the Society of Naval  
Architects and Marine  
Engineers

- Agile Competitiveness
- Accuracy Control and Measurement
- Integrated Product and Process Development
- Education and Training
- Industrial Engineering and Automation
- World Class Procurement
- Quality Control
- Planning/Control
- Surface Preparation and Coatings
- Virtual Organizations
- Producibility Improvements
- Facilities
- Environmental Effects
- People Power
- Marine Industry Standards
- Outfitting and Production Aids
- Product Work Breakdown Structure
- Progress Reports on MARITECH Projects

## NSRP Panel Activities



SP-1, Facilities and Environmental Effects, met in San Diego, October 18-20 and dedicated one afternoon to long-range strategic

planning. The members created a new panel mission and new goals and objectives that are in line with the ECB's recently developed Thrust Areas. During the planning session, panel members also developed a checklist to be used during the brainstorming of FY-97 projects. This checklist ensured that potential projects focused on the ECB's Thrust Areas. The members developed 43 possible projects, they will review and vote on these abstracts during their March 1996 meeting in Denver, Colorado.

During the third quarter of 1995, there were six SP-1 projects completed and final reports distributed.

0441 N1-92-1, *Evaluation of Toxic Air Emissions*

0444 N1-02-2, *Subtask 7, CAA Title V Permit Certification*

0445 N1-89-2, *Subtask 2, Historical Overview of VOC Emissions*

0449 N1-89-2, *Subtask 5, Abatement of Marine Coatings Containing Heavy Metals*

0452 N1-93-8, *Filtration of Runoff from Pressure Washing Vessel Hull in Drydock*

0453 N1-92-3 *Environmental Restoration Guide*

At the October meeting, the panel members were given an update on each of SP-1's active projects.

N1-92-2, the third phase of *Environmental Studies and Testing*, is moving right along. There are five active subtasks:

Subtask 6, EPCRA Section 313 (Form R) Reporting Consistency; Subtask 8, Common Sense Initiative Study for the Shipbuilding Industry; Subtask 9, Development of Comments of Proposed Rule MP&M, Phase I; Subtask 10, Interim Tracking Contaminated Sediment Management; and Subtask 11, Regulatory Reform.

NASSCO is performing N1-93-1, *Study of the Treatment, Recycling, and Disposal of Spent Abrasive*. This project is approximately 45% complete and on schedule. Phase I was completed in October 1995 and Phase II should be starting before the end of the year. This project will analyze and determine the most cost effective options available to shipyards for the treatment, reuse, recycling, and disposal of spent abrasive, particularly mineral slags.

*continued on page 11*

I am interested in preparing a paper for the 1997 Ship Production Symposium. I will provide a one-page abstract. Deadlines are listed below:

- Paper abstracts are due March 27, 1996. • First draft manuscripts are due July 22, 1996.
- Authors of accepted abstracts will be notified by April 24, 1996

Tentative Paper Title: \_\_\_\_\_

Author(s): \_\_\_\_\_

Organization: \_\_\_\_\_

Address: \_\_\_\_\_

City/State/zip: \_\_\_\_\_

Country: \_\_\_\_\_

Telephone: \_\_\_\_\_ Fax: \_\_\_\_\_

Please return to: NSRP 1997 Ship Production Symposium Coordinator, SNAME, 601 Pavonia Avenue, Jersey City, NJ 07306, phone: (201)798-4800, fax: (201)798-4975.

**San Diego, California**  
**February 14-16, 1996**  
**Hyatt Regency**

Sponsored by The Ship Production Committee and  
hosted by the San Diego Section of the Society of  
Naval Architects and Marine Engineers

# 1996 Ship Production **SYMPOSIUM** & *Exhibition*

## **“International Commercial Competitiveness in the Year 2000 and Fleet Support & Maintenance”**

*Over the three days of the Symposium,  
some 65 sessions will be presented,  
of which approximately:*

- 70% will be formal papers.*
- 15% will be panel discussions addressing  
key technical issues in open debate.*
- 10% will be case studies where  
shipyards will present particular  
issues of common interest.*
- 5% will be talks or idea market places to  
allow full exchange of ideas  
in a free-style setting.*

*The Symposium will place high emphasis on  
international participation with up to 25%  
of sessions being presented by European or  
Far Eastern ship yard representatives  
and 10% presented jointly by U.S.  
and foreign yards and vendors.*

*The Technical Program is  
accurate at time of printing but  
is subject to change and  
revision without notice.*

*Dear Attendee:*

*You are cordially invited to participate in the SNAME/NSRP Ship Production Symposium, on February 14-16, 1996 and the NSRP CAD/CAM/CIM Workshop on February 12-13, 1996 at the Hyatt Regency, La Jolla in beautiful San Diego, California.*

*This Symposium is the only annual event in the United States to present shipbuilding technologies through technical presentations and exhibits ranging from computer-aided design and robotics, to predictive maintenance, marine coatings, and training. The theme of the Symposium is “International Commercial Competitiveness in the Year 2000, Fleet Support and Maintenance.” It will provide a forum for you to interact with expert authors, shipbuilders, designers, owners, and marine specialists. The Symposium will showcase and discuss technical subjects of common interest to the ship production and support communities. You will have plenty of opportunities to meet and share ideas with these industry leaders.*

*The Ship Production Symposium’s technical program focuses on in-depth presentations on a broad variety of topics and is designed for shipbuilders and experts from North America, Europe, and the Far East. Subjects are arranged by tracks, with information geared toward these specific audiences:*

- Senior Management, including shipyard leaders and regulatory policy makers.*
- Technical Management, including line management and decision makers in the ship design and construction business.*
- Ship Conversion and Maintenance, including the ship repair community.*

*The CAD/CAM/CIM Workshop will identify the key features of systems currently operating at world-class shipyards and will discuss critical planning and implementation issues which most significantly contribute to the success of those companies.*

*Total attendance is expected to be between 400 and 600 professionals. For those attendees arriving early, there is a get-acquainted reception scheduled for Tuesday, February 13, from 6:30 p.m. to 8:30 p.m. in the exhibit hall.*

*Space is limited, so make your reservations now and take this opportunity to experience this valuable forum with major industry leaders.*

*We look forward to seeing you at the Symposium and/or the Workshop.*

*Sincerely,  
Peter Jaquith, Conference Committee Chair*

# Symposium Highlights

February 14-16, 1996

## SHIP PRODUCTION SYMPOSIUM PROGRAM

### Wednesday 14 February

Time	Executive Track	Technical Track	Maintenance/Repair Track
0730	Registration		
0830	INTRODUCTION AND WELCOME TO SAN DIEGO & THE SHIP PRODUCTION SYMPOSIUM Richard H. Vortmann, CEO National Steel and Shipbuilding		
	INTERNATIONAL SHIPBUILDING MARKET Guest Speaker - Carlos Martinez de Albornoz, Head Astilleros Españoles (AES) and Chairman Euroyards		
0930	Break		
1000	<b>COMMERCIAL MARKETING</b> <i>International Marketing Study</i> Paul Stott	<b>DESIGN AND PRODUCTION PROCESSES</b> <i>Design for Assembly/Manufacturability: Winning the Global Manufacturing War By Design</i> Case Studies Facilitated by A. Sandy Munro	<b>COMMERCIAL MAINTENANCE AND REPAIR</b> <i>COMMERCIAL REPAIR INTERNATIONAL MARKET</i> Panel Discussion with U.S. and Foreign Repair Managers Facilitated by Mitchell E. Steller
	<i>Ship Construction Financing</i> Nancy Mattson	<b>PRODUCTION ENGINEERING, A MISSING FUNCTION?</b> <i>Panel Discussion with U.S. and Foreign Design and Production Managers</i> Facilitated by Peter E. Jaquith	<i>Creating Market Winners Through Innovative Major Conversions</i> Case Studies by Hans-Michael Meissner, Wesley D. Wheeler
	<b>COMMERCIAL MARKETING</b> <i>Panel Discussion with U.S. Shipbuilding Marketing Executives</i> Facilitated by Paul Stott		
1200	Lunch - US Maritime Policy Guest Speaker - VADM Herberger, Maritime Administration		
1330	<b>MARITECH DEVELOPMENT PROJECTS</b> <i>CURRENT SUCCESSES AND LESSONS LEARNED</i> Panel Discussion with U.S. Shipbuilding Executives Facilitated by Robert Schaftran	<b>DESIGN AND PRODUCTION PROCESSES</b> (Cont) <i>Concurrent Engineering Applications</i> (Author to be Determined)	<b>NAVY MAINTENANCE AND REPAIR</b> <i>Navy Phase Maintenance Strategy</i> (Author to be determined)
		<i>A Revolution in Warship Design: Navy-Industry Integrated Product Teams (IPT's)</i> Bob Keane, Barry Tibbitts	<i>Regional Maintenance in the Southwest Pacific: A Primer</i> Capt. R.W. Tobin
1500	Break		
1530	<b>MARITECH OPTIONS FOR THE FUTURE</b> <i>Panel Discussion with U.S. Shipbuilding Executives</i> Facilitated by Robert Schaftran	<b>INDUSTRIAL ENGINEERING APPLICATIONS</b> Case Studies Facilitated by Massood Gaskari	<i>The Future of Navy Ship Maintenance: One Point of View</i> Capt. Gerald B. Blanton
			<i>Ready Reserve Fleet: Ship Maintenance and Activations</i> Owen J. Doherty
1900	DINNER AT SCRIPPS - STEPHEN BIRCH AQUARIUM		

## Thursday 15 February A.M.

Time	Executive Track			Technical Track
730	Registration			
830	<b>CAD/CAM/CIM AUTOMATION AND ACCURACY CONTROL</b>  <i>CAD/CAM/CIM EXECUTIVE REPORT</i> <i>Paper and Panel</i> Facilitated by John Horvath and Richard Moore		<b>COMMERCIAL MAINTENANCE AND REPAIR</b> (Cont) <i>Communication Needs in Engine Maintenance</i> Ingmar Ahlqvist, Borje Fagelklo	<b>TRAINING, HR, SAFETY, AND ENVIRONMENTAL</b>  <i>The Systemic Approach to Employee Development: The Key to Competitive Advantage</i> Chris Chen
			<i>Marine Engine Performance, Monitoring and Maintenance</i> Edward Matthews	<i>Apprenticeship Roundtable</i> Pamela B. Cohen
1000	Break			
1030	<b>BUSINESS REALIGNMENT</b>  <i>Strategic Planning: Hype or Business Tool?</i> Pete Babich	<b>CAD/CAM/CIM AUTOMATION AND ACCURACY CONTROL</b> (Cont) <i>Implementing a World Class Shipbuilding System</i> Douglas Martin, William Hale, Rick Lovdahl, Brian Scott	<i>Security Assistance Program at the Naval Sea Systems Command</i> Capt. R.P. Fiske	<b>TRAINING, HR, SAFETY, AND ENVIRONMENTAL</b> (Cont) <i>Employee Training Development in the 90's</i> Jack Cavanaugh
	<i>Using Benchmarking, Best Practices &amp; Outsiders to Create Breakthrough Ideas</i> A. Sandy Munro	<i>Making the Jump to Product Model Technology</i> Jonathan M. Ross, Luis Garcia	<b>IDEA MARKETPLACE FOR MAINTENANCE AND REPAIR</b> Facilitated by Mitchell E. Steller	<i>Workplace Innovations</i> Patricia R. Pate, Bruce Bongiorno
		<i>Development of STEP Model Database and Translators for Data Exchange Between Shipyards</i> Joyce Howell, Dan Wooley, Burt Gishner, Jeff Wyman		
1200	Lunch - NAVY ACQUISITION AND MAINTENANCE POLICY IN THE 21st CENTURY Guest Speaker - VADM Stemer, NAVSEA			

