



REPORT OF SURVEY CONDUCTED AT

**U.S. COAST GUARD, MAINTENANCE AND
LOGISTICS COMMAND-ATLANTIC
NORFOLK, VA**

APRIL 2002



Best Manufacturing Practices

1998 Award Winner



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Foreword



This report was produced by the Office of Naval Research's Best Manufacturing Practices (BMP) Program, a unique industry and government cooperative technology transfer effort that improves the competitiveness of America's industrial base both here and abroad. Our main goal at BMP is to increase the quality, reliability, and maintainability of goods produced by American firms. The primary objective toward this goal is simple: to identify best practices, document them, and then encourage industry and government to share information about them.

The BMP Program set out in 1985 to help businesses by identifying, researching, and promoting exceptional manufacturing practices, methods, and procedures in design, test, production, facilities, logistics, and management – all areas which are highlighted in the Department of Defense's 4245.7-M, *Transition from Development to Production* manual. By fostering the sharing of information across industry lines, BMP has become a resource in helping companies identify their weak areas and examine how other companies have improved similar situations. This sharing of ideas allows companies to learn from others' attempts and to avoid costly and time-consuming duplication.

BMP identifies and documents best practices by conducting in-depth, voluntary surveys such as this one at U.S. Coast Guard, Maintenance and Logistics Command-Atlantic (MLCLANT), Norfolk, Virginia conducted during the week of April 29, 2002. Teams of BMP experts work hand-in-hand on-site with the company to examine existing practices, uncover best practices, and identify areas for even better practices.

The final survey report, which details the findings, is distributed electronically and in hard copy to thousands of representatives from industry, government, and academia throughout the U.S. and Canada – *so the knowledge can be shared*. BMP also distributes this information through several interactive services which include CD-ROMs and a World Wide Web Home Page located on the Internet at <http://www.bmpcoe.org>. The actual exchange of detailed data is between companies at their discretion.

The MLCLANT provides maintenance and logistics support to Coast Guard commands in 40 states east of the Rocky Mountains, as well as commands in Puerto Rico, U.S. Virgin Islands, and Europe, and is committed to meeting or exceeding the support service requirements of Commander, Atlantic Area and Commander, U.S. Maritime Defense Zone, Atlantic and their subordinate commands. Among the best examples were accomplishments in the Acquisition Team Process, Cutter Class Maintenance Plan, and Measures of Effectiveness.

The BMP Program is committed to strengthening the U.S. industrial base. Survey findings in reports such as this one on the Maintenance and Logistics Command-Atlantic expand BMP's contribution toward its goal of a stronger, more competitive, globally-minded, and environmentally-conscious American industrial program.

I encourage your participation and use of this unique resource

A handwritten signature in cursive script that reads "Anne Marie T. SuPrise".

Anne Marie T. SuPrise, Ph.D.

Director, Best Manufacturing Practices

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Section 1

Report Summary

Background

Until 1987, the United States Coast Guard's basic structure included twelve autonomous districts aggregated into two areas — a Headquarters and a number of specialized commands. District Commanders provided oversight for subordinate commands that delivered services to the public. Engineering and other support was provided by a combination of generic unit level resources, district staffs, contractors, and in some cases by Headquarters. In August 1986, the Commandant concluded that some consolidation of these common support functions on an area-wide basis would require fewer resources. The plan, developed by the project team, created the Maintenance and Logistics Commands (MLCs) on the East and West Coasts. These new MLCs consolidated support services allowed reprogramming support personnel to operational mission areas.

The United States Coast Guard Maintenance and Logistics Command - Atlantic (MLCLANT), located in Norfolk, Virginia, provides maintenance and logistics support to Coast Guard commands in 40 states east of the Rocky Mountains, as well as commands in Puerto Rico, U.S. Virgin Islands, and Europe. MLCLANT is committed to meeting or exceeding the support service requirements of Commander, Atlantic Area and Commander, U.S. Maritime Defense Zone, Atlantic and their subordinate commands. MLCLANT's resolve to "be ready" is achieved by engaging early in the planning process and working proactively with customers to understand their needs. MLCLANT seeks ways to lower costs and enhance Coast Guard operations, and develops and fosters a workplace that encourages trust and enables each member to fulfill his or her full potential. The men and women of MLCLANT are proud to perform their mission of providing world class support through the use of new technology and streamlined business processes, and are committed to renewing MLCLANT through continuous improvement and by embedding quality in all that they do. It is important to the Command that it "reach out" to build strong community relations and to educate the public on the value of the Coast Guard. MLCLANT reduces its workload by eliminating non value-added tasks and acts as a catalyst

for implementing new technologies to improve its mission to "Keep Coast Guard units and personnel in the Atlantic Area Semper Paratus" (Always Ready). MLCLANT accomplishes this by identifying existing and future support requirements; providing responsive, integrated logistics services to meet those requirements; creating innovative support solutions; aggressively seeking opportunities to relieve operational commanders of support responsibilities; and developing deliberate support planning processes that facilitate the application of limited resources to achieve maximum benefits.

This survey was conducted in conjunction with the Continuous Improvement of Drydocking Management project of the Gulf Coast Region Maritime Technology Center. The BMP Survey Team observed the dedication of MLCLANT personnel in accomplishing their mission within the financial constraints that exist, and considers the practices in this report to be among the best in government and industry.

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Section 2

Best Practices

Management

Acquisition Team

The Acquisition Team process has proven to reduce problems encountered during ship availabilities. By having all interested parties involved in the Acquisition Team process, fewer chances of mistakes or omissions can occur.

The acquisition strategy and process being used at the U.S. Coast Guard, Maintenance & Logistics Command-Atlantic (MLCLANT) help ensure thorough preparation as ships enter either dry-dock or port side repair and maintenance events. The process consists of a team of players from all the required disciplines involved in cutter maintenance and the overall availability scheduling process.

MLCLANT assembled an Integrated Product Team (IPT), called the Acquisition Team (A-Team). This

team consists of the type desk manager (team chairman), an engineering specifications writer, contracting personnel, administrative personnel, logistics support personnel, and the port engineer from a Naval Engineering Support Unit (NESU). Other ad-hoc members are added to the A-Team as required. Members join or withdraw as expertise is required, and may serve on several different A-Teams simultaneously.

The A-Team process (Figure 2-1) begins when the Naval Engineering Division sends an official message to the affected cutter, and the NESU informs cutter personnel of the upcoming Work Definition Conference. This meeting is held between the NESU engineer and cutter personnel to generate the initial work list (WL) that depicts the needed and desired repairs/modifications. After review and required modifications of the initial list are made by the type desk manager, the first A-Team meeting is held to finalize the scope of work, validate the acquisition strategy, and deliver the work package for specification draft development.

The specifications writer then prepares a first draft of the specification and submits it to the entire A-Team for review and comment. A-Team members forward their comments to the type desk manager for his review and concurrence. After approval, the comments are incorporated into the specification and the second A-Team meeting is scheduled. The second meeting is usually held aboard the vessel, and involves a detailed review of the specification and a “shipcheck” to ensure all necessary details are covered and accurate. Results from this meeting provide the final specification (or statement of work) which is forwarded to contracting for start of the procurement process.

