Final Technical Report

DATE: 3/4/2009

Section I

Technical Status Report

Technology Investment Agreement 2008-344

between

the Advanced Technology Institute (ATI)

and

Bender Shipbuilding and Repair Co., Inc.

for

Shipbuilding Opportunities in Short Sea Shipping (S3)

Bender Shipbuilding and Repair Co,. Inc.
Malone Consulting
Tedesco Consulting
Herbert Engineering

Shipbuilding Opportunities in Short Sea Shipping (S3)

Project Overview

The goal of this project is to accelerate the shipbuilding opportunities associated with potential U.S.-based Short Sea Shipping (S3) operations. The specific objectives of the project are:

a. To continue the NSRP engagement with Short Sea Shipping.
b. Provide a bridge from preliminary analysis to a broader effort that may be undertaken, perhaps as an NSRP RA project.
c. Improve focus on reducing costs for construction of S3 vessels in the U.S.
d. More clearly concentrate the S3 effort on Ro-Ro vessels of varying size and configuration
e. Facilitate possibilities for forming consortia (owners, operators, U.S. shipyards, partnered foreign shipyards, suppliers and technical support companies)

Project Goals and Objectives

The proposed project addresses four of the top six recommendations that were outputs of the NSRP-sponsored S3 Workshop in Orlando, FL on April 19-20, 2007, namely:

a. Analysis and application of "Virtual Shipbuilding," including lessons learned overseas
b. Leverage partnerships between U.S. and foreign shipyards
c. Leverage examples of success in overseas construction methods and supply chain business practices applicable to S3
d. Leverage examples of success in overseas designs applicable to S3

It is important to note that many of the focus areas addressed in this project (e.g., virtual shipyard concept, innovative construction methods, supply chain practices, and design characteristics) are directly applicable to Naval as well as commercial ship design and construction programs and have been and continue to be investigated through various NSRP programs.

Workbook

Bender Shipbuilding and Repair Co., Inc. took over the responsibility for collating and assembling the material for the workshop. 50 workbooks where produced for the meeting. Each book included the revised agenda, presentation material, biographies, and a directory of all the attendees. All of this material was and is posted on ATI's website.

NSRP PDMT America's Marine Highways Workshop October 2008

The October 2008 Workshop focused on leveraging international experience, potential partnerships with foreign shipyards, and the applicability of the "virtual shipbuilding" concept to Marine Highways vessel construction. This was followed by sections that address the key topics in the workshop agenda: Operator Perspectives; Virtual Shipbuilding; Lessons Learned from International Shipyards; Shipbuilder Perspectives; International Partnerships; U.S. Navy Interest in Marine Highways; Opportunities for Vessel Financing; DOT and MARAD Developments; and Conclusions and Recommendations. The presentation materials are available for download at the NSRP's online Marine Highways library:

http://advancedmaritimetechnology.aticorp.org/short-sea-shipping/nsrp-pdmt-americas-marine-highways-workshop-october-2008

The Workshop was also captured on video and posted on the Maritime TV site for viewing by all interested parties. The link is as follows:

http://www.tvworldwide.com/events/maritimetv/nsrp/081021/

Attendees:

Dan Bagnell	CDI Marine
Paul Bea	PHB Public Affairs
Luke Blessinger	ATI
Benedict Boesche	Flensburger Schiffbau GmbH (FSG)
Roger Bohnert	MARAD
John Cameron	Tradeworthy, Inc.
Michael Cameron	International Shipholding Corp
Brian Carter	NASSCO
Sean Connaughton	MARAD
Clay Cook	Seward & Kissel LLP.
Maurizio De Pellegrini	International Marketing & Business
Laury Deschamps	SPAR Associates, Inc.
Art Divens	U.S. NAVY – PEO Ships
Scott W. Fernandez	Horizon Lines
Stephen Flott	SeaBridge Inc.
Rami Hirsimaki	Delta Marin Contracting Ltd.
Erik F. Johnsen	International Shipholding Corp.
Markku Kanerva	Delta Marin Contracting Ltd.
Jon Kaskin	U.S. NAVY – Office of CNO (N42)
John Malone	Malone Consulting Services
Frank McGrath	BMT Designers & Planners
Sid Mizell	VT Halter Marine, Inc.
Mark Oakes	Allied Science & Technology
Ron Pearson	Aker Yards Marine
Bill Peterson	MAPC & Washburn & Doughty
PierCipriano Rollo	Fincantieri
Ron Selvidge	Art Anderson & Associates
Stan Shumway	LogisticsPlus
Justin Slater	Marinette Marine
Bret Smart	Webb Institute
Matt Tedesco	Tedesco Consulting Services
Rick Thorpe	Herbert Engineering
Marty Toyen	Seaworthy Systems
Harvey Walpert	Bender Shipbuilding & Repair Co., Inc.
Stan Wheatley	CCDoTT
Shawn Wilber	Bender Shipbuilding & Repair Co., Inc.
John Wise	Webb Institute
Dave Wood	Northrop Grumman
Hans van Schuppen	Damen Shipyards
Mark Yonge	Maritime Advisors

The participants of the Workshop provided broadly varying perspectives in each discussion area. A breakdown of origin/field for Workshop participants is as follows:

