

# GULF COAST REGION MARITIME TECHNOLOGY CENTER

## QUARTERLY REPORT

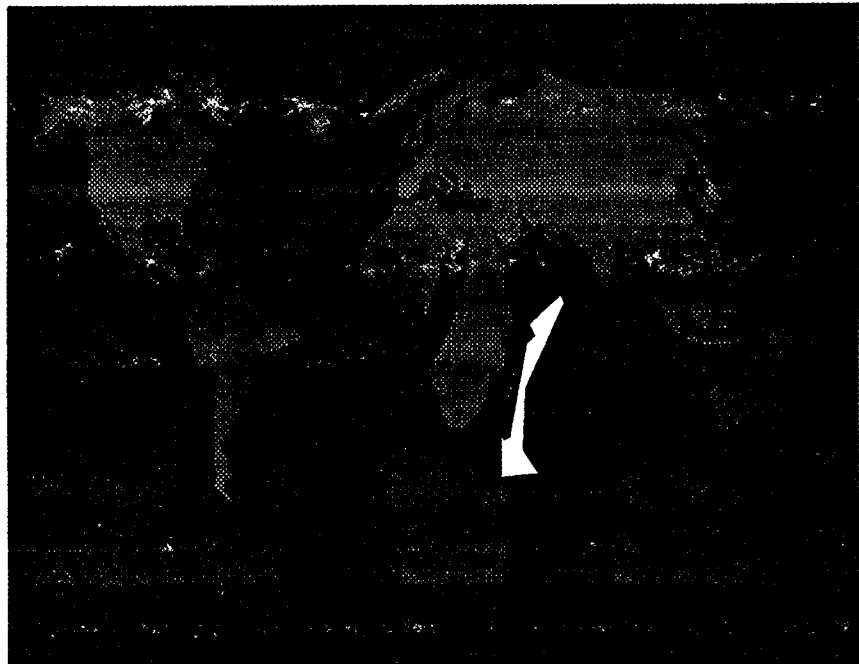
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**GULF COAST REGION MARITIME  
TECHNOLOGY CENTER  
QUARTERLY REPORT**

**Cooperative Agreement N00014-94-2-0011**

**REPORT PERIOD: Oct. 1, 1994 - Dec. 31, 1994**

**SUBMITTED TO: Mr. Dale Rome  
Acting Director  
Shipbuilding Technology Office  
Carderock Division  
Naval Surface Warfare Center**

**SUBMITTED BY:  
Gulf Coast Region Maritime Technology Center  
New Orleans, LA**

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## EXECUTIVE SUMMARY

A Cooperative Agreement was signed on September 26, 1994 between the University of New Orleans and the Office of Naval Research to initiate the Gulf Coast Region Maritime Technology Center (GCRMTC). The GCRMTC is the first of four centers planned to operate under the National Maritime Technology Center. The Center at present includes a Site at the University of New Orleans and a Site at Lamar University at Orange, Texas. The mission of the Center is to enhance the international competitiveness of the U.S. shipbuilding industry through cooperation with the Navy, maritime industry, academic and private research centers.

Through December 31, 1994 the GCRMTC was to 1.) hire the Center staff and the staff for both Sites, 2.) renovate office/research space, 3.) purchase research infrastructure software and equipment and purchase office equipment and furniture, 4.) initiate In-House Research projects where appropriate, 5.) initiate Marketing, Environmental and Standards Centers, 6.) plan and initiate a workshop and 7.) establish procedures to initiate research contracts with shipyards and suppliers.

Nearly all of the Center, the New Orleans Site and the Orange Site administrative staff were hired between October 1 and December 31, 1994. The renovation of the facilities at the New Orleans Site was planned and construction should be completed by February 15, 1995 at no cost to the project. The refurbishment at the Orange Site is slated for February 13, 1995. Furniture and office equipment were ordered for the UNO Site and the Center.

A program plan, covering October 1, 1994 through December 31, 1996, consisting of a combined PERT/GANT chart and corresponding budget was submitted by each Site. The charts show the projected tasks. The tables show the projected appropriations and expenditures for both Sites. See Figures 1 and 2 and Tables 1 and 2.

The first workshop for the Center is planned for February 22-23, 1995 and will be held at the New Orleans Hilton. The objectives of the workshop are to detail the purpose and capabilities of the Center, identify and prioritize technology thrust areas and identify research project concepts which meet these thrust areas. The Center prepared a tentative agenda and invited over 130 representatives from shipyards, suppliers and government agencies.

A detailed procedures manual was prepared for the Center in October 1994 and reviewed by both Sites and the Government Program Manager (GPM). A second draft was prepared in December for the quarterly program review. The manual provides directions in operating each Site as well as the Center and provides a step-by-step procedure for proposal preparation, submission, and review.

Over 36 research proposals were submitted by the New Orleans Site to the Center. After extensive review of these proposals by the Center and a committee formed by the GPM, 11 of these research projects were approved to start January 1, 1995. A summary of the status of each of the 11 projects is included in the report. The Center also issued a sub-contract to

the Naval Biodynamics Laboratory. The equipment for the research projects and the infrastructure for the Center is in various stages of acquisition via bidding processes.

The GCRMTC is committed to initiating three Centers i.e. Shipbuilding Environmental Resource Center, Shipbuilding Process and Product Standards Center and Marketing Resource Center. The Shipbuilding Environmental Center is being initiated at the New Orleans Site and the Marketing Resource Center at the Orange Site and the progress is included in the report. The Standards Center is in the planning stages and will be discussed at the February 22-23 Workshop.

The Lamar University - Orange Site has been designated as the Site for a Center for research and applications related to the use of simulation in ship design. This multi-million dollar facility will utilize a state-of-the-art design simulation Silicon Graphics computer system. The system when completed will enable ship designers and builders to utilize a virtual reality such that they would for all practical purposes be able to see details inside the ship during the design stages. The start of construction of this facility is planned for February 10, 1995. On completion this facility will be a major asset to the Center and the shipbuilding industry.

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# **GCRMTC QUARTERLY REPORT**

**October 1, 1994 - December 31, 1994**

## **1. BACKGROUND**

The Gulf Coast Region Maritime Technology Center (GCRMTC) is one of four centers planned to operate under the National Maritime Technology Center. Additionally centers are planned for the East and West coasts and one for the Great Lakes area. Funds were provided to initiate the GCRMTC in FY 93 and it will serve the nation until the other sites are initiated.

The GCRMTC reports to Mr. Dale Rome, Acting Director, National Shipbuilding Office (NSO). The NSO manages the National Maritime Technology Center as well as several other Centers and agencies.

A Cooperative Agreement was signed on Sept. 26, 1994 between the University of New Orleans and the Office of Naval Research. The agreement included the organizational structure and the statement of work for the Gulf Coast Region Maritime Technology Center and its two sites (New Orleans and Orange) and the initial budget authority for the Center and its sites.

The initial thrust of the GCRMTC was to: 1.) hire the staff for the New Orleans site and the Lamar-Orange site, 2.) renovate office/research space, 3.) purchase research infrastructure software and equipment, purchase office equipment and furniture, 4.) initiate In-House Research projects where appropriate and 5.) initiate a Marketing Center, an Environmental Center, and a Standards Center.

## **2. GCRMTC ADMINISTRATION**

### **2.1 Center and New Orleans Site**

The Executive Director of the GCRMTC is Dr. John N. Crisp who is on leave from academic duties from January 1, 1995 through August 31, 1995. The remaining administrative staff of the Center and the New Orleans Site are:

New Orleans Site Director	-	Dr. Robert Latorre
Resource Manager	-	Mr. Jan Smith
Assistant to Director	-	Mr. Milton Frank
Network Manager	-	Mr. J. Trevor Smith
Graduate Assistant	-	Mr. Ashish Raval

## 2.2 Lamar Site

The administrative staff are:

Lamar Site Director	-	Mr. H. Bruce Bongiorno
Contracts & Procmt. Mgr.	-	Mr. Jeevan Campos
Network & MIS Mgr. (1)	-	Mr. John Cardener
Network & MIS Mgr. (2)	-	Mr. Vinay Saxena
Researcher & Project Mgr.	-	Being considered at present

Nearly all the administration staff were hired between Oct. 1, 1994 and Dec. 31, 1994. See Figure 1 for the GCRMTC Organization Chart.

## 2.3 NEW ORLEANS SITE STAFFING (RESEARCH)

To date 11 in-house research projects were approved by the Program Manager and Principal Investigators were assigned for each project. The principal investigators are, at present, hiring graduate students and implementing sub-contracts for consultants on various projects. Each of the principal investigators has established contact with a shipyard or shipyard supplier and is establishing a working relationship with them on their project. One Principal Investigator has already setup a collaborative project with industry in which they will contribute up to \$100,000 in research on the project.

These projects were selected from 36 proposals after extensive reviews both by the GCRMTC and by the Program Manager. The proposals were all ranked by the Program Manager.

## 2.4 CENTER AND NEW ORLEANS SITE FACILITIES

The Center and New Orleans Site are co-located in office space being renovated on the second floor of the College of Engineering Building. The renovation will be completed on or before Feb. 15, 1995 at no cost to the project.

The Center will be moved to a new building (CERM) which is scheduled for completion in about 2 years. The Center will occupy some 4200 square feet in the new building which will be located in the recently acquired Research and Technology Park adjacent to the University of New Orleans campus.

Furniture, office equipment and computers have been ordered for the Center and New Orleans Site Administrative Offices. Additionally, planning is in process to establish a computer network to link project researchers, the UNO VAX system and Lamar University-Orange computer systems.

### **3. GCRMTC PROGRAM PLAN**

The program plan covering October 1, 1994 through December 31, 1996 includes a combined PERT/GANT chart showing the projected tasks along with a table showing detailed projected appropriations and expenditure charts for the GCRMTC/New Orleans Site and the Lamar University-Orange Site (LUO). The budget charts show summary expenditures amounts from FY 93/94 appropriations in addition to anticipated expenditures for FY 95 appropriations.

The PERT/GANT charts are shown as Figure 2 and the corresponding appropriation/expenditure tables as Table 1 and Table 2. Based on input from the program review group the industry collaboration was listed separately in the tables. Table 3 represents the current LUO budget.