## Thursday 15 February P.M.

Time	Executive Track			
1330	<b>BUSINESS REALIGNMENT</b> (Cont) <i>Shipyard Reengineering</i> Mitchell E. Steller, Tom Brewton, Gary R. Laughlin	<b>CAD/CAM/CIM AUTOMATION AND ACCURACY CONTROL</b> (Cont) <i>Completely Computer Integrated Ship Production - Fantasy or Near Upcoming Reality</i> Einar Pedersen, Stig Aga, Jon Fredrik Hatling, Karl Erik Kjelstad	<b>DESIGN AND PRODUCTION PROCESSES</b> (Cont) <i>SHIPBOARD TEST PROGRAMS FOR COMMERCIAL SHIP NEW CONSTRUCTION AND MAJOR CONVERSION</i> <i>Panel Discussion with U.S. and Foreign Test and Trials Managers</i> Facilitated by Glenn Ashe	<b>TRAINING, HR, SAFETY, AND ENVIRONMENTAL</b> (Cont) <i>Human Resource Innovation</i> Chuck Rupy
		<i>Flexible Robotics for Shipbuilding Meeting the Productivity Challenge</i> Ron Reeve, Robert Rongo	<i>Preconstruction Primers for Improved Shipyard Efficiency</i> John Kelly	<i>A Model of Environmental Management System Introduced in the Shipyards of "Astilleros Españoles" Group</i> Jesús Casus Rodríguez
	<b>SHIP BUILDER/SUPPLIER PARTNERSHIPS</b> <i>Case Studies</i> Facilitated by Philip R.J. Lloyd	<i>Automatic Programming System for Shipyard Robots</i> Fritz Prinz, Sivram Nallun, Scott McGhee, Ron Reeve, Robert Rongo, Jim Hemmerle		
1500	Break			
	<b>WORLD-CLASS MANUFACTURING</b> <i>North American Industry Case Studies</i> Facilitated by Jay Carson	<i>The Reason for Robotization in Shipbuilding</i> Carl Erik Skjoldstrup	<i>15-Year Ballast Tank Coating</i> By Hemple Marine (Author to be Determined)	<i>Environmental Compliance in the 90's Japanese Yard</i> (Author to be Determined)
				<i>U.S. Navy Enhanced Tank Preservation Procedure: Pilot Program Application on Selected Ships</i> Alexis Kaznoff, A. Richard Parks, Gordon Kuljian
	<i>Advanced Welding Robot System to Ship Hull Assembly</i> Yasuhisa Okumoto			
1830	RECEPTION			
1930	Dinner - ECONOMIC DEVELOPMENT AND THE SHIPBUILDING MARKETPLACE IN THE EARLY 21st CENTURY Guest Speaker - Paul Slater, CEO First International Group of Companies			



# Friday 16 February

Time	Executive Track			
0830	<b>U.S. DESIGN &amp; PRODUCTION INNOVATIONS</b>  <i>Double Eagle, Design and Production Innovations</i> Mike Keenan	<b>STRATEGIC APPROACH TO SHIPBUILDING STANDARDS</b>  <i>N6-94-1 World Class Shipbuilding Standards</i> Philip R.J. Lloyd, Walter Devine, Devens D. Arnett  <i>International Standards for Marine Shipbuilding Applications</i> Sjoerd Hengst	<b>SHIPYARD FACILITIES AND MAINTENANCE</b>  <i>Development and Evaluation of Marmara Shipyard's Expansion Programme</i> A. Yücel Odaba İ, Selim Alkaner, İ. Aykut. Öiçer	<b>CAD/CAM/CIM AUTOMATION AND ACCURACY CONTROL</b> (Cont) <i>The Development of a Welding Protocol for Automated Shipyard Manufacturing Systems</i> Joel Milano, S. Douglas Mauk, Ben Kassel  <i>A Predictive Technique for Bucking Analysis of Thin Section Panels Due to Welding</i> Panagiotis Michaleris, Andrew DeBiccan
	<i>Modular Engine Room Design and Construction for the Strategic Sealift Ships</i> Peter E. Jaquith, B.J. Fontaine, John Silveira, Steve Dunbarr, Harry Nelson, Richard Burns	<i>ISO/IMO/IACS Relationships and Initiatives</i> Charles Piersall	<i>Shipyard Modernization, A Shipbuilder's Experience</i> Ron J. McAlear	<i>Control of Distortion in Thin Ship Panels</i> Chris Conrardy, Randy Dull
	<i>Midterm Sealift Technology Development Program (Author to be Determined)</i>	<i>Standardization in the Chinese Shipbuilding Theater (Author to be Determined)</i>  <i>USCG Alternate Compliance Program (Author to be Determined)</i>	<i>Advanced Maintenance Strategies... the Revolution in Industrial Maintenance, It's Here Today, or is it?</i> Kevin E. Carey	<i>Video Photogrammetry in Shipbuilding</i> John D. Brown
1030	Break			
1100	<b>PLAN TO ACHIEVE WORLD CLASS PRODUCTIVITY</b> <i>Panel Discussion with U.S. Shipbuilding Operations Executives</i> Facilitated by Edmund C. Mortimer			



## Registration

Registration is due by January 12, 1996. Registrations received after January 12, 1996 will be subject to a fee increase. Symposium fees are listed below.

Registration and fees for both the workshop and the Symposium may be mailed to: SNAME c/o Concepts Meeting & Trade Show Mgmt., 6540 Lusk Blvd., Suite C-124, San Diego, CA 92121. For information or forms, please contact Marissa Patino at (619)535-0050 or send an e-mail message to: [planners@conceptsmeet.com](mailto:planners@conceptsmeet.com).

If you are paying by credit card, you may register by faxing a registration form to (619) 535-8252. If you register by fax, do not send your registration by mail.

### Ship Production Symposium February 14-16, 1996

- SNAME Member ..... \$250
- Non Member ..... \$300
- Student ..... \$50

The following food functions will be included in the full registration fee: Wednesday, Lunch; Thursday, Lunch; and Dinner Banquet (Guests may attend the banquet for \$35 each.) Registrations received after January 12, 1996 will be subject to a \$50 increase.

### CAD/CAM/CIM Workshop February 12-13, 1996

- SNAME Member ..... \$120
  - Non Member ..... \$120
  - Student ..... \$120
- Registrations received after January 12, 1996 will be subject to a \$25 increase. ■



## Hotel Accommodations

The 1996 Ship Production Symposium will be held at the beautiful Hyatt Regency, La Jolla. This landmark hotel was designed by world-famous architect Michael Graves and is located just 20 minutes north of San Diego International Airport - Lindbergh Field. Special discounted rates of \$125 for single or double occupancy are available at the Hyatt Regency, La Jolla for Symposium participants from Sunday, February 11, 1996 through Friday, February 16, 1996. There are also a limited number of rooms available at the 1996 Government per-diem. All rates are subject to applicable state, local, and any occupancy taxes in effect at the time of the Symposium. Please make your reservation early since space is limited. Check-in time is 3:00 p.m. and check-out time is noon.

To make your accommodations reservation, please contact the Hyatt Regency, La Jolla at (619)552-1234 and mention the "SNAME Ship Production Symposium" to get the discounted rate.

The hotel cut-off date is January 29, 1996. After this date, rooms may not be available. ■



## Social Activities

### Thursday Banquet

A reception and dinner banquet will be held Thursday, February 15 at 6:30 p.m. Guest speaker Paul Slater, CEO, First International Group of Companies will discuss "Economic Development and the Shipbuilding Marketplace in the Early 21<sup>st</sup> Century"

This event is included in the registration fee for all Symposium attendees; guests may attend for \$35 each.

### Dinner at the Stephen Birch Aquarium-Museum

Join your friends and colleagues for an enchanting evening and dinner at the renowned Stephen Birch Aquarium-Museum. This exciting event is scheduled for Wednesday, February 14, 1996 at 6:45 p.m.

The Stephen Birch Aquarium-Museum is situated on a spectacular site overlooking the Pacific Ocean. This unique facility presents undersea creatures in a realistic habitat and allows visitors to experience the frontiers of marine science through interactive museum exhibits. Motor coaches will depart the hotel at 6:30 p.m. Tickets for this event are \$55 per person and guests are welcome.

### NASSCO Shipyard Tours

Don't miss the opportunity to visit National Steel and Shipbuilding Company (NASSCO) of San Diego. NASSCO is the largest shipyard on the U.S. West Coast and has constructed the majority of the commercial vessels built in the U.S. in recent years. Presently, NASSCO has an experienced workforce of approximately 5,000 men and women. Visitors will have the opportunity to visit the shipyard under working conditions. At the time of visitation, NASSCO will have one Navy supply ship, three Sea Lift conversions, and one of three Sea Lift new construction vessels under construction, with various repair projects underway. NASSCO's mission is to be the best shipyard in the world. Visits to the shipyard are scheduled for Tuesday, February 13, and Friday, February 16, 1996. Times will be announced later.

### Golf

Arrangements for golf at many of San Diego's spectacular facilities including Aviara, Carlton Oaks, Carmel Mountain Ranch, Eastlake, Temecula Creek, Torrey Pines, Mount Woodson, and Whispering Palms can be made directly through the hotel. Please contact the Concierge at the Hyatt Regency, La Jolla for more information.

### Cruises After the Symposium

Extend your trip by taking a cruise to Mexico. Choose from a three-night cruise which leaves on Friday afternoon, February 16, or a seven-night cruise departing Sunday, February 18. Rates start at \$279 for the three-night cruise and \$714 for the seven-night cruise (per person based on double occupancy). For more information, call Cruise Holidays of Downtown San Diego at (619)239-SAIL (7245) or (800)339-SAIL. ■

## Official

United Airlines and Delta Airlines are the official carriers for the SNAME Symposium.

- To reserve at the discounted rates on United Airlines, please call (800)521-4041 and reference the SNAME Symposium ID code 560YP. Meeting desk hours are 7:00 a.m. - 10:00 p.m. ET.
- To reserve at the discounted rates on Delta Airlines, please call (800)241-6760 and use the SNAME reference code XC0020. Delta's Meeting Network Sales desk hours are 8:00 a.m. - 11:00 p.m. ET. ■

*The Technical Program is accurate at time of printing but is subject to change and revision without notice.*

## CAD/CAM/CIM Workshop

# Highlights

February 12-13, 1996

The CAD/CAM/CIM Workshop is a function of the NSRP sponsored project titled "Evaluate the Shipbuilding CAD/CAM Systems." This project has gathered the design systems, CAM process automation, and production control systems expertise of a number of U.S. shipyards and supplier companies to evaluate and analyze the state-of-the-art in shipbuilding computer systems integration. The primary objective of the project is to identify the key features of CAD/CAM systems implementation at world class shipyards which most significantly contribute to the success of those companies in commercial shipbuilding.

### This workshop will provide:

- Exposure to the strategies of companies that have determined that they could change both their management and process cultures to remain competitive and viable in unfavorable commercial shipbuilding market conditions.
- Understanding of how some of the most advanced and competitive shipyards in the world have gone about planning, developing, and implementing systems and process improvements to achieve high levels of performance.
- The opportunity to develop an in-depth understanding of the processes and technology in daily operation at the evaluated organizations and how these are integrated to result in a highly efficient commercial shipbuilding process.

### Topics to be Covered:

- Description of processes using CAD/CAM/CIM.
- Specific assessment findings regarding shipbuilding processes.
- Examples of processes including CAD/CAM/CIM outputs.

### CAD/CAM/CIM Implementation Case Studies:

- Top-down strategic planning of a vision or business plan.
- Process change, cultural change, and personnel involvement.
- Technology enablers and road blocks.
- Cost of doing business versus cost benefit analysis.

### Implementation Planning Demonstration:

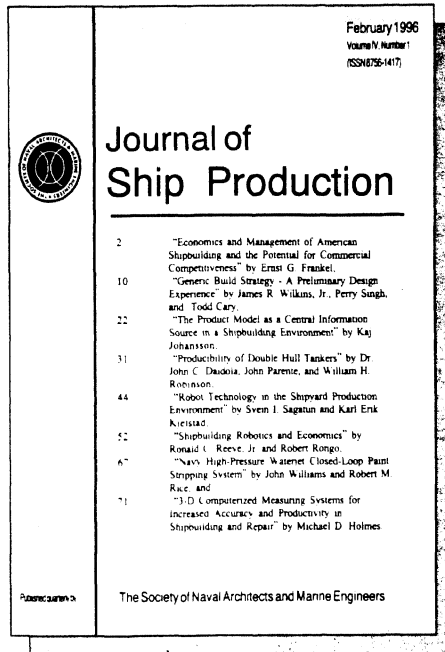
- How to get started.
- What is an effective CAD/CAM/CIM strategy?
- What comes first: technology or business vision? ■

# Journal of Ship Production

The Journal of Ship Production is a professional journal dedicated to ship production and to publishing the results of technical research relevant to shipyard professionals. For subscription information contact: SNAME, 601 Pavonia Ave., Jersey City, NJ 07306.