Six (6)	U.S. Shipyards
Six (6)	Foreign Shipyard/ Design Agents
Six (6)	Ship Owner/ Operator / Shipper
Seven (7)	U.S. Design Agents
Seven (7)	Consultants
Two (2)	U.S. Navy
Two (2)	MARAD
Two (2)	CCDOT
Two (2)	ATI
Two (2)	Students

Agenda-Day One: Tuesday, October 21, 2008

America's Marine Highways Workshop

Location: ATI, Trident Research Center, Charleston, SC

0730-0800	Registration and Breakfast	Meeting Room
0800-0830	Welcome and Workshop Overview	Walpert/ Malone/ Self
0830-0845	Retrospective	Malone
0845-0915	Marine Highways Update	Yonge/ Bea
0915-1015	Operator Panel Discussion	Cameron/ Fernandez/ Johnsen/ Toyen
1015-1030	Break & Networking	
1030-1140	Virtual Shipbuilding Overview	Thorpe
1140-1220	Cost-Benefit from Modularization	Deschamps
1220-1335	Lunch & Speaker	Erik Johnsen
1335-1505	International Shipyards Presentation, I	Kanerva/ Hirsimaki
1505-1535	Break & Networking	
1535-1650	International Shipyards Presentation, II	Rollo/ DePellegrini
1650-1700	Wrap Up	Malone
1730-2000	Reception & Dinner with Speaker	Sean Connaughton

Meeting Review - Day One

I. Welcome and Workshop Overview

The group was given a brief introduction by Rick Self from ATI who thanked everyone for participating. Mr. Malone and Harvey Walpert provided opening comments and discussed some of the work that went into hosting the event.

II. Retrospective

John Malone presented a review of results from the April 2007 NSRP Short Sea Shipping Workshop because of new survey results indicating changes in perspective on key survey questions within the last year. This was followed by presentations addressing the key topics in the workshop agenda: Operator Perspectives; Virtual Shipbuilding; Lessons Learned from International Shipyards; Shipbuilder Perspectives; International Partnerships; U.S. Navy Interest in Marine Highways; Opportunities for Vessel Financing; DOT and MARAD Developments; and Conclusions and Recommendations.

III. Marine Highways Update

Mark Yonge and Paul Bea offered an overview of America's Marine Highways Past, Present and Future addressing the current situation in Europe, examples of Marine Highways operations in the U.S. today, potential new Marine highways services, and major legislative milestones for Marine Highways. This discussion helped to serve as background for the workshop.

It was reported that Europe has seen substantial investment in Marine Highways from the European Union (EU) and individual governments. The two-phased Marco Polo Program, currently in its second phase, has provided funding for a variety of projects related to freight infrastructure and startups. It was noted that this program was made possible because the EU has a focused transport policy. Recent legislation in the U.S. authorizing a Marine Highways program under the Energy and Security Act of 2007 is considered a step in the right direction. However, the act did not provide any funding for the Marine Highway system.

The experience in Europe emphasized the importance of having promotional organizations in each region to champion Marine Highways. It was noted later in the workshop (discussed in this report under DOT and MARAD Developments) that the Department of Transportation is establishing regional offices in the U.S. to facilitate and coordinate developments in Marine Highways.

Figure 1 U.S. Maritime Administration Logo for the new Marine Highway

A variety of new and potential Marine Highways services have been announced including:

James River Barge Line - An inland barge transporting containers between the Port of Richmond and the Port of Hampton Roads

Great Lakes Feeder Lines - Feeder service throughout the Great Lakes, St. Lawrence River and East Coast

EcoTransport - Barge feeder service between the ports of Oakland and Stockton, California

SeaBridge Freight Marine Highway - High capacity tug and barge that holds 600 TEUs of containerized freight will shuttle between Tampa and Brownsville, TX

CoastalConnect - Purpose-built Ro-Ro's serving New England I-95 corridor

Horizon Lines - Coastwise container feeder network on U.S. East Coast

A wide range of vessel designs have been proposed for Marine Highways markets including traditional tug-barge, articulated tug-barge, both in container on barge and Ro-Ro varieties, high speed trimaran trailer-ships, high speed Ro-Ro mono-hulls, and both larger and smaller traditional Ro-Ro's. There was substantial discussion on the potential for a single Marine Highways design that could server multiple markets. There was also substantial discussion of the merits of "keeping it simple" versus the advantages of using technology to improve efficiency and throughput. The discussion highlighted opportunities to develop Ro-Ro designs that could serve multiple markets resulting in series production. However the general consensus was that there are opportunities for a range of different designs and capabilities tailored to the needs of specific markets.

Subsequent to the April 2007 Workshop, a survey of workshop participants investigated perspectives on a variety of Marine Highways topics including: Marine Highways markets; challenges for Marine Highways; federal regulatory or legislative action; state and local action; and cost components for Marine Highways operations. During the recent October 2008 Workshop, the results of the previous workshop were reviewed and these topics were revisited in the more current survey. This section presents the results of this review. In the survey, participants were asked to distribute 100 points between up to five market characteristics from the 2007 results, or new characteristics that they chose to add. This would serve to further elucidate the participants' perspectives regarding the relative importance of various characteristics when evaluating potential markets. Relative to the 2007 results, there was increased emphasis on the importance of market volume and efficient port and inland operations to support a given route.

i. Market Characteristics

The market characteristics considered most important included market volume and cargo availability, price/cost savings door to door and profit potential, ability to maintain reliable and efficient service, and availability of efficient port and inland operations to support the route as illustrated in Figures below.