Execution of the contract is monitored daily by the NESU en-

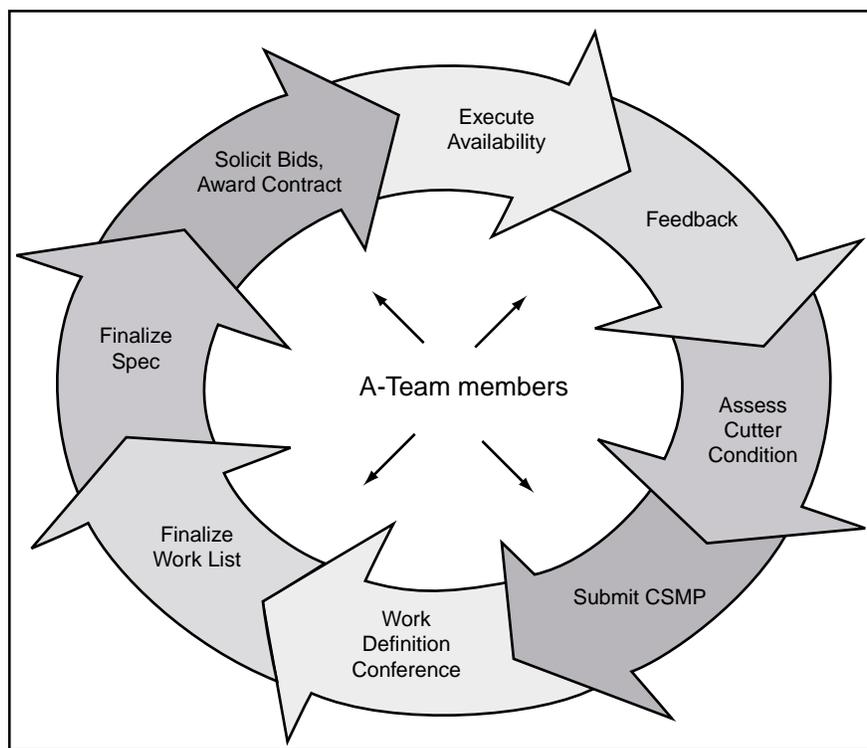


Figure 2-1. A-Team Process

gineer and members of the ship crew. The A-Team's review and partnering with the contractor ensure compliance with the contractual requirements and identify other areas of concern early, allowing for speedy contract modifications should the need arise.

At the conclusion of the contract's execution, a third meeting is held among all members of the original A-Team. During this meeting, feedback is solicited from all A-Team members, lessons learned are reviewed for each particular contract line item, and ways to improve the entire process for future work are uncovered. By members focusing on a common goal, the A-Team makes a significant contribution in keeping projects on schedule and within budget.

Cost Analysis and Estimating Process

Cost estimating tools and processes developed by the Maintenance and Logistics Command-Atlantic have dramatically improved the accuracy and completeness of government estimates and contracts administered at this location. Continuous updates and refinements of the processes and data enable the Maintenance and Logistics Command-Atlantic to accomplish its mission quicker and more effectively.

The preparation of quality cost estimates is essential to the operation of the Maintenance and Logistics Command-Atlantic (MLCLANT). These cost estimates must adequately cover the scope of planned ship repair, overhaul, and drydocking activities to maintain ship mission readiness within budget. The processes developed and continuously being refined at MLCLANT allow the Naval Engineering Division to accurately prepare government estimates, reflecting fair market value, that are then used to justify contract awards for the required work. Several different estimating processes are used depending on the type of contracting vehicle used to accomplish the work. Internal guides explain to personnel the estimate types and methods to be used for each task assignment (e.g., historical prices; parametric tables; or labor and material breakdown templates).

To begin the estimating process, a work list (WL) and supporting documents are forwarded to the engineering specifications branch where initial or preliminary government estimates are prepared for

comparison to budget. Once this comparison is made and budget issues are resolved, the WL defining the full scope of work is finalized. The final estimate is used to validate the acquisition strategy and enables contracting personnel to more effectively evaluate bids for the needed contractual work.

A major tool used in the estimating process is the standard work templates. By comparing the scope of the standard work items to each unique task, pricing can be obtained for the unique task, and historical data can be collected enabling continuous updates and refinement of the templates to reflect the most used work items and market conditions. This continual updating process ultimately ensures the accuracy of the new estimates. In addition, the process helps ensure that contracting personnel have adequate tools for bid evaluation. Feedback loops have been established between contracting and engineering estimating personnel allowing the comparison of abstracts for scope and price and updating the templates with current market prices.

Further refinements are being implemented in the standard work templates that will minimize unused options and keep the templates current. An interactive database of work items showing cutter class, work item, region, season, bidder, bid, pricing unit, and quantity is being created. This database will enable future estimates to account for more variables in contract pricing while further improving the estimating process.

Cutter Class Maintenance Plan

The Maintenance and Logistics Command-Atlantic's new Cutter Class Maintenance Plan eliminated inconsistencies across the Fleet, provided new tools for tracking maintenance activities to study the effectiveness of existing policies, and allowed flexibility to test new technology to implement condition based maintenance.

The Maintenance and Logistics Command-Atlantic's (MLCLANT's) Cutter Class Maintenance Plan (CCMP) was developed for Maintenance Policy Guidance and establishes the best and most cost effective maintenance procedures. The CCMP identifies funding responsibilities and defines unit re-

sponsibility for completing the maintenance and establishing the maintenance cycle. Under previous versions of the CCMP, cutter classes were independent of one another which created maintenance policy inconsistencies. Different versions of the CCMP existed between the Pacific and Atlantic Commands, and more recurring maintenance was performed because unnecessary work was scheduled. Tracking tools were also poor which made maintenance difficult to manage.

In 2001, the MLCLANT's new CCMP was introduced which allowed all cutter classes to be consistent and contained in one file. The new CCMP is easier to modify, making it more responsive to improvement initiatives. Both Pacific and Atlantic Commands now work with the same CCMP. This has resulted in a better maintenance policy and integration of better practices being used by both Commands. Personnel moving from coast to coast need not adapt to different maintenance philosophies. The Engineering Logistics Command manages and maintains the new CCMP. The new CCMP enables tracking of deferred maintenance, and if a maintenance item is deferred twice, the maintenance policy is reviewed to determine whether a change is necessary. Under the new CCMP, an annual review of maintenance policies is conducted, and implementation of new condition based monitoring systems is considered during these reviews.

The CCMP is used in conjunction with the Fleet Logistics System (FLS) for budgeting. The FLS provides access to the Naval Engineering Planning Listing, Casualty Reports data analysis, and Current Ship Maintenance Projects (CSMPs).

The U.S. Coast Guard is changing from a time-based maintenance policy to Condition Based Maintenance (CBM), and has partially implemented CBM in selected cutter classes. CBM sometimes requires special training, tools, and analysis skills. Training in A and C schools is being modified, and a long-term plan with goals that includes providing training and equipment to the intermediate level maintenance teams has been developed. CBM application can be expanded when annual CCMP reviews are completed to include other cutter classes. MLCLANT realized many benefits from CBM including eliminating unnecessary overhaul of vents, deferring vent duct cleaning with vent duct inspections, and reducing labor from 96 to four hours for clutch inspections.

Cutter Engineering Report

The Cutter Engineering Report contains information related to problems facing the crew. The Maintenance and Logistics Command-Atlantic analyzes and prioritizes the problems and develops solutions or, at a minimum, brings visibility of the problem to Headquarters.

Each Coast Guard Cutter must submit a Cutter Engineering Report (CER) annually, listing the condition of the cutter hull, mechanical and electrical systems. The CER is submitted by the Engineering Officer and signed by the Commanding Officer. The report consists of six sections: Section I (Safety Items), Section II (Hull), Section III (Machinery/Electrical), Section IV (Administrative Program), Section V (Cutter Engineering Summary), and Section VI (Remarks).

Section V of the report contains up to five significant (high priority) problems in naval engineering equipment that are beyond the ship's force capability to correct due to manpower availability, manpower capability, or funding, and requires action or assistance from the Maintenance and Logistics Command-Atlantic (MLCLANT) or higher authority. CERs from all cutters in the same class are analyzed to generate the top ten issues for that class. The top ten issues list is used in justification for planned obligation program funding, the need for an engineering change request, or assessment of the cutter class. The Fleet Logistics System (FLS) database is updated annually with the CER information, and a new Naval Engineering Planning List is printed and sent to the unit. The engine hours are reviewed by the Type Desk Manager, and maintenance is planned and budgeted based on the number of hours since the last overhaul and any related comments. A reply is sent to the cutter acknowledging his top five issues and informing what actions are to be taken to correct current problems.

The top ten list allows MLCLANT to readily identify and prioritize problems common to each cutter class and provide solutions.

Marketing to Increase the Bidder Pool

In response to the declining number of bids for repair projects, the Maintenance and Logistics Command-Atlantic interviewed repair facilities to identify the root causes of the problem. Feedback from the repair yards resulted in policy changes, and a marketing effort was implemented resulting in significant increases in bid responses.