Following are the contents for the February 1996 issue of the Journal:

- "Economics and Management of American Shipbuilding and the Potential for Commercial Competitiveness" by Ernst G. Frankel;
- "Generic Build Strategy - A Preliminary Design Experience" by James R. Wilkins, Jr., Perry Singh, and Todd Cary;
- "The Product Model as a Central Information Source in a Shipbuilding Environment" by Kaj Johansson;
- "Producibility of Double Hull Tankers" by Dr. John C. Daidola, John Parente, and William H. Robinson;
- "Robot Technology in the Shipyard Production Environment" by Svein I. Sagatun and Karl Erik Kjelstad;



- "Shipbuilding Robotics and Economics" by Ronald C. Reeve, Jr. and Robert Rongo;
- "Navy High-Pressure Waterjet Closed-Loop Paint Stripping System" by John Williams and Robert M. Rice; and
- "3-D Computerized Measuring Systems for Increased Accuracy and Productivity in Shipbuilding and Repair" by Michael D. Holmes. ■

## SHIP PRODUCTION Second Edition

*Richard L. Storch, Colin P. Hammon,  
Howard M. Bunch, & Richard C. Moore*

This work has been completely revised and updated to reflect current information and practice in the shipbuilding industry. In particular, the portion of the book dealing with ship repair, overhaul, and conversion has been significantly expanded. The overall system described in the book will not reflect practice in any one shipyard; instead, it presents a unified shipbuilding system from which understanding of the total process can be obtained. The book serves as a valuable resource for practicing shipbuilding professionals, and is also suitable for teaching at the university level. *Ship Production* is published jointly by SNAME (call (800)798-2188) and Cornell Maritime Press (call (800)638-7641). The price is \$80; SNAME members can purchase the book (from SNAME) for \$60.



# NSRP Panel Activities

*continued from page 5*

Different types of technology available for the treatment of spent abrasive will be identified and testing will be performed to determine the effectiveness of the reused abrasive, and options for recycling and disposal of the spent abrasive. Any methods available to process the hazardous components will be evaluated.

**N1-93-3, Waste Water Treatment Technology Survey** is being performed by Bath Iron Works. This project is 15% complete. The objective of this project is to review the currently available waste water treatment systems that can effectively remove hydrocarbons from an oily water mixture without the need to transport and/or store the waste water prior to discharge. The selected waste water technologies will be evaluated on their technical soundness, reliability, and cost effectiveness in the removal of oil from fuel compensating ballast tanks when a ship is being overhauled at a shipyard. This technology will be required to meet current and possible future discharge limits under the Clean Water Act.

**Title V Permit for Shipyards: Strategy Guide for Development of General Permit, N1-94-1**, is being performed by Austin Environmental, Inc. and is 30% complete. The project's objective is to assist shipyards in dealing with the upcoming Title V permitting process, inform the shipyards of Title V Federal Operating Permit procedures, and show them how the industry should interact with the process.

**N1-94-2, Environmental Training Module - Phase I**, is being performed by NASSCO and Austin Environmental, Inc. Module one is complete and work has started on modules two and three. This project will provide training modules which will cover environmental topics that affect all shipyards which perform new construction and repair operations.

NASSCO is performing **Development of Shipbuilding and Repair Air BMP, N1-94-4**. The project is on schedule and 80% complete. The objectives of the project are: 1) perform shipyard surveys of characteristic criteria pollutant and HAPs emitting processes, 2) evaluate control techniques and options to minimize uncontrolled air emissions, and 3) establish standardized Air Quality BMPs for the shipbuilding and repair industry.

**Solid Waste Segregation and Recycling, N1-94-5**, is being performed by Austin  
*continued on next page*

# NSRP Panel Activities

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Environmental, Inc. This project is 35% complete and the first deliverable has been given to program management for review. The objective of the project is to research and identify methods and equipment to effectively segregate, minimize, and recycle shipyard waste materials. Through this effort, shipyards will reduce the cost of disposing of their waste. ■

## SP-3 SURFACE PREPARATION AND COATING

SP-3, Surface and Preparation and Coating, met in San Diego October 16-17, 1995 and jointly with SP-1, Facilities and Environmental Effects on October 17. The SP-3 session was devoted largely to long range planning. The new mission statement developed by the panel is: "To be acknowledged as the world's authority for surface preparation and coating for the marine industry."

Following the planning session, the panel prepared a list of project ideas to be expanded into abstracts for consideration by the panel at the next meeting. The projects that receive a majority of panel member votes will be presented to the ECB for approval for funding in FY-97. Any shipyard wishing to submit an abstract for consideration by the panel may do so by contacting John Meacham (414)743-5574 x281 or Kay Freeman (601)935-3919 for submittal format and instructions. All abstracts are due to John by January 20, 1996.

The next panel meeting will be held March 6-7, 1995 at the Sheraton — Denver West. The panel will visit West Colorado School of Mines, where Professor Stephen Liu is heading an NSRP Panel SP-7 project to study the problems of welding through primers. This is a very exciting project which views the problem of welding through primer coats as a welding problem as well as a coatings problem. The benefits of this project to the shipbuilding industry are expected to be great.

Work has recently begun on two SP-3 projects. N3-95-5, *Cost Effective Total Enclosure System for Surface Preparation and Coating in Dry Docks* (Alaska Ship & Dry Dock) and N3-95-7, *User's Guide to Selection of Blasting Abrasives* (Steel Structures Painting Council.) ■

## SP-4 DESIGN/ PRODUCTION INTEGRATION

SP-4, Design/ Production Integration, has recently completed one project and has four other projects in work. NSRP Report 0443 titled "U.S. Shipbuilding - International Market Study" was performed by A&P Appledore International and issued in June 1995. In the study, a shipbuilding demand forecast was developed for the ten year period from 1996 through 2005 from a detailed review of 58 separate categories of ship size and type. World shipbuilding capacity analysis and other factors impacting the supply/demand balance such as product life cycle, legislative pressures, fleet nationality, and domestic ordering preferences were considered in identifying particular market factors with potential for penetration by U.S. shipyards. Much of this study and another SP-4 study published earlier this year, NSRP Report 0434 titled "Requirements and Assessments for Global Shipbuilding Competitiveness," was the basis for a MARAD Conference on "Shipbuilding Competitiveness" held in Washington D.C. in July 1995. Anyone interested in obtaining a copy of these reports may contact the NSRP Publications Coordinator at (313)763-2465.

The four projects currently in work are: N4-94-1, *Evaluate Shipbuilding CAD/CAM Systems*. This project is being performed by a team that includes people from NASSCO, Newport News, Bath Iron Works, Avondale, McDermott, CYBO Robots, Proteus Engineering, and the University of Michigan-Marine Systems Division. The goals of this three phase project include 1) evaluating existing state-of-the-art shipbuilding CAD CAM processes, 2) defining requirements for a future integrated system, and 3) developing specifications for software modules of these requirements. The project is currently in its first phase. A Quality Function Deployment (QFD) approach has been used to identify a variety of "needs" for CAD CAM systems and to establish an evaluation methodology to be used in visits overseas. Approximately 400 questions have been generated and refined into major need categories. Visits to shipyards in Europe and Japan are planned for this quarter.

N4-94-3, *Convert NIDDESC Standards to ISO Standards*. This project is being performed by a team that includes the original NIDDESC authors from Newport News, NASSCO, and Ingalls Shipbuilding. The goal of this project is to gain acceptance of the five NIDDESC protocols for ship arrangements (AP215), ship molded form (AP216), ship piping (AP217), ship structure (AP218), and ship mechanical systems (AP226) as international standards

by the International Standards Organization. To date, AP216 has been voted to be approved for CDC with suggested changes to naval ship reference origin and all internal surfaces included. APs 215 and 217 are soon to be presented to the ISO Shipbuilding Working Group for a vote to more forward CDC. Earlier differences between the project team and Maritime concerning the definition for ship's structure have largely been resolved with the AP now more closely resembling the initial NIDDESC definition.

N4-93-6, *Develop a Common Sense Design Manual for the Producibility of Hull Foundations*. This project is being accomplished by VIBTECH, Inc. and is nearing completion. Mr. John Hopkinson, President of VIBTECH, gave a presentation of results for this project at the last SP-4 meeting in June at Bath Iron Works. A questionnaire had been sent to shipyards to identify existing design and producibility problems and recommendations. Significant common problems found through this effort include a lack of standard design footprint dimensions and bolting pattern for equipment, lack of timely VFI to support drawing schedules sufficient to support foundation designs, costly over design of foundations for shock requirements, and designers often only copying previous foundation designs thus disregarding possible improvements. Strong recommendations by most of the shipyards include simplifying 3010 design requirements for foundations into an easy-to-use cookbook and providing designers with "mounting methods" guidance. A number of strategies to improve foundation producibility were presented to the panel (with examples) including developing standard foundations, simplifying the designs to reduce fitting requirements, lifting foundations off structure, simplifying the hull equipment items, minimizing bolt chocking and brackets, simplifying installation connections, and planning for the earliest possible installation on subassemblies. Regarding standard foundations, a list of 27 standard frame, truss, and grillage foundation types were presented that maximize producibility.

N4-94-5, *Develop Methods to Implement Results of Past NSRP Projects*. This project is being accomplished by Bernier & Associates. The first of three surveys has been completed and focuses upon the industry awareness of the NSRP. The first survey included responses from 89 individuals including 65 representatives from 20 commercial shipyards. Through use of an electronic questionnaire, Bernier & Associates was able to obtain an unprecedented 85% response rate. Some interesting results are the NSRP News was found to be by far the most frequently used source for

## Regional Short Courses on Shipbuilding and Ship Repair

*please see the SP-9  
panel report on  
page 14 for more  
information*

### QUALITY FUNCTION DEPLOYMENT

October 19-20, 1995 Seattle, Washington  
November 9-10, 1995 Mobile, Alabama  
December 14-15, 1995 San Diego, California

### DESIGN FOR PRODUCTION

November 8-10, 1995 Seattle, Washington  
Nov. 29 - Dec. 1, 1995 Newport News, Virginia  
December 18-20, 1995 Mobile, Alabama  
January 8-10, 1996 San Diego, California  
Jan. 31- Feb. 2, 1996 Bath, Maine

### MODERN COMMERCIAL SHIP PRODUCTION

November 8-10, 1995 San Diego, California  
November 15-17, 1995 Bath, Maine  
November 28-30, 1995 Mobile, Alabama  
December 13-15, 1995 Newport News, Virginia  
Feb. 28-Mar. 1, 1996 Seattle, Washington

### ADVANCED TECHNOLOGY

January 4-5, 1996 Mobile, Alabama  
February 12-13, 1996 San Diego, California  
Feb. 28 - Mar. 1, 1996 Seattle, Washington  
March 4-5, 1996 Bath, Maine  
April 18-19, 1996 Newport News, Virginia

### ZONE TECHNOLOGY IMPLEMENTATION TO SHIP REPAIR AND OVERHAUL

March 6-8, 1996 Jacksonville, Florida  
March 20-22, 1996 Baltimore, Maryland  
April 10-12, 1996 San Diego, California  
April 25-27, 1996 Seattle, Washington

management are active members on this committee.

The panel is also working closely with SP-9 on a number of education and training subjects. One potential project is to develop a number of safety training videos to capture various shipbuilding/ship repair processes. These videos would be made available to the industry in order to reduce the occurrence of injuries to our workers and to reduce costs due to lost time, medical, workers compensation, etc.

A number of other subject areas are being addressed involving ergonomics, quality circles, etc. which involve both labor and management. In fact, at the September convention of the Metal Trades Department in Las Vegas, a formal proposal was made and approved by the Metal Trades Department to actively work with the SP-5 panel. As stated by Mr. Rick Tira of the I.B.E.W., "This group (SP-5) of professionals has been recognized to have accomplished a number of actions that have benefited our industry and have helped to inspire a 'team' atmosphere vs. a 'we/they' atmosphere between labor and management. In supporting the SP-5 panel, we will accelerate the process of becoming more competitive in the global shipbuilding/ship repair market." ■

information on the NSRP: in general, the great majority of individuals were found to obtain outside maritime-related information through trade journals, newsletters and conferences with specific, highly cited examples identified: improved public relations was judged as a most pressing need, and more.