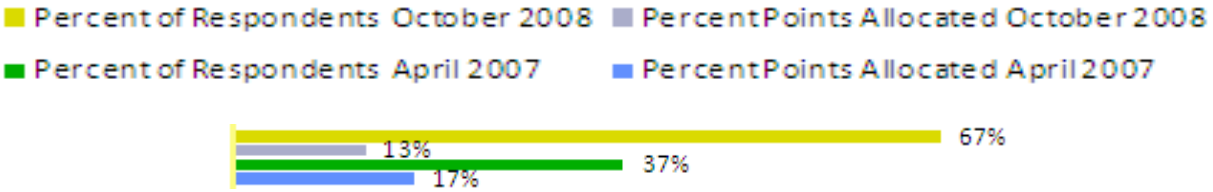

Figure 2 Price Cost Savings Door-to-Door &Profit Potential

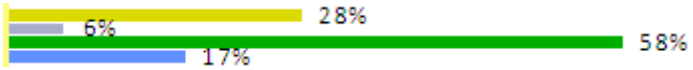

Figure 3 Deficiencies in Land Modes

(Rail Problem, HAZMAT, Congestion, Lack of Capacity…)

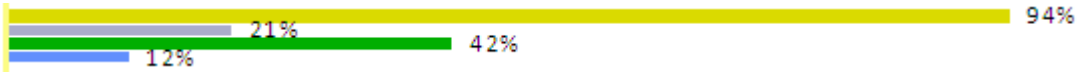

Figure 4 Market Volume / Cargo Availability

Figure 5 Attractive Niches (Type, Time Sensitivity, HAZMAT, Out of Gauge, Dense Cargo…)

Figure 6 Ability to Maintain Reliable & Efficient Service

Figure 7 Balanced Trade

Figure 8 Availability of Efficient Port & Inland Operations to Support the Route

Figure 9 Frequency / Schedule Requirements

(Speed, Time Sensitivity, Low to Moderate Value Commodities)

ii. Market Characteristics - continued

The market characteristics considered most important included market volume and cargo availability, price/cost savings door to door and profit potential, ability to maintain reliable and efficient service, and availability of efficient port and inland operations to support the route as illustrated in Figures below.

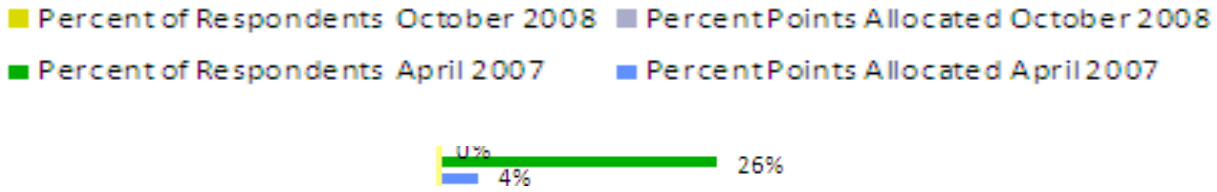

Figure 10 Passenger Availability

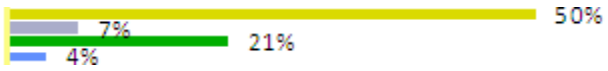

Figure 11 Environmentally Friendly Mode compared to Existing Modes

Figure 12 Cooperation from Labor & Terminals

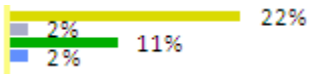

Figure 13 Industrial or Population Area

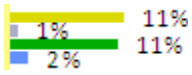

Figure 14 Long Distance

Figure 15 Truck Hub & Clustering of Shippers Around Ports

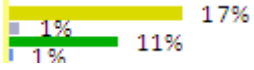

Figure 16 Safe & Secure Mode compared to Existing Mode

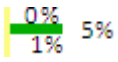

Figure 17 Seasonality

iii. Potential Markets

Exploring potential markets, results in 2008 were similar to those from 2007 with participants believing that promising markets exist on the East Coast, West Coast, and Gulf Coast as illustrated in Figures below.

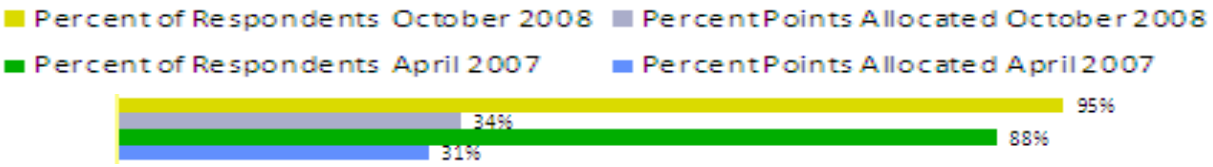

Figure 18 U.S. East Coast

Figure 19 U.S. West Coast

Figure 20 Gulf to Mid / North Atlantic

Figure 21 U.S. Gulf Coast

Figure 22 Great Lakes

Figure 23 Feeder Services

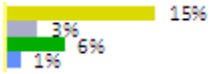

Figure 24 Florida – Puerto Rico

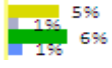

Figure 25 Hawaii – West Coast

Figure 26 Niche (Cross L.I. Sound, Cross Harbor, Etc.)

iv. Marine Highways Challenges

Participants were also asked to indicate what they believed were the challenges to Marine Highways. As illustrated in the Figures below, ship construction cost, port infrastructure and landside considerations, and vessel operating costs were considered to be the significant challenges for Marine Highways.

