

January, 1998  
NSRP 0504

SHIP PRODUCTION COMMITTEE  
FACILITIES AND ENVIRONMENTAL EFFECTS  
SURFACE PREPARATION AND COATINGS  
DESIGN/PRODUCTION INTEGRATION  
HUMAN RESOURCE INNOVATION  
MARINE INDUSTRY STANDARDS  
WELDING  
INDUSTRIAL ENGINEERING  
EDUCATION AND TRAINING

# **THE NATIONAL SHIPBUILDING RESEARCH PROGRAM**

## **Define the Impact of Foreign “Metric” Ships on Material and Inventory Control in U.S. Shipyards**

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

in cooperation with  
Newport News Shipbuilding

# Report Documentation Page

*Form Approved  
OMB No. 0704-0188*

Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

1. REPORT DATE <b>JAN 1998</b>	2. REPORT TYPE <b>N/A</b>	3. DATES COVERED <b>-</b>	
4. TITLE AND SUBTITLE <b>The National Shipbuilding Research Program, Define the Impact of Foreign "Metric" Ships on Material and Inventory Control in U.S. Shipyards</b>		5a. CONTRACT NUMBER	
		5b. GRANT NUMBER	
		5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)		5d. PROJECT NUMBER	
		5e. TASK NUMBER	
		5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) <b>Naval Surface Warfare Center CD Code 2230-Design Integration Tower Bldg 192, Room 128 9500 MacArthur Blvd Bethesda, MD 20817-5700</b>		8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)		10. SPONSOR/MONITOR'S ACRONYM(S)	
		11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT <b>Approved for public release, distribution unlimited</b>			
13. SUPPLEMENTARY NOTES			
14. ABSTRACT			
15. SUBJECT TERMS			
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT <b>SAR</b>
a. REPORT <b>unclassified</b>	b. ABSTRACT <b>unclassified</b>	c. THIS PAGE <b>unclassified</b>	
19a. NAME OF RESPONSIBLE PERSON			

## DISCLAIMER

These reports were prepared as an account of government-sponsored work. Neither the United States, nor the United States Navy, nor any person acting on behalf of the United States Navy (A) makes any warranty or representation, expressed or implied, with respect to the accuracy, completeness or usefulness of the information contained in this report/manual, or that the use of any information, apparatus, method, or process disclosed in this report may not infringe privately owned rights; or (B) assumes any liabilities with respect to the use of or for damages resulting from the use of any information, apparatus, method, or process disclosed in the report. As used in the above, "Persons acting on behalf of the United States Navy" includes any employee, contractor, or subcontractor to the contractor of the United States Navy to the extent that such employee, contractor, or subcontractor to the contractor prepares, handles, or distributes, or provides access to any information pursuant to his employment or contract or subcontract to the contractor with the United States Navy. ANY POSSIBLE IMPLIED WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR PURPOSE ARE SPECIFICALLY DISCLAIMED.

# “Define The Impact Of Foreign ‘Metric’ Ships {SI Metric Systeme} On Material And Inventory Control In U.S. Shipyards”

---

N8 -92-3 SP Panel 8 Industrial Engineering

Final Project Report

Via NSnet and The Internet

---

Submitted By

**BMS & Associates Inc.**

**P.O. Box 2863**

**La Jolla, CA 92038**

[bmschram@cts.com](mailto:bmschram@cts.com)

## Table of Contents

**Acknowledgment**

**Project Overview**

**Project Approach and Activity Summary**

**Project Key Definitions**

**Project Key Linkages**

**Specific Resource Linkages**

### **Acknowledgment**

To be part of hard copy report only.

### **Project Overview**

This is the first NSRP Project report to be presented electronically, via [NSNET](#) as one of its discussion forums, with direct linkages to and from the Internet. This report will be defined via its major, categories and links listed below. The Project report will be comprised of a brief summary of the project, its benefits and its accomplishments. Followed by a brief discussion of conclusions and recommendations. The main body of the report will be the identification of various metrication relative resources, categorized emphasizing how information is exchanged, with their direct electronic linkages via the Internet. The application of this electronic medium, and such a forum within the NSRP's [NSNET](#), represents a significant strategic technology to

support the objective of leapfrogging with technology to gain a global share of the shipbuilding markets.

The fear of a negative impact to shipbuilding, material and inventory control due to converting to metrics was found to be quite minimal, once it was realized that the many complexities involved had various timely trade-offs as part of becoming globally competitive. The conversions have since realized to be part of the change to be global, to which U.S. shipbuilding is now committed to. A key requirement became how, what and where could we better define, use and communicate metric material and inventory control information.

The optimizing of this information transfer became the focus of this project. We early on saw the potential for the industry and NSRP to utilize electronic medium for its research and communications. Fortunately this project, has benefited with the speed of the recent electronic evolutions, and has been able to publish electronically. The accessible resources included range from shipyards, standards organizations, the NSRP Library, government agencies, academia, trade organizations, and shipbuilding vendors and suppliers. Thus any shipyard or resource can research, gather, learn, communicate and share with and from each other, in this electronic forum. Global commerce is now via the Internet, we are easily part of it with our NSNET Home Page, your Internet browser, various software tools, linkages, and e-mail.

## **Project Report Sections**

- **Project Approach and Activity Summary**
- **Project Report Table of Contents**
- **Project Conclusions and Recommendations**
- **Project Key Linkages**
- **Specific Resource Linkages**

### **Project Approach and Activity Summary**

This NSRP SP 8, Industrial Engineering project was initiated as the direct result of a panel meeting presentation, from the Caterpillar Corporation, on their experiences in entering the global marketplace and converting to the metric system. Concurrently NSRP Panel SP 6, Marine Industry Standards was well into and completing their NSRP Project #0399 A METRICATION OF U.S. SHIPBUILDING - THE CHALLENGES AND OPPORTUNITIES@. Funding, extensions and other delays have occurred with this SP 8 Project # N8 -92-3, such that this output format is the key benefit to the industry.