In the May 1995 meeting of the NSRP Executive Control Board, two projects submitted by SP-4 were approved for funding. The first of these projects includes N4-96-1 *Activity Analysis for a World Class Design Model*. The goal of this project is to develop an engineering design process model and recommendations that U.S. shipyards can use to benchmark and improve their existing ship design processes. Detailed analysis of sequence and duration for specific engineering tasks in each stage of design will be accomplished for U.S. and leading foreign shipyards, compared, and a world class design model developed. The second project is 4-96-7 *Convert NIDDESC Standards to ISO Standards, Phase II* and involves follow-up efforts to the Phase I project currently in work. Those interested in these projects and or participating with the SP-4 Design/Production Integration Panel should contact Ronn E. Besselièvre at (601)935-2440. ■

## SP-5 HUMAN RESOURCE INNOVATIONS

SP-5, Human Resource Innovations, has been very active in following up on actions established during their "Fourth Workshop on Human Resources"

which was held in June. A number of meetings have been convened with various organizations i.e. American Shipbuilders Association (ASA), the National Institute on Occupational Safety and Health (NIOSH), NAVSEA's Human Resource Center (HRC), the Maritime Committee on Safety and Health (MACOSH) and various labor and management organizations. Per panel chairman Chuck Rupy, "The main thrust of this activity is to increase the panel's linkage with these organizations so that we work together on Human Resource subject areas to share our 'best practices' and avoid each organization 'plowing over the same ground.'"

A good example of this can be illustrated by the SP-5 project on Worker's Compensation, where over 20 individual shipbuilding ship repair companies, which represent about 50 different facilities, are participating in this project. In the safety and health areas, the panel is working with the Maritime Advisory Committee on Safety and Health to revise existing regulations as well as participate in the development of new regulations. A total of three panel members representing both labor and

## SP-8 INDUSTRIAL ENGINEERING

SP-8, Industrial Engineering, met on November 7-8, 1995 in San Diego. National Steel & Shipbuilding Company hosted the

meeting. The focus of this meeting was to brainstorm for new ideas and develop and assign abstract titles for 1997 projects. The panel utilized the ECB's newly developed Thrust Areas for brainstorming.

A portion of the panel meeting was devoted to a discussion of what can be done to increase shipyards' involvement in the panel and encourage regular attendance. It was decided that developing a good list of abstracts and their consequent approval for funding by the ECB is the key to the success of SP-8's mission. In addition, the panel chair will take on a campaigning task to promote the potential strength of industrial engineering within the industry.

The next panel meeting is scheduled for February 12-13, 1996. The focus of that meeting will be to review all abstracts and vote on a selected few to present to the ECB for funding. If a shipyard is interested in presenting an abstract in the next panel meeting, please contact Massood Gaskari, acting panel chair, at NASSCO (619)544-3447 before December 20, 1995.

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## Thrust...

continued from page 2

has achieved a significant first step in providing industry direction to the MARITECH program. It is expected that the NSRP will continue its role in helping shape the future of U.S. shipbuilding technology research.

### **Integration of Design/Engineering with Planning, Procurement, and Production**

1. Develop a world class design model that U.S. shipyards can use to benchmark and improve their existing ship design processes.
2. Assist U.S. shipyards in developing customer-oriented ship designs and production build strategies that satisfy ship owner's needs.
3. Develop simulation capabilities that allow U.S. shipyards to better define capacities and identify bottlenecks in their engineering, planning, procurement, and production processes.
4. Develop standard construction details for high volume items such as pipe and cable hangers, miscellaneous foundations, etc. that are pre-approved by classification organizations to minimize ship design and construction costs.
5. Develop methods to efficiently apply purchased designs to existing U.S. shipyard production systems.
6. Develop integration strategies that allow U.S. shipyards to attain the lowest cost for materials and equipment for commercial ships.
7. Develop methods to improve the planning and scheduling of multiple projects to prevent bottlenecks and enhance just-in-time supply of material and subassemblies to each work station.
8. Develop integration strategies to eliminate organizational barriers to efficient information exchange between engineering, planning, procurement and production organizations.
9. Further improve CAD product model definition to include information requirements for additional shipbuilding processes such as possibly greater levels of detail design and engineering analysis, material sourcing and procurement, manufacturing, quality assurance and accuracy control, and test and trials.
10. Develop CAD software to increasingly automate and/or support these additional shipbuilding processes.
11. Develop CAD systems architecture and tools for digital data transfer in support of

automation in production.

12. Map information development, dissemination, and exchange processes in ship design and construction to better identify where CAD/CAM/CIM can be effectively expanded and applied.

### **Process Modeling**

1. Apply process modeling techniques to identify and correct redundancies, inefficiencies, and constraints in critical shipbuilding processes. The process modeling must include identification and analysis of all relevant inputs and outputs to each critical process - including consideration for materials, labor, facilities, methods, consumables, policies and regulations, and organizational cultural impediments.
2. For each of the critical processes to be modeled, evaluate weighed value relative to the overall shipbuilding process to focus efforts on those processes that offer the greatest potential savings to U.S. shipyards. Intuitively, specific critical shipbuilding processes with the potential for high cost savings include: material acquisition, steel construction, outfitting, and painting.
3. For each of the critical processes, benchmark the best practices of world class shipbuilders, and other industries, and develop strategies to apply these practices within U.S. shipyards.

### **Improved Business Practices**

1. Develop methods to improve the material procurement process such as helping U.S. shipyards build relationships with suppliers, reduce regulatory impediments, increase standardization and pre-approval of supplier materials equipment allowing negotiation of only cost delivery schedule, build infrastructure for electronic transfer of information between suppliers and shipyards, and (potentially) apply industry-wide mass purchasing power.
2. Develop methods to improve interaction with regulatory bodies such as USCG, ABS, DNV, Lloyds, OSHA, etc., to minimize regulatory impacts to U.S. ship design, material procurement, and manufacturing
3. Assist U.S. shipyards in building strategic partnerships and alliances with world class commercial shipbuilders, design firms, suppliers, etc., to facilitate technology transfer and accelerate productivity improvement, and foster joint operations that improve commercial competitiveness.

# NSRP Panel Activities

continued from previous page

**SP-9**  
EDUCATION  
AND TRAINING

Response to the SP-9 Regional Short Courses on Shipbuilding and Ship Repair has been strong. The five courses are part of two NSRP projects being sponsored by SP-9: N9-94-1, *Short Courses for the Training of Shipyard Management and Workers*, and N9-91-4, *Training for Implementing Zone Technology in the Repair and Overhaul Environment*. The schedule is printed on page 13. If interest warrants, additional courses may be held in the Washington, DC, area. For further information, please contact Thomas Lamb or Mark Spicknall at (313)763-2465, Fax (313)936-1081, e-mail nalamb@umich.edu or spicknall@umich.edu.

Most of the video footage for project N9-93-5, *Video Tapes on Advanced Ship Production*, has been selected. Newport News, Avondale, Peterson Builders, NASSCO, and the Shipyard Instructional Design Center have been particularly generous in providing original footage, and best generation copies of videos from the masters. Some additional footage is needed; the project team at UMTRI is planning a trip to shoot original video at a shipyard in early December. Draft video scripts for all three tapes are complete and work is progressing on refining the scripts into a narrative nature. The scripts will be "story-boarded" so that missing video can be obtained on the shoot. The videos will be previewed at a shipyard in January. The final product will be distributed on one roughly 60-minute video tape, with instruction manuals.

The second edition of the book *Ship Production* (project N9-90-3) was released in October, 1995. Please see the advertisement on page 11 for more information. ■

4. Develop methods to improve human resource management in U.S. shipyards with particular emphasis on identifying manufacturing tasks for cross-craft skills implementation, developing craft training programs, and evaluating necessary changes in production organizational structure to support this transition. ■

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## New Library Catalogues Available

The National Shipbuilding Research and Documentation Center has completed work on updated catalogues for the Publications and AVMAST Libraries. Now presented on electronic databases, the catalogues will be distributed on floppy disks for either the Windows™ or Macintosh® operating systems. No special software is needed: the diskettes will automatically install both the databases and a search engine onto your hard disk. Like the old paper versions, the catalogues list the title, author, date published, and abstract for documents, and title, abstract, and format for AVMAST materials. Users can search the databases for names or words in all fields; boolean searches are available. A request form can be generated automatically for ordering any of the library holdings.

The electronic Catalogues will be distributed free of charge, on request. A business reply card is provided above for your convenience. You can also mail, fax, or e-mail your request to the Documentation Center. Be sure to specify if you use the Windows or Macintosh operating system. (A paper version of the Catalogues will be available for photocopying and distribution fees.)

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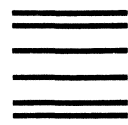
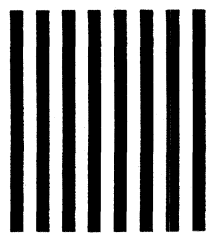
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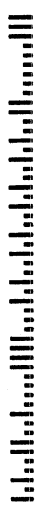
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## NSRP

MARINE SYSTEMS DIVISION  
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# NSRP *NEWS*

NATIONAL SHIPBUILDING RESEARCH PROGRAM

U.S. Navy  
Advanced Research Projects Agency  
U.S. Department of Defense and  
The University of Michigan

APRIL 1996  
VOL. 10 NO. 1



## NSNET UPDATE!

*NSnet is your electronic gateway to the shipbuilding industry. Currently, NSnet is involved in a number of exciting projects. See details inside this issue.*

**Publications Library & AVMAST Library Catalogues Now Available in Electronic Format!**

*Request your copy today! Find out more on page 15*

February 12-16. . .

# 1996 Ship Production Symposium & CAD/CAM/CIM Workshop

This year's Ship Production Symposium and CAD/CAM/CIM Workshop was held in San Diego at the La Jolla Hyatt, February 12-16. The fine weather, a strong technical program, and record-breaking exhibit numbers made this symposium the largest for over a decade with general attendance exceeding 540 professionals. The event was sponsored jointly by The Society of Naval Architects and Marine Engineers (SNAME) and the National Shipbuilding Research Program (NSRP).

Reflecting the growing optimism in the U.S. shipbuilding industry, the 1996 symposium provided a bustling and interactive forum focused on the theme of "International

including several from Europe, Japan, Korea, and China.

The symposium was preceded by a two-day CAD CAM CIM workshop which exceeded expectations by attracting more than 90 participants. The workshop included strong presentations by world class leaders in the industry, such as Torben Anderson, Executive Vice President of Development from Denmark's Odense Steel and Shipyard Company. The workshop presented computer-aided design and manufacturing through a program of case studies, papers, and exercises designed to increase U.S. awareness of CAD CAM CIM implementation.

The symposium also featured CAD CAM CIM technologies as part of a four-track program of technical presentations directed toward four audiences, namely: senior management; technical management; ship conversion and repair engineers; and those interested in human resources, safety, and training issues. Within these four tracks, the program was further subdivided into "mini-tracks" which grouped papers, case studies, and panel discussions of a similar subject into a cohesive two-and-a-half day program.

## Speakers

The symposium opened with an introduction and welcome by Richard H. Vortmann, CEO of National Steel and Shipbuilding Company of San Diego. Vortmann introduced Carlos Martinez de Albornoz, CEO of Astilleros Espanoles Group of Companies, who spoke about the international shipbuilding market and the driving forces

behind shipbuilding demand for the period 1996 to 2005. During lunch, the symposium was honored to introduce Vice-Admiral Herberger, the Administrator of MARAD, who addressed U.S. maritime policy and the challenges that await the U.S. domestic shipbuilding industry.



Members of the CAD/CAM/CIM Workshop Committee

During lunch on February 15, the Elmer L. Hann Award was presented to Paul Stott, Senior Consultant from A & P Appledore, for his work in the area of marketing. The William F. Kennedy Award was presented to William Patrick Keene, Senior Vice President, Operations, of Ingalls Shipbuilding, Inc. In addition, Dave Donohue was presented with a plaque commemorating his six years of dedicated service as chairman of the Executive Control Board (ECB). This was followed by a speech by Vice-Admiral Sterner, Commander NAVSEA, who addressed the Navy acquisition and maintenance policy in the 21<sup>st</sup> century. At the evening banquet, Paul Slater, CEO of First International Group of Companies gave a lively address entitled *Economic Development and the Shipbuilding Marketplace in the Early 21<sup>st</sup> Century*. Also at the banquet, plaques were presented to all the symposium organizing staff and committees for their effort in making the event successful.

The final event of the symposium was a panel discussion between U.S. shipbuilding executives on the U.S. plan to achieve world class productivity, with Edmund Mortimer as the moderator.