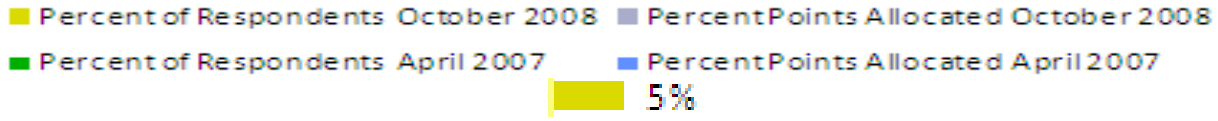

Figure 27 Environmental Challenges

Figure 28 Ship Construction Costs

Figure 29 Vessel Operating Costs (Including Fuel)

Figure 30 Port Infrastructure

Figure 31 Sources of Financing

Figure 32 Shipper Receptivity

Figure 33 Door-to-Door Service Time

Figure 34 Regulatory / Tax Disincentives

v. Cost Elements

When asked to prioritize cost elements for marine highways, participants considered vessel operating costs, vessel construction costs, and port infrastructure costs to be the most significant cost elements, as illustrated in the Figures below.

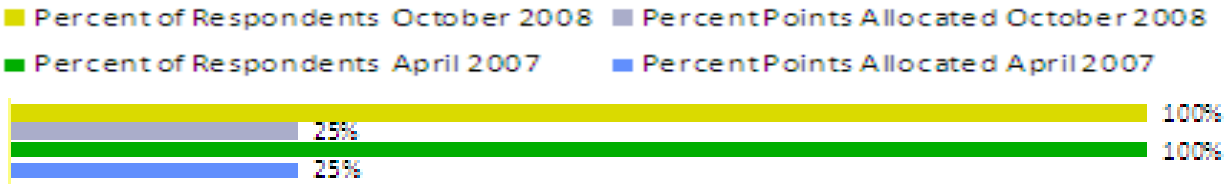

Figure 35 Vessel Operating

Figure 36 Vessel Construction

Figure 37 Port Infrastructure

Figure 38 Financing

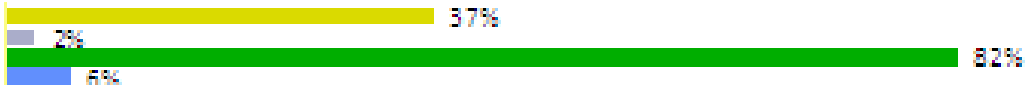

Figure 39 Yard Tractor

Figure 40 Harbor Maintenance Tax

Figure 41 Drivers

Figure 42 Trailers

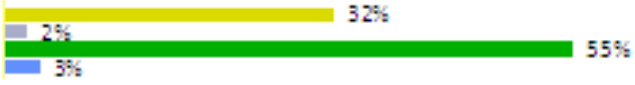

Figure 43 Trucks

Figure 44 Other

vi. Federal Action Needed

When asked what Federal regulatory or legislative action is required to promote Marine Highways, financing support, elimination of HMT and tariffs, and port availability and access were emphasized, as illustrated in Figures below.