In 1996, the Maintenance and Logistics Command-Atlantic (MLCLANT) observed a decline in the responses to procurement invitations for bids. Since only a few bidders were present in Districts 8 and 9, the prices were up significantly and at times, no bids were received which resulted in missed availabilities. Vessels traveling long distances for repair projects lost cutter operational days (i.e., a vessel was not available for operation when required to transit several days to a repair facility).

To address the problem, MLCLANT identified what it was doing wrong and how specifications could be improved. MLCLANT identified sources of supply and accomplished its goal with limited funds. In September 1996, a four-member Quality Action Team (QAT) was established which later grew to 28 members. The QAT located potential repair facilities by using the inland river guide, newspapers, telephone book yellow pages, and assistance from its Naval Engineering Support Units (NESUs). Based on past experience and knowledge, the QAT established expected problem areas (e.g., paperwork, personnel, facilities issues). More than 100 repair facilities were contacted to discuss government contracting with the U.S. Coast Guard. Many of the problems MLCLANT anticipated were validated by discussions and research; however, other problems arose from the discussions which would otherwise not have been identified.

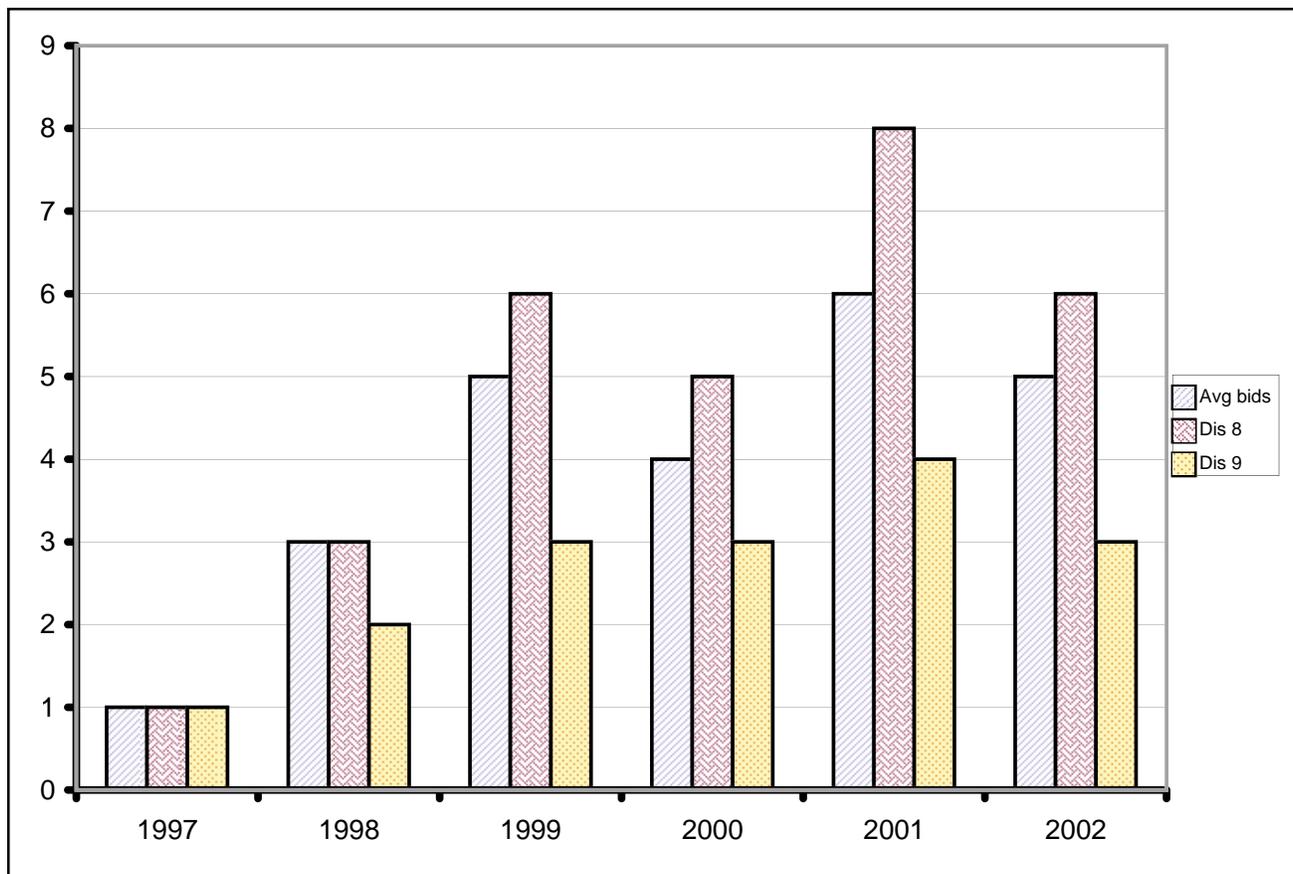


Figure 2-2. Bid Statistics

Interviews with the repair facilities showed four categories of barriers to the bidding process:

- Excessive Paperwork
 - Lengthy specifications
 - Burdensome contract documentation
 - Lack of dock certifications by several small repair facilities
- Excessive Personnel On-site
 - Too many Coast Guard personnel and inspectors
- No on-site port engineer to authorize changes
- Facilities
 - Drydock occupied too long while awaiting government decisions on needed repairs
 - No recuperation of actual costs compared with commercial clients
- Filler Work
 - Government contracts not considered reliable income

The QAT made the following recommendations:

- Reduce paperwork in the specifications area
 - Decrease required inspection
 - Reduce number of required condition reports and references required
- Reduce paperwork in the contracting area
 - Issue solicitations on disk
 - Implement base award with option years
 - Implement multi-ship contracts
- Decrease personnel on-site
 - Temporarily assign some crew members to other operational units
- Speed up change order process
 - Authorize Port Engineer to negotiate changes up to \$2,500
 - Reduce number of review levels

The QAT made other recommendations and implemented them as funds became available. Since many companies were computerized, MLCLANT began the processing of bids electronically. Marketing at trade shows was also implemented. Marketing has emphasized the need to teach contractors how to work with the government and also filled a niche for providing companies access to government contracting information. MLCLANT is approaching its sixth year at the International Work Boat Show and now also exhibits at the Acquisition Reform Conference and the Society of Naval Engineers trade shows. MLCLANT's practice marketing strategy has increased bid responses per solicitation from zero or one bid in FY97 to between six and 10 bids in FY01 (Figure 2-2).

Measures of Effectiveness

Since 1991, the Maintenance and Logistics Command-Atlantic has maintained Measures of Effectiveness by collecting and analyzing data in eight categories: Acquisition Process, Financial Management, Product / Service Timeliness, Naval Engineering Support Unit, Availability Readiness, Inventory Accuracy, Customer Service, and Casualty Response.

The Maintenance and Logistics Command-Atlantic (MLCLANT) uses Measures of Effectiveness (MOEs) to help focus on important issues and drive improvement within their key success factors. MOEs are in various formats and part of MLCLANT's Total Quality Management initiative. These measures are grouped into eight categories: Acquisition Process, Financial Management, Product/Service Timeliness, Naval Engineering Support Unit (NESU), Availability Readiness, Inventory Accuracy, Customer Service, and Casualty Response. MOEs were developed as a reporting system to measure critical processes within the Naval Engineering Program. The MOEs evolved out of MLCLANT's desire to standardize its measurement activities. MOEs include the following areas: Acquisition, Process, Discipline, and Future Goals; Results; Cutter Reliability; and Configuration Compliance.

MLCLANT uses a format which requires that the measures be Specific, Measurable, Agreed Upon, Realistic, Time-framed (SMART). The Acquisition Process measures four success rates:

- Contract Award and Start Date
MLCLANT's success rate of 30 days between contract award and start date is an important goal. In FY99 and FY00, MLCLANT realized a dramatic improvement; however, FY01 brought a decline in this measure. This was caused by several factors including the initiation of a new "best-value" contracting method, which complicated the bid evaluation. This measure now has a positive trend for FY02. Overall, 56% of availabilities were awarded at least 30 days prior to the start date.
- Containing Contract Growth
Since FY97, MLCLANT has consistently contained contract growth to less than 20% for more than 80% of the contracts (Figure 2-3). In FY01, 94% of the contracts had less than 20% contract growth.