Industrial Engineering techniques were applied to gather analyze, categorize, coordinate and communicate, and drove this project throughout. The SP-8 Panel and Program Management were very supportive to find and develop new techniques and approaches with the NSRP projects and research. Now all NSRP projects' must have shipyard application as their only true measure of value. The outputting of this project via NSNET has is specifically to provide direct utilization of a shipyard to this project.

The project defined and conducted two sets of industry surveys the traditional way. These were met with common apathy, relative to subject matter and the harsh realities of local in house priorities. The medium was mailing, telephone, and faxing of data. Participation was poor.

The budget for this project was utilized to better gather and share information. The progress, requests, and communication on this project was shown by its being discussed and presented with the following NSRP Panels at their Panel Meetings: SP- 4 - Design to Production, SP- 5 Human Resources, SP-6 Standards, SP- 8 Industrial Engineering and SP - 9 - Training. The visits with specific government agencies, industries and institutions, provided us with the required global overview. We also found it most beneficial to attend various relative conferences and trade shows. The CALS EXPO was attended numerous times, and provides a basis for this report. CALS is defined later in the report. We would then document and share these visits with the SP-8 and other NSRP panels, NSRP project development activity, as well a scheduling various activities with staff at shipyards.

We tried to bring in concurrently, information relative to how other industries are progressing in the general area of global competition and specifically were there any real keys to metric conversion. The directions being taken, for inventory and material control became the main focus. The tools to better research and communicate then became our specific focus. Thus the objective being met to output this project electronically via NSNET, became its main objective.

The technical issues of metric conversion were never a real part of this particular project. The impact to material and inventory control is simply a matter of management and planning. Our finding was that to get into a position of global competitiveness, the access to information is a basic requirement. In shipbuilding there are a great many complex channels of information required to do business globally, that is really doing business metrically. These complexities range from CAD drawing conversions, to training, database conversions, to dual sets of tools, and parts bins for either standard or metric parts.

The analogy of Elliot Goldratt's " *A Theory of Constraints* ", as to Global and Local constraints applies with the shipbuilding approach to metric conversion. To compete globally, there are a great many major business processes which require timely change. The application and conversion to the SI International Metric Standard is a local process within the set of Global Processes. The global inventory and material control processes undergoing change, to compete globally, all have inherently committed to the required conversion to International Metric Standards.

The local processes required at various points of the overall processes all present opportunities to have a cost effective conversion. This project has attempted to provide a time proven Industrial Engineering approach by gathering, analyzing, categorizing and communicating. The following approach hierarchy relative to cost has been basic to this project.

# ADOPT ADAPT DEVELOP

## Project Key Metrication Definitions

Most of the technical aspects of the conversion to the SI metric system were excellently presented by Soik and Associates in the two SP-6 NSRP Projects: NSRP#0399 "Metrication Of U.S. Shipbuilding - The Challenges And The Opportunities", NSRP # 0437 "Metrication In U.S. Shipbuilding - Training Volume I Instructors Manual & Volume II Transparencies, Tests And Worksheets".

We found that that the most frequently asked question was for a working definition of soft and hard metrics. Below are two sets of definition gathered by the MARAD via their library at NMREC (National Maritime Resource and Educational Center) <http://nmrec.dot.gov> NMREC is a fantastic resource for the whole industry to utilize.

### Hard Metric and Soft Metric Definitions

1. From the American Society of Civil Engineers' Committee on Metrication Home Page on December 12, 1997:

· "Know the difference between a 'soft' metric conversion and a 'hard' metric conversion. 'Soft' metric conversion is an exact conversion. 'Hard' metric conversion is 'soft' conversion taken to the next level that is converted values are rounded, rational equivalents. For example, a 'soft' conversion of 6" is 152.4 mm. A

'hard' conversion of 6" is 150mm. Remember, 'hard' metric conversions will accelerate the learning process and acceptability of the metric system." The point of contact is Chris Stone and the e-mail address is: [cstone@infi.net](mailto:cstone@infi.net). Their Internet address is: <http://www.pilot.infi.net/~cstone/comindex.htm>.

3. From the Maritime Metric Practice Guide developed by the Maritime Administration's Office of Ship Construction, dated December 1978:

- "Soft Conversion is the process of changing the inch-pound measurement language to equivalent metric units within acceptable measurement tolerances without changing the physical configuration. In other words, it is the same item both before and after conversion."
- "Hard Conversion is the process of changing the inch-pound measurement language to non-equivalent metric units which necessitates physical configuration changes outside those permitted by established measurement tolerances. Although the term is in general use, it is technically incorrect when applied to specific items because no 'conversion' takes place; rather, a new metric item (requiring a new part identification) is created to replace the customary item."

## **CALS - DEFINITIONS**

**Continuous Acquisition and Life-cycle Support. This is revised from: Computer-Aided Logistics Support. CALS is a government sponsored initiative with the following :**

## **CALS STRATEGY**

**VISION:** Facilitate Enterprise Integration and promote an Electronic Commerce environment to enhance industrial competitiveness and economic growth through process improvement, information technology and international product data exchange technology.

**Goal:** For small to large businesses and government to be able to work real time in a digital environment from common data bases to Procure, Design, Develop, Manufacture, Distribute and Service Products.

### **Project Conclusions and Recommendations**

#### **Executive Summary:**

The fact that the U.S. Shipbuilding Industry has continued to learn and grow globally can be partly attributed to their focusing of common goals and objectives via the NSRP. This project has hopefully demonstrated how important communication and sharing is to any industry that wants to be globally competitive.