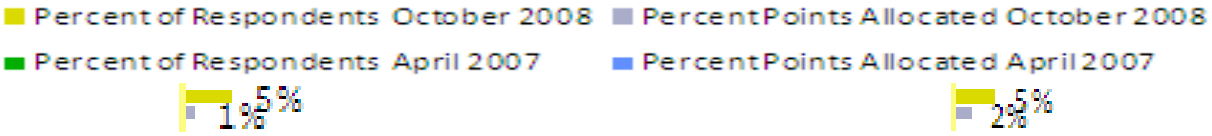

Figure 45 Environmental / Going Green

Figure 46 Give MARAD Authority for National Strategy

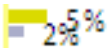

Figure 47 Overhaul of Dredge Funding

Figure 48 Mandate Dual-Use Vessels

Figure 49 Level Taxes with the Other Modes

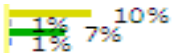

Figure 50 Revision of 24-Hour Rule

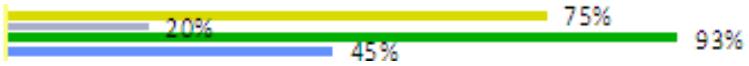

Figure 51 Financing Support, Loan Guarantees, Low Interest Loans…

Figure 52 Eliminate Harbor Maintenance Tax and Tariffs

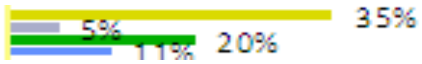

Figure 53 Increase Road-Use Tax, Tax for Public Costs

Figure 54 Revision of 24-Hour Rule

Figure 55 Port Availability

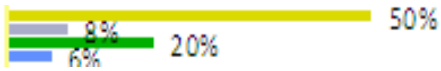

Figure 56 Credits for Modal Shift

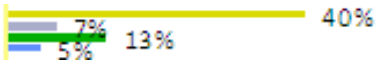

Figure 57 Facilitate Partnerships with Stakeholders

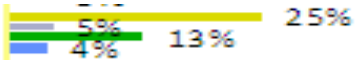

Figure 58 Bolster Defense Features Incentives

Figure 59 Reduce Manning Requirements

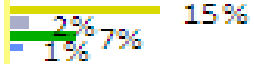

Figure 60 Broaden Alternate Tonnage Tax

Figure 61 Jones Act Reform Figure

vii. State and Local Action Needed

When asked what state and local action was required, there was increased emphasis on creating incentives for use of Marine Highways as illustrated in the Figures below.

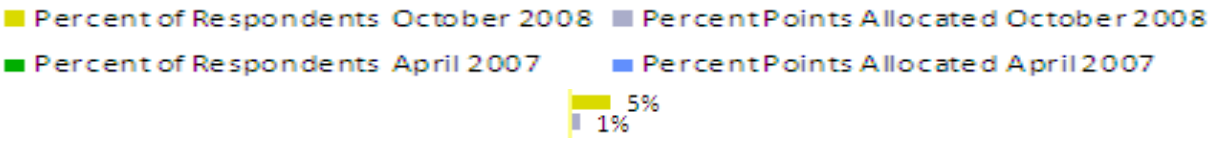

Figure 62 MARAD & Military Pressure

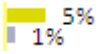

Figure 63 Cooperation Between States

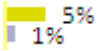

Figure 64 Develop and Incentivize Rail

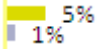

Figure 65 MPO Involvement Planning

Figure 66 Port Availability, Promote New Terminals

Figure 67 Financial Support, Bond Measures

Figure 68 Create Incentives to Take Freight Off Roads to Achieve Public Benefits, and/ or Tax Congestion and Emissions Contributions of Other Modes

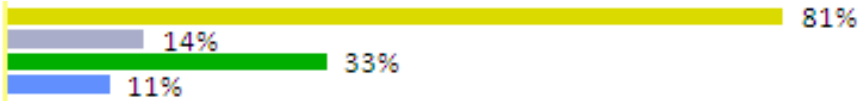

Figure 69 Improve Highway Links to/ from Ports

Figure 70 Assist Yards in Becoming More Competitive Lowering Building Costs

IV. Operator Panel Discussion

John Cameron of Tradeworthy Inc., Scott Fernandez of Horizon Lines, Erik Johnsen of International Shipholding Corporation (ISC) and Marty Toyen of Rolls-Royce/Seaworthy led the discussion of operator perspectives on Marine Highways during this session, following the panel discussion, Erik Johnsen gave a more extensive presentation regarding ISC's Marine Highways efforts.

Horizon Lines: Scott Fernandez pointed out that we are at a crossroads with:

- Diesel prices up more than 30% over $4 a gallon (at time of the Workshop)
- Highway construction costs over $30 million dollars per mile
- Congestion costing the U.S. 3.7 billion hours, 2.3 billion gallons of fuel, and $200 billion per year
- Container ports expected to process 40 million containers by 2020

Horizon Lines is a supporter of the Marine Highways Program and they see strong opportunities for Marine Highways. Currently, Horizon Lines has three older container vessels, which could be put into coastwise service. Horizon is exploring Miami, FL - Elizabeth, NJ service as well as Houston – Jacksonville – Norfolk – Elizabeth routes. Horizon believes that the time is right for a container feeder service in these markets but there are challenges that must be addressed. Specifically, the Harbor maintenance tax must be removed and Title XI must be reinforced with additional funding. Work with the many stakeholders in the transportation industry including the railroad and trucking industries needs to be of a partnership relationship rather than competitive as it has been viewed in the past. Labor agreements need to be achieved with the various unions that work the waterfront and other areas of the transportation system. Closer, coordinated work with the Metropolitan Planning Organizations (MPOs) will be required. Investigation of new construction options for the long term (existing vessels are an initial introduction to get a service going) that would incorporate improved fuel efficiency and emissions mitigation as well as better speed and perhaps better capacity. Some areas requiring further exploration include Ro/Ro, Lo/Lo, integrated tug-barge, tug and barge, and other potential Marine Highways concepts.