### **4. WORKSHOP NO. 1 (FEB. 22-23, 1995)**

The first workshop for the Center is planned for Feb. 22-23, 1995 and will be held at the New Orleans Hilton. The Center, based on input from the two Sites and the Government Program Manager invited over 130 representatives from U.S. Shipyards, Shipyard Suppliers and government agencies. A tentative agenda was prepared for the workshop with Congressman Robert Livingston scheduled as the keynote speaker. The plans include a dinner at the Allegro Bistro, a lunch at UNO, and a tour of the New Orleans Site labs at the end of the workshop. The workshop will be conducted at no cost to the participants except for lodging and transportation.

### **5. PROCEDURES MANUAL**

A detailed procedures manual (draft) was prepared by the Center in October 1994 and submitted to both Sites and the Government Program Manager for review. Based on feedback the Center prepared a very good second draft of the Procedures Manual for use by the Principal Investigators at both Sites. The manual provides direction in operating each site as well as the Center and provides a step-by-step procedure for submitting problem statements, RFPs, reviewing proposals, project reports, travel, etc. It is noted that a few forms have yet to be completed and that future revisions will continue to enhance the document.

## **6. NEW ORLEANS SITE ACTIVITY REPORT**

### **6.1 In-House Project Status**

Over 36 research projects were submitted to the Center and 11 of these proposals, after extensive review of the Center and the Government's Program Manager, were approved. Special procedures were put in place to obtain approval of equipment over \$25,000. Computer software and equipment is being purchased for each of the 11 projects. The detailed status report of each project is included in the Appendix. A summary of the status of each project is presented on the following pages:

## ***Project Title***

Inexpensive Non-Toxic Pigment Substitutes for Chromium in Primer for Aluminum Substrate

## ***Principal Investigators***

Alfred Daech - Project Engineer  
Dr. Kenneth L. McManis

**Funds Authorized: \$119,436**

## ***Synopsis***

To investigate a corrosive inhibitor to replace chromium for aluminum substrates. The inhibitor is based on lithium.

## ***Actions Taken to Date:***

- Literature search is being updated
- Company is being sought to manufacture and test the product
- Pigments are being studied
- Budgets have been set up to monitor expenses and charges

## ***Actions To Be Taken:***

- Order and set-up equipment to test passivity
- Order a variety of pigments for testing
- Make the crude coating

## ***Project Title***

Applications of Integrated Optical Fiber Sensor Systems in Shipbuilding and Shipboard Monitoring

## ***Principal Investigators***

Dr. Shing M. Lee - Project Engineer

Dr. Rasheed M. A. Azzam

**Funds Authorized: \$192,038**

## ***Synopsis***

To investigate the possibility of using an integrated optical-fiber-sensor system for shipboard monitoring.

## ***Actions Taken to Date:***

- Literature search is being conducted
- Compiling a list of laboratory equipment
- Purchasing an HP Lightwave Polarization Analyzer
- Theoretical analyses of waveguide modes are on-going

## ***Actions To Be Taken:***

- Preliminary investigation of D-shape fibers will be conducted
- A literature search and survey of common fiber-optic communication systems will be conducted
- Investigate the designs of fiber sensor head for pressure, temperature, and current sensors

***Project Title***

SOCP Ship's RAM Database (Integrated RAM Database)

***Principal Investigator***

Dr. Bahadir Inozu - Project Engineer

**Funds Authorized: \$200,583**

***Synopsis***

To collect data from merchant ships for new failures, and download existing ship machinery failure history data, to optimize shipbuilding practices and reliability.

***Actions Taken to Date:***

- Software development of programs DATE and SHIPPER have been awarded to System Exchange Inc.
- New international data exchange standards are being examined
- Specifications for SUN Sparc 20 computers have been submitted

***Actions To Be Taken:***

- Specs for the Ship Performance Indicator Program SPIN will be developed
- Application protocols of STEP will be examined
- Transfer of machinery failure history from ship log books into program DATE

***Project Title***

Performance Simulation of Marine Propulsion Systems Under Extreme Conditions

***Principal Investigator***

Dr. Bahadir Inozu - Project Engineer

**Funds Authorized: \$180,841**

***Synopsis***

To examine the performance of marine propulsion under extreme conditions using computer simulation.

***Actions Taken to Date:***

- Request for Merlin Software has been submitted
- Confidential data has arrived for Colt-Pielstick 10 PC 4.2 Engines
- Test runs were started for selected ice loads using UNO/ECN software

***Actions To Be Taken:***

- Coordinate the installation of MERLIN software system
- Data for the MAN B&W and the Colt-Pielstick engines will be entered
- Results of samples will be analyzed

## ***Project Title***

Improvement of Technology Transfer Process

## ***Principal Investigators***

Mr. William J. Lannes - Project Engineer

Mr. James W. Logan

**Funds Authorized: \$127,569**

## ***Synopsis***

To improve the technology transfer process to enhance the shipbuilder's capability to accept new innovations and move them rapidly to their design phase.

## ***Actions Taken to Date:***

- Kim D. Jovanovich has been hired as a consultant
- Literature and electronic information sources are being evaluated
- Several organizational meetings between investigators and the consultant have been held

## ***Actions To Be Taken:***

- Investigators and consultant will develop initial model of technology transfer
- A prototype structured interview methodology survey and accompanying survey will be developed
- The prototype will be pilot tested before widespread implementation

## ***Project Title***

Concurrent Engineering Processes in Shipbuilding

## ***Principal Investigators***

Dr. Norman L. Whitley - Project Engineer

Dr. Stephen C. Lipp

**Funds Authorized: \$185,389**

## ***Synopsis***

To conduct an investigation of current shipbuilding methodology and the incorporation of computer-based procedures in shipbuilding design.

## ***Actions Taken to Date:***

- Plan to visit Huntsville to see Intergraph's 3-D Ship Modeling Center
- Pinlin Zhuang has been hired as research assistant
- Current NSRP literature has been surveyed and is being forwarded to P.I.

## ***Actions To Be Taken:***

- Contact Kelvin Lynaugh of Navy's ERAM program
- A survey of shipyard's needs will be conducted
- Training of shipyard personnel in the new methods will be endeavored

## ***Project Title***

An Accurate and Efficient Technique to Predict Vessel Roll Damping

## ***Principal Investigators***

Dr. Jeffrey Falzarano - Project Engineer  
Dr. Surya Dinavahi

**Funds Authorized: \$222,296**

## ***Synopsis***

To apply state-of-the-art time accurate Reynolds-Averaged Navier-Stokes method for solving unsteady turbulent flow around arbitrary hull form configurations.

## ***Actions Taken to Date:***

- Begin selection of candidate hull forms for analysis
- Purchasing SG Power Indigo II computer system
- Discussions with Dr. Korpus at SAIC regarding refining tasks, schedules, and budgets

## ***Actions To Be Taken:***

- Complete SAIC sub-contract and begin work
- Complete preliminary literature survey
- Select candidate hull forms for analysis and acquire lines plans

## ***Project Title***

Shipboard Sensors

## ***Principal Investigators***

Dr. Russell E. Trahan - Project Engineer

Dr. Paul Chirlian

Mr. Robert Lipp

**Funds Authorized: \$256,281**

## ***Synopsis***

To develop fiber optic based sensors specifically for the commercial shipbuilding industry using existing technology.

## ***Actions Taken to Date:***

- Meetings with Kim Jovanovich of Omni-Technologies were held
- Statement-of-work was developed and delivered to the UNO research office
- Collection of information about sensor types on various navy ships is underway

## ***Actions To Be Taken:***

- Completion of the sensor survey
- Redesign the sensors for testing

***Project Title***

High Efficiency, High Power Density Motor Drives for Maritime Applications

***Principal Investigator***

Dr. Pragasen Pillay - Project Engineer

**Funds Authorized: \$77,002**

***Synopsis***

To examine the application of the latest in motor drive technology for maritime applications.

***Actions Taken to Date:***

- Contacted engineers at Newport News Shipbuilding to discuss collaboration
- Meetings were scheduled with Newport News to obtain electrical drawings of an aircraft carrier
- Discussions with Avondale Shipyards are still underway

***Actions To Be Taken:***

- Collect data on PM and SRM motors and drives

### ***Project Title***

Development of High Speed Marine Vehicle Design Database

### ***Principal Investigators***

Dr. Robert Latorre - Project Engineer

Dr. Paul Herrington

**Funds Authorized: \$495,853**

### ***Synopsis***

Addresses the lack of necessary data for selecting an efficient and economically priced high speed marine craft.

### ***Actions Taken to Date:***

- Developed recreational power boat performance database
- Attended NSWC David Taylor Model Basin Symposium
- Structure/Hydrodynamic testing using the tow tank was conducted

### ***Actions To Be Taken:***

- Arrange site visits of domestic shipyards
- Development of hydrofoil catamaran design rules
- Site visit to Scientific Marine Services

***Project Title***

A Study of the Structural Design Procedures in the Shipbuilding Industry

***Principal Investigators***

Dr. Michael Folse

Dr. Norma Jean Mattei

**Funds Authorized: \$ 90,746**

***Synopsis***

The feasibility to investigate a Loaded Resistance Factor Design (LFRD) in the structural design of ships.

***Actions Taken to Date:***

- Participation from McDermott Shipbuilding Inc. has been assured
- Survey of existing design procedures has begun

***Actions To Be Taken:***

- Update literature search
- Evaluate types of loads associated with ship design
- Study effects of LRFD design approach on construction techniques
- Evaluate economic impact of using LRFD design approach

## ***Project Title***

Process Modeling of Outfitting in New Construction

## ***Principal Investigators***

Ms. Patricia Raines Pate  
Director, Quality and Productivity Division

Staff, Quality and Productivity Division  
John Gray Institute/Lamar University System

**Funds Authorized:** To be determined pending proposal development

## ***Synopsis***

Create a model of the current outfitting processes used by a local shipbuilder. Using this model as a baseline, analyze and evaluate changes in outfitting methods for impact on the cost and schedule. The most reasonable changes will be implemented and results correlated with predictions from process simulation models.