Peter Jaquith of National Steel and Shipbuilding Company of San Diego, Symposium Chairman

Commercial Competitiveness in the Year 2000, Fleet Support and Maintenance." This attracted a wide cross-section of industry executives, marine engineers, and designers and included a number of ship owners and financiers. The organizers were particularly pleased to welcome a large representation from many foreign shipyards

## Key Technical Topics

The **Commercial Marketing mini-track** included presentations on *International Marketing Study* and *Ship Construction Finance*, followed by a panel discussion on commercial marketing.

The **Maritech Development Projects** were reviewed, with panel discussions on current successes, lessons learned, and options for the future.

The **Business Realignment mini-track** included presentations on *Strategic Planning, Using Benchmarking, and Shipyard Reengineering*. A panel discussion on ship builder/supplier partnerships and world class manufacturing highlighted various case studies.

The **U.S. Design and Production Innovation mini-track** provided presentations on *Double-Eagle Design and Production, Modular Engine-Room Design and Construction for the Strategic Sealift Ships* and *Mid-Term Sealift Technology*.



Capt. Charlie Piersall introduced authors of world-class shipbuilding standards presentations

The **Design and Production Processes Program** provided presentations on *Design for Assembly/Manufacturability, Production Engineering, Concurrent Engineering Applications, A Revolution in Warship Design, Industrial Engineering Applications, Pre-Construction Primers for Improved Shipyard Efficiency, 15-Year Ballast Tank Coatings, and U.S. Navy Enhanced Tank Preservation Procedure*.

Dick Moore of the University of Michigan Transportation Research Institute, Marine Systems Division (UMTRI-MSD) moderated the **CAD/CIM/CIM Automation and Accuracy Control mini-track**, which provided presentations on National

Shipbuilding Research Program activity, *Implementation of a World Class Shipbuilding System, Making a Jump to Product Model Technology, Development of a STEP Model Database, Computer-Integrated Ship Production, U.S. Initiative for Shipbuilding Robotics, Reasons for Robotization in Shipbuilding, Advanced Welding Robot System to Ship Hull Assembly, Development of Welding Protocol for Automated Shipyard Manufacturing Systems, Predictive Technique for Buckling Analysis of Thin Ship Panels, Control of Distortion in Thin Ship Panels, and Video Photogrammetry in Shipbuilding*.

Capt. Charlie Piersall organized and moderated the mini-track on **Strategic Approach to Shipbuilding Standards**, which provided presentations on *World-Class Shipbuilding Standards, International Standards for Marine Shipbuilding Applications, ISO/IMO/IACS Relationships and Initiatives, Standardization in the Chinese Shipbuilding Theater, and United States Coast Guard Alternate Compliance Program*.

The **Training, Human Resources, Safety, and Environmental mini-track** provided provoking presentations on *A Systematic Approach to Employee Development, Apprenticeships, Employee Training Development in the 90's, Workplace Innovations, Human Resource Innovations, Environmental Management Systems in Astilleros Espanoles Shipyard, Environmental Compliance in the 90's in Japan, and Environmental Compliance in the 90's in the U.S.*

The **Shipyard Facilities and Maintenance mini-track** provided presentations on *Development of Marmara's Shipyard Expansion Program, Shipyard Modernization, and Advanced Maintenance Strategies*.

The **Commercial Maintenance and Repair Program**, provided presentations on *International Market Commercial Repair, Innovative Major Ship Conversions, Communication Needs in Engine Room Maintenance, Data Transfer of Engine, and Plant Maintenance Data and Idea Marketplace for Maintenance and Repair*.

The **Navy Maintenance and Repair mini-track** provided presentations on *Navy Phased Maintenance Strategy, the Future of Navy Ship Maintenance*, by Capt. Blanton, and *Ready Reserve Fleet Ship Maintenance*.

story continued on page 15

## Ship Production Committee Panel Meeting Calendar

### SP-1 Facilities and Environmental Effects

- July 15-17, 1996  
Norfolk, Virginia  
Contact: Michael Chee  
(619)544-7778

### SP-3 Surface Preparation and Coating

- Contact: Kay Freeman  
(601)935-3919

### SP-4 Design/Production Integration

- July 17-18, 1996  
U.S.C.G. National Maritime Center  
Arlington, Virginia  
Contact: Ronn Besselievre  
(601)935-2969

### SP-5 Human Resource Innovations

- Contact: Charles F. Rupy  
(203)433-3724

### SP-6 Marine Industry Standards

- April 1-2, 1996  
U.S.C.G. National Maritime Center  
Arlington, Virginia
- July 9-10, 1996  
Bath, Maine  
Contact: Stephen E. Laskey  
(207)442-1117

### SP-7 Welding

- August 1996 (tentative)  
Newport News, Virginia  
Contact: Lee Kvidahl  
(601)935-3564

### SP-8 Industrial Engineering

- June 11-12, 1996  
(Strategy Meeting)  
Orange, Texas  
Contact: Massood Gaskari  
(619)544-3447

### SP-9 Education and Training

- June 27-28, 1996  
Washington (state)
- October 10-11, 1996  
Bath, Maine  
Contact: Pamela B. Cohen  
(313)936-1051



# SHIP PRODUCTION SYMPOSIUM

NATIONAL SHIPBUILDING  
RESEARCH PROGRAM

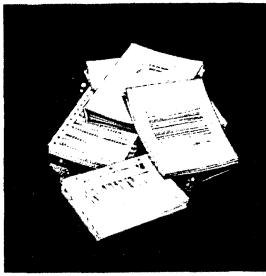
## **“International Competitiveness by 2000: A Progress Report”**

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Engineers*

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April 21-23, 1997**

1997 Ship Production  
Symposium Coordinator:  
SNAME  
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Jersey City, NJ 07306  
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fax 201-798-4975

- Agile Competitiveness
- Accuracy Control and Measurement
- Integrated Product and Process Development
- Education and Training
- Industrial Engineering and Automation
- World Class Procurement
- Quality Control
- Planning/Control
- Surface Preparation and Coatings
- Virtual Organizations
- Producibility Improvements
- Facilities
- Environmental Effects
- People Power
- Marine Industry Standards
- Outfitting and Production Aids
- Product Work Breakdown Structure
- Progress Reports on MARITECH Projects
- Welding



## Recent Additions to the Publications Library

### NSRP 0430

Title: Development of a Shielded Metal Electrode for Welding HSLA-100 Steel  
Author: D.A. Fleming, S. Liu, D.L. Olson,  
Colorado School of Mines  
Date: October 1994

Abstract: This report addresses the development of a welding consumable for use with the shielded metal arc (SMA) welding process in joining HSLA-100 steel plate. Special considerations for welding of HSLA-100 steel are discussed, as well as properties of shielded metal arc welding consumables. Results of the testing of nine separate series of electrodes, differing in flux composition, are presented. (206 p.)

### NSRP 0432

Title: Phase II: EMATS Inspection of Welds; Phase Analysis: Eddy Current Inspection of Welds  
Author: W. M. Latham, P.J. Latimer, Babcock & Wilcox  
Date: October 1994

Abstract: This report discusses the reliability of ElectroMagnetic Acoustic Transducers (EMATS) in assessing the acceptability of the surfaces of finished welds. Experimental techniques, samples, instrumentation, and results of the investigation of EMATS are discussed. (34 p.)

### NSRP 0434

Title: Requirements and Assessments for Global Shipbuilding Competitiveness  
Author: Richard Lee Storch, Thomas Lamb, A&P Appledore  
Date: March 1995  
Abstract: This report contains an extensive evaluation of five U.S. and five overseas shipyards and provides a description of the current state of international and U.S. competitiveness. The paper's objectives are to 1) determine relative technology levels, 2) determine relative status of facilities, 3) determine facilities required to compete, 4) provide an indication of the competitive position of U.S. yards, and 5) identify actions for U.S. yards to take to compete internationally. (270 p.)

### NSRP 0437

Title: Metrication in U.S. Shipbuilding - Training  
Volume I Instructor's Manual  
Volume II Transparencies, Tests & Worksheets  
Author: Peterson Builders, Inc.  
Date: February 1995  
Abstract: This report contains a two volume series designed for a shipyard, repair facility, design firm or other ship-related organization anticipating near-term work requiring extensive use of the metric system in design, procurement and manufacturing trades. Its overall role is to provide a practical preparation for the actual conversion of some or all of the functions of the shipyard to the metric system in support of an imminent metric contract. Volume I is comprised of an Instructor's Manual to accompany the seven student lesson plans concerning local and global perspectives of metrication, basics of the metric system and the use of metrication in engineering, manufacturing and the support trades. Volume II contains the transparencies, tests and student worksheets to accompany the lesson plans. (188 p.)

### NSRP 0438

Title: Evaluation of U.S. and International Marine Engineering Standards for Acceptability in U.S. Flag Vessel Applications - Final Report Summary  
Author: National Steel and Shipbuilding Company  
Date: March 1995  
Abstract: The objective of this project was to support the acceptance of foreign/international standards for equipment, components and material by the U.S. Coast Guard and to support the use of those standards by the U.S. shipbuilding industry. This report is a summary of the final report, Volume II. Topics include: shipyard surveys to develop priority lists of equipment, review of the equipment and standards equivalency evaluation procedure, equipment and standards database development, and prioritized equipment category analyses.

## Your Shipbuilding Library

The National Shipbuilding Research and Documentation Center at the University of Michigan Transportation Research Institute is your source for all shipbuilding research information. Included are all reports produced by the NSRP since its beginning in 1971, SNAME Ship Production Symposia papers, and a variety of technical and non-technical shipbuilding information from other sources. The National Shipbuilding Research and Documentation Center is comprised of two libraries which are continually updated with the latest research and informational materials.

The Publications Library has over 400 written documents (symposia proceedings, books, research reports, papers, etc.), in both microfiche and hard copy formats. Documents from the Publications Library can be purchased in either of these formats for the cost of duplication and shipping. The annually updated *Bibliography of Publications* lists all available documents topically and provides brief abstracts for each entry.

The AVMAST Library (AudioVisual Material Available for Shipyard Training) has more than 500 films, video tapes, slides, and other materials in its holdings. All AVMAST library materials can be borrowed by persons in the shipbuilding repair industry or the Navy for a minimal shipping and handling fee. The *Catalogue of AudioVisual Material Available for Shipyard Training* is published annually and lists all films, video tapes, and other materials topically. It also provides a brief abstract for each training module. (Copies of some AVMAST tapes can be purchased. Complete information is available in the AVMAST Catalogue.)

New Library Catalogues are now available; see page 17 to order a copy. The Catalogues will soon be accessible on the World Wide Web at URL: <http://www.umich.edu/~sumtrans/docctr>. For more information, please call the Documentation Center Coordinator at (313)763-2465; write to the Documentation Center, Marine Systems Division, UMTRI, 2901 Baxter Road, Ann Arbor, MI 48109-2150; or send an e-mail message to: [Doc.center@umich.edu](mailto:Doc.center@umich.edu) ■

continued on next page

## Recent Additions to the Publications Library

continued from previous page

This report also contains recommendations concerning the development of detailed guidance on the equivalency process. (88 p.)

### NSRP 0431

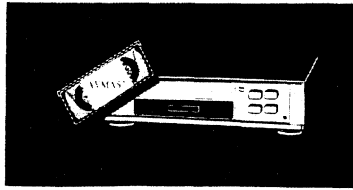
Title: Autogenous Pipe Welding  
Author: Mare Island Naval Shipyard  
Date: November 1994

Abstract: The purpose of this task was to evaluate the suitability of autogenous automatic gas tungsten arc welding (GTAW-AU) process for tubing/thin-wall piping systems, and to provide a welding parameter matrix for the commonly used tubing/thin-wall pipe material types and sizes for Navy marine applications. An evaluation of automatic tube/pipe welding equipment was performed and a suitable automatic tube/pipe welding system was selected. The major problem throughout the project was determined to be alignment. It was recommended that the GTAW-AU process be considered in new revisions to qualification and fabrication documents placing strict requirements of weld joint alignment, welding parameter ranges, welding position, and base metal chemistry variations between heats of material. Because unique parameters are required for each application a comprehensive welding parameter matrix was determined not to be feasible. (41 p.)