- **Meeting Contract Start Dates**
Since FY97, MLCLANT has demonstrated a high level of success in starting availabilities on time and had an overall success rate of 96% in FY01.
- **Meeting Contract Completion Dates**
Since FY96, completion rates have been on a steady rise (Figure 2-4), with an on-time success rate in FY01 of 80% for completing availability contracts.

MLCLANT's product timelines are controlled by an availabilities milestone objective established through the Fleet Logistic System (FLS) workflow. Information is reviewed quarterly and feedback is provided on the following timelines: sending the availability project start message; and timeliness in receiving work list (WL) submission, completing draft package, sending final specification to type desk managers, and bid openings. An Availability Start Day Message informs a unit of an availability project commencement and the start of the planning process. Prior to FY99, MLCLANT's success rate in this measure was high. In FY01, the overall success rate for sending out the Availability Start Day Message was 59%. After analysis, MLCLANT determined that the problematic implementation of FLS caused the drop.

The measure, timeliness in completion of draft package, compares planned vs. actual dates on appropriate project schedules. The draft package describes the repairs needed and the specifications used at the second Acquisition Team (A-Team) meeting review. The goal is to ensure that the draft is completed in accordance with the established timelines. In FY01, the on-time success rate for the completion of draft specification packages was 72%, and 90% for completion of draft specifications within five days of the planned date. This represents a moderate improvement over prior years.

Other measures include:

- **Final Specifications**—timeliness in sending final specifications to the Support Branch with established timelines. Since FY98, MLCLANT has seen consistent increases in this measure. For FY01, the success rate was 89%, and 98% within five days
- **Timeliness in Bid Openings**—ensures the bid openings are completed in accordance with established timelines. In FY01, the overall success rate for opening bids on time was 74%, and 77% within five days.

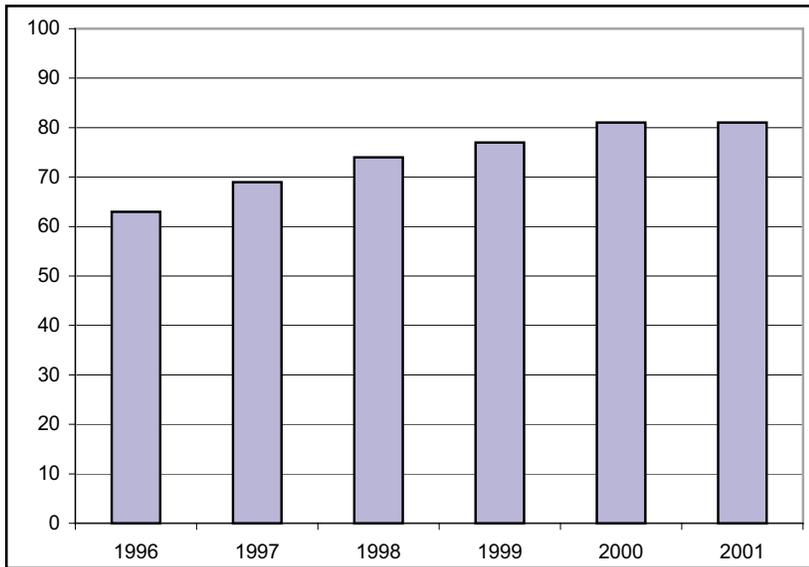


Figure 2-3. Monitoring Contract Growth

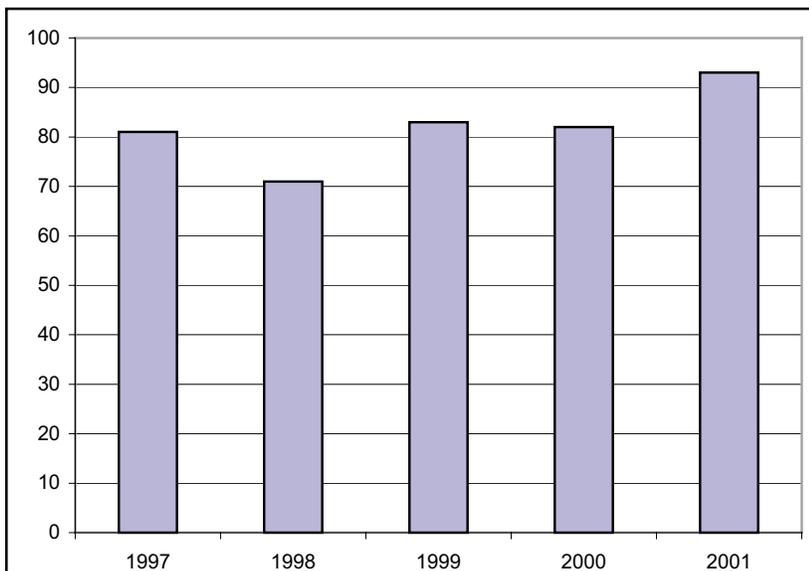


Figure 2-4. Planned Completion Dates

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- Customer Satisfaction for the MLCLANT and Contractor—derived from the number of positive and negative responses from the MOEs' status report submitted by the procurement section. The goals are to evaluate and compare the level of customer satisfaction with the availability process, and measure, analyze, and maintain a high level of customer satisfaction. Since FY97, MLCLANT has exceeded a 95% customer satisfaction rate.
 - Naval Engineering Post Availability Scores—measures the level of customer satisfaction with the Naval Engineering Division's contribution to the availability process. Twenty-eight questions are asked, and the score is derived from the average numeric scores given for the Naval Engineering Division from the Post Availability Survey. Here, the goal is to measure, analyze, and improve the level of customer satisfaction. The Naval Engineering Division has provided its customers with adequate service for the last four years. In FY01, the customer satisfaction average was 3.89 out of a possible five. In the third and fourth quarters FY01, MLCLANT maintained an average score of four.

By expanding and improving its measures, MLCLANT can identify trends and process problems, support and track improvement efforts, benchmark and conduct risk assessments, demonstrate results, and focus on significant issues.

Storing and Accessing Repair Specification Data

The Maintenance and Logistics Command-Atlantic's proactive approach for storing and accessing repair specification data resulted in the standardization of recurring work list submissions and elimination of duplication of effort.

The Maintenance and Logistics Command-Atlantic's (MLCLANT's) Engineering Specification Branch provides specifications for commercial and government repair work, and provides technical support. Since 90% of ship repair work is recurring, work items are classified as Managed Items (MIs) which originate from the Cutter Class Maintenance Plan (CCMP). These items are maintained by the Subject Matter Expert (SME) and reflect MLCLANT's latest policies (e.g., references, standards, and

phrases). MIs have broad cutter class application and require little tailoring to fit a given class or unit. When an SME discovers the need to revise an existing MI, the SME submits a request for revision which consists of the revised MI, an explanation of the changes and why they are necessary, and any changes needed to the applicable list.

The section chief reviews the proposed changes, and approves, disapproves, or refers the changes to the Managed Item Package Generator (MIPG) Board which consists of the MIPG custodian, section chiefs, and branch chief. The MIPG Board discusses the proposed changes and responds to the SME whether or not to proceed with the changes. When a need arises to correct an obvious clerical error in an MI, the person finding the error notes the discrepancy, e-mails the MIPG custodian, and copies the e-mail to the SME. The MIPG custodian then makes the clerical corrections in the MI folder.

Running the MIPG is the first step in developing the first draft of a specification package. It ensures that the latest MIs are being used in the package. MIPG is a Macro application. In addition to the MIPG, the specifications branch maintains Standard Work Item Templates (SWITs). These templates are work items that recur frequently (e.g., type of door, door sizes and locations, drawing numbers), but require input from the Project Engineer (PE) to make them specific.

Current Ship Maintenance Projects (CSMPs) are written by the ship and submitted to the PE for approval. The CSMP provides the information needed by the specifications branch to complete the specification package. New (non-MI) work items require collaboration among the SME, PE, and Cutter Class Coordinator (CCC) to complete. Reference material and the latest applicable documents are researched and identified for use. A reference folder is available which contains links in finding specification data, as well as updated Standard Specifications, Federal and Military Specifications, Industry Standards, and links to Coast Guard and NAVSEA Drawings.