## ***Actions Taken to Date:***

- Meeting with local shipbuilder
- Stage II Problem Statement written
- Submittal of Stage II Problem Statement to UNO for forwarding to GIAB or GPM
- Project Proposal under development

## ***Actions to Be Taken:***

- Submit Project Proposal to Center for authorization

## ***Project Title***

Analysis of Regional Ship Repair Market

## ***Principal Investigators***

Mr. Roy G. Huckaby  
Director, Small Business Development Division

Staff, Small Business Development Division  
John Gray Institute/Lamar University System

**Funds Authorized:** To be determined pending proposal development

## ***Synopsis***

Determine the size and characteristics of the ship repair market in the Southeast Texas region. Identify market niches and key success factors for penetration of the market. Recommend industry, government, and academic initiatives to aid in penetration of the ship repair market.

## ***Actions Taken to Date:***

- Meeting with local shipbuilder
- Stage II Problem Statement written
- Submittal of Stage II Problem Statement to UNO for forwarding to GIAB or GPM
- Project Proposal under development

## ***Actions to Be Taken:***

- Submit Project Proposal to Center for authorization

***Project Title***

Translation of Japanese Computer Integration Manufacturing (CIM) Report

***Principal Investigators***

Mr. H. Bruce Bongiorni  
GCRMTC-LUO Site Director

**Funds Authorized:** To be determined pending proposal development

***Synopsis***

Translate Japanese CIM report into English. Provide copies to SP-4 Panel.

***Actions Taken to Date:***

- Authorization to proceed given by Center and project approved by GPM

***Actions to Be Taken:***

- Procure translation services

## 6.2 Subcontracted Industry Research (NBDL)

### *Project Title*

NBDL Project

### *Principal Investigator*

Dr. Thomas Dobie - Project Engineer

**Funds Authorized: \$100,000**

### *Synopsis*

To develop a training program for CBMT trainers to combat the effects of motion sickness.

### *Actions Taken to Date:*

- Dr. Dobie is awaiting green card approval from American Embassy in London

## 6.3 Infrastructure Buildup Status

The budget for the Infrastructure equipment in the original Center proposal was reduced sharply from \$1,468,000 to \$ 505,000 in order to initiate more research projects in support of the Center's mission. In fact, of the \$ 505,000 some \$ 380,000 of the infrastructure equipment will apply directly to ongoing research projects. The infrastructure equipment is being ordered at present.

## **7.0 INITIATION OF CENTERS**

The GCRMTC is committed to initiating three Centers i.e. Shipbuilding Environmental Resource Center, Shipbuilding Process and Products Standards Center, and Marketing Resource Center.

### **7.1 Shipbuilding Environmental Resource Center**

The University of New Orleans already had considerable resources invested in its Urban Waste Management and Research Center (UWMRC) which is a cooperative Research Center with the EPA. The UWMRC already has established an international reputation in integrated environmental remediation involving land, sea and air pollution. The UWMRC has an Environmental Information Resource Center which will be expanded to include shipbuilding activities and ship operation.

The proposed Shipbuilding Environmental Resource Center is a natural extension of the existing UWMRC. The background, mission and goal and objectives of the proposed Shipbuilding Environmental Resource Center follows:

## **ENVIRONMENTAL INFORMATION RESOURCE CENTER**

### **Background**

National concern for the generation and emission of pollutants connected with industrial activities is producing more stringent environmental regulations. In responding to these concerns and their effect on the shipbuilding industry, the Gulf Coast Region Maritime Technology Center (GCRMTC) has established the Environmental Information Resource Center (EIRC). The purpose of the EIRC is to provide access and documentation to research, the development of technologies, and information on training programs which brings together industry, government, and academia to address the critical environmental issues of the shipbuilding industry. The resources developed through these activities will assist in the development of methods for preventing or controlling the pollution identified in the design, maintenance and construction of ships.

Shipyards are faced with an increasing number of decisions related to waste management and other environmental issues under various federal and state regulations. The Resource Conservation and Recovery Act (RCRA) and similar state laws define "solid waste" as any "discarded" material that is not otherwise excluded from regulation. Materials can be classified as "abandoned," "recycled," or "considered inherently waste-like" and disposed of accordingly. Liquid wastes, sludges and solid wastes are included in this definition. Facilities using materials and processes or storing materials which are regulated under RCRA are subjected to Subtitle C requirements, including permits, financial assurance, corrective action, and management requirements. More and more shipyards are seeking means to recycle waste materials either to meet waste minimization goals or reduce disposal costs and liability.

The 1990 Clean Air Act Amendments (CAAA) specifically identify 189 hazardous air pollutants. Industry will be required to meet emission standards for these pollutants using either the Maximum Achievable Control Technology (MACT) or Generally Available Control Technology (GACT), based on the magnitude of the air pollutants emitted. Also, the Federal Water Pollution Control Act (also known as the Clean Water Act) requires National Pollutant Discharge Elimination System (NPDES) permits for storm water discharges associated with industrial activity. Stormwater management practices for the shipbuilding industry must be developed to minimize environmental quality control cost.

Because of the dynamic nature of environmental engineering techniques as applied to various industries and the development of regulatory requirements, there is a need for a concentrated effort and research to understand these techniques in order to retrofit their application to the shipbuilding industry and other naval facilities. Many industries have made a concerted effort in the development of new environmental management techniques. To maintain an international competitiveness, it is imperative that the shipbuilding industry develops ways for applying new and innovative techniques in waste minimization, pollution prevention, emission reduction etc. In order for the shipbuilding industry and the leadership of naval facilities to plan and implement environmental methodologies, a readily available source of information is needed.

The EIRC of the GCRMTC builds on a foundation of environmental research at the University of New Orleans through its Urban Waste Management and Research Center (UWMRC). The EIRC is supported by researchers who have conducted studies and developed environmental technologies related to the needs of industry and government. Many of the environmental programs of the UWMRC are conducted through a cooperative agreement with the U.S. Environmental Protection Agency. The UWMRC also maintains the Louisiana Technical Assistance Program (LaTAP), a non-regulatory program, to aid businesses in the development of pollution prevention programs for the Louisiana Department of Environmental Quality. LaTAP and the UWMRC have established a resource of technical information on pollution prevention for some 30 different industries. Much of the information on waste minimization through materials and process changes is applicable to the shipbuilding industry. Recycling options, both on site and off site, are included in the database. Access to a nationwide network of waste exchanges is also available.

Currently, associates of EIRC are involved in programs with government, industry, and academia to solve problems and regulations concerned with air emissions, utilization and disposal of residual materials, surface and groundwater pollution, pollution prevention, and many others. They possess the background required to address the solution and management of environmental issues associated with shipbuilding facilities, port facilities, ocean transport, and offshore facilities. The working relationship with UNO's academic naval engineering and environmental management programs in a cooperative relationship with the local shipbuilding activities along the Gulf Coast provides a unique opportunity for the development of the environmental management requirements for this industry.

## **EIRC Mission and Goal**

The EIRC mission is to establish 1) a national depository of environmental data for the shipbuilding industry, 2) a network that will link industry with research and proven technologies, and 3) outreach training and educational programs. These activities include the survey and cataloging of existing environmental practices and the development of a system that networks available environmental resources. The EIRC has implemented an electronic information management system for technical and regulatory support. In addition to the existing UWMRC-LaTAP technical library, other sources of environmental information on current technologies and regulations are included in the network such as the EPA Risk Reduction Laboratory in Cincinnati, EPA Pollution Prevention Information Clearinghouse, the National Shipbuilding Research Program, the AVMAST Library at the University of Michigan and others. Newsletters and other informational materials will also be developed by the EIRC for distribution to shipyards and others in the industry.

To assist the environmental mission and goals of the GCRMTC, the EIRC will develop partnerships and strengthen existing relationships with industry, academia, and government. The GCRMTC provides the focal point or hub for these partnerships, which is key to effective research and development. The EIRC will provide assistance and information on programs involving:

- Research
- Technology Transfer
- Education
- Activities in the Development of Environmental Standards

## **EIRC OBJECTIVES**

- To develop an environmental network to provide technical, management, regulatory and educational support to the shipbuilding industry.
- To support the UWMRC as a primary information and training resource for the network.
- To develop a coordinated environmental communication system or clearinghouse to share and distribute technical, regulatory and management information.
- To provide access to environmental specialists that can provide the latest technical and regulatory information concerning Federal and state requirements.
- To establish a network that has access to all waste minimization, pollution prevention, and waste management, and the outreach and educational capabilities to transfer this information to shipyards.
- To establish a wide program for the training of shipyard personnel on environmental and regulatory issues.

Specific environmental issues are currently being addressed and catalogued to assist in the identification of the needs and further development of environmental management technologies for the shipbuilding industry and the U.S. Navy. The EIRC will serve as a national resource in addressing the following:

- o SHIP DESIGN AND OPERATIONS
  - Solid Waste Management Options
  - Product/Material Use Evaluation
  - Environmentally Compatible Paints/Coatings
  - Toxic Emissions/OSHA Options
  
- o SHIPBUILDING AND REPAIR
  - Pollution Prevention/Waste Minimization
  - Waste Management
    - waste water
    - stormwater
    - solid/hazardous wastes
  - Air Emissions Management

## **7.2 Shipbuilding Process and Products Standards Center**

In the Statement of Work the Center was to establish a Maritime Standards Resource Center. Clearly both UNO and LUO have an interest in initiating such a center and both have contacts with potential partners for this venture. UNO has made preliminary contacts with NAVSEA and ABS while LUO has made contact with members of the NSRP SP-6 Panel.

At the Program Review meeting in Seattle it was agreed that no action would be taken toward development of the Standards Center until after discussion by workshop participants.

## **7.3 Marketing Resource Center**

A study of the feasibility of an International Shipbuilding Marketing Resources Center is part of the work scope identified in the Statement of Work. LUO is forming a work plan for the study.

To this end, LUO has submitted the appropriate problem statement to UNO and the GPM for review. LUO has also requested and received a proposal from Professor Howard M. Bunch for his assistance in developing the feasibility study work plan. His proposal is pending internal consulting agreement approvals.

## 8. LAMAR UNIVERSITY SYSTEM SITE ACTIVITY REPORT

### 8.1 Milestones

The following table summarizes the LUO progress as of 12/31/94 and planned milestones for the next six months. These events and dates are subject to revision based on information developed during the meetings with The New Orleans Site and from the February, 1995 Workshop.