Metrication and a commitment to its application, always have been treated with apathy with most U.S. industries. They felt that change for the sake of change is not good business. Yet, change as a part of overall processes changes provides for true integration of all levels of change into the final set of processes. Metric conversion in the U.S. Shipbuilding Industry is going through these subtle yet progressive changes. In doing such, the direct impact on material and inventory control will be quite minimal if any. The many levels and complexities of such changes can be best accomplished at local levels with lessons being learned from the outside. The initial and future utilization of the INTERNET and its ever growing tools and applications now are the medium which to learn and grow with the outside world.

The key Industrial Engineering techniques of analysis, categorization and communication provide the conduit for continuous improvement of the local and global processes. The utilization of the **INTERNET** to allow for the cost effective application of specific tasks as to **ADOPT - ADAPT - OR DEVELOP**, is the key to integration of changes.

The NSRP has been a wonderful tool for the industry, although too often underutilized and appreciated. The industry leadership is gradually learning that concurrent project communicating and sharing provides for leveraging of the research funds. There are many other organizations associated with U.S. Shipbuilding, which have been electronically *linked* in this report. They all in their own way provide key resources for the industry to utilize. These *linkages with, suppliers, vendors, government agencies, standards organization and the like must now be continuously expanded upon and utilized. This is the key global process change for this industry to continue to grow and compete globally.*

## Conclusions and Recommendations:

- To compete globally you must be able to do business with the SI International metric standards at all levels .
- The speed of technical change is toward doing business electronically: to do such, this industry must change its processes in a timely and cost effective manner. The industrial engineering techniques to be cost effective require continuous analysis of change and implementation via its analysis to: *adopt, adapt or develop* .
- U.S. shipbuilding leadership can no longer isolate themselves locally if they wish to effectively compete globally.
- Competition means no free lunch, thus old barriers of communications with suppliers and vendors must change to be globally competitive. This also applies to those many government agencies, which are also changing. All business entities have limited resources and for all to prosper in the future many key business processes are changing, the future of business integration will be via standards of electronic communications.
- We strongly recommend the establishment of stronger relationships with vendors and suppliers.
- We recommend that conversion to the metrics system be the focused subject matter for all industry training programs on change and culture change. To often training subject matter has no real tie to their business. Metric conversion should be the focus tool to train and show how to bring about change with all levels of subject matter and to all levels of your organization. Change must occur within engineering, purchasing, material control, planning, ships production, ship repair, and is integrated with all outside support organizations.
- Each shipyard should via NSNET download and apply the metrication training so well set forth in the NSRP Panel SP -6, Report 0399 “Metrication of US Shipbuilding - The Challenges and Opportunities.” This report as well as its companion NSRP # 0437 “Metrication in U.S. Shipbuilding - Training, Volume I Instructors Manual, Volume II Transparencies, Tests & Worksheets.” Also listed with UMTRI is the video for the shipbuilding industry. All of which would be part of the above noted focused subject matter management programs.
- The scope of the ever expanding and improving technical communication, information exchange and processing will continuously require timely and effective efforts as to when to: *adopt, adapt or develop*. Change management and project management becomes critical strategies for growth.
- NSRP projects must have more focus on the continuous concurrent progress communications via this electronic forum.
- NSRP projects should all be required to conduct application surveys via the Internet.
- The NSRP should define on the [INTERNET](#) a clearinghouse site so that anyone can list, reference, search and know who, what and where things are happening. We currently have limited funds and many groups doing projects with similar objectives and potential application for many groups. A clearinghouse of past, current, active and future related activities would be inexpensive and provide unlimited benefits to all. Again we could apply: *adopt, adapt or develop*.
- The NSRP panels should each have a fixed budget for attendance at relative conferences or trade shows. These would be then reported, reviewed with their specific reference, contact and information shared via the [INTERNET](#) and its linkages within thirty days of attendance.

## Project Benefits:

- The sharing of a project status and activity among various NSRP panels .
- The integration of various outside organizations and research into a project and directly to the NSRP

- panels and shipyards.
- The open communication with shipyards and the many other support groups, vendors, suppliers, government agencies and standards organizations.
- The output being the direct utilization of the electronic medium of the Internet, its tools, perspective and scope of resources all at ones desktop.

## Project Key Linkages

### Key Linkages:

Listed below are selected key Linkages, which we have found to be most valuable and relative to this NSRP Project. Please take the time to visit each site. Once at each please search for topics relating to metrication, standards, and other Links. Use the tools such as bookmarks and e-mail to gather, categorize and store your information.

### Metric Supplier Directories:

**U.S. Metric Association.** 10245 Andasol Ave., Northridge CA 91325-1504 Tel. 818-368-7443 <http://lamar.colstate.edu/~hillger/>. We recommend that each and every shipyard purchase their *AMETRIC VENDOR LIST* @ Consisting of companies that produce metric -systems-based industrial parts, components, products, and building and construction materials. This list is very comprehensive and is frequently updated. Its use is basic to objectives of limiting the impact of metrication, since its lists those who now supply metric parts.

**The Association for Manufacturing Technology.** 7901 Westpark Drive, McLean, VA Tel 703-893-2900 <http://www.mfgtech.org> We recommend their ADomestic Suppliers of Metric Materials

### Standards Organizations:

· **American Society of Civil Engineers - Committee on Metrication** –

<http://www.pilot.infi.net/~cstone/comindex.htm> The basic SI Systems International internet site. The best for most definitions. Please visit and bookmark this site as well as its linkages to other Metric sites.