### NSRP 0433

Title: Portable Pipe Laser Beam Cutting/Welding System  
Author: Mare Island Naval Shipyard  
Date: April 1995

Abstract: The purpose of this project was to promote automated laser welding of commercial pipe utilizing a solid state fibre optic delivered Nd:YAG laser. Other technical objectives of this project included metallurgical analysis of laser weld techniques, limitations of current Nd:YAG pipe welding systems, quality control options, investigation of laser cutting techniques in marine materials, and associated safety equipment requirements. Pipe welding was accomplished on five different types of metals. Non-destructive testing, as well as macroscopic examination and radiographic testing, was accomplished for some weld samples. Design optics and drive mechanisms for orbital welding of pipes and tubes on inside and outer surfaces were presented. (36 p.) ■



### PR 31

Astilleros Españoles - A Leader's Profile  
Astilleros Españoles is described. A short history of the company is provided, along with a description of the capabilities of each of its shipyards, and a catalogue of the types of ships each yard produces. Astilleros's dedication to promoting international cooperation is stressed. [VHS...19 min.]

### PR 32

Jesse Engineering Co. Presents - CNC Branch Tube Cutting Machine  
This videotape presents the CNC Branch Tube cutting machine of the Jesse System. It is a computer controlled automated system for tube cutting. This videotape provides a step-by-step demonstration of how the automated machine works. This equipment was provided by Jesse Engineering Co. to the Guangzhou Shipyard. [VHS...4 min.]

### USN 407

Safety - Lead Safety  
This booklet concerns the safety requirements that must be followed whenever work operations can result in exposure to lead dust, fumes, or residue (Job Performance Aid).

### USN 408

Boilermaker - Reboilers  
This package concerns proper inspection and verification of heat exchangers (Instructor Guide and Student Guide).

### USN 409

Welding - Methods of Preheating  
This tape discusses three methods of heating metals prior to welding operations so that weld integrity is not jeopardized. Pre-weld safety procedures are also covered. [3/4" UMATIC...11 min.]

### USN 410

Pipefitter - Templating and Targeting  
This tape concerns the procedures that should be followed when making templates and targets during the installation of shipboard piping systems. It stresses the need for these procedures to be done effectively in order to keep cost and waste to a minimum. [3/4" UMATIC...15 min.]

### USN 411

Rigging - A Day in the Life of a Cranewalker  
This tape explains the duties and responsibilities of a cranewalker. [3/4" UMATIC...9 min.]

## Recent Additions to the AVMAST Library

### USN 412

Temporary Services - CHT Hookups  
This package explains the safety precautions and procedures for connecting CHTs to assure sanitary systems. Also discussed are the differences in fitting sizes for submarines and surface ships (Job Performance Aid). [3/4" UMATIC...10 min.]

### USN 413

Rigging - Downgrading - Selecting the Proper Size Gear to Carry the Load  
This videotape explains the use and application of formulas and charts to determine the capacity of rigging equipment to handle the load, as well as on-site procedures to ensure safe load handling. [3/4" UMATIC...21 min.]

### USN 414

High Volume, Low Pressure Painting  
This videotape explains the components, the basic operation theory, and the advantages and disadvantages of using this system. [3/4" UMATIC...8 min.]

### USN 415

Rigging - Weight of the Load  
This tape discusses both the primary and secondary methods for determining the weight of a load. It also explains the methods which provide total control of a rigged load at all times. [3/4" UMATIC...7 min.]

### USN 416

Pipefitter - Oxygen Cleanliness Part 3 - Shipboard Oxygen Cleaning and Testing  
This tape concerns the procedures that should be followed when cleaning parts and components that will be used in oxygen systems. It makes examples of past accidents to demonstrate the value of oxygen piping safety. [3/4" UMATIC...34 min.]

### USN 417

Rigging Safety - Luck Doesn't Last  
This video shows some of the hazards of rigging. [3/4" UMATIC...10 min.]

### USN 418

Crane Testing Category II - Bridge Cranes, and Category III - Traveling Wall Cranes  
These two videotapes explain the safety testing of bridge and traveling wall cranes. [VHS...13 min. and 13 min.] ■

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*Connect With the World's* goal is to put every AISE shipyard and supplier at the show on the World Wide Web. Home pages will be constructed and computers will be installed so that everyone — AISE attendees and exhibitors alike — will be able to monitor the progress of AISE's site on the World Wide Web. A team of Internet specialists will be on hand to answer questions and provide assistance.

# Lloyds Maritime Information Service Reports

NSnet has recently arranged to receive a monthly report from Lloyds Maritime Information Services. The report will be made available on the NSnet World Wide Web server, and it will be sent to subscribers to the e-mail list announce@nsnet.com. If you have a Web browser, simply point to URL

<http://www.nsnet.com>

To subscribe to the Announce list, send an e-mail message to

TO: majordomo@nsnet.com  
SUBJECT: [leave blank]  
MESSAGE: subscribe  
announce [insert your e-mail address]

Following are excerpts from the March 1996 Report.

## LMIS Monthly Shipbuilding Review

### World Ship Construction in 1995

Summary Table of 1995 World Orderbook\*

Ship Type	Grt on Orderbook	No of Vessels
Bulkers	17,133,715	508
Tankers	11,113,002	248
Liners	9,085,109	386
General Cargo	2,144,189	475
Passenger	2,103,782	78
Passenger/ Ferry	99,414	97
Passenger/ RoRo/ Ferry	288,285	11
Ore/ Bulk/ Oil	390,000	6

Source: LMIS 1996.

\* Ships ordered or under construction.

#### New Orders by Shiptype

- A strong freight market in 1995 kept up the high level of orders first seen in 1993.
- The total orderbook stood at 42.36m gt.
- The total orderbook (ships ordered or under construction) increased by 7% (3.0 m gt) in 1995 with 25.5m gt of orders recorded last year - compared to 25.6m gt in 1994.
- General cargo and containership orders continued to increase with the sector dominated by the ordering of large containerships. Orders increased by 2m gt to 8.1m gt.
- Ordering of ore and bulk carriers remained steady at 10.2m gt - down 0.9m gt - representing 40% of the newbuilding market.
- Tanker orders nearly halved in 1995 down to 3.3m gt from 6.1m gt - a reaction to relatively high ordering in the early 1990's and current industry feelings about the oil freight markets.

#### New Orders by Country

- South Korean yards substantially increased their level of orders in 1995 which had dropped last year from a record high of 1993.
- Korean yards have invested heavily in new facilities, research and development and productivity improvements in 1994 and their market share climbed from 22.1% to 30.4%.
- Japanese yards pushed forward with modernisation to offset labour shortages and a strong Yen.
- Japanese orders fell from 11.8m gt in 1994 to 8.9m gt last year on the back of further appreciation of the Yen.
- The EU shipyards market share increased marginally to 15.4% (3.9m gt) with the rest of the world at 19.3% (4.9m gt).

#### January 1996

- In January a total of 1.42m gt of ships were ordered. They included 13 bulkers, 2 tankers, 25 liners and 1 passenger ferry



## Financial Issues

### Bremer Vulkan

GERMAN shipbuilding giant Bremer Vulkan began the month with accusations of misspending of European Union funds and ended it revealing a Dm1 billion (\$670 million) loss and a Dm2.4 billion (\$1.6 billion) of debts. It has had to apply for legal protection from its creditors, 27,000 jobs are under threat and it has an orderbook of Dm7 billion (\$4.7 billion) of vessels at loss-making prices. All this after the board said in August 1995 that they expected the yard to make a profit. At the end of February the company was thrown a lifeline in the form of an extra Dm100 million (\$67 million) of credit which cover costs and the wage bill for two months. The yard is not expected to survive intact.

### How the Losses Came to Light

- THE German government said that state guarantees covering loans to the Bremer Vulkan group were in line with European Union rules, in a letter to the European Commission. **Source: Lloyd's List, 3 February. Confirmed.**
- GERMAN Shipyard Bremer Vulkan may have to call in further loans to finance two containership newbuildings and pay its wage bill. **Source: Lloyd's List, 10 February. Confirmed.**
- AN Dm850 million (\$570 million) aid package for two eastern German shipyards has been misused by German shipbuilders Bremer Vulkan, a source at the European Commission claimed. **Source: Lloyd's List, 13 February. Rumour.**
- THE European Community is launching an inquiry into the handling of Dm850 million (\$570 million) in state aid from the German government to Bremer Vulkan to restructure East German yards. **Source: Lloyd's List, 15 February. Confirmed.**
- GERMAN shipbuilder Bremer Vulkan has suspended trading in its shares amid growing speculation about the group's future. **Source: Lloyd's List, 17 February. Confirmed.**
- GERMANY'S largest shipbuilding group Bremer Vulkan filed for protection from its creditors and said it would need a capital infusion of Dm2 billion (\$1.35 billion) to survive this year. The company have a Dm7 billion orderbook. **Source: Lloyd's List, 22 February. Confirmed.**
- THE Bremer Vulkan Group is likely to be broken up after hopes of a rescue bid from public funds were dashed. **Source: Lloyd's List, 23 February. Rumour.**
- GERMAN Shipbuilders Bremer Vulkan chances of survival improved as agreement on an interim rescue package was reached by the receiver and the group's creditors. **Source: Lloyd's List, 27 February. Rumour.**
- GERMAN Shipyard Bremer Vulkan has won a two month reprieve after some of the group's sequestrators secured interim finance of "less than Dm100m (\$67.7m)" from the group's banks. **Source: Lloyd's List, 28 February. Confirmed.**
- BREMER Vulkan is seeking fresh talks with ship owners over orders that would be loss producing under German insolvency proceedings, the company's Chief Executive Udo Wagner said. He added that the group's total debts were around Dm2.4 billion (\$1.6 billion). **Source: Lloyd's List, 28 February. Confirmed.**
- BRUSSELS confirmed that loan guarantees for vessels under construction at Bremer Vulkan will be extended by the European Commission. The Commission also announced the start of a formal investigation into the misuse of Dm450 million (\$305 million) of government funds. **Source: Lloyd's List, 29 February. Confirmed.**

### Other Financial Issues

- HAMBURG based shipyard Blohm and Voss revealed losses of Dm40 million (\$26.7 million) in 1994-95 and said it would be hard pressed to break even this year. **Source: Fairplay, 1 February. Confirmed.**
- THE Sedef yard in Tezla bay, Turkey has been handed a lifeline in the form of a \$250 million loan from Japan to the Turkish Emlak bank. **Source: Fairplay, 1 February. Confirmed.**
- FINLAND'S Economic Policy Ministerial Committee has proposed a Fmk2 billion (\$444 million) should be set aside for shipbuilding subsidies. **Source: Fairplay, 1 February. Rumour.**
- THE US Maritime Administration has turned down a Title XI loan application for \$1,000 million from World City America to build "Phoenix World City" - planned as the largest cruise ship ever. The project now looks in doubt. **Source: Lloyd's List, 6 February. Confirmed.**
- THE five largest Korean shipbuilders are expected to win orders for 164 vessels worth \$8.9 billion this year, according to projections from the Import-Export bank of Korea. This is a 20% rise in volumes. **Source: Fairplay, 8 February. Rumour.**
- TWO British companies and a German group are in the running for a contract to manage Greek shipyard Hellenic for the next five years. Vickers Shipbuilding and Engineering Ltd., the UK subsidiary of American engineers Brown & Root and Howaldtswerke-Deutsche Werft/Ferrostaal are the remaining bidders out of an initial field of 11. **Source: Lloyd's List, 9 February. Confirmed.**
- THE European Bank for Reconstruction and Development, ABN Amro Bank and Meespierson have given a \$225 million syndicated loan to four Croatian shipyards so they can fund eleven 39,600dwt product tanker newbuildings for Novrossiysk shipping company. **Source: Lloyd's List, 12 February. Confirmed.**
- NORWEGIAN shipbuilding and engineering group Brattvaag has taken over newbuilding and ship repair firm Soviknes Verft to strengthen its west coast activities. **Source: Lloyd's List, 15 February. Confirmed.**

*continued on next page*

# LMIS Monthly Shipbuilding Review

continued from previous page

- UK conglomerate Trafalgar House has sold its mothballed Scott Lithgow shipyard in Port Glasgow to Clydeport for £1.95 million (\$2.95 million). Trafalgar House also confirmed it was in talks with Norwegian group Kvaerner about a possible \$800 million takeover.  
**Source: Lloyd's List, 29 February. Confirmed.**