Seaworthy Systems: Marty Toyen of Seaworthy Systems discussed challenges for Marine Highways based on Seaworthy's efforts in trying to start a Marine Highways service from Port Elizabeth to Bridgeport. Seaworthy's work suggests that the cost of vessels is not the major hurdle. Rather, landside costs are the significant contributors to Marine Highway economics. In the envisioned operation, tug-barge service would be provided. It was noted that the vessel movement round trip for a trailer would be approximately $280, with comparable truck movement being $400 per trailer. However, drayage costs to pick up and deliver loads to and from the terminals as well as landside costs such as terminal costs and fees make a marine highways operation less economical. For runs on the east coast, cargo may need to be drayed as far as 200 to 300 miles, and this drayage makes a Marine Highways service uneconomical. The implication is that Marine Highways must be selective about cargo, and seek out cargo opportunities that minimize these drayage distances. Terminal location also becomes an important factor. It was noted that in Connecticut, road congestion problems are tied to commuter traffic rather than truck traffic. As a result, it is difficult to get state or local support

for Marine Highways. The importance of partnering with trucking companies was emphasized, rather than competing with them. Small or independent carriers currently handle the bulk of the freight that Seaworthy's service would carry. "They have no 401k, their wife is their secretary, and they have no office or blackberry."

Tradeworthy Inc.: John Cameron of Tradeworthy Inc. provided an overview of existing operations in the Port of Charleston. The discussion focused on real-world issues that the Charleston transportation community is encountering. The following were highlighted as challenges for Marine Highways:

- Rail is a natural complement to Marine Highways. However there is limited connectivity
- Large ports are already dedicated to international container cargo, and competition between ports is geared toward capturing this lucrative business rather than supporting Marine Highways
- In looking at the coastwise hub and spoke concept, every port is interested in serving as a hub but there is no regional or national strategy for "spoke" ports that would be natural fits for Marine Highways
- Limited funds are being spent on import/export channels rather than domestic channels
- Dredge funds are allocated to develop and improve ports through a Congressional ear-mark process rather than a national strategic planning process
- Environmental regulations may impede development of Marine Highways on the East Coast

International Shipholding Corporation: International Shipholding (ISC) saw opportunity in the 1990's when NAFTA was approved and Mexico privatized their rail service. ISC started their service by becoming a short distance rail company. ISC started with two 65 car capacity rail-on/rail-off ships from Mobile to Coatzacoalcos, Mexico. Rail cars are jacked up and secured at the four corners while in transit. After three years, a second deck was added to the vessels so that they can carry 115 cars. In each terminal, they have capacity for 500 rail cars. Erik Johnsen noted that their experience in a niche market illustrates some of the challenges for Marine Highways. They had to operate at a deficit for over a year because ISC had to prove they would be a steady and reliable service before shippers would use them. Now, after a few years, the vessels finally operate at capacity.

A challenge for establishing a Marine Highway operation is that in order to make an investment in Marine Highways vessels, an operator must have hard cargo commitments to fill the ships.

However, in order to fill the ships, an operator must have a track record of reliable service. This suggests that emerging Marine Highways operators need to be prepared to operate below capacity as they grow their business. It also suggests that business models must be flexible and scalable. In the case of ISC, they started with relatively small vessels and added decks when they could capture more freight.

Erik Johnsen indicated that in the markets ISC has explored, the cost of building ships in the U.S. is a significant hurdle. He suggested that Marine Highways needs designs that will suit the core business of trailers and containers at a reasonable price, and that simple generic designs that will work in a variety of markets should be the focus of further work. For example, ISC estimated that a medium sized vessel carrying 140 trailers at 18 knots would need to be priced in the $60 to $70 M range.

For Marine Highways to work domestically, ISC believes that action is required on the part of Government, Shipyards, Ship owners, and Customers/ Shippers. Government needs to take leadership to define deep-water ports and make sure that funds are directed as needed to preferentially support these ports. Other ports should be designated as Marine Highways ports, and shallower draft ports may be appropriate for this as well. Deep water ports will continue to be in demand for importing containers, and it is unlikely that this terminal space would be made available for Marine Highways services. Erik Johnsen suggested that the Federal Government should invest in the shipyards to assist them in reducing their costs. The Federal Government should also offer a "green" tax credit to shippers to incentivize the use of Marine Highway alternatives. It was also suggested that the Harbor Maintenance Tax has a tax base of $500 billion, which should be used to help facilitate the Marine Highways initiative. However, it was pointed out that HMT funds are not really available as they are used on other Government projects.

V. Operator Survey

Two key questions were explored in the surveys related to operator perspectives, with highlights of responses presented below:

1. What do operators see as impediments, challenges, or opportunities for existing or potential ship operators and Marine Highways?
    - Convincing shippers that Marine Highways can be reliable and getting cargo commitments
    - Competitiveness with traditional modes (highways) per trailer costs
    - Demonstrating Marine Highways to be a better environmental option
    - Reduced fuel costs
    - Development of agreements with labor
    - Lack of supporting landside infrastructure and terminals in locations conducive to economical service
    - Terminal charges are too high
    - Taxes and disincentives must be removed or mitigated
    - Financing and loan guarantees must be readily available for marine highways
    - Priority placed on the core domestic business and defining the domestic market
    - Establishment of good business relationships with shippers, logistics companies, and trucking companies to ensure cargo availability

2. To what extent is vessel cost an impediment for operators entering into Marine Highways service?

    - There was consensus that the high cost of vessels in the U.S. is an impediment to investment. However, many believed that vessel construction costs were not a bigger impediment than operating costs, labor costs, or infrastructure costs. Some participants indicated that the challenge is not matching international rates, but rather achieving realistic reductions of 20% or greater relative to current pricing that would result in more favorable economics for Marine Highways.