<i>Description</i>	<i>Planned Date</i>	<i>Actual Date</i>
Meetings with Area Industry	11/1/94	11/16/94
Develop Problem Statements	11/25/94	12/16/94
Core Staffing Complete	11/25/94	2/1/95
SGI Equipment Order	2/9/95	
Projection System Order	2/20/95	
Authorize Work On In-House Projects	3/3/95	
Projection System Installation	3/15/95	
Facilities Substantial Completion	3/25/95	
SP-9 Meeting @ LUO	4/19/95	
GCRMTC Workshop @ LUO	5/17/95	

## 8.2 Simulation-Based Design Center

LUO has been designated as the site at which a center for research and applications related to use of simulation in ship design will be established. Founding of this center requires staffing system administration positions, refurbishing a facility, designing a specialized computer network, specification of equipment, procurement of equipment and software, and training of staff.

Using state-of-the-art computer and network technologies, this Center will work with industry to apply simulation, concurrent engineering and visualization technologies to the shipbuilding industry. This site will provide a collaborative design and engineering environment for use by industry, government and academic partners. The Center envisions that by using the resources of this facility, consortiums of design and manufacturing businesses of all sizes can coalesce into "virtual enterprises" to compete in the international markets.

To date the following activities have been completed:

*System administration staffing* - Mr. John Cardner and Mr. Vinay Saxena have been hired to develop the design specifications, install the equipment and software, and maintain the system after installation.

*Facility refurbishment* - Design of the facility has been completed, bids requested and received, and government approval requested. Government approval has been granted by the Grants Officer. Lamar University approval is expected on 2/9/95 and start of construction is planned for 2/10/95.

*System design* - LUO staff have been working with system users, staff from other similar installations, and equipment vendors to develop a network that will meet the needs of center users. The design is substantially complete.

*Equipment specifications* - Specifications were developed for procurement of the specialized computer systems from Silicon Graphics, projection equipment, and ancillary system components.

*Procurement of equipment and software* - Approval has been received from the GPM and the Grants Officer for procurement of the Silicon Graphics equipment. The necessary funds are being secured through GCRMTC to allow issuance of purchase orders to Silicon Graphics. Also a request for approval to purchase equipment and software from Fakespace and projection equipment from Electrohome was submitted.

*Staff training* - Training related to the Silicon Graphics equipment and software has been identified. Training was included in the request for approval by the GPM and the Grants Officer. The training needs have been revised and request for approval was included with the revised request for approval of equipment.

### 8.3 Sponsored Projects

Using the Center's Procedures Manual as a guide, LUO developed, with industry input Stage II Problem Statements. LUO then issued RFPs to the Lamar University System staff. Based on these problem statements, the following is a summary of the proposed projects:

#### *Process Modeling of Outfitting in New Construction*

It is proposed to develop a model of the current outfitting processes used by a local shipbuilder who has optimized his steel fabrication and assembly operation. Using this model as a baseline, changes in the operation will be analyzed and evaluated on the basis of costs and benefits. The most reasonable changes will be implemented and results correlated with predictions from process simulation models.

#### *Short Turn Around Repair Project Management*

It is proposed to review the operations of a regional ship repair business and determine its current business processes. Using this review as a baseline, the necessary changes in procedures and methods which will improve the business's ability to compete in the foreign ship repair business will be determined.

The research will include review and analysis of techniques for planning and control of ship repair projects. Based on this review and evaluation, an effective planning procedure will be developed and tested. After testing the developed procedure, a recommended practice standard will be presented with attendant training.

#### *Analysis of Regional Ship Repair Market*

It is proposed to analyze the regional market for ship repair services. The initial scope of the analysis will be for the Texas gulf coast region. The analysis will determine the size of the market, specific niches, and key success factors for market penetration. Based on this information, specific recommendations will be made for industry, government, and academic projects. The analysis will serve as a model for marketing efforts in other areas of the country.

In addition to the above listed in-house projects, LUO has identified at least one project which has been undertaken on behalf of the NSRP SP-4 Panel. This project is summarized as follows:

*Translation of Japanese CIMS project report*

LUO has agreed to have this report translated from Japanese into English for distribution to SP-4 panel members.

9. SUMMARY

The GCRMTC objectives and milestones are being met in a timely fashion. The pertinent achievements of the two sites and the Center were as follows:

1) Cooperative Agreement signed between ONR and the University of New Orleans and initial funding of \$8.2 million authorized.

2) Hiring of core staff at the New Orleans Site, the Orange Site and the Center is nearly complete.

3) A program plan covering October 1, 1994 through December 31, 1996 was prepared. The plan included PERT/GANT charts showing the appropriations, projected tasks, and expenditures for each Site and the Center.

4) Renovation of office/research space should be completed at both sites during the first quarter of 1995.

5) The Center issued an RFP to the New Orleans staff and processed 36 research proposals through the Government Program Manager. Eleven proposals were approved for funding and the projects were initiated effective January 1, 1995.

6) Completed first draft of Procedures Manual in October 1994 which provides direction in operating each site as well as the Center. A second draft was prepared in December for review.

7) The first workshop for the Center was planned for February 22-23, 1995 in New Orleans. The Center invited over 130 representatives from U. S. Shipyards, Suppliers and government agencies.

8) Arranged to have representatives from the Center and both Sites attend the 1995 Ship Production Symposium & Exhibition, January 25-27, 1995 in Seattle, Washington. The Center arranged to set up and operate a booth at the exhibition to publicize its activities.

9) The GCRMTC is committed to initiating three Centers. The New Orleans Site initiated the Shipbuilding Environmental Resource Center. The Orange Site will be responsible for the initiation of the Marketing Resource Center which is in the planning stages at present. The third

Center, Shipbuilding Process and Product Standards Center, is in the planning stage and the GCRMTC will endeavor to arrive at a mission statement for this Center at the February 22-23, 1995 Workshop.

10) The Orange Site has made significant progress towards letting contracts to initiate the Simulation Based Design Center at Lamar University-Orange. This Center has been designated the Center for Excellence in Ship Hull Design.

## **10. RECOMMENDATIONS**

Based on a review of the October 1, 1994 to December 31, 1994 activities of the Center and the New Orleans and Orange Sites along with the feedback from the Program Manager and Staff, the following actions are recommended:

- 1) Complete the first workshop, February 22-23, 1995, and utilize the results to:
  - a) Identify and prioritize technology thrust areas.
  - b) Identify research project concepts which meet these thrust areas.
- 2) Form the Government/Industry Advisory Board immediately after the February 22-23, 1995 Workshop.
- 3) Streamline and enhance the GCRMTC Procedures Manual and distribute copies to all current and potential Principal Investigators.
- 4) Plan to obligate an average of 50% of the new appropriations collectively for the two Sites (FY94 and beyond) to sub-contracts with shipyards and suppliers (after operating expenses of each site and the Center are deducted). The 50% of the appropriations would not necessarily be 50% from each Site, i.e. since the New Orleans Site has a great deal of in-house capability compared to the Orange Site it might for example be that 25% of the funding comes from the New Orleans Site and 75% from LUO.
- 5) Establish the mission of the Standards Center and initiate the Center.
- 6) Continue to reassess and reset GCRMTC milestones.