## Highlights of the Month

### Confirmed New Contracts in February

- BRAZIL'S Grupo Libra announced it was to embark on a \$560 million fleet renewal plan building eight vessels in the next three years. The vessels will be built at Brazilian shipyard CCN Maua.  
**Source: Lloyd's List, 2 February. Confirmed.**
- GREEK Shipowner Glafki Maritime have awarded an order for three further Aframax tankers to Japan's NKK Corporation. The \$135m deal for the 110,000dwt vessels is part of the company's fleet renewal plan.  
**Source: Lloyd's List, 2 February. Confirmed.**
- FRENCH container shipping company Compagnie Maritime d'Affretement has ordered four new 4,000 teu vessels to operate on its Europe - Far East service. The ships are all being built at South Korean yards.  
**Source: Lloyd's List, 2 February. Confirmed.**
- ITALIAN shipbuilder Nuovi Cantieri Apuania has won two domestic contracts for specialised tankers from PG&M Castaldi and Finaval.  
**Source: Lloyd's List, 2 February. Confirmed.**
- ITALIAN Shipowner Bottiglieri de Navigazione has ordered three panamax bulkers in cash from troubled Danish shipbuilders Burmeister and Wain at \$32 million each. Bottiglieri believe the prospects for Panamax good.  
**Source: TradeWinds, 2 February. Confirmed.**
- MAERSK Supply has signed a contract for two large off-shore supply ships from Norwegian yard Simek. The 20,020bhp vessels would be the most powerful offshore support ships ever built.  
**Source: TradeWinds, 2 February. Confirmed.**
- TEEKAY Shipping announced it had signed an "opportunistic" deal with the Onimichi yard in Japan for a \$45m Aframax tanker and added it was discussing an option for two more.  
**Source: Lloyd's List, 6 February. Confirmed.**
- CLYDESIDE shipyard in the UK has won the £20 million (\$29.7 million) contract to build the replacement for the Scottish Fisheries ship Scotia that is being retired after 25 years.  
**Source: Lloyd's List, 7 February. Confirmed.**
- UNITED Arab Shipping Company has ordered ten 3,800 teu to be built by three Japanese yards for delivery in 1998. UASC is pursuing a new building strategy based around growth in the east-west container trade and a redistribution of smaller sized tonnage.  
**Source: Fairplay, 8 February. Confirmed.**
- DANSKE Statsbaner has ordered two double ended ro-ro passenger ferries from Orskov Christiansen Staalskibsvaert as part of a plan to cut the Rødbyhavn Puttgarden crossing time by 15-45 minutes. DSB is investing a total of Dkr1 billion (\$174 million) in the route despite Danish and German plans to build a bridge directly between the two countries that could threaten ferry business on the route.  
**Source: Lloyd's List, 14 February. Confirmed.**
- US Congressmen who oppose the OECD Shipbuilding Agreement are set to launch their first formal attack on the controversial anti-subsidy package this week.  
**Source: Lloyd's List, 26 February. Confirmed.**
- THE Thyssen group has announced an extensive restructuring of its shipbuilding interests - mainly at Blohm + Voss in Hamburg and Thyssen Nordseewerke in Emden to "expand the market position and improve purchasing".  
**Source: Lloyd's List, 26 February. Confirmed.**
- CALIFORNIA'S National Steel & Shipbuilding has been given a \$207 million contract for the construction of a further Strategic Sealift ship. The navy holds an option on a further two ships.  
**Source: Lloyd's List, 14 February. Confirmed.**
- ABG Shipyard in Gujarat, India has won a Norwegian contract to build a specialised class of short sea paper carrier.  
**Source: Lloyd's List, 15 February. Confirmed.**
- AP MOLLERS have ordered the two most powerful offshore support ships ever at 20,020 bhp from the Norwegian Simek yard.  
**Source: Lloyd's List, 16 February. Confirmed.**
- US Shipyard Avondale has pulled out of a project to build a series of new 42,000dwt product tankers with the Russian Primorsk Shipping Group.  
**Source: Seatrade Weekly, 19-25 January. Confirmed.**
- Norwegian State Company Statoil has placed an order with Spanish state controlled Astilleros Espanoles for a 125,000dwt shuttle tanker that will be one of the most advanced in the world.  
**Source: Lloyd's List, 26 February. Confirmed.**
- GRAND Alliance partners Neptune Orient Line and NYK Line have ordered a total of seven post panamax containerships - totalling nearly 45,000teu - from Japanese yards this month confirming the containership industry's trend towards large vessels.  
**Source: Lloyd's List, 28 February. Confirmed.**
- FRENCH bulk owner Louis Dreyfus has placed a two-ship handymax order with Japan's Ishakawajima-Harima Heavy industries yard. The company has traditionally ordered its handymaxes from Poland's Stonia Gdansk.  
**Source: Lloyd's Shipping Economist, February. Confirmed.**
- GERMAN shipbuilder Flender Werft has received an order to build five more ships based on its 2062 teu F2000T design for Claus Peter Offen.  
**Source: Fairplay Newbuildings, February. Confirmed.**
- DANISH Yard Aarhus Flydedok is set to start work on seven reefers for Russian company Dalemoproduct in April.  
**Source: Fairplay Newbuildings, February. Confirmed.**
- SEMBAWANG Bethlehem, Singapore has had an option on a second 37,000 dwt open hatch bulk carrier confirmed by China National Transport Corporation.  
**Source: Lloyd's List, 21 February. Confirmed.**

## Rumoured New Contracts in February

- MALAYSIAN owner Star Cruise may cancel its \$700 million order for two cruise ships to be built at the Jos L Meyer shipyard and opt to buy the Norwegian Cruise Line's Windward and Dreamward.  
**Source: Fairplay, 1 February. Rumour.**
- AUSTRALIAN company Ampol has been holding preliminary discussions with Korean yards over a possible order for an Aframax tanker.  
**Source: TradeWinds, 2 February. Rumour.**
- MORE than 1,000 jobs were threatened at British shipyards Vosper Thornycroft and Yarrow Shipbuilders when the UK government did not award them orders for Type 23 Frigates.  
**Source: Lloyd's List, 3 February. Rumour.**
- THE Chinese shipyard Dalian is believed to be negotiating with another Chinese builder, Hudong Shipyard, for a series of four 46,000 dwt bulk carriers from IMC Holdings.  
**Source: Fairplay, 8 February. Rumour.**
- MALAYSIAN International Shipping Corporation is sounding out the market with a view to building four panamax bulkships and two 2,700 - 3,300 teu containerships. Hyundai Heavy Industries who have carried out much of MISC's Newbuilding in the 1980's are prime contenders for the contracts.  
**Source: Lloyd's List, 14 February. Rumour.**
- THREE Japanese shipbuilders are tipped to be the front runner for the new generation of up to six 5,500-6,000 post-panamax containerships sought by NYK Line. Ishikawajima-Harima Heavy Industries, Mitsubishi Heavy Industries and Mitsui Engineering & Shipbuilding have joined forces for the contract.  
**Source: Lloyd's List, 14 February. Rumour.**
- ITALIAN operator Silversea Cruises are looking to build to cruiseships at two Italian yards.  
**Source: Fairplay, 15 February. Rumour.**
- BRITISH Petroleum is looking for tenders from shipyards to build five VLCC's that could total \$450 million. The company is believed to have contacted around a dozen yards, mostly in the Far East with outline specifications for the 300,000 dwt tanker.  
**Source: Lloyd's List, 21 February. Rumour.**
- JAPANESE containership operator NYK is reported to have ended plans to order 6,000 teu ships and is now looking to build 5,500 teu vessels after a downturn in the Asian market.  
**Source: Fairplay, 22 February. Rumour.**
- KOBE Shipyard, destroyed in an earthquake on 17 January, 1995, will be operational again at the end of march.  
**Source: Lloyd's List, 26 February. Rumour.**
- THE Kvaerner Fjellstrand yard in Singapore is set to increase its capacity after six new orders for 40m Flying Cat catamarans. Capacity was reduced last year due to a lack of business.  
**Source: Fairplay Newbuildings, February. Rumour. ■**

# Journal of Ship Production

May 1996  
Volume 14 Number 1  
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## Journal of Ship Production

3	<i>Analysis of Competitiveness in Commercial Shipbuilding</i> , by Sjoerd Hengst and J.D.M. Koppies.
15	<i>The Use of Fuzzy Logic in Shipping and Shipbuilding Market Modeling, Analysis and Forecasting</i> , by Michael G. Parsons and Jun Li.
22	<i>The Product Model as a Central Information Source in a Shipbuilding Environment</i> , by Kaj Johansson.
37	<i>Concurrent Engineering: Application and Implementation for U.S. Shipbuilding</i> , by James G. Bennett, and Thomas Lamb.
48	<i>Small Ship Producibility</i> , by James M. Leake and Dale E. Calkins, and
59	<i>WLBs and WLMs: A Production Line Approach to Shipbuilding</i> , by Bernard F. Bentgen and Timothy J. Danhieux.

Publisher's name

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The Journal of Ship Production is a professional journal dedicated to ship production and to publishing the results of technical research relevant to shipyard professionals. For subscription information contact: SNAME, 601 Pavonia Ave., Jersey City, NJ 07306.

Following are the contents for the May 1996 issue of the Journal:

- *Analysis of Competitiveness in Commercial Shipbuilding*, by Sjoerd Hengst and J.D.M. Koppies;
- *The Use of Fuzzy Logic in Shipping and Shipbuilding Market Modeling, Analysis and Forecasting*, by Michael G. Parsons and Jun Li;
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- *WLBs and WLMs: A Production Line Approach to Shipbuilding*, by Bernard F. Bentgen and Timothy J. Danhieux. ■



# Changing Business Practices for the Marine Industry

A Workshop for

- Suppliers
- Shipbuilders
- Shipowners

April 10, 1996  
Ernest N. Morial  
Convention Center  
New Orleans,  
Louisiana

Sponsored by:  
ARPA/MARITECH  
Office of Naval Research  
MANTECH Program  
Facilitated by:



National Center for  
Manufacturing Sciences

## You are invited:

You are invited to attend a workshop on how suppliers, shipbuilders, and shipowners can work together to build ships more efficiently and competitively. The workshop takes place one day before, and at the same site as, the American International Shipbuilding Expo. Come to the Expo earlier and attend the workshop to:

- **Learn** about new business practices in the international marine community that will help you improve the way your organization views and deals with all of your business partners.
- **Meet** potential new business partners.
- **See** demonstrations of the latest technology that can help you obtain and exchange product, design, and other technical and business information among suppliers, shipbuilders and shipowners.

## The Purpose:

If the U.S. marine industry is to succeed in the international marketplace, suppliers and shipbuilders must learn to become viable business partners. ARPA and ONR sponsored a project that studied European supplier-shipbuilder relationships. The results offer lessons that can help your company become more competitive.

This workshop will present the research findings of this project. It will also provide you the opportunity to learn about defense acquisition reform in the U.S., learn about conducting business with international customers, and participate in demonstrations of high technology partnering tools.

## Who Should Attend:

If you are conducting, or wish to conduct, business in the international marine industry, attend the workshop.

- **Suppliers** to the domestic and international marine community — learn about new domestic procurement regulations and about the changing supplier-shipbuilder relationships. Hear about methods and strategies for dealing with international shipbuilders and fellow suppliers.
- **Shipbuilders** — learn about new ways of dealing with suppliers, and how to more efficiently conduct business with suppliers and owners.
- **Shipowners** — hear about new ways in which suppliers and builders can work together more effectively to improve the quality and efficiency of new builds.

## Preliminary Agenda:

- 8:30 **Opening Remarks**  
Overview of the ARPA/ONR Program  
Keynote Speakers -  
Honorable John W. Douglass ASN, RD&A  
Dr. Giorgio Cossutti, Fincantieri Shipyard  
Introduction to breakout sessions
- 10:15 **Morning Break**
- 10:30 **Morning breakout sessions**  
A - Acquisition Reform  
B - Re-Thinking the Customer  
C - Collaboration Tools
- 11:45 **Break**
- 12:00 **Luncheon**  
Guest Speaker from Industry
- 1:15 **Break**
- 1:30 **Afternoon breakout sessions**  
D - How To Market Internationally  
E - After The Order ....  
F - Collaboration Tools
- 3:00 **Afternoon Break**
- 3:30 **Summaries of breakout sessions**
- 5:00 **End of workshop**

## How to Register:

This workshop is sponsored by the Office of Naval Research. Workshop fee: \$100 if paid before March 27; \$150 if paid after March 27, 1996 (includes on-site payment).