· **ASTM** - American Society for Testing and Materials - Committee F-25 on Ships and Marine Technology

- SHIIP Vision. <http://www.niip.org>. The shipbuilding information infrastructure, provided by the NIIP consortium, will deliver this information to the shipbuilder in a consistent and comprehensible format. The open, standards-based infrastructure deployed by NIIP will be built on existing and emerging standards including the Object Management Group, STEP and Workflow Management Coalition organizations. The SHIIP project will develop and deploy a new shipbuilding methodology that addressed both people and organizational issues. New shipbuilding processes will be developed, documented and validated by a broad-based team of shipbuilders. New organizational paradigms, such as a team-based approach to shipbuilding, will be investigated, deployed and measured for effectiveness. The SHIIP project is intended to be a deployment project; consequently, the SHIIP information infrastructure will avoid high-risk services. It will utilize services, which have been demonstrated in working prototypes, most notably through the NIIP consortium demonstrations. The purpose of this project is to identify and resolve those technical issues that will be encountered in transforming the prototype to a production-grade system. These issues include salability, robustness, and the ability of the information infrastructure to utilize legacy applications and data stores.

-**National Maritime Resource and Educational Center:(NMREC):** They have been and should be the key resource for the industry. They are set up to serve the shipbuilding industry with updated, data and technology. Please note the links available on NMREC Home Page ( They are the words "USCG" and "NAVSEA" actually on the umbrella logo) - they should provide one with direct linkages of industry value.

<http://nmerc.dot.gov>

- **The Regional ECRC Program.** <http://www.ecrc.ctc.com/>. The ECRC, Electronic Commerce Regional Center, is a nationwide network funded through NIST. They provide industry with task specific training, research as to how and what to do to convert to *ec* electronic commerce. They spoke at a combined SP-5 & 9 Panel meeting, as well as attending SP-6 & 8 Panel meetings. They have been utilized by most shipyards, MARAD, UMTRI and other shipbuilding related organizations at the national level. They were most cooperative with this specific project and to the industry as a whole. The CALS EXPO was where we first met with them. The costs of their program for outreach and training had been funded for participating companies by NIST.

<http://www.ecrc.ctc.com/>.

· **The Association for Manufacturing Technology.**

<http://www.mfgtech.org>. The purpose of this 200-page directory is to help buyers locate some of the finest manufacturing machinery and equipment in the world. The member products directory is widely used by industry executives, market researchers, financial analysts, and manufacturing engineers worldwide. The Product Listing Section groups manufacturers under each specific product in the listings. These are keyed to a detailed Product Identification Section. An electronic searchable version of this directory is now available on this web site.

- American Society of Civil Engineers. Committee on Metrication. <http://www.pilot.infi.net/~cstone/comindex.htm>. Systeme International. The ASCE Committee on Metrication is implementing the policy statement set forth by the ASCE Board of Directors in response to the issue and rationale for conversion from the English unit system of measurement to the SI (System International) system of measurement. The American Society of Civil Engineers Committee on Metrication – Chairperson, Maria Grazia Bruschi, P.E., C.A.M.S., e-mail at [74367.105@compuserve.com](mailto:74367.105@compuserve.com). Co-Chairperson, Chris Stone, P.E., C.M.S., e-mail at [cstone@infi.net](mailto:cstone@infi.net).
- Metric WWW Sites of Interest. <http://www.pilot.infi.net/~cstone/comindex.htm>.

## **National and International Standards:**

- **Society of Automotive Engineers.** <http://www.sae.org/PRODSERV/>. This group has a vast amount of documented detailed experience, data and contacts. They as we know have made the conversion !!
- **International Organization for Standardization.** ISO <http://www.iso.ch/welcome.html>. this body is the leader for doing global business. A must site to visit and work with.

· **The U.S. Coast Guard.** The Home Page has extensive links available. The USCG are the defining body for marine standards enforcement and activity. They are very open and supportive and participative with the various international standards organizations. They have also hosted and participated with various NSRP Panel meetings and projects.

<http://www.uscg.mil/hq/g-m/nmc/standards/index.htm>.

- **TC8 Ships and Marine Technology.** <http://www.iso.ch/meme/TC8.html>. Standardization of design, construction, structural elements, outfitting parts, equipment, methods and technology, and marine environmental matters, used in shipbuilding and the operation of ships, comprising sea-going ships, vessels for inland navigation, offshore structures, ship-to-shore interface and all other marine structures subject to IMO requirements. AG Advisory Group.
- **American Society of Mechanical Engineers (ASME).** <http://asme.org>.
- **The Society of Naval Architects and Marine Engineers.** <http://www.sname.org>. The NSRP

is a part of SNAME.

- **NIST - Metric Program (National Institute of Standards and Technology)**  
<http://ts.nist.gov/ts/>

## **Codes and Standards:**

- American Society of Mechanical Engineers (ASME). <http://asme.org/>.
- AASHTO Metrication Clearinghouse Newsletters.

<http://tti.tamu.edu/metric/newsltr/banner.html>.

## **Metric Units, Standards, Practices:**

· SI Jakub Associates. 43 Westbrook Road, West Hartford, CT 06107-3467. Tel: 860-521-7924. E-mail [sijakub@aol.com](mailto:sijakub@aol.com). <http://www.webcreations.com/metric>. Looking for help with the metric system? SIJ Associates has provided metrication services to corporations, state and federal government agencies, and small businesses for over 15 years.

## **Specific Resource Linkages**

### **Government Agencies & Information:**

· **AASHTO Metrication (American Association of State Highway and Transportation Officials)**

Web: <http://tti.tamu.edu/metric/index.html>

· **Alabama Metric Conversion (Alabama Department of Transportation)**

Web: [http://www.dot.state.al.us/Boards\\_Committees/metrication/index.htm](http://www.dot.state.al.us/Boards_Committees/metrication/index.htm)

• **Caltrans Metric Program**

Web: <http://www.dot.ca.gov/hq/oppd/metric/metricprg.html>

E-mail: [jchampa@trmx3.dot.ca.gov](mailto:jchampa@trmx3.dot.ca.gov)

• **Federal Metric Legislation**

Web: <http://www.pilot.infi.net/~cstone/asceref9.htm>

• **GSA Metric Design Guide**

Web: [http://www.gsa.gov/pbs/pc/tc\\_files/metric.htm](http://www.gsa.gov/pbs/pc/tc_files/metric.htm)