During the third Acquisition Team (A-Team) meeting, web-based feedback and post availability reports are used to identify opportunities for continuous improvement. SMEs, PEs, and CCCs continuously strive for improvement, so feedback on work items within a specification is encouraged. Basic IT technology is successfully leveraged to manage, store, and access repair specification data, avoiding duplication of effort and standardizing work list (WL) submissions. MLCLANT's approach to new ideas and technology is continuing to bring new ways of doing business.

Section 3

Information

Management

Information Management Availability Feedback & Process Improvement

The Maintenance and Logistic Command-Atlantic's specification feedback form provides a closed loop for feedback on the specification when problems or discrepancies are encountered.

In August 2000, the Maintenance and Logistics Command-Atlantic (MLCLANT) implemented a specification feedback process that closed the loop between the originator of the feedback document and the person or organization responsible for taking final corrective action to ensure resolution of global problems discovered with standardized work specifications. MLCLANT defines specification feedback as information discovered during the availability planning process or after contract award, and has applicability beyond the scope of a single availability or is beyond the Acquisition Team's (A-Team's) ability to resolve. With this clear definition, other inputs that are routine to specification development or correction input, or inputs that should be submitted directly to A-Team members, are handled informally and not tracked, allowing high-level focus and thorough research on the significant issues received.

An example of a specification feedback is:

The work specification calls for updating a piece of equipment in accordance with a given Coast Guard standard or process. That standard or process dictates the use of a process that no longer meets EPA approval. This problem is not correctable on the work specification or by the A-Team. A change to the master standard or process is required and must have formalized change approvals.

When a problem is discovered that meets the definition, a Specification Feedback Form is completed and sent to MLCLANT engineering. The form is an easy means to quickly pass feedback back to the Specifications Branch so that appropriate changes can be made in future contracts. The form allows for a description of the problem, and also requests a recommended solution to the problem.

The Specification Feedback Form is available on both the Internet and Intranet, so that all involved parties have the capability to use the process.

A unique part of this process is that the originators of *all* specification feedback forms receive a reply to their input. An electronic follow-up file is created, and the status of the feedback is shown as pending until the issue is resolved. To date, more than 95% of all Specification Feedback Reports have been successfully closed out. The original feedback submission, along with status and other information, is posted and maintained on the Coast Guard Intranet.

Management Integrated Training Team

The Maintenance and Logistics Command-Atlantic developed the Management Integrated Training Team approach to training. The goal of the team is to provide training needed by personnel to perform their jobs in the most cost effective manner possible.

The Maintenance and Logistics Command-Atlantic (MLCLANT) instituted a Management Integrated Training Team (MITT) consisting of representatives of each branch. Before the MITT was formed, training was limited due to continually decreasing available funds. Most training was provided by commercial vendors, and few billets were available for government schools. Little training was provided to subordinate commands, such as the Naval Engineering Support Units (NESUs). Most in-house training was accomplished at the work group level with little coordination between the groups. In 1999, a Climate Assessment Survey was conducted, and a change in management occurred at the same time. The survey revealed that employees perceived a lack of training necessary to perform their jobs and were frustrated with the shortage of professional development and educational opportunities.

The MITT was designed to supplement other types of training. Commercial training is used to train one or two persons per field of expertise, and those trained then provided training to others. The Coast Guard's web-based Information Technology training is utilized. In-house training is provided for the Port Engineers at approximately one-fourth of

the cost of commercially provided training. The MITT is a component of the division business plan. Training plans are developed and budget recommendations are made. Employees and managers are provided the opportunity for feedback. Alternative training strategies are used to continue to provide the most training opportunities for employees. Regular use of formal surveys ensures the continuing quality and applicability of the training provided. Web conference-based training sessions are planned for personnel aboard cutters and subordinate commands.

The MITT approach provides cost effective training that employees need to effectively perform their jobs or for professional development. There are two overall advantages, beyond saving costs: 1) the internal Coast Guard trainers are provided a professional opportunity as they develop, plan, and deliver formal training to their colleagues and, 2) the training is tailored to the specific needs of Coast Guard Naval Engineering, since frequently the commercially available courses include areas not applicable to cutter maintenance programs.

Using the Coast Guard Intranet to Push & Pull Information

With the advancement of web technology, Engineering Officers of the U.S. Coast Guard cutter fleet who are planning depot work can now view the latest Cutter Class Maintenance Plans and listings of managed work items for their cutter class, search on-line specifications by cutter class or key word, cannibalize historical work items, and submit well documented work lists, all more efficiently and cost effectively.

As web technology has developed and continues to grow, the Maintenance and Logistics Command-Atlantic (MLCLANT) has taken advantage of the

developments to improve the efficiencies of the organization and its mission. Prior to the development of the Coast Guard Intranet system, preparing for shipyard repair availability was labor intensive and inefficient. An Engineering Officer aboard a cutter had access to only their own cutter's old specifications. Nothing was readily available to assist in developing a work list (WL) and Current Ship Maintenance Project (CSMP) that listed all maintenance items required to be performed. Other specifications and recurring maintenance lists were located either at portside (within the Engineering Command Office at the Naval Engineering Support Unit [NESU]) or elsewhere.

With the development and continued expansion of the Coast Guard Intranet system, all information that is cutter-related and specific, as well as standard specifications, Cutter Class Maintenance Plans (CCMPs), Long-Range Maintenance Plans, guides, forms, tutorials, and discussions of frequently encountered technical issues are now available to the entire Coast Guard organization 24/7. Maintenance technologies and philosophies continually change, so a means of conveying current policy and practice becomes imperative. This information is necessary for the Cutter Engineering Officer to effectively perform his duties.

By effectively implementing web technology, MLCLANT delivers guidance in an entirely new way, resulting in an enormous impact on overall productivity. Guidance can be instantly cross-referenced through a boundless number of hyperlinks and separate link pages suiting individual audiences and making the guidance more accessible and palatable for everyone.

MLCLANT uses the Intranet to push information out to their customers and also to pull information from them, allowing Engineering Division personnel to easily take advantage of and incorporate lessons learned from customers into future packages and share them with others.

Appendix A

Table of Acronyms

ACRONYM	DEFINITION
A-Team	Acquisition Team
CBM	Condition Based Maintenance
CCC	Cutter Class Coordinator
CCMP	Cutter Class Maintenance Plan
CE	Cutter Engineer
CER	Cutter Engineering Report
CSMP	Current Ship Maintenance Project
FLS	Fleet Logistics System
IPT	Integrated Product Team
MI	Managed Item
MIPG	Managed Item Package Generator
MITT	Management Integrated Training Team
MLC	Maintenance and Logistics Command
MLCLANT	Maintenance and Logistics Command - Atlantic
MOE	Measure of Effectiveness
NESU	Naval Engineering Support Unit
PE	Project Engineer
QAT	Quality Action Team
SMART	Specific, Measurable, Agreed Upon, Realistic, Time-framed
SME	Subject Matter Expert
SWIT	Standard Work Item Template
WL	Work List