For registration information, contact Barbara Johnson

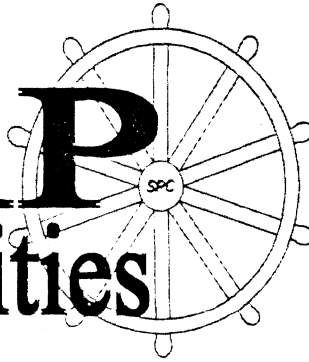
### *Changing Business Practices for the Marine Industry*

National Center for Manufacturing Sciences  
3025 Boardwalk  
Ann Arbor, MI 48108-3266  
Inquiries: 313-995-4938

## Hotels and Accommodations:

Call the New Orleans Convention Housing Bureau at 1-800-345-1187 to reserve your room.

# NSRP Panel Activities



## SP-1 FACILITIES AND ENVIRONMENTAL EFFECTS

SP-1, Facilities and Environmental Effects, met March 6-8, 1996 in Denver. The panel members reviewed FY-97 project abstracts and voted for the projects to

be presented to the ECB in May. The following is a list of those projects:

- N1-97-1 *Environmental Studies and Testing*
- N1-97-2 *SARA 313 TRI Guide for Shipbuilding Industry*
- N1-97-3 *Review of Developing Environmental Requirements*
- N1-97-4 *Particulate Emission Factors for Blasting Operations in Shipyards*
- N1-97-5 *Effects of Shipyard Discharges Containing Tributyltin*
- N1-97-6 *Participation on ISO 14000 Technical Advisory Group*

There are three facilities project abstracts that are being revisited before any final decision is made on what ones will be presented to the ECB in May.

Several SP-1 projects have recently been funded:

- N1-95-1 *Impact on Shipyards from the Reauthorization of the Federal Clean Water Act (Hartman Engineering, Inc.)*
- N1-95-3 *Development of Guidance for Selecting Legitimate Recycling Products & Processes (Collier, Shannon, Rill & Scott)*
- N1-95-2 *Developing a Shipyard Program for NPDES Compliance (Penn State & NASSCO)*

During the first quarter of 1996, the following final reports were published:

- 0457 N1-92-1, Subtask 1  
*Characterizing Shipyard Welding Emissions and Associate Control Options*
- 0458 N1-94-4  
*Air Quality Best Management Practice (AQBMP) Resource Document for Shipyards*
- 0462 N1-92-2, Subtask 8  
*Review of Environmental Protection Agency's Common Sense Initiative. ■*

## SP-4 DESIGN/ PRODUCTION INTEGRATION

SP-4, Design/Production Integration, recently met at Newport News Shipbuilding on March 6-7, 1996. The meeting was primarily devoted to the discussion and

selection of research projects to be presented to the NSRP ECB for funding approval in FY-97. Abstracts for 20 projects were reviewed in detail, and ultimately, eight chosen for submittal covering such topics as process modeling of ship's life cycle; electronic data interchange with shipbuilding suppliers; steel purchasing practices. CAD-based producibility measurement systems, accuracy control; design techniques to advance "cold" preoutfitting, methodologies for use of purchased designs; and, CAD data transfer standards.

Also in the meeting, a status was provided on each of the four SP-4 Panel projects currently in work. N4-94-1, *Evaluate Shipbuilding CAD/CAM Systems*, is being performed by a team of five shipyards, CYBO Robots, Proteus Engineering, and the Marine Systems Division of the University of Michigan Transportation Research Institute (UMTRI - MSD.) Shipyards visited to-date as part of the phase I CAD/CAM/CIM "assessment" task include Odense Steel Shipyard, Odense, Denmark; and three Japanese Shipyards, Mitsubishi Heavy Industries, Nagasaki, Hitachi Zosen Ariake Works, Nagasu; and briefly, Ishikawajima-Harima Heavy Industries (IHI) Kure Shipyard, Kure, Japan. The extent to which CAD/CAM/CIM is applied to a wide variety of shipyard activities such as early stage design, detail design, procurement, steel and outfitting production, etc., was analyzed in detail. A draft phase I report is under review and should be issued in April. This phase I assessment study also provided the basis for a CAD/CAM/CIM workshop held just prior to the 1996 Ship Production Symposium recently held in San Diego. Phase II to define state-of-the-art system requirements and phase III development of selected specifications should be complete by August 1996.

N4-94-3, *Convert NIDDESC Standards to ISO Standards*, is being performed by a team that includes the original NIDDESC authors from Newport News, NASSCO, and Ingalls Shipbuilding, and supported by UMTRI - MSD. Progress is being made in gaining acceptance of five NIDDESC Application Protocols as international standards with several (APS 215,

216 and 217) to move forward for CDC. Earlier differences between the project team and Maritime concerning the definition for ship's structure have largely been resolved. A one year, phase II project to continue these efforts by the same project team should start in early April 1996.

N4-93-6, *Develop a Common Sense Design Manual for the Producibility of Hull Foundations*, is being performed by VIBTECH, Inc., and is also nearing completion. A draft report has been completed and is under review. The report provides recommendations to improve both existing foundation design processes and products within U.S. shipyards. Key to improvement of foundation design processes is the recommendation to integrate current drafting and engineering activities. Particular emphasis has been placed on the use of graphics to illustrate foundation producibility principles and concepts. Included within the producibility discussion is a description of 27 standard foundation types derived from statistical analysis of existing foundations. Importantly, for each standard foundation type, a table of specific scantling sizes is provided to suit various equipment load conditions. The report also provides a discussion of the technical methodology to analyze, test and validate the innovative foundation designs. The final project manual should be issued in April 1996.

N4-94-5, *Develop Methods to Implement Results of Past NSRP Projects*, is being performed by Bernier & Associates. The third of three surveys in the project is well along, having-received responses from most of those surveyed. As demonstrated in the first two surveys, the use of a unique electronic questionnaire has produced an unprecedented response rate (all within the range of 70%-85%). The first survey focused upon industry awareness of the NSRP, the second survey on the use of NSRP research and the third survey on recommendations for NSRP operations. A large number of specific recommendations are being evaluated. Results are planned to be presented to the NSRP ECB in May 1996

A new SP-4 panel project, N4-96-1, *Activity Analysis for a World Class Design Model*, is expected to start in April 1996. The goal of this project is to develop an engineering design process model and recommendations that U.S. shipyards can use to benchmark and improve their existing ship design processes. ■

*panel reports continued  
on next page*

# NSRP Panel Activities



## SP-5 HUMAN RESOURCE INNOVATIONS

SP-5, Human Resource Innovation, recently completed a very successful project on workers compensation with over 45 shipyard private and public

locations participating. In addition to building a database of the various elements of this major cost driver, the best practices of the various shipyards will be shared with the industry. A workshop will be scheduled and the cognizant participating shipyard personnel will be invited to meet face to face to share their knowledge and to improve networking among their peers.

Recently, the panel was pleased to hear that Secretary Reich has extended the charter of the Maritime Advisory Committee of Safety and Health (MACOSH) for another two years. The SP-5 panel, working with national labor leaders and the SCA, was the principal organization credited with the establishment of this committee. Four SP-5 members sit on the MACOSH committee which focuses on regulation reform in the health and safety arena.

A panel project is nearing completion in the area of shipyard economic conversion. This project established an international model for a typical European shipyard building a 40,000 DWT tanker. Comparing the organizational structure of a typical U.S. shipyard to the international model has yielded significant differences in the direct and indirect labor to build the same ship. Preliminary results of this project formed the base of one of the presentations at the recent Ship Production Symposium in San Diego.

One of the major thrusts of the SP-5 panel during the next year will be to improve the networking of many of our shipyards in order to both share "best practices" for a number of our shipbuilding processes as well as to facilitate cognizant shipyard and government personnel working together to address some of our key industry problems. ■

## SP-6 MARINE INDUSTRY STANDARDS

Crucial to the ability of U.S. shipbuilders to be globally competitive is establishing a set of internationally acceptable U.S. shipbuilding standards. To accomplish this task, communication and teamwork among former and current competitors is required. The SP-6 panel continues to exemplify the best aspects of teaming by shipyards at the national level. The foremost example of this is the multi-year four-project effort to identify the approach, establish the list, and implement consensus U.S. shipbuilding standards. This effort was initiated with SP-6 project N6-93-1, *Evaluation of U.S. and International Marine Engineering Standards of Acceptability in U.S. Flag Vessel Applications*. A team of participants from the marine industry was brought together to undertake and accomplish the project. Follow-up on project N6-94-1, *World Class Shipbuilding Standards* was proposed to use the information developed as a result of project N6-93-1 to establish a focused subset of national shipbuilding standards. Again, a team composed primarily of shipyard representatives was formed to undertake this project. The globally acceptable standards that are to be identified by project N6-94-1 will be the beginning of a set of consensus U.S. shipbuilding standards. This set of standards will be expanded by SP-6 project N6-95-4, *Standards Database Maintenance*, which is currently being rescoped and prioritized by the panel as a result of initial reports from the findings of project N6-94-1. The fourth project in the series to establish U.S. shipbuilding standards, is being prepared for the FY-97 program SP-6 panel presentation at the May 1996 ECB meeting for approval. This project is entitled *Establishing the List of U.S. Shipbuilding Standards*. All of the four projects culminate with establishing the list of consensus national standards for the U.S. shipbuilding industry.

Additionally, the SP-6 panel is undertaking a team approach with representation of SP-8 panel on a joint approach to one of SP-6's FY-97 project ideas. Communications have also taken place on another FY-97 project that SP-6 and SP-4 may be able to accomplish together. ■

## SP-7 WELDING

SP-7, Welding, had its most recent meeting in Florence, SC. The meeting was held at the ESAB Welding & Cutting, Inc. facility and as a part of the meeting agenda a very informative tour of the welding power supply manufacturing lines was provided.

Progress reports on the panel research projects were made during the meeting. Summarizing the reports:

- *Square Butt Welding of Pipe* — The project is complete and the final report will soon be published.
- *Develop a Thermal Spray Manual* - The manual is taking shape and is very inclusive of material required by any facility that will utilize the thermal spray process.
- *Welding Through Primer* — The proper mix of required materials that will improve the quality of welds made through preconstruction primers is being defined. Experimental flux cored electrodes will be developed as part of this project.
- *Ultra Portable Power Supply/Wire Feeder* — A prototype unit has been constructed and is being evaluated for performance characteristics.
- *Welding Fume Study* — A report was provided that described potential changes in the limits for personnel exposure to hexavalent chromium. Several shipbuilding production processes were sampled to determine existing conditions that may require modifications if new federal regulations are put in place.

To improve the communication of the work of the panel to the welding community outside of shipbuilding, SP-7 agreed to sponsor a technical session at the 1997 American Welding Society annual conference. ■

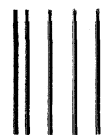
## SP-9 EDUCATION AND TRAINING

SP-9, Education and Training, met February 19, 1996, in San Diego. Panel members reviewed FY-97 project abstracts and voted to present the following four to be presented to the ECB in May:

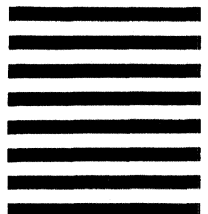
- N9-97-1, *Develop a Method to Measure Cost-Savings and Productivity Gain of Training Programs*
- N9-97-2, *Create a Consortium to Develop Models for Apprenticeship Training Programs*
- N9-97-3, *Leadership Development*
- N9-97-4, *Study of Shipyard Engineering and Management Work Force: Staffing, Tasking, Qualification, Trends and Development.* ■

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**1996 Ship Production  
Symposium**

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Capt. Fiske gave an invaluable presentation entitled *Activation and the Security Assistance Program at the Naval Sea Systems Command*.

**Exhibits:**

Other important activities included an ongoing exchange between the symposium attendees and the various exhibitors. The range of exhibits was extensive, covering many areas of ship design and construction activities from pipe fittings to computer aided design packages for systems and structure. The exhibit featured a "low-light" room that allowed companies such as Intergraph, KCS, and Sener to present computer systems in an amenable environment.

**Conclusion:**

From a statistics viewpoint, the 1996 Ship Production Symposium was one of the most successful ever. In the view of the organizing team from the San Diego Chapter of SNAME, however, the success was



The Registration Area

embodied in both the optimism, and enthusiasm of the attendees.

The Organizing Committees, led by Pete Jaquith, applaud the speakers, authors, and attendees who came to San Diego in a positive mood ready to turn the tide of U.S. shipbuilding into world competitiveness. We thank you. ■

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Members of the University: Lane Baker, Laurence B. Deitch, Daniel D. Horning, Shirley M. McFee, Rebecca McGowan, Andrea Fischer Newman, Philip H. Power, and James J. Duderstadt, *ex officio*.

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