· **Metric Conversion Act of 1975 (Full Text)**

Web: <http://www.fatty.law.cornell.edu/uscode/15/205a.html>

• **Montana Metrics (Montana Department of Transportation)**

Web: <http://www.mdt.mt.gov/metric/mtmetric.htm>

E-mail: [u4689@long.mdt.mt.gov](mailto:u4689@long.mdt.mt.gov)

Phone: (406) 444-6207

• **Naval Inventory Control Point**

Web: <http://www.code05.icpmech.navy.mil/points.htm>

E-mail: [john\\_stokes@icpmech.navy.mil](mailto:john_stokes@icpmech.navy.mil)

Phone: (717) 790-6843

Fax: (717) 790-5946

• **NIBS Construction Metrication Council (National Institute of Building Sciences)**

Web: <http://www.nibs.org/cmcl.htm>

• **NIST Metric Program (National Institute of Standards & Technology)**

Web: <http://ts.nist.gov/ts/>

• **Texas Metric Workshop (Texas Department of Transportation)**

Web: <http://www.dot.state.tx.us/insdtdot/orgchart/rtt/fdoqtrly/tq10-1/question.htm>

• **Utah Metric Conversion Guide (Utah Department of Transportation)**

Web: [http://www.sr.ex.state.ut.us/cgi-bin/folioisa.dll/metric\\_g.nfo?](http://www.sr.ex.state.ut.us/cgi-bin/folioisa.dll/metric_g.nfo?)

• **Veterans Affairs Metrication (United States Department of Veterans Affairs)**

Web: [http://www.va.gov/facmgt/standard/metr\\_idx.htm](http://www.va.gov/facmgt/standard/metr_idx.htm)

• **Washington State Metrication (Washington State Department of Transportation)**

Web: <http://www.wsdot.wa.gov/metrics/>

Professional Organizations:

• **American Petroleum Institute**

Web: <http://www.api.org/>

Email: [pr@api.org](mailto:pr@api.org)

Phone: (202) 682-8000

• **ANMC (American National Metric Council)**

Email: [anmcmetric@aol.com](mailto:anmcmetric@aol.com)

Phone: (301) 718-6508

Fax: (301) 656-0989

• **ASCE Metrication Committee (American Society of Civil Engineers)**

Web: <http://www.pilot.infi.net/~cstone/comindex.htm>

Email: [74367.105@compuserve.com](mailto:74367.105@compuserve.com)

• **ASMENET (American Society of Mechanical Engineers)**

Web: <http://www.asme.org/>

Publication Database: <http://www.asme.org/catalog/index.html>

Phone: (800) 843-2763

Fax: (973) 882-1717

• **ATSSA Metrication Policy (American Traffic Safety Services Association)**

Web: <http://www.atssa.com/CTCDM.htm>

• **AWWA Metrication Policy (American Water Works Association)**

Web: <http://www.awwa.org/govtaff/metripol.htm>

• **Business and Design Forum 2001**

Email: [webmaster@bdf2001.com](mailto:webmaster@bdf2001.com)

Phone: (714) 229-8579 (Chad) or (702) 876-2685 (Hal)

• **CALS Expo USA 1997**

Web: <http://www.adpansia.org/21stcentury/default.htm>

• **IEEE Standards (Institute of Electrical & Electronics Engineers)**

Web: <http://www.standards.ieee.org/>

• **ITE Metrication Policy (Institute of Transportation Engineers)**

Web: <http://www.ite.org/metricv.htm>

• **MINA (Metric Importers of North America)**

Web: <http://www.m-i-n-a.org/>

• **U.S. Metric Association**

Web: <http://lamar.colostate.edu/~hillger/>

Phone: (818) 363-5606

Fax: (818) 368-7443

Industry Publications:

- **AASHTO Metrication Clearinghouse Newsletter**

Web: <http://tti.tamu.edu/metric/newsltr/banner.html>

Email: [anne@ttiadmin.tamu.edu](mailto:anne@ttiadmin.tamu.edu)

Phone: (505) 661-0434

Fax: (505) 661-1707

- **Marine Digest**

Web: <http://www.marinedigest.com/>

Email: [marinedigest@marinedigest.com](mailto:marinedigest@marinedigest.com)

Phone: (206) 682-3607

Fax: (206) 682-4023

- **Marine Log**

Web: <http://www.marinelog.com/>

Email: [nblenkey@infohouse.com](mailto:nblenkey@infohouse.com)

Phone: (212) 620-7200

Fax: (212) 633-1175

## **Metric Vendors:**

- **Bossard International, Inc.**

Web: <http://www.bossardusa.com/>

Phone: (603) 433-5900

- **Maryland Metrics**

Web: <http://www.mdmetric.com/>

Email: [sales@mdmetric.com](mailto:sales@mdmetric.com)

Phone: (800) 638-1830

Fax: (800) 872-9329

- **Metric Blue**

Web: <http://www.metricblue.com/>

Phone: (800) 451-2539

- **Suburban Bolt & Supply Company**

Web: <http://www.suburbanbolt.com/>

- **ILS - Marine Parts Information Network - 1-800-233-3414**
- **Metric Marine - T- 415-492-9202 F. 415-492-9206**

## **Organizations:**

- **American Petroleum Institute**

Web: <http://www.api.org/>

Email: [pr@api.org](mailto:pr@api.org)

Phone: (202) 682-8000

- **ANMC (American National Metric Council)**

Email: [anmcmetric@aol.com](mailto:anmcmetric@aol.com)

Phone: (301) 718-6508

Fax: (301) 656-0989

- **ASMENET (American Society of Mechanical Engineers)**

Web: <http://www.asme.org/>

Publication Database: <http://www.asme.org/catalog/index.html>

Phone: (800) 843-2763

Fax: (973) 882-1717

- **Business and Design Forum 2001**

Email: [webmaster@bdf2001.com](mailto:webmaster@bdf2001.com)