# **FIGURES AND TABLES:**

**FIGURE 1 - GCRMTC ORGANIZATION CHART**

**FIGURE 2 - GCRMTC PROGRAM PLAN**

**TABLE 1 - CENTER & SITE PLANNING BUDGET**

**TABLE 2 - ORANGE SITE PLANNING BUDGET**

**TABLE 3 - ORANGE SITE BUDGET/EXPENDITURE PLAN  
(YEAR 1)**



# GULF COAST REGION MARITIME TECHNOLOGY CENTER PROGRAM PLAN

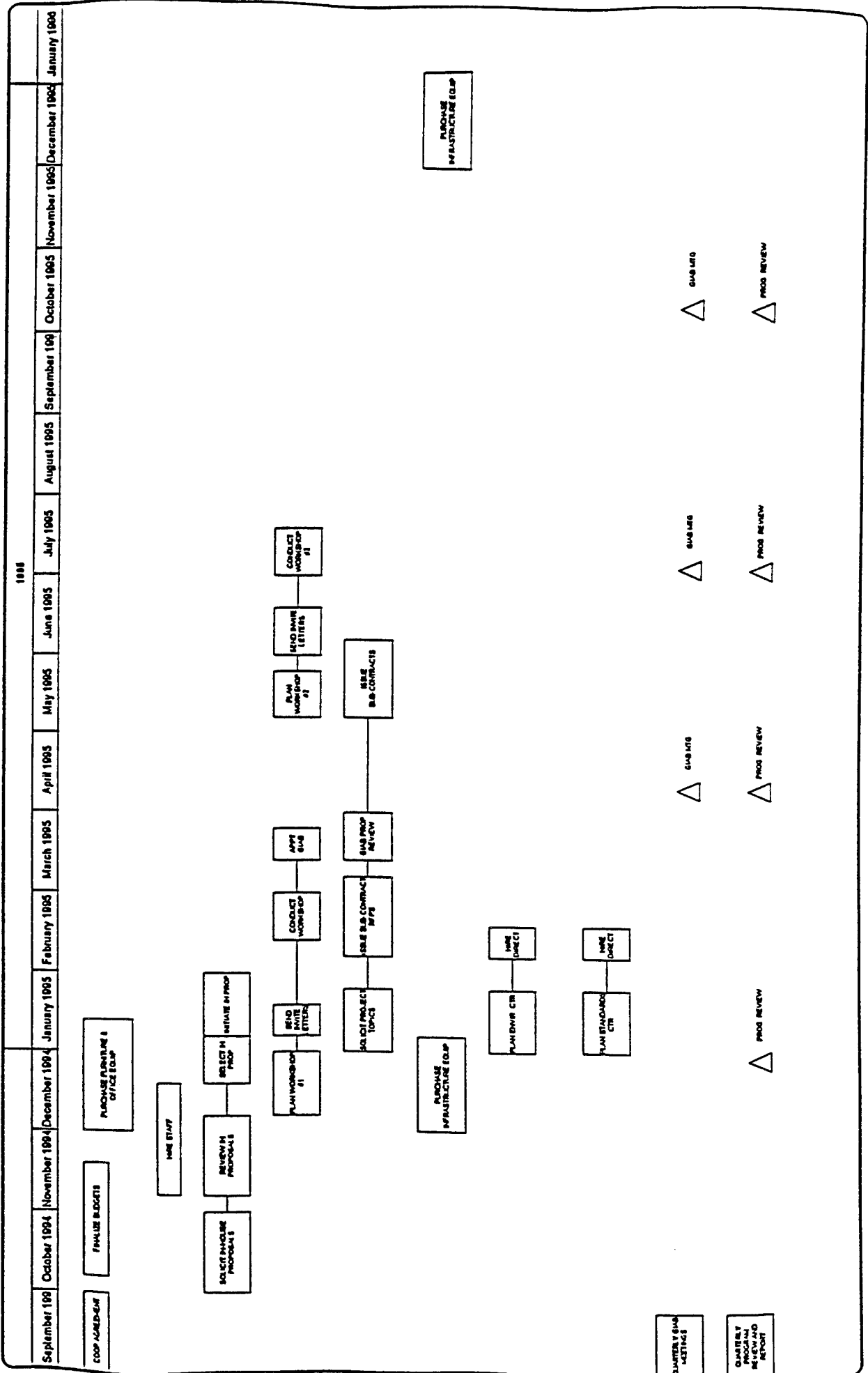


Figure 2 - GCRMTC Program Plan  
31

TABLE 1 - Center & Site Planning Budget

GULF COAST REGION MARITIME TECHNOLOGY CENTER  
CENTER AND NEW ORLEANS SITE PLANNING BUDGET

Funding Appropriations And Increments	Fiscal Year 1995 UNO Site and Center				Fiscal Year 1996 UNO Site and Center				Fiscal Year 1997 UNO Site and Center			
	QI - FY 95 Oct - Dec 94	QII - FY 95 Jan - Mar 95	QIII - FY95 Apr - Jun 95	QIV - FY 95 Jul - Sep 95	QI - FY 96 Oct - Dec 95	QII - FY 96 Jan - Mar 96	QIII - FY 96 Apr - Jun 96	QIV - FY 96 Jul - Sep 96	QI - FY 97 Oct - Dec 96	QII - FY 97 Jan - Mar 97	QIII - FY 97 Apr - Jun 97	QIV - FY 97 Jul - Sep 97
<b>Totals</b>	\$2,300,000	\$640,080 \$571,330	\$640,081	\$640,081	\$875,000	\$875,000	\$875,000	\$875,000	\$1,250,000	\$1,250,000	\$1,250,000	\$1,250,000
<b>Expenditures</b>												
Internal Administration	\$42,580	\$170,890	\$127,890	\$127,890	\$124,033	\$124,033	\$133,943	\$133,943	\$133,943	\$133,943	\$133,943	\$133,943
Infrastructure		\$125,000			\$10,000				\$34,807	\$34,807	\$34,807	\$34,807
Professional Services		\$350,285	\$23,943	\$23,943	\$34,807	\$34,807	\$34,807	\$34,807	\$34,807	\$34,807	\$34,807	\$34,807
Initiate Center		\$1,309,425	\$124,675	\$124,675	\$124,675	\$124,675	\$124,675	\$124,675	\$124,675	\$124,675	\$124,675	\$124,675
Workshop		\$169,200	\$28,200	\$28,200	\$28,200	\$28,200	\$28,200	\$28,200	\$28,200	\$28,200	\$28,200	\$28,200
LU 3% Administration		\$34,035	\$34,035	\$34,035	\$55,290	\$55,290	\$27,645	\$27,645	\$34,035	\$34,035	\$34,035	\$34,035
<b>Sub-Total</b>	\$76,615	\$444,743	\$310,543	\$338,743	\$348,805	\$387,005	\$321,070	\$349,270	\$327,460	\$355,660	\$327,460	\$355,660
<b>In-House Projects</b>												
Jan - Dec 95		\$1,233,237	\$477,350	\$477,350	\$477,350	\$200,000	\$200,000	\$200,000	\$319,384	\$319,384	\$319,384	\$319,384
Jul95-Jun96			\$400,000	\$400,000	\$200,000	\$319,384	\$200,000	\$200,000	\$300,000	\$300,000	\$300,000	\$300,000
Jan96-Dec96												
Jul96-Jun97												
Jan97-Dec97												
<b>Subcontracted Projects</b>												
Jan 95 NDBL		\$25,000	\$25,000	\$25,000	\$25,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000
Oct95-Sep96												
Apr96-Mar97												
Oct96-Sep97												
Apr97-Mar98												
<b>Totals</b>	\$76,615	\$1,702,980	\$812,893	\$1,241,093	\$1,251,155	\$1,086,389	\$1,240,454	\$1,368,654	\$1,446,844	\$1,455,660	\$1,527,460	\$1,255,660
<b>Funding Balance</b>	\$2,223,385	\$1,731,815	\$1,559,003	\$957,991	\$581,838	\$370,447	\$4,993	\$761,339	\$564,495	\$358,835	\$81,375	\$75,715
<b>Industry</b>												
Collaboration Revenues			\$100,000	\$100,000	\$200,000	\$200,000	\$200,000	\$200,000	\$300,000	\$300,000	\$300,000	\$300,000
Expenditures			\$100,000	\$100,000	\$200,000	\$200,000	\$200,000	\$200,000	\$300,000	\$300,000	\$300,000	\$300,000

TABLE 2 - Orange Site Planning Budget

Lamar University at Orange  
 Gulf Coast Regional Maritime Technology Center  
 Planned Budget 10/1/94 through 9/30/96

	year 1						year 2		
	4th 94	1st 95	2nd 95	3rd 95	4th 95	1st 96	2nd 96	3rd 96	
	Dec-94	Mar-95	Jun-95	Sep-95	Dec-95	Mar-96	Jun-96	Sep-96	
funding									
1993 appropriation	\$4,401,758								
1994 appropriation					\$3,575,420				
expenditures									
staffing	\$21,835	\$296,533	\$296,533	\$296,533	\$277,888	\$277,888	\$277,888	\$277,888	
equipment	\$17,500	\$1,975,691			\$325,000				
facilities		\$450,000							
operations		\$20,325	\$20,325	\$20,325	\$39,550	\$39,550	\$39,550	\$39,550	
fees	\$88,035	\$88,035	\$88,035	\$88,035	\$71,509	\$71,509	\$71,509	\$71,509	
project funding									
marketing resource									
center		\$105,620	\$105,620	\$105,620	\$84,413	\$84,413	\$84,413	\$84,413	
sponsored research		\$158,579		\$158,579	\$588,255	\$588,255		\$588,255	
rapid response					\$44,077	\$44,077	\$44,077	\$44,077	
funding balance	\$4,274,388	\$1,179,605	\$669,092	(\$5000)	\$2,732,984	\$1,627,294	\$1,109,859	\$000	

TABLE 3 - Orange Site Budget/Expenditure Plan (Year 1)

**LAMAR UNIVERSITY at ORANGE**  
**Gulf Coast Regional Maritime Technology Center**  
**Revised Budget - Year 1**

Objects of Expense	ORIGINAL Approved Budget	PROPOSED Revision to Budget	VARIANCE	Explanation
<b>Labor:</b>				
Executive Administration	38,739	38,739	0	Variance in labor caused by the timing involved in hiring staff for the center.
Site Director	120,361	117,119	3,242	
Contract Compliance	98,969	79,637	19,332	
Network & CIS Managers	160,834	132,078	28,776	
Project Coordinators	315,382	149,206	166,176	
Research Staff	404,683	198,941	205,742	
Professional Start-Up	36,180	0	36,180	
Secretarial	32,800	28,066	4,734	
<b>Sub-total Labor</b>	<b>1,207,968</b>	<b>743,786</b>	<b>464,182</b>	
<b>Equipment:</b>				
Software/Hardware and Associated Training Needs	1,973,691	2,183,391	(207,700)	Revised figures are based on updated quotes on equipment.
Office Equipment	17,500	35,000	(17,500)	
<b>Sub-total Equipment</b>	<b>1,993,191</b>	<b>2,218,391</b>	<b>(225,200)</b>	
<b>Facilities:</b>				
Installation of SBD Laboratory	450,000	459,200	(9,200)	Bids were solicited for this project; these figures represent contracted amounts.
Architectural Fees	0	45,920	(45,920)	
Other (ads, printing, etc.)	0	4,000	(4,000)	
<b>Sub-total Facilities</b>	<b>450,000</b>	<b>509,120</b>	<b>(59,120)</b>	

TABLE 3 - Orange Site Budget/Expenditure Plan (Year 1)-(continued)

LAMAR UNIVERSITY at ORANGE  
 Gulf Coast Regional Maritime Technology Center  
 Revised Budget - Year 1

Objects of Expense	ORIGINAL Approved Budget	PROPOSED Revision to Budget	VARIANCE	Explanation
Maintenance & Operations:				
Phone	9,500	24,000	(14,500)	Revisions are requested based on current information on the project's requirements
Postage	2,000	2,500	(500)	
Printing	2,200	3,200	(1,000)	
Office Supplies	3,600	5,000	(1,400)	
Office Furniture	17,000	40,000	(23,000)	
Sub-total Maint. & Operations	34,300	74,700	(40,400)	
Travel:				
Center Staff	25,000	25,000	0	No revisions requested
Project/Research Staff	22,000	22,000	0	
Sub-total Travel	47,000	47,000	0	
Sponsored Research:				
Marketing Resource Center	0	158,004	(158,004)	These dollars are being proposed to be allocated as follows:
Sponsored Industry Projects	317,158	324,701	(7,543)	Marketing Res Ctr: \$ 158,004 In-House Projects: \$ 162,351 NSRP Projects: \$ 162,350 * * Incl SP-4 Trans Proj-\$30,000
Sub-total Sponsored Research	317,158	482,705	(165,547)	
Handling Fee:				
1 % fee to LU-O	352,141	326,056	26,085	Adjustment based on corrected calculation
Sub-total Handling Fee	352,141	326,056	26,085	
<b>TOTAL BUDGET</b>	<b>730,799</b>	<b>730,799</b>	<b>0</b>	<b>No adjustment in total allocation</b>