Appendix B

BMP Survey Team

Team Member

Activity

Function

Larry Robertson
(812)854-5336

Crane Division
Naval Surface Warfare Center
Crane, IN

Team Chairman

Management Team

Don Hill
(317)849-3202

BMP Field Office
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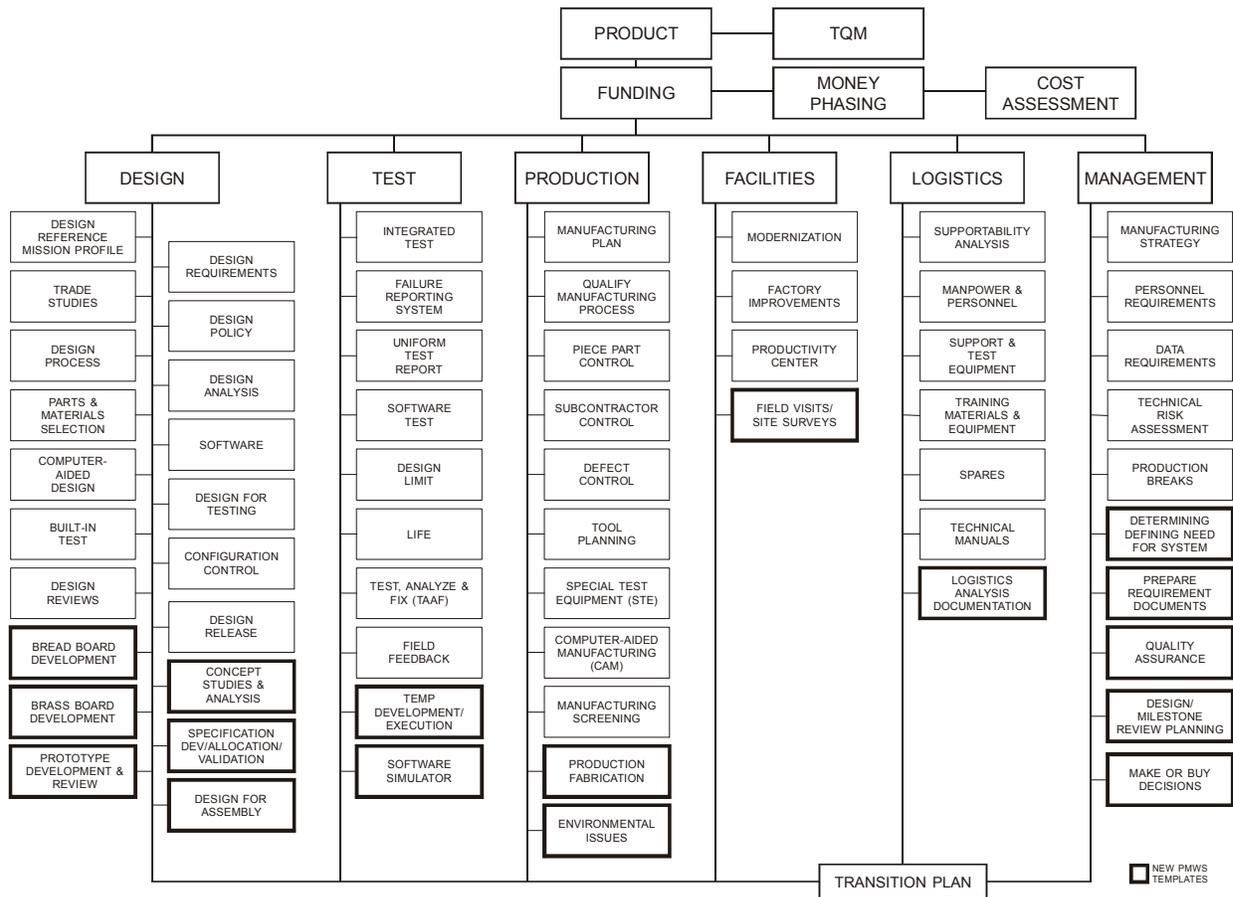
Appendix C

Critical Path Templates and BMP Templates

This survey was structured around and concentrated on the functional areas of design, test, production, facilities, logistics, and management as presented in the Department of Defense 4245.7-M, *Transition from Development to Production* document. This publication defines the proper tools—or templates—that constitute the critical path for a successful material acquisition program. It describes techniques for improving the acquisition process by addressing it as an *industrial* process that focuses on the product’s design, test, and production phases which are interrelated and interdependent disciplines.

The BMP program has continued to build on this knowledge base by developing 17 new templates that complement the existing DOD 4245.7-M templates. These BMP templates address new or emerging technologies and processes.

“CRITICAL PATH TEMPLATES FOR TRANSITION FROM DEVELOPMENT TO PRODUCTION”



Appendix D

The Program Manager's WorkStation

The Program Manager's WorkStation (PMWS) is an electronic suite of tools designed to provide timely acquisition and engineering information to the user. The main components of PMWS are KnowHow; the Technical Risk Identification and Mitigation System (TRIMS); and the BMP Database. These tools complement one another and provide users with the *knowledge, insight, and experience* to make informed decisions through all phases of product development, production, and beyond.

KnowHow provides knowledge as an electronic library of technical reference handbooks, guidelines, and acquisition publications which covers a variety of engineering topics including the DOD 5000 series. The electronic collection consists of expert systems and simple digital books. In expert systems, KnowHow prompts the user to answer a series of questions to determine where the user is within a program's development. Recommendations are provided based on the book being used. In simple digital books, KnowHow leads the user through the process via an electronic table of contents to determine which books in the library will be the most helpful. The program also features a fuzzy logic text search capability so users can locate specific information by typing in keywords. KnowHow can reduce document search times by up to 95%.

TRIMS provides insight as a knowledge based tool that manages technical risk rather than cost and schedule. Cost and schedule overruns are downstream indicators of technical problems. Programs generally have had process problems long before the technical problem is

identified. To avoid this progression, TRIMS operates as a process-oriented tool based on a solid Systems Engineering approach. Process analysis and monitoring provide the earliest possible indication of potential problems. Early identification provides the time necessary to apply corrective actions, thereby preventing problems and mitigating their impact. TRIMS is extremely user-friendly and tailorable. This tool identifies areas of risk; tracks program goals and responsibilities; and can generate a variety of reports to meet the user's needs.

The **BMP Database** provides experience as a unique, one-of-a-kind resource. This database contains more than 2,500 best practices that have been verified and documented by an independent team of experts during BMP surveys. BMP publishes its findings in survey reports and provides the user with basic background, process descriptions, metrics and lessons learned, and a Point of Contact for further information. The BMP Database features a searching capability so users can locate specific topics by typing in keywords. Users can either view the results on screen or print them as individual abstracts, a

single report, or a series of reports. The database can also be downloaded, run on-line, or purchased on CD-ROM from the BMP Center of Excellence. The BMP Database continues to grow as new surveys are completed. Additionally, the database is reviewed every other year by a BMP core team of experts to ensure the information remains current.

For additional information on PMWS, please contact the Help Desk at (301) 403-8179, or visit the BMP web site at <http://www.bmpcoe.org>.



Appendix E

Best Manufacturing Practices Satellite Centers

There are currently ten Best Manufacturing Practices (BMP) satellite centers that provide representation for and awareness of the BMP Program to regional industry, government and academic institutions. The centers also promote the use of BMP with regional Manufacturing Technology Centers. Regional manufacturers can take advantage of the BMP satellite centers to help resolve problems, as the centers host informative, one-day regional workshops that focus on specific technical issues.

Center representatives also conduct BMP lectures at regional colleges and universities; maintain lists of experts who are potential survey team members; provide team member training; and train regional personnel in the use of BMP resources.

The ten BMP satellite centers include:

California

Chris Matzke

BMP Satellite Center Manager
Naval Surface Warfare Center, Corona Division
Code QA-21, P.O. Box 5000
Corona, CA 92878-5000
(909)273-4992
FAX: (909)273-4123
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District of Columbia

Chris Weller

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U.S. Department of Commerce
14th Street & Constitution Avenue, NW
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Thomas Clark

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3301 North Mulford Road
Rockford, IL 61114
(815) 921-3057
FAX: (815)654-4459
adme3tc@rvcc.il.us

Iowa

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BMP Satellite Center Manager
Iowa Procurement Outreach Center
2273 Howe Hall, Suite 2617
Ames, IA 50011
(515)294-4461
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Louisiana

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UAMTCE, Room 163-Station 122
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Appendix F

Navy Manufacturing Technology Centers of Excellence

The Navy Manufacturing Technology Program has established Centers of Excellence (COEs) to provide focal points for the development and technology transfer of new manufacturing processes and equipment in a cooperative environment with industry, academia, and the Navy industrial facilities and laboratories. These consortium-structured COEs serve as corporate residences of expertise in particular technological areas. The following list provides a description and point of contact for each COE.