Phone: (714) 229-8579 (Chad) or (702) 876-2685 (Hal)

- **CALS Expo USA 1997**

Web: <http://www.adpansia.org/21stcentury/default.htm>

- **Naval Inventory Control Point**

Web: <http://www.code05.icpmech.navy.mil/points.htm>

Email: [john\\_stokes@icpmech.navy.mil](mailto:john_stokes@icpmech.navy.mil)

Phone: (717) 790-6843

Fax: (717) 790-5946

- **U.S. Metric Association**

Web: <http://lamar.colostate.edu/~hillger/>

Phone: (818) 363-5606

Fax: (818) 368-7443

- **EC in Action**

Web: <http://www.ecinaction.com/>

Cals Expo 1996 – Literature Project File

## **CALS EXPO '96**

OFFICAL PROGRAM GUIDE -OCT. 28-31,1996

407-322-7000

[jmk@magicnet.net](mailto:jmk@magicnet.net)

<http://calsexpo.ecrc.gmu.edu>

Listing of conference presentations and exhibitors

### **ec.com MAGAZINE**

The magazine for electronic commerce

### **FEDERAL COMPUTER WEEK MAGAZINE**

The magazine for federal computing interface

### **SMALL BUSINESS FORUM - CALS EXPO 96 FOLDER**

Outline of presentations

**CALS RIC FLYER**

317-306-3035

[TAWW@PO3.NAWC-AD-INDY.navy.mil](mailto:TAWW@PO3.NAWC-AD-INDY.navy.mil)

An activity our industry can learn from directly

**NAVY CALS FYLER**

An activity our industry can learn from directly

**NAVAL SEA LOGISTICS CENTER**

717-790-3705

<http://www.nslc.fmso.navy.mil>

Programs brochure

**ECRC -ELECTRONIC COMMERCE RESOURCE CENTER**

510-267-7432

[allen@ctc.com](mailto:allen@ctc.com)

<http://www.ecrc.ctc.com>

Brochure of services

**US ARMY LOGISTICS INTEGRATION AGENCY**

703-617-4481

[aschmack@alexandria.army.mil](mailto:aschmack@alexandria.army.mil)

<http://134/11/28/15/webs/logweb/cals/hmpg.htm>

Pocket guide for implementing CALS in the acquisition process

**ARCC - ACQUISITION REFORM COMMUNICATIONS CENTER - FLYER**

888-747-2722

[hayessi@acq.osd.mil](mailto:hayessi@acq.osd.mil)

<http://www.acq.osd.mil/dau/arcc>

An activity central to EC and reform which we can learn from

**ANSRS - AUTOMATED NONSTANDARD REQUISITIONING SYSTEM**

717-790-7417

Information pamphlet -navy supply systems command

**NATIONAL SECURITY INDUSTRIAL ASSOCIATION**

202-775-1440

1996 annual report & directory expo technical sponsor

**PARTNET - BROCHURE**

801-581-1118

<http://www.part.net>

[john.creer@part.net](mailto:john.creer@part.net)

Software VDI vendor

**SPEC -2000M INTEGRATED MATERIAL MANAGEMENT**

44 (0) 1332 347123

Brochure from an European industry aerospace association

**ADVANCED PROCUREMENT & LOGISTICS SYSTEMS**

+44 (0) 181 8933986

[techapp@cix.compulink.co.uk](mailto:techapp@cix.compulink.co.uk)

[Http://www.techapps.co.uk](http://www.techapps.co.uk)

Brochure for London conference April >97

**DLSC -DEFENSE LOGISTICS SERVICE CENTER**

DSN 932-4725

616-961-4725

<http://www.dlcs.dla.mil>

DLA - defense logistics agency manual

**LLYOD LAMONT DESIGN, INC**

FLYER

703-925-0660

Service provider

**US - ARMY EC SUPPORTING ENHANCED SYSTEM ACQUISITION MANAGEMENT**

Presentation

## **DOD - EC INFORMATION CENTER**

<http://www.acq.osd.mil/ec>

EC-EDI -certified value added network (van) list

### **CALS INTERNATIONAL**

#### **MAJOR TASK COMMITTEE**

Headed by Frank Brake - Newport News

#### **ISO DRAW**

408-260-3450

<http://www.isodraw.com>

CALS software

## **JLSC - JOINT LOGISTICS SYSTEMS CENTER**

DSN 785-0336

513-255-0336

<http://www.jlsc.wpafb.af.mil>

Full brochure depot maintenance material & ammunition mgt.

### **AT&T SERVICES**

800-746-7846

<http://www.att.com/easycommerce>

Brochures

## **INTRODUCTION TO DOD - ELECTRONIC COMMERCE**

800-334-3414

703-696-0411

[dodedi@acq.osd.mil](mailto:dodedi@acq.osd.mil)

<http://www.acq.osd.mil/ec/>

Version 2 - handbook for business - defense acquisition reform

### **INTERNET + INTRANET**

212-447-6400

[info@internetcommerce.com](mailto:info@internetcommerce.com)

<http://www.internetcommerce.com>

Flyer - this is the future

**MICRO-FRAME TECHNOLOGIES, INC**

800-235-4142

<http://www.microframe.com>

Brochures with demo diskette

**UNICE ++**

**VARIOUS CALS FOREIGN COUNTERPARTS**

322 2376511

[main@unice.be](mailto:main@unice.be)

Information flyers

**DATA CONVERSION LABORATORY**

718-357-8700

[office@dclab.com](mailto:office@dclab.com)

Service company

**CALS/CE REPORT**

713-690-7644

[calsrpt@infoassets.com](mailto:calsrpt@infoassets.com)

Use for contacts

**ELECTRONIC COMMERCE MONITOR**

703-525-9700

[monitor@bmainc.com](mailto:monitor@bmainc.com)