# APPENDIX A

## PROJECT STATUS REPORTS:

- ◆ Inexpensive Non-toxic Pigment Substitute for Chromium in Primer for Aluminum Substrate
- ◆ Applications of Integrated Optical Fiber Sensor Systems in Shipbuilding and Shipboard Monitoring
- ◆ Integrated RAM Database
- ◆ Performance Simulation of Marine Propulsion Systems Under Extreme Conditions
- ◆ Improvement of Technology Transfer Process
- ◆ Concurrent Engineering Processes in Shipbuilding
- ◆ Ship Capsizing (An Accurate and Efficient Technique to Predict Vessel Roll Damping)
- ◆ Shipboard Sensors
- ◆ High Efficiency, High Power Density Motor Drives for Maritime Application
- ◆ Development of High Speed Marine Vehicle Database
- ◆ A Study of the Structural Design Procedures in the Shipbuilding Industry
- ◆ Process Modeling of Outfitting in New Construction
- ◆ Analysis of Regional Ship Repair Market
- ◆ Translation of Japanese Computer Manufacturing Report

**FIRST PROGRESS REPORT - GCRMTC PROJECT      JANUARY 20, 1995**

**PROJECT TITLE:**

Inexpensive Non-toxic Pigment Substitute for Chromium in Primer for Aluminum Substrate  
(Project #1)

**PRINCIPAL INVESTIGATOR:** Alfred Daech - Project Engineer (Chemical Engineer)

**CO-INVESTIGATOR:** Kenneth L. McManis

**RESEARCH ASSISTANT:** Mrs. Li Ly (Chemical Engineer) will start approx. Feb. 1, 1995

**BRIEF SYNOPSIS:**                      To investigate a corrosion inhibitor to replace chromium for aluminum substrates. This inhibitor is based on Lithium.

**ACTIONS TO DATE:**

- (1) Literature search has been updated, 60 new references found and are being ordered thru UNO Library.
- (2) Company sought to manufacture and test product. Verbal agreements have been made with company: EURO Navy Research will test and formulate coatings. Mr. Daech will inspect the facility. (This inspection will be done while attending Orlando conference NACE in March, 1995. EURO Navy Research - 2600 NW 55th. Court, Ste. 230, Ft. Lauderdale, FL.
- (3) Equipment for impedance testing is being selected since the equipment is not locally available. It will be shown at the Pittsburg Conference in New Orleans in March 1995.
- (4) Pigments are being studied. Manufacturers are being contacted by phone.
- (5) Miscellaneous consumable office supplies have been purchased and are in the office.
- (6) Long Distance Access Code given to PI and Copy Code given to PI for billing purposes.
- (7) Budget set up for monitoring expenses/charges.

**ACTIONS TO BE TAKEN:**

- (1) Order new literature as available
- (2) Order and set-up equipment to test passivity.
- (3) Shake down equipment and start testing.

- (4) Order a variety of pigments for testing.
- (5) Make the crude coating.
- (6) Conference attendance by PI, Mr. Daech:
  - 1. NACE March 27-31, 1995 Orlando, FL
  - 2. Pittsburg Equipment Confeence, March 6-10, 1995, New Orleans

**COMMENTS:** Mr. Al Daech has started to work officially via funding on this project as of January 1, 1995. A graduate/researcher was found (chemistry major) and she is qualified to do the technical work.

**Applications of Integrated Optical Fiber Sensor Systems  
in Shipbuilding and Shipboard Monitoring**

(Project #14)

**Principal and Co-Investigator:**

Drs. Shing M. Lee and Rasheed M.A. Azzam

**Synopsis:**

Fiber-optic sensors offer many advantages that are significant in shipboard monitoring. However, few optical fiber-sensor systems available today can meet the Navy's needs with acceptable performance and cost. We propose a novel fiber-optic-sensor system based on in-line photopolarimetric measurements using D-shape fibers to address the performance and cost issues. The system is compact, sensitive, and can be multiplexed throughout the ship to provide hazard warning, pollution monitoring, processing monitoring, etc. With the use the D-shape fiber, the sensor head is integrated to improve the compactness and reliability. This work is to investigate the applicability of shipboard monitoring using such a fiber optic system.

**Action to Date (as of the end of January):**

Literature has been collected for the current state of technology on fiber-optic sensors. The ideal dual-use technologies are temperature and pressure sensors integrated into existing fiber-optic-communication network.

We are at the final stages of compiling a list of necessary laboratory equipment for this project and obtaining their price quote from the venders. The major piece of equipment, the HP Lightwave Polarization Analyzer will be here shortly on consignment when the purchasing order is sent. The purchase orders will be sent out by the end of January.

Theoretical analyses of waveguide modes are on-going. The propagation and attenuation coefficients for a single-mode D-shape fiber will be obtained shortly.

**Actions to be taken (Through the end of March):**

All necessary equipment will be in-place. Preliminary investigation of D-shape fibers will be conducted. The effects of fiber twisting on the state of polarization will be study in detail.

D-shape-fiber mode characteristics will be determined theoretically for the fibers with different materials deposited on the D-surface. The detector ends of the fiber sensors can then be designed.

A survey of common fiber-optic-communication systems will be compiled. Special focus will be on the common multiplexing and de-multiplexing techniques. A reliable connection for polarization maintaining fibers will be found.

We will investigate the designs of fiber sensor head for pressure, temperature, and current sensors. The advantages and drawbacks of different configurations will be investigated.

# GCRMTC PROGRESS REPORT

January 16, 1995

**Title:** Integrated RAM Database (Project # 18)

**Principal Investigator:** Dr. Bahadir Inozu

## **Synopsis of the Project:**

We are establishing an integrated RAM database at University of New Orleans for Ship Operations Cooperative Program (SOCP) to collect field data from merchant ships for new failures, to download existing ship machinery failure history data from ship logs, to access international RAM databases, to investigate reliability and maintainability of existing shipboard components, and to provide a basis for optimizing ship maintenance and ship building practices, increasing the reliability, safety and quality of U.S. ship operations and recommending new ship designs.

SOCP was formed in 1993. Current participants of SOCP are U.S. Maritime Administration, National Oceanic and Atmospheric Administration (NOAA), American Bureau of Shipping (ABS), U.S. Coast Guard, Military Sea Lift Command, Sea-Land Service, Energy Transportation Corporation, and ARCO Marine.

Database development has three parts as follows:

### *Part 1. Development of RAM Data Collection Program DATE and Data Review/Display Program SHIPPER for Onboard Use.*

A stand alone RAM data entry program, named DATE, will be developed. DATE will have the capability to interface with existing maintenance programs of SOCP participants. Special meters will be installed at selected ship machinery to record exact equipment running hours on a trial basis. Ship Performance Review Program, SHIPPER will enable the chief engineer to sort and view thirteen critical performance indicators / RAM indices.

### *Part 2. Development of RAM Data Review/Display Program, SPIN, for Shoreside for Individual SOCP Participants*

RAM data collected from the ships will be first sent to headquarters of the shipping companies. Ship Performance Indicator Program SPIN will be developed. SPIN will be an expanded version of SHIPPER. SPIN will enable ship operators to merge data from various ships of their fleet and to examine various combinations of performance indicators for problem detection and operation optimization. Shipping companies will forward their RAM data regularly to the master database to be established at UNO.

### *Part 3. Development of Master RAM Database at UNO*

An expanded version of SPIN, Program Ships' RAM will be developed to merge, to process, to analyze and to disseminate ships' RAM data provided by various shipping companies within SOCP. Data provided by other domestic and international sources will also be deposited at the master database.

**Actions to Date:** Software development of programs DATE and SHIPPER has been awarded to Systems Exchange Inc. Data entry program DATE will be demonstrated on January 19, 1995 during the SOCP Executive Committee meeting in McLean, VA. Copies of DATE will be distributed to SOCP members for a three month testing period during the week of January 23, 1995. Ship Performance Review Program SHIPPER will be ready on February 19, 1995 for a three month testing period. Programs will be based on Powerbuilder.

Various RAM data base related actions/proposals will also be discussed during the SOCP executive committee meeting including integration of statistical process control, estimation of missing RAM data (Judgmental Numbers), and development of RAM Cost Trees.

New international data exchange standard STEP - Standard for the Exchange of Product Model Data (ISO 10303) is currently examined for implementation. SOCP members are also informed about CALS (Continuous Acquisition and Life-cycle Support) developments worldwide and the role of integrated databases for the implementation of CALS strategy.

Specifications for SUN Sparc 20 computers needed for the database have been provided for the bidding process on December 19, 1995.

#### **Actions to be taken:**

- Specifications for the Ship Performance Indicator Program SPIN will be developed for software development.
- Application protocols of STEP (ISO 10303) will be examined.
- Transfer of nameplate data for ship machinery and assignment of operation codes will be coordinated for program SHIPPER.
- Meters for running hours will be selected and installed for testing.
- Transfer of machinery failure history from ship log books into program DATE will be initiated.

# GCRMTC PROGRESS REPORT

January 16, 1995

**Title:** Performance Simulation of Marine Propulsion Systems Under Extreme Conditions  
(Project # 20)

**Principal Investigator:** Dr. Bahadir Inozu

## **Synopsis of the Project:**

We are investigating the performance of marine propulsion systems under extreme conditions using computer simulation. Steady state and dynamic responses of the engine to various loads and failure modes are the main focus of this investigation.

This study has three objectives as follows:

### ***Task 1. Examination of operation in ice brash or pack ice***

Operation involves instantaneous ice torque at MCR and fast load rejection at MCR. Main focus will be on dynamic response as described by torque, rpm, fuel flow, peak cylinder pressure, exhaust temperature, and turbo rpm.

### ***Task 2. Investigation of extended full load operation beyond MCR***

Operation involves continuous full load/full fuel for 5 days (120 hrs.). Main focus will be on steady state response as described by torque, rpm, peak cylinder pressure, inlet manifold pressure, exhaust temperature, and gallery lube oil temperature. Failure modes will also be investigated.

### ***Task 3. Examination of operation with no intake air filter or with a dirty intake filter/reduced pressure in engine compartment***

Operation involves no filter restriction (intake air filter removed) at MCR and specified maximum static vacuum at compressor inlet (engine operation at MCR). Main focus will be on steady state response as described by torque, rpm, peak cylinder pressure, inlet manifold pressure, exhaust temperature, and static pressure at compressor inlet. Failure Modes will also be investigated.