VI. Virtual Shipbuilding Overview

The April 2007 NSRP Short Sea Shipping Workshop concluded that "Virtual Shipbuilding" may be an approach to reducing the cost or risk of building Marine Highways vessels in the United States. In the recent October 2008 workshop, Rick Thorpe of Herbert Engineering, who serves as the Technology Transition Coordinator for the Center for Commercial Deployment of Transportation Technologies (CCDoTT), led a discussion of virtual shipbuilding focused on the following:

1. What are the potential advantages that could be realized from Virtual Shipbuilding?

2. What conditions are required for Virtual Shipbuilding to be successful? What vessel characteristics are best suited for Virtual Shipbuilding?

3. What risks may be associated with Virtual Shipbuilding?

4. What action may be taken to mitigate these risks?

5. May Virtual Shipbuilding be employed to reduce the cost of Marine Highways Vessels?

Virtual Shipbuilding (VS) was defined as "a combination of two or more ship construction entities with capable management and technical staff to organize the planning, scheduling, budgeting, design and engineering, procurement, production control, testing and program management for the design and construction of ships." Key elements of a suggested VS approach include significant participation by the ship owner/operator in the program planning and ship design process as well as a good business relationship between the ship owner/operator and the shipper customer.

Potential strengths of a virtual shipbuilding modular approach include:

- Cost reduction by using more labor productive and lower overhead fabrication and sub-assembly facilities and scopes of work tailored to specialized expertise

- Accelerated production schedules associated with distributing the work over multiple facilities

- Avoid peak manpower demands at a single facility
- Geographic separation to reduce risk and increase resource availability
- Reduce value of work exposed to unforeseen events
- Reduce value of work concentrated at assembly shipyard
- Allowing the final shipyard to leverage its capabilities during final vessel construction

Cost analysis conducted under a CCDoTT project in conjunction with Herbert Engineering and SPAR Associates suggests potential cost savings of 15% to 30% compared to commercial or dual commercial/military yards. Weaknesses and risks associated with virtual shipbuilding include additional layers of contracting, greater program management requirements, and the added transportation costs associated with the interim products and assemblies moving to final assembly. Poor program management, planning, or technical direction entails greater risks in virtual shipbuilding because of the increased levels of coordination required to succeed. Misunderstandings of requirements or scope between participants, as well as between ship buyer and the prime shipbuilder can result in cost over-runs and schedule delays to a greater degree than traditional shipbuilding projects. As a result, one suggested mitigation strategy is to have the ship owner act as the prime program manager subcontracting construction to participating yards.

Lessons learned from the AHL Tanker Project, which began in July 2007, were presented. Ship Construction Strategies, Inc. and AHL acted together as the construction manager to each vessel owner, with a total of three 49,000 DWT product/chemical tankers being built. The "virtual shipyard" is comprised of seven subcontractors to AHL: Aker Yards Marine, Genoa Design International, Atlantic Marine Alabama, R&R Shipbuilding, Jamestown Marine Metal Sales, L-3 Communications, and Louisiana Machinery/Caterpillar. It was noted that this approach was facilitated by a pre-existing high degree of trust and close working relationship between AHL's President, Ship Construction Strategies Principal, and Atlantic Marine Holdings President and CEO.

Key lessons learned to date include:

- Success is dependent on a highly engineered product that minimizes the interfaces and overlap between sections. Vessel types and designs that are suited to clean subdivision and modularization are best suited for virtual shipbuilding. VS would be most effective if vessels are designed with VS in mind from the outset.
- Communication, coordination and cooperation are critical for success. To facilitate this, a central coordinating team must oversee the entire program. On the AHL project, Ship Construction Strategies serves this function.
- It is estimated that approximately 30% of the overall project duration has been reduced compared to completing the project in a single shipyard. This schedule reduction is the

result of performing work concurrently in multiple facilities and performing work in facilities that get to focus on their core strengths.

- In the case of the AHL project, the ship owner took responsibility for the design and performance responsibility that typically would fall on the shipyard. As a result, the shipyard did not need to add contingency money for work outside their expertise.

- Recent events associated with Hurricane Ike demonstrate the potential benefit of geographic distribution in parts of the country typically impacted by hurricanes. One of the facilities was impacted by the storm, but the project was able to realign work to compensate.

There was considerable discussion among participants regarding the factors that would motivate a virtual shipbuilding arrangement. For example, would a shipyard elect to enter into a VS arrangement unless it was motivated by capacity or capability constraints? In the case of the AHL project for example, it appeared that schedule reduction, workload leveling, and capacity all were motivating factors. The general consensus was that successful virtual shipbuilding arrangements would likely be born out of necessity as the most effective way for a particular ship owner, primary yard, or group of cooperating yards to most effectively pursue specific projects that other yards might choose to do traditionally or might choose not to pursue. It was also suggested that such arrangements, under the careful management of a strong central coordinating program management team, could allow facilities with more competitive costs to pursue Marine Highways vessels that they might not otherwise pursue.

It was also noted that material costs in shipbuilding typically represent 60% of total value. Given this, there may be limits to the cost savings that could be attributed to economies from VS whereas the schedule savings, workload leveling, and capacity constraint mitigation advantages of VS may be compelling under the right circumstances. It was pointed out that schedule reduction typically equates to cost reduction resulting from lower overhead and the reduced impact of inflation and cost escalation.