Useful publication

**SOFT QUAD**

212-880-6430

[joe@sq.com](mailto:joe@sq.com)

<http://www.softquad.com>

Software vendor=s data sheets

**IGES/PDES**

803-760-3327

[uspro@scra.org](mailto:uspro@scra.org)

January 27, 1997 workshop -step is major

**ASME ECRC WORKSHOP**

800-843-2763

[infocentral@asme.org](mailto:infocentral@asme.org)

Via satellite Dec. 11, 1996

**VIRTUAL ENTERPROSE SYSTEMS, INC**

EDI - on CD-rom service evaluation

**DLSC - DEFENSE LOGISTICS SERVICE CENTER**

717-790-1480

[Catherine M Carpinello@nslc.fmso.navy.com](mailto:Catherine_M_Carpinello@nslc.fmso.navy.com)

<http://www.nslc.fmso.navy.mil/oars.htm>

Their overview video of their services

**OPEN ARCHITECTURAL RETRIEVAL SYSTEM**

OARS - Naval Sea logistics system flyer

**DLA- FLYER**

215-737-8352

Automated systems for cataloguing and ordering textiles - learn from models

**JTAV - NAVY**

703-428-1081

Joint total asset visibility - program flyer

**CDMD-OA -NSLC PACIFIC**

510-246-5980

<http://www.cdmd.navy.mil>

Flyer on software configuration data managers database - open architecture

**NAVAL AVIATION SYSTEMS TEAM**

800-367-4886

[dtc@indy.navy.mil](mailto:dtc@indy.navy.mil)

<http://147.159.7.231>

DTC - DMS technology center

**EDI - NEWS SHOW ISSUE**

EDI - PUBLICATION

BMS 11-24-97 duplicate information

Cals Expo:

Item/Company/Product/Service/Comments

· **INTEGRATED DATA ENVIRONMENT HANDBOOK +**

**205-955-8707**

<http://www.laiso.redstone.army.mil>

ARMY - AMC

(LAISO)

**IDE - IMPLEMENTATION**

Plan good model to review

· **NATO SYMPOSIUM ON EC CODIFICATION**

**616-961-4847**

[gwilliams@dlsc.dla.mil](mailto:gwilliams@dlsc.dla.mil)

SAN DIEGO, CA

MAY 1997

Want to attend

Shipyards must attend

· **DOING BUSINESS WITH NASA**

**202-358-2088**

**800-2NASA95**

<http://www.hq.nasa.gov/office/codek>

A collection of their handouts for small business

Reference of how they do business

· **TRW - SMALL BUSINESS - SUB-CONTRACT PROCUREMENT**

310-814-0321

[Jan.Korn@trw.com](mailto:Jan.Korn@trw.com)

Various manuals - key contacts, policy manual

Good samples of how to work with vendors / ec

· **VICOM - MULTI-MEDIA**

403-452-4082

<http://www.vicom.ca>

Software for integrating with various platforms

· **SUPPLY TECH, INC**

313-998-4000

[schmenk\\_k@supplytech.com](mailto:schmenk_k@supplytech.com)

Full service ec based distributor

To work with on this project's survey very positive towards shipbuilding

· **BRITISH AEROSPACE**

+44-1252-373-232

A good example of global activity and industry competence

· **HUGHES TECHNICAL SERVICE S COMPANY**

310-335-6370

520-663-6439

"Aims" - advance integrated maintenance support system

Another good model for industry review

Metrication, machinery associations

· **"MEARS" A PAPERLESS ECP REVIEW PROCESS**

205-842-0867

<http://www.mears.redstone.army.mil>

Diskettes - us army cals project

Great model - will forward to SP-4/6 & purchase. Management.

Future project !!

· **“NIIP” – NATIONAL INDUSTRIAL INFORMATION INFRASTRUCTURE**

**PROTOCOLS**

203-978-2946

<http://www.niip.org>.

[director@niip.org](mailto:director@niip.org)

Virtual enterprise computing - manufacturing in the 21 st century - consortium for collaborative computing

Standards for industries - shipbuilding must get on board via – ecrc

ECRC & DLA

· **MANAGEMENT TECHNOLOGY -VARIOUS SOFTWARE**

304-367-1699

[richman@mantech-wva.com](mailto:richman@mantech-wva.com)

Man tech international corp.

Key player with the DLA - defense logistics agency

Again good models for review -

· **COMPUTER ASSISTED TECHNOLOGY TRANSFER - A NATIONAL REINVENTION LABORATORY**

405-736-5966

[jsteil@po6.tinker.af.mil](mailto:jsteil@po6.tinker.af.mil)

<http://catt.bus.okstate.edu/>

Another fully applied and calcs developed software/study

Good sample including local governments

· **KBSI - KNOWLEDGE BASED SYSTEMS , INC**

409-206-5274

[products@kbsi.com](mailto:products@kbsi.com)

<http://www.kbsi.com>

Software and project expertise - various modeling tools

· **"ONE SMART SHIP"**

301-227-5314

**THE YORKTOWN**

Reprint of the study project with calcs

· **ELECTRONIC PURCHASING INFORMATION CORPORATION – “EPIC”**

212-613-3400

**AN AFFILIATE OF THE THOMAS PUBLISHING COMPANY “CONNECT US”**

There “connect us” product is applicable to all global networks future project

· **“DOC DEPOT” ELECTRONIC DOCUMENT WAREHOUSING SOLUTION. PRODUCT BRIEF**

813-572-3254

[greg\\_bell@atk.com](mailto:greg_bell@atk.com)