Best Manufacturing Practices Center of Excellence

The Best Manufacturing Practices Center of Excellence (BMPCOE) provides a national resource to identify and share best manufacturing and business practices being used throughout government, industry, and academia. The BMPCOE was established by the Office of Naval Research's BMP Program, the Department of Commerce, and the University of Maryland at College Park. By improving the use of existing technology, promoting the introduction of improved technologies, and providing non-competitive means to address common problems, the BMPCOE has become a significant factor to counter foreign competition.

Point of Contact:
Anne Marie T. SuPrise, Ph.D.
Best Manufacturing Practices Center of Excellence
4321 Hartwick Road
Suite 400
College Park, MD 20740
Phone: (301) 403-8100
FAX: (301) 403-8180
E-mail: annemari@bmpcoe.org

Institute for Manufacturing and Sustainment Technologies

The Institute for Manufacturing and Sustainment Technologies (iMAST) is located at the Pennsylvania State University's Applied Research Laboratory. iMAST's primary objective is to address challenges relative to Navy and Marine Corps weapon system platforms in the areas of mechanical drive transmission technologies, materials processing technologies, laser processing technologies, advanced composites technologies, and repair technologies.

Point of Contact:
Mr. Robert Cook
Institute for Manufacturing and Sustainment Technologies
APL Penn State
P.O. Box 30
State College, PA 16804-0030
Phone: (814) 863-3880
FAX: (814) 863-1183
E-mail: rbc5@psu.edu

SCRA Composites Manufacturing Technology Center

The Composites Manufacturing Technology Center (CMTC) is a Center of Excellence for the Navy's Composites Manufacturing Technology Program. The South Carolina Research Authority (SCRA) operates the CMTC and The Composites Consortium (TCC) serves as the technology resource. The TCC has strong, in-depth knowledge and experience in composites manufacturing technology. The SCRA/CMTC provides a national resource for the development and dissemination of composites manufacturing technology to defense contractors and subcontractors.

Point of Contact:
Mr. Henry Watson
SCRA Composites Manufacturing Technology Center
100 Fluor Daniel Engineering Building
Clemson, SC 29634-5726
Phone: (864) 656-6566
FAX: (864) 656-4435
E-mail: watson@scra.org

Electronics Manufacturing Productivity Facility

The Electronics Manufacturing Productivity Facility (EMPF) identifies, develops, and transfers innovative electronics manufacturing processes to domestic firms in support of the manufacture of affordable military systems. The EMPF operates as a consortium comprised of government, industry, and academic participants led by the American Competitiveness Institute under a Cooperative Agreement with the Navy.

Point of Contact:

Mr. Alan Criswell
Electronics Manufacturing Productivity Facility
One International Plaza, Suite 600
Philadelphia, PA 19113
Phone: (610) 362-1200
FAX: (610) 362-1294
E-mail: criswell@aci-corp.org

Electro-Optics Center

The Electro-Optics Center (EOC) is a national consortium of electro-optics industrial companies, universities, and government research centers that share their electro-optics expertise and capabilities through project teams focused on Navy requirements. Through its capability for national electronic communication and rapid reaction and response, the EOC can address issues of immediate concern to the Navy Systems Commands. The EOC is managed by the Pennsylvania State University's Applied Research Laboratory.

Point of Contact:

Dr. Karl Harris
Electro-Optics Center
West Hills Industrial Park
77 Glade Drive
Kittanning, PA 16201
Phone: (724) 545-9700
FAX: (724) 545-9797
E-mail: kharris@psu.edu

Navy Joining Center

The Navy Joining Center (NJC) provides a national resource for the development of materials joining expertise and the deployment of emerging manufacturing technologies to Navy contractors, subcontractors, and other activities. The NJC works with the Navy to determine and evaluate joining technology requirements and conduct technology development and deployment projects to address these issues. The NJC is operated by the Edison Welding Institute.

Point of Contact:

Mr. David P. Edmonds
Navy Joining Center
1250 Arthur E. Adams Drive
Columbus, OH 43221-3585
Phone: (614) 688-5096
FAX: (614) 688-5001
E-mail: dave_edmonds@ewi.org

National Center for Excellence in Metalworking Technology

The National Center for Excellence in Metalworking Technology (NCEMT) provides a national center for the development, dissemination, and implementation of advanced technologies for metalworking products and processes. Operated by the Concurrent Technologies Corporation, the NCEMT helps the Navy and defense contractors improve manufacturing productivity and part reliability through development, deployment, training, and education for advanced metalworking technologies.

Point of Contact:

Mr. Richard Henry
National Center for Excellence in Metalworking
Technology
c/o Concurrent Technologies Corporation
100 CTC Drive
Johnstown, PA 15904-3374
Phone: (814) 269-2532
FAX: (814) 269-2501
E-mail: henry@ctc.com

Energetics Manufacturing Technology Center

The Energetics Manufacturing Technology Center (EMTC) addresses unique manufacturing processes and problems of the energetics industrial base to ensure the availability of affordable, quality, and safe energetics. The EMTC's focus is on technologies to reduce manufacturing costs, improve product quality and reliability, and develop environmentally benign manufacturing processes. The EMTC is located at the Indian Head Division of the Naval Surface Warfare Center.

Point of Contact:

Mr. John Brough

Energetics Manufacturing Technology Center

Indian Head Division

Naval Surface Warfare Center

100 Strauss Avenue

Building D326, Room 227

Indian Head, MD 20640-5035

Phone: (301) 744-4417

DSN: 354-4417

FAX: (301) 744-4187

E-mail: broughja@ih.navy.mil

Gulf Coast Region Maritime Technology Center

The Gulf Coast Region Maritime Technology Center (GCRMTC) fosters competition in shipbuilding technology through cooperation with the U.S. Navy, representatives of the maritime industries, and various academic and private research centers throughout the country. Located at the University of New Orleans, the GCRMTC focuses on improving design and production technologies for shipbuilding, reducing material costs, reducing total ownership costs, providing education and training, and improving environmental engineering and management.

Point of Contact:

Dr. John Crisp, P.E.

Gulf Coast Region Maritime Technology Center

University of New Orleans

College of Engineering

Room EN-212

New Orleans, LA 70148

Phone: (504) 280-3871

FAX: (504) 280-3898

E-mail: jcrisp@uno.edu

Appendix G

Completed Surveys

As of this publication, 126 surveys have been conducted and published by BMP at the companies listed below. Copies of older survey reports may be obtained through DTIC or by accessing the BMP web site. Requests for copies of recent survey reports or inquiries regarding BMP may be directed to:

Best Manufacturing Practices Program
4321 Hartwick Rd., Suite 400
College Park, MD 20740
Attn: Anne Marie T. SuPrise, Ph.D., Director
Telephone: 1-800-789-4267
FAX: (301) 403-8180
annemari@bmpcoe.org

1985	Litton Guidance & Control Systems Division - Woodland Hills, CA
1986	Honeywell, Incorporated Undersea Systems Division - Hopkins, MN (now Alliant TechSystems, Inc.) Texas Instruments Defense Systems & Electronics Group - Lewisville, TX General Dynamics Pomona Division - Pomona, CA Harris Corporation Government Support Systems Division - Syosset, NY IBM Corporation Federal Systems Division - Owego, NY Control Data Corporation Government Systems Division - Minneapolis, MN
1987	Hughes Aircraft Company Radar Systems Group - Los Angeles, CA ITT Avionics Division - Clifton, NJ Rockwell International Corporation Collins Defense Communications - Cedar Rapids, IA UNISYS Computer Systems Division - St. Paul, MN
1988	Motorola Government Electronics Group - Scottsdale, AZ General Dynamics Fort Worth Division - Fort Worth, TX Texas Instruments Defense Systems & Electronics Group - Dallas, TX Hughes Aircraft Company Missile Systems Group - Tucson, AZ Bell Helicopter Textron, Inc. - Fort Worth, TX Litton Data Systems Division - Van Nuys, CA GTE C ³ Systems Sector - Needham Heights, MA
1989	McDonnell-Douglas Corporation McDonnell Aircraft Company - St. Louis, MO Northrop Corporation Aircraft Division - Hawthorne, CA Litton Applied Technology Division - San Jose, CA Litton Amecom Division - College Park, MD Standard Industries - LaMirada, CA (now SI Manufacturing) Engineered Circuit Research, Incorporated - Milpitas, CA Teledyne Industries Incorporated Electronics Division - Newbury Park, CA Lockheed Aeronautical Systems Company - Marietta, GA Lockheed Missile Systems Division - Sunnyvale, CA (now Lockheed Martin Missiles and Space) Westinghouse Electronic Systems Group - Baltimore, MD (now Northrop Grumman Corporation) General Electric Naval & Drive Turbine Systems - Fitchburg, MA Rockwell Autonetics Electronics Systems - Anaheim, CA (now Boeing North American A&MSD) TRICOR Systems, Incorporated - Elgin, IL
1990	Hughes Aircraft Company Ground Systems Group - Fullerton, CA TRW Military Electronics and Avionics Division - San Diego, CA MechTronics of Arizona, Inc. - Phoenix, AZ Boeing Aerospace & Electronics - Corinth, TX Technology Matrix Consortium - Traverse City, MI Textron Lycoming - Stratford, CT