## **Actions to Date**

- Purchase request for MERLIN with two licenses (one for UNO, one for CDNSCW) has been forwarded to Mr. J. Smith on December 19, 1994.
- Specifications for the two SUN SPARC 20 stations **urgently needed** to run MERLIN software were provided on December 19, 1995 for the bidding process.
- Confidential data has arrived for Colt-Pielstick 10 PC 4.2 Engines.

- Test runs were started for selected ice loads using UNO/ECN software.
- A special iceload has been forwarded to Lloyd's Register for a sample run on MERLIN.
- A special planning meeting will be held on January 20, 1995 at CDNSWC in Washington DC.

#### **Actions to be taken**

- A special meeting will be scheduled with Dr. Hetet and Dr. Banisoleiman for the installation of MERLIN and sample runs.
- Based on the action plan to be set during the planning meeting, data for the low speed MAN B&W engine and medium speed Colt Pielstick engine will be entered into MERLIN and UNO/ECN programs for comparative simulation studies for the ice loads.
- Results of sample runs will be analyzed.

#### **Comments**

It is **extremely important** to obtain access to one of the SUN computers at the computer science department to run MERLIN until our SUN computers arrive for the success of this project. CDNSWC is scheduled to present a progress report by Feb. 15, 1995. I was informed that delivery of our computers may take up to 75 days due to the bidding process of UNO and delivery policy of SUN. Delivery of SUN is expected to take about a month.

**TITLE OF PROJECT:** Improvement of Technology Transfer Process  
Project Number: 30  
Account Number: 327-01-5110  
Date: 1/16/95

**PRINCIPAL INVESTIGATOR:** William J. Lannes, Associate Dean, College of Engineering, University of New Orleans.

**CO-PRINCIPAL INVESTIGATOR:** James W. Logan, Associate Professor, Department of Management, College of Business, University of New Orleans.

**CONSULTANT:** Kim D. Jovanovich, Omnicron Telecommunications

### **SYNOPSIS**

Competitiveness in the shipbuilding industry is directly linked to the speed at which new innovations can be utilized to improve productivity or bring new technology and designs to market. This program will develop a methodology and implementation protocol based on current best practices and incorporation of critical success factors important to all stakeholders.

The initial model will be developed from an extensive literature review and the experience of the research team. The interdisciplinary team was chosen to bring different stakeholder perspectives into the model and insure that the model and implementation process was grounded in real world experience. The team consists of a researcher from the College of Business whose expertise is in the area of innovation and technology management, a researcher from the College of Engineering, who has 30 years experience in technology transfer issues in industry and the military, and a consultant who has extensive experience in developing and transferring high technology into ships and shipyards.

Information obtained from the initial literature review will be used to develop a structured survey instrument. This instrument will be used to gather information from the various stakeholders in the technology transfer process within the shipbuilding industry. This will insure that best practices, both in the literature, and those practices existing within the shipbuilding industry, but not previously identified in the literature, are incorporated into the final technology transfer model.

The model developed will be tested in actual shipyard environments to determine its usefulness in field conditions. Feedback from this testing will be incorporated into the final delivered model and implementation protocol. During the entire process of model development, extensive use will be made of feedback from all stakeholders in the technology transfer decision process.

## **ACTIONS TO DATE**

1. A consultant, Kim D. Jovanovich, has been hired and he has made initial contact with principals in the shipbuilding industry about our project. Initial contact with stakeholders in the shipbuilding industry has been supportive of our project and supported our hypothesis that this is an area that is in need of research and improvement.
2. Research assistant candidates have been screened and one will be hired by the end of January.
3. Literature and electronic information sources are being evaluated for usefulness to the project and efficiency of use.
4. Several organizational meetings have been held between the investigators and consultant. These meetings have resulted in a general agreement on a schedule and procedural matters, as well as educating each of the participants about the strengths of each member of the research team.
5. Necessary paperwork and scheduling details have been initiated by the members of the research team with regard to the University.

## **ACTIONS TO BE TAKEN THROUGH MARCH**

By the end of March, 1995, the following actions should be accomplished:

1. A research assistant will be hired and will work full time on research to develop initial model and initial survey instruments.
2. Investigators and consultant will develop initial model of technology transfer using current best practices. This model will be targeted for an April submission deadline for publication at the Southern Management Association meeting. This will insure feedback from other experts in the technology transfer field.
3. Based on the initial model and feedback, an prototype structured interview methodology and accompanying survey instrument will be developed. This instrument will be pilot-tested prior to widespread application in the field.
4. Concurrent with model and survey development, the consultant will be developing a list of stakeholders in the shipbuilding industry to participate in the interview and survey process.
5. The research team's goal is to have the initial instrument and survey sample in place by the first of April in order to accomplish initial survey and interview contacts in the period of April through July.

### Status of Project as of January 20, 1995

I. PROBLEM TITLE: Concurrent Engineering Processes in Shipbuilding (previously titled "Software Applications for Shipbuilding Optimization") (Project #27)

#### II. RESEARCH:

- 1) Pinlin Zhuang has been hired as a research assistant to help in this project. Along with his being an excellent student, Mr. Zhuang has several years experience working in the shipbuilding industry.
- 2) Research is underway to tap the UNO library of materials on foreign shipbuilding practices. Being as Japanese, Chinese, and German shipbuilding periodicals are available from the library, this will provide the baseline from which current CIM methods in U.S. shipbuilding, and Gulf Coast shipbuilding in particular, will be ranked.
- 3) Current NSRP literature has been surveyed, and relevant material is being forwarded to us as of this writing.
- 4) A videotape was viewed on Friday, January 13 describing the Navy's and Intergraph's CAD-2 standard. The videotape was obtained from Stephen Baum of Intergraph corporation with special permission from the Navy. The CAD-2 standard is the three-dimensional product modeling standard for the future building of ships for Navy contracts. As far as the Navy is concerned, they are hoping for the adoption of this standard in commercial shipbuilding.
- 5) A second graduate student is being considered for the position of research assistant on this program. It will be later this month before the position is filled.
- 6) As of yet, Kevin Lynaugh of the Navy's ERAM program has not been contacted about the applicability of concurrent engineering (CE) programs in current Navy proposals.
- 7) Tom Lamb, president of the Gulf Coast chapter of SNAME, has expressed great interest in being involved in our proposed activities. We will be contacting him in the next week.
- 8) Plans are underway to travel to Huntsville to see Integraph's 3-D Ship-Modeling Center.

#### III. EQUIPMENT (HARDWARE/SOFTWARE):

- 1) Verbal agreement has been obtained through Matt Logsdon and Stephen Baum of Integraph to the obtaining of hardware for "free" and software at a substantially reduced cost for establishing the laboratory for investigating and refining concurrent engineering processes as used in the shipbuilding industry. The final written agreement of hardware/software purchase and utilization should be obtained in the near future.
- 2) Survey of shipyard's needs will begin immediately with the completion of the initial literature survey. For this project this will mean several on-site visits to local shipyards. At present, the idea is to focus on Avondale shipyard, being as they appear to be most in need of our services. The angle which will be pursued in attempting to convince Avondale of the utility of our methods is a cost-benefit analysis, stressing the fact that existing computer facilities will not be rendered obsolete overnight by the adoption of our methods.
- 3) Other shipyards in the local area will also be pursued, being as the methodology to be provided will be applicable to any shipyard. In this respect, it may be necessary to have a number of different computer systems to handle the broad diversity of systems available in different shipyards.
- 4) From the onset, the training of shipyard personnel in the new methods will be endeavored. As such, the identification of shipyard needs will be a process concurrent with obtaining shipyard heuristic expertise from the trainees. This will tailor specific methods to specific shipyards.

IV. SUBMITTED BY: NAME: Normal L. Whitley & Stephen C. Lipp  
TITLE: Associate & Assistant Professor  
AFFILIATION: University of New Orleans  
ADDRESS: New Orleans, LA 70148-2230  
PHONE: (504) 286-6652

# Gulf Coast Maritime Technology Center (UNO Advanced Marine Technology Center)

**Interim Progress Report:** Ship Capsizing (An Accurate and Efficient Technique to Predict Ship Roll Damping) #36, January 16, 1995

**Principal Investigator:** Dr. Jeffrey M. Falzarano, Assistant Professor, Naval Architecture and Marine Engineering (UNO)

**Co-Principal Investigator:** Dr. Richard A. Korpus, Senior Research Scientist, Marine Hydrodynamics (SAIC, Ship Technology)

**Synopsis:** This project will develop an accurate and efficient technique to predict ship roll damping using the Finite Analytic Reynolds Averaged Navier Stokes (FA-RANS) solution technique. This capability will be used to improve naval and commercial hull form design with regards to minimizing the most critical resonant roll motions and loads. The approach to be utilized will be to apply progressively more accurate yet computer intensive approximations. Comparisons will be made with existing and obtained model and full scale data. Extensive use will be made of existing SAIC capability and UNO experimental and computer resources including the new Cray.

#### **Actions to date:**

- o Working on updating literature survey which involves previous experimental and computational approaches to predict ship roll damping. This will also be used to possibly identify hull forms for comparison.
- o Working with UNO Research Office on SAIC subcontract.
- o Working with UNO purchasing to acquire SG Power Indigo II.
- o Begin selection of candidate hull forms for analysis, consultation with SAIC/NAVSEA Naval Architecture and Hydrodynamics.
- o Discussions with SAIC personel regarding refining tasks/schedule/budget/etc.
- o Hire Graduate student for project

#### **Actions to be taken by March 1:**

- o Complete updating preliminary literature survey.
- o Complete SAIC sub-contract and begin work (February 1).
- o Purchase and Install SG Power Indigo II. Upgrade existing DEC's.
- o Select candidate hull forms for analysis and acquire lines plans.
- o Begin work on development and analysis tasks with SAIC personnel.

#### **Comments:**

Throughout this project we will coordinate with US Navy and commercial maritime personnel, as much as practical, in order to select suitable candidate hull forms for analysis and focus on relevant problems and useful analysis approaches.

## **Progress Report January 16, 1994**

**Title of Project:** #16 Shipboard Sensors

Principal and Co-Investigators: Dr. Russell E. Trahan, Jr. PI, Dr. Paul Chirlian, and Mr. Robert Lipp, Co-investigators.