**ALLIANT TECH SYSTEMS - PRESENTATION GIVEN AT CALS EXPO**

Good model to review

Future project

· **DEFENSE PERSONNEL SUPPORT CENTER, ANNUAL REPORT**

800-523-0705

<http://www.dpsec.dla.mil>

One of many great outputs from the dla - defense logistics agency

· **“POWER PUBS” ATA COMPLIANT DATABASE PUBLISHING SYSTEM**

619-476-9335

619-476-9209

SYSTEMS ENGINEERING SOLUTIONS, INC

· **ARMY ACQUISITION REFORM POLICY MEMO 10-24- 96**

**BASIC MEMO STATING REFORM AND LISTING KEY REFERENCES**

· **PDI -CALS CENTRUM**

THE NETHER LANDS

+31-30-602-1551

[calsnl@euronet.nl](mailto:calsnl@euronet.nl)

Global participation flyer

· **ASP ARMY ACQUISITION REFORM PROJECT PRESENTATION**

**"ELECTRONIC COMMERCE- SUPPORTING ENHANCED SYSTEM ACQUISITION MANAGEMENT**

Good paper

· **J-CALS WORKFLOW TEMPLATE DEVELOPMENT PROCESS - PRESENTATION**

<http://www.laiso.redstone.army.mil>

Basic systems from jcal - a must primer

Industry must follow and train to JCALS info

· **AGILITY FORUM**

PRODUCTS AND SERVICES

800-923-2445

<http://www.agility.forum.org>

An excellent industry resource if utilized

To meet with they have an annual show in San Diego. Some past industry work is unfinished!!

· **“LINK ONE” PUBLISHING**

800-90LINK1

SOFTWARE INTEGRATING PACKAGE

· **AVIATION WEEK PLUS**

213-480-5229

<http://www.awgnet.com>

**AVIATION WEEK PUBLICATION WITH CONCURRENT EXPO HANDOUTS**

· **ARMY CALS IMPLEMENTATION PLAN**

703-617-4718/4618

[sbarth@alexandria-emh1.army.mil](mailto:sbarth@alexandria-emh1.army.mil)

[acip@pentagon-hqdadss.army.mil](mailto:acip@pentagon-hqdadss.army.mil)

DISKETTE - LOGISTICS INTEGRATION AGENCY

Another great way to learn from example with contacts

· **“CALs EXPO 96**

CD-ROM OF THE PROGRAM

Great reference

· **NIIP**

203-978-2946

[director@niip.org](mailto:director@niip.org)

<http://www.niip.org>.

Repeat document

· **“NGM” - NEXT GENERATION MANUFACTURING**

**1-800-646-7765**

A flyer on this ongoing consortium of various quality organizations

Great forum to learn with and from shipyards must get involved

Future project type

· **“JUMP START” AN EDI TUTORIAL AND REFERENCE GUIDE**

**CD -ROM THE TOOLS NA PACKAGING OF THE FUTURE**

**WILL BE INVOLVED DIRECTLY WITH METRICATION**

Good reference base

· **“MEARS”**

**205-842-0867**

[ccarlisl@immcmssl.redstone.army.mil](mailto:ccarlisl@immcmssl.redstone.army.mil)

**DISKETTES OF ECP PROGRAM AS WELL AS CONTACTS**

A great standard format for the industry and its vendors to apply

Future project they will present to NSRP panels

· **"RESOURCE MATCHING PROGRAM" !!**

**714-660-1960**

[jbushnel@bxa.doc.gov](mailto:jbushnel@bxa.doc.gov)

**THE BUREAU OF EXPORT ADMINISTRATION U.S. DEPARTMENT OF COMMERCE**

Money and support !!!!

· **"PAPERLESS PM"**

**PROJECT FLYER**

**810-574-5924/5**

[schenk@cc.tacom.army.mil](mailto:schenk@cc.tacom.army.mil)

**ANOTHER JOINT PROJECT VIA THE ARMY, CALS AND OTHERS UTILIZING THE LATEST TECHNOLOGIES**

This is again great share-ware

Future project

· “MIDDLE EAST DIVERSIFICATION AND DEFENSE MARKET ASSESSMENT” JULY 1996

202-482-4695

[orji@bmpcoe.org](mailto:orji@bmpcoe.org)

[jisbell@bxa.doc.gov](mailto:jisbell@bxa.doc.gov)

**COMPREHENSIVE GUIDE FOR ENTRY INTO OVERSEAS MARKETS - U.S. DEPT. OF COMMERCE**

· CALS APEC 97

CONFERENCE ANNOUNCEMENT

KOREA EXHIBITION CENTER - SEOUL KOREA

82-2-756-5872~4

DECEMBER 8-10, 1997

**THE INTERNATIONAL CONFERENCE AND EXHIBITION ON CALS IN THE PACIFIC RIM**

· “NAVY CALS”

BROCHURE

703-602-0068

[digeronimo\\_rose@hq.navsea.navy.mil](mailto:digeronimo_rose@hq.navsea.navy.mil)

DETAILS THE OVERALL CALS NAVY ACTIVITY

· “SOLDIER SUPPORT NETWORK” – TACOM

<http://www-ssn.ria.army.mil>

**ANOTHER ARMY PROGRAM - TANK AUTOMOTIVE AND ARMAMENTS COMMAND**

This work can be reviewed and bench marked for industry applications

If you have any questions or comments e-mail the webmaster at [gobiecki@rohan.sdsu.edu](mailto:gobiecki@rohan.sdsu.edu)

**This is the end of this NSRP Report.**

***Respectfully Submitted to SNAME NSRP Ship Production Committee- Research Panel SP-8, " INDUSTRIAL ENGINEERING.***

***BMS & Associates, INC***

Additional copies of this report can be obtained from the  
National Shipbuilding Research and Documentation Center:

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

Documentation Center  
The University of Michigan  
Transportation Research Institute  
Marine Systems Division  
2901 Baxter Road  
Ann Arbor, MI 48109-2150

Phone: 734-763-2465  
Fax: 734-936-1081  
E-mail: [Doc.Center@umich.edu](mailto:Doc.Center@umich.edu)