1991	<p><i>Resurvey of Litton Guidance & Control Systems Division</i> - Woodland Hills, CA Norden Systems, Inc. - Norwalk, CT (now Northrop Grumman Norden Systems) Naval Avionics Center - Indianapolis, IN United Electric Controls - Watertown, MA Kurt Manufacturing Co. - Minneapolis, MN MagneTek Defense Systems - Anaheim, CA (now Power Paragon, Inc.) Raytheon Missile Systems Division - Andover, MA AT&T Federal Systems Advanced Technologies and AT&T Bell Laboratories - Greensboro, NC and Whippany, NJ <i>Resurvey of Texas Instruments Defense Systems & Electronics Group</i> - Lewisville, TX</p>
1992	<p>Tandem Computers - Cupertino, CA Charleston Naval Shipyard - Charleston, SC Conax Florida Corporation - St. Petersburg, FL Texas Instruments Semiconductor Group Military Products - Midland, TX Hewlett-Packard Palo Alto Fabrication Center - Palo Alto, CA Watervliet U.S. Army Arsenal - Watervliet, NY Digital Equipment Company Enclosures Business - Westfield, MA and Maynard, MA Computing Devices International - Minneapolis, MN (now General Dynamics Information Systems) <i>(Resurvey of Control Data Corporation Government Systems Division)</i> Naval Aviation Depot Naval Air Station - Pensacola, FL</p>
1993	<p>NASA Marshall Space Flight Center - Huntsville, AL Naval Aviation Depot Naval Air Station - Jacksonville, FL Department of Energy Oak Ridge Facilities (Operated by Martin Marietta Energy Systems, Inc.) - Oak Ridge, TN McDonnell Douglas Aerospace - Huntington Beach, CA (now Boeing Space Systems) Crane Division Naval Surface Warfare Center - Crane, IN and Louisville, KY Philadelphia Naval Shipyard - Philadelphia, PA R. J. Reynolds Tobacco Company - Winston-Salem, NC Crystal Gateway Marriott Hotel - Arlington, VA Hamilton Standard Electronic Manufacturing Facility - Farmington, CT (now Hamilton Sundstrand) Alpha Industries, Inc. - Methuen, MA</p>
1994	<p>Harris Semiconductor - Palm Bay, FL (now Intersil Corporation) United Defense, L.P. Ground Systems Division - San Jose, CA Naval Undersea Warfare Center Division Keyport - Keyport, WA Mason & Hanger - Silas Mason Co., Inc. - Middletown, IA Kaiser Electronics - San Jose, CA U.S. Army Combat Systems Test Activity - Aberdeen, MD (now Aberdeen Test Center) Stafford County Public Schools - Stafford County, VA</p>
1995	<p>Sandia National Laboratories - Albuquerque, NM Rockwell Collins Avionics & Communications Division - Cedar Rapids, IA (now Rockwell Collins, Inc.) <i>(Resurvey of Rockwell International Corporation Collins Defense Communications)</i> Lockheed Martin Electronics & Missiles - Orlando, FL McDonnell Douglas Aerospace (St. Louis) - St. Louis, MO (now Boeing Aircraft and Missiles) <i>(Resurvey of McDonnell-Douglas Corporation McDonnell Aircraft Company)</i> Dayton Parts, Inc. - Harrisburg, PA Wainwright Industries - St. Peters, MO Lockheed Martin Tactical Aircraft Systems - Fort Worth, TX <i>(Resurvey of General Dynamics Fort Worth Division)</i> Lockheed Martin Government Electronic Systems - Moorestown, NJ Sacramento Manufacturing and Services Division - Sacramento, CA JLG Industries, Inc. - McConnellsburg, PA</p>
1996	<p>City of Chattanooga - Chattanooga, TN Mason & Hanger Corporation - Pantex Plant - Amarillo, TX Nascote Industries, Inc. - Nashville, IL Weirton Steel Corporation - Weirton, WV NASA Kennedy Space Center - Cape Canaveral, FL <i>Resurvey of Department of Energy, Oak Ridge Operations</i> - Oak Ridge, TN</p>

1997	<p>Headquarters, U.S. Army Industrial Operations Command - Rock Island, IL (now Operational Support Command)</p> <p>SAE International and Performance Review Institute - Warrendale, PA</p> <p>Polaroid Corporation - Waltham, MA</p> <p>Cincinnati Milacron, Inc. - Cincinnati, OH</p> <p>Lawrence Livermore National Laboratory - Livermore, CA</p> <p>Sharretts Plating Company, Inc. - Emigsville, PA</p> <p>Thermacore, Inc. - Lancaster, PA</p> <p>Rock Island Arsenal - Rock Island, IL</p> <p>Northrop Grumman Corporation - El Segundo, CA (<i>Resurvey of Northrop Corporation Aircraft Division</i>)</p> <p>Letterkenny Army Depot - Chambersburg, PA</p> <p>Elizabethtown College - Elizabethtown, PA</p> <p>Tooele Army Depot - Tooele, UT</p>
1998	<p>United Electric Controls - Watertown, MA</p> <p>Strite Industries Limited - Cambridge, Ontario, Canada</p> <p>Northrop Grumman Corporation - El Segundo, CA</p> <p>Corpus Christi Army Depot - Corpus Christi, TX</p> <p>Anniston Army Depot - Anniston, AL</p> <p>Naval Air Warfare Center, Lakehurst - Lakehurst, NJ</p> <p>Sierra Army Depot - Herlong, CA</p> <p>ITT Industries Aerospace/Communications Division - Fort Wayne, IN</p> <p>Raytheon Missile Systems Company - Tucson, AZ</p> <p>Naval Aviation Depot North Island - San Diego, CA</p> <p><i>U.S.S. Carl Vinson (CVN-70)</i> - Commander Naval Air Force, U.S. Pacific Fleet</p> <p>Tobyhanna Army Depot - Tobyhanna, PA</p>
1999	<p>Wilton Armetale - Mount Joy, PA</p> <p>Applied Research Laboratory, Pennsylvania State University - State College, PA</p> <p>Electric Boat Corporation, Quonset Point Facility - North Kingstown, RI</p> <p><i>Resurvey of NASA Marshall Space Flight Center</i> - Huntsville, AL</p> <p>Orenda Turbines, Division of Magellan Aerospace Corporation - Mississauga, Ontario, Canada</p>
2000	<p>Northrop Grumman, Defensive Systems Division - Rolling Meadows, IL</p> <p>Crane Army Ammunition Activity - Crane, IN</p> <p>Naval Sea Logistics Center, Detachment Portsmouth - Portsmouth, NH</p> <p>Stryker Howmedica Osteonics - Allendale, NJ</p>
2001	<p>The Tri-Cities Tennessee/Virginia Region - Johnson City, TN</p> <p>General Dynamics Armament Systems - Burlington, VT</p> <p>Lockheed Martin Naval Electronics & Surveillance Systems-Surface Systems - Moorestown, NJ</p> <p>Frontier Electronic Systems - Stillwater, OK</p>
2002	<p>U.S. Coast Guard, Maintenance and Logistics Command-Atlantic - Norfolk, VA</p>