**Brief Synopsis of Project:** This project will examine the use of existing US Navy fiber optic shipboard sensing technology for commercial marine applications. The US Navy has sponsored research and development in the past for various fiber optics based shipboard sensors. UNO will study the possible application of these sensors for commercial applications through a redesign of each.

**Actions to Date:** Dr. Trahan met with Mr. Kim Jovanovich of Omni-Technologies on Monday, January 9 to discuss a Statement-of-Work to be used to subcontract work for this project. On Thursday, January 12, Mr. Jovanovich delivered a completed Statement-of-Work to Dr. Trahan and this was delivered on Friday to Mike Trammell in the UNO Office of Research. She will process the documents to officially get Omni-Technologies as a subcontractor for this project.

We are in the process of hiring graduate students and student workers for the project.

Mr. Jovanovich is in the process of collecting information about sensor types on various Navy ships. The next step is to obtain the same information for commercial vessels such as Casino river boats, passenger ferries and oil tankers.

**Actions to be taken:** The schedule of work requires that the sensor survey be completed during the first month of the contract and then the sensor redesign should be completed by the end of April.

**High Efficiency, High Power Density Motor Drives for Maritime Application**  
(Project #15)

Principal Investigator: Dr. Pragasen Pillay

**SYNOPSIS:**

Many shipboard auxiliaries utilize fixed-speed motors. Some modern ships are starting to use variable speed drives, although even here, the older induction or wound rotor synchronous motor technology is still being used. It is opportune at this point to examine the application of the latest in motor drive technology for maritime applications.

It is proposed here to characterize permanent magnet (PM) motor drives, induction motor drives, and switched reluctance motor (SRM) drives according to size, weight, efficiency, controllability, initial cost, operating cost, maintainability, torque to inertia ratio, torque per unit current, speed range, braking capability, torque pulsations, feedback devices, rectifier inverter rating and acoustic noise over a range of horsepower sizes applicable to shipboard auxiliaries. At the same time, the load requirements will also be characterized including the speed-torque curve, speed range and accuracy. Thus the best drive for a given application will be determined, with particular attention being paid to PM drives because of their higher efficiency and power density. This project will help both the naval and the merchant shipbuilding industry in applying variable speed drives.

**ACTIONS TO DATE:**

Contacted engineers at Newport News Shipbuilding to discuss collaboration.

**ACTIONS TO BE TAKEN:**

A meeting has been arranged for 2/2/95 to meet with Mr. Erik Amudsen and Mr. C. T. Smith in Newport News where it is hoped to obtain the electrical drawings of an aircraft carrier as well as to quantify the nature of the collaboration. Discussions with Avondale are still continuing. The collection of commercial data on PM and SRM motors and drives has also begun.

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# Development of High Speed Marine Vehicle Design Database

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*Interim Status Report*

Contract Number: GCRMTC - 10

January 12, 1995

Robert Latorre

Department of Naval Architecture and Marine Engineering

Paul D. Herrington

Department of Mechanical Engineering

University of New Orleans

New Orleans, LA 70148

# I. Synopsis of Project

This project addresses the lack of necessary data for selecting an efficient and economically priced high speed marine craft. The project will provide new data for designers. The project emphasizes the development of required design standards and database methodology for systematic studies focused on the design of efficient and economically priced high speed marine transport craft. The database, covering a number of alternate designs, will be used to introduce Computer Integrated Manufacturing into the workplace. It is anticipated that a follow-up joint UNO/shipyard ARPA/MARITECH project will develop a new high speed vessel design (Task I.3b).

Over the past decade advances in computer, material science, and software, opened the possibility for designers to obtain advanced high speed Marine transport craft running at a speed of 35-50 knots. The capacity and speed of these craft make them competitive with helicopters and aircraft when the travel distance is between 100 and 1000 km. Presently these craft are being developed in Northern Europe and the Pacific Rim countries. With the weakening of the US dollar, there is a developing market niche for US shipyards to competitively market these craft worldwide. The technology has had its roots in high speed naval craft similar to those recently built by Gulf Coast Shipyards.

This project is focused on the development of a systematic design database for advanced marine craft. Preliminary studies indicate that local shipyards have the capability to produce a high speed catamaran, with/without supporting foils. This is a natural step beyond the present single hull high speed craft built by Gulf Coast Shipyards. Because of the secondary goal of introducing competitive concepts, the database will include a number of systematic design variations and production related areas such as advanced lightweight materials, cost advantages from using different structural arrangements as well as water jet versus propeller propulsive units. Information derived from the project will be disseminated in joint workshops with Gulf Coast Shipyards (Tasks I.6 and II.6). The project also includes an educational benefit by involving undergraduate students in the project as a part of their design course credit.

## II. Actions to Date

### A. *Project Startup.*

1. Setup project milestones and contracts with Dr. Robert Latorre (40% AY, 100% Sum), Dr. Paul Herrington (50% AY, 100% Sum), graduate research assistant Tien Pan (ME) and undergraduate assistant Jason Mills (NAME).

### B. *Project Tasks.*

#### Task I.1 Survey of state of the art (Months 1-3).

1. Literature review completed covering ten journals (1980-1994). Approximately 50 entries were obtained for the data base.
2. Developed recreational power boat performance database for approximately 400 boats (length 20 – 50 ft) including monohulls as well as catamarans.
3. Attended NSWC David Taylor Model Basin symposium (High Performance Ships in East Asia and Australia by Dr. Frank Peterson, 1/10/95).

#### Task I.2 Site visits to domestic and overseas shipyards/offices (Month 2)

1. Attended SNAME meeting and International Marine Exposition to develop contacts (11/94).
2. Attended Workboat conference to discuss high speed catamaran design with shipbuilders (12/94).
3. Network with Dr. Frank B. Peterson concerning visit to Australian Fast Ferry Shipbuilders.

#### Task I.3a Development of hydrofoil catamaran design rules (Months 4-6)

1. Obtained ABS rules for high speed craft.

2. Requested DNV rules for catamarans.

Task I.5 Preliminary structure/hydrodynamic testing using tow tank and structure laboratories (Months 9-11).

In order to start the structural tests in month 9, we need to acquire and set-up the space frame. Since this is a long lead item, requiring bid specification development and on-site construction, we have begun the following activities related to this task:

1. Discussions with several vendors.
2. Preliminary bid specifications for testing fixture developed in conjunction with Scientific Marine Services.
3. Visit to David Taylor Research Center's Structural Laboratory.

### III. Actions to be Taken (through 3/31/95)

The actions to be taken through the end of March, 1995 includes:

Task I.1 Survey of state of the art (Months 1-3).

1. Complete state of the art review.
2. Prepare a 10-15 page report which will be merged with the final report.

Task I.2 Site visits to domestic and overseas shipyards/offices (Month 2)

1. Arrange site visits of domestic shipyards. We intend to coordinate this with the February 1995 University of New Orleans Marine Industry Workshop.
2. Make arrangements and schedule overseas shipyard visit in February 1995. Due to the academic year calendar and examinations, it was not possible to schedule this during 1994.

Task I.3a Development of hydrofoil catamaran design rules (Months 4-6)

1. Using available rules, perform design calculations.
2. Development of initial design rules.

Task I.5      Preliminary structure/hydrodynamic testing using tow tank and structure laboratories (Months 9-11)

1. Site visit to Scientific Marine Services.
2. Final bid specification for structural test components completed.

### ***Project Title***

A Study of the Structural Design Procedures in the Shipbuilding Industry (Project #23)

### ***Principal Investigators***

Dr. Michael Folse

Dr. Norma Jean Mattei

**Funds Authorized: \$ 90,746**

### ***Synopsis***

The feasibility to investigate a Loaded Resistance Factor Design (LFRD) in the structural design of ships.

### ***Actions Taken to Date:***

- Participation from McDermott Shipbuilding Inc. has been assured
- Survey of existing design procedures has begun

### ***Actions To Be Taken:***

- Update literature search
- Evaluate types of loads associated with ship design
- Study effects of LRFD design approach on construction techniques
- Evaluate economic impact of using LRFD design approach

## ***Project Title***

Process Modeling of Outfitting in New Construction

## ***Principal Investigators***

Ms. Patricia Raines Pate  
Director, Quality and Productivity Division

Staff, Quality and Productivity Division  
John Gray Institute/Lamar University System

**Funds Authorized:** To be determined pending proposal development

## ***Synopsis***

Create a model of the current outfitting processes used by a local shipbuilder. Using this model as a baseline, analyze and evaluate changes in outfitting methods for impact on the cost and schedule. The most reasonable changes will be implemented and results correlated with predictions from process simulation models.

## ***Actions Taken to Date:***

- Meeting with local shipbuilder
- Stage II Problem Statement written
- Submittal of Stage II Problem Statement to UNO for forwarding to GIAB or GPM
- Project Proposal under development

## ***Actions to Be Taken:***

- Submit Project Proposal to Center for authorization

***Project Title***

Analysis of Regional Ship Repair Market

***Principal Investigators***

Mr. Roy G. Huckaby  
Director, Small Business Development Division

Staff, Small Business Development Division  
John Gray Institute/Lamar University System

**Funds Authorized:** To be determined pending proposal development

***Synopsis***

Determine the size and characteristics of the ship repair market in the Southeast Texas region. Identify market niches and key success factors for penetration of the market. Recommend industry, government, and academic initiatives to aid in penetration of the ship repair market.

***Actions Taken to Date:***

- Meeting with local shipbuilder
- Stage II Problem Statement written
- Submittal of Stage II Problem Statement to UNO for forwarding to GIAB or GPM
- Project Proposal under development

***Actions to Be Taken:***

- Submit Project Proposal to Center for authorization

***Project Title***

Translation of Japanese Computer Integration Manufacturing (CIM) Report

***Principal Investigators***

Mr. H. Bruce Bongiorno  
GCRMTC-LUO Site Director

**Funds Authorized:** To be determined pending proposal development

***Synopsis***

Translate Japanese CIM report into English. Provide copies to SP-4 Panel.

***Actions Taken to Date:***

- Authorization to proceed given by Center and project approved by GPM

***Actions to Be Taken:***

- Procure translation services