Based on the participant discussion, VS may be best suited to vessels of a size that are larger than mid-tier yards might otherwise pursue but smaller than a larger shipyard might typically be interested in. Other candidates may be non-standard vessels, which entail risks that traditional shipyards would not elect to bear, with the owner acting as the lead partner. In these circumstances, owners might elect to take responsibility for the design, team with a company to act as the coordinating agency to oversee the project, and subcontract with a number of shipyards in a virtual shipbuilding arrangement. In the survey responses, it was suggested that Virtual Shipbuilding approaches might be best suited for series runs of numbers of similar ships that might better take advantage of specialization of facilities. It was also suggested that having complete engineering available at the start of construction would contribute to the success of VS and mitigate risks associated with coordinating the team. Some participants expressed concern that the risks of virtual shipbuilding were significant.

Participants highlighted potential risks in the survey responses:

- Wide span of control and diffused responsibilities
- Parochial interests may result in less efficient efforts
- Selecting the wrong partners
- Incomplete cooperation and commitment between partners
- Immature design development prior to starting construction
- Failure of one entity/partner could jeopardize the program
- Control and management of interfaces critical to success

Participants, also suggested actions that could be taken to mitigate risks:

- Strong leadership and participation from owners
- Strong partnership arrangement with very strong program management
- Effective dispute resolution procedures clearly set-up in teaming agreements
- Completion of a well-engineered design prior to start of construction
- Application of VS to less complex vessels
- Accurate assessment of team member capabilities
- Strong program management, monitoring, and control
- Synchronization of collaboration tools and IT systems
- Identification and control of interfaces
- Focus on material and equipment supplier management
- Start with smaller vessels, demonstrate the process, and expand to more complex vessels

VII. Cost-Benefit from Modularization

Laurent Deschamps of SPAR Associates discussed Extended Modularization of Ship Design and Build Strategy as a complement to Rick Thorpe's discussion of Virtual Shipbuilding. In this presentation, it was pointed out that VS makes expanded use of modules to carry the concept of early stage of construction cost savings further. Benefits of expanded modularization include:

- Reduced construction schedules with modules built in parallel and associated reductions in cost resulting from lower overhead and less impact of inflation
- Series production of modules results in learning effects
- Modules can be built by competitive facilities that may be more cost effective than the fully integrated shipyard
- By designing for modularity, the impacts of changes are more easily isolated and managed thereby reducing costs associated with changes on a lead ship

It was also noted that a modular approach requires greater attention to engineering, engineering quality, and design standards to properly manage interfaces.

Cost estimates were prepared for a notional CCDoTT High Speed Trailership (HST) 140-53' trimaran trailership using SPAR's trimaran cost model. The cost model permits quick assessments of costs, risk, and design / mission trade off alternatives. The model provides a

range of structural, powering, equipment and ship system selections to predict weights, costs and various performance characteristics. The cost model generates cost estimates at approximately SWBS level three details, summarized as follows:

Recurring Costs

SWBS	
100	Structures
200	Propulsion
300	Electrical
400	Electronics & Navigation
500	Auxiliary Systems
600	Outfit & Furnishings
700	Armament
800	Technical Support
900	Shipyard Services
1000	Margin, Bonds & Insurance

Figure 71 SPARS Recurring Costs

World Class shipyards have been employing build strategies that have enabled them to dramatically lower their cost, improve conditions, quality and extend ship design features and capabilities.

a. Improved Manufacturing & Assembly Methods

A few of the methods for improving manufacturing include Pre-outfitted hull block construction and outfitted equipment & systems modules. Another method looks into minimizing and/ or eliminating expensive staging. Technology plays a part in group technology manufacturing methods and improved assemblies. Improvements can be made in labor as well as in facilities. Cross-trade work agreements and outsourcing specialty work with the reduction of non-value added labor costs (minimizing worker-walking time as an example) improves the manufacturing and assembly issues.

b. Improved Procurement & Material Control

Procurement and material control can be improved with near-in-time procurement scheduling joined with improved vendor relations & pricing agreements. The grouping of material work order kitting becomes easier with standardized material parts & components. Another avenue to improve material control is using material buffer storage nearer to worksites.

c. Improved Business Processes

Some improved business processes include streamlining & integration of departmental business process management while simultaneously improving labor, material, subcontractor planning & scheduling. Timely and accurate progressing joined with cost & earned value reporting is possible. Improving cost estimating & faster RFP responses are driven by advanced process and cost management metrics. The advanced metrics are driven by automated data collection systems. Finally, improvements in contract payments supporting advanced building methods, efficiencies, and streamlined government contract oversight requirements are included as well.

d. Improved Ship Designs & Engineering

A large factor in improving ship designs and engineering is based on the integration of the two systems. The integration is helped with including standardized (repeatable) components and interim products, which help simplify the ship and related ship systems.

e. The Efficient Shipyard Pursues Strategies that Maximize Productivity of the Assembly Processes:

Many of the known strategies to increase the productivity of the assembly process can be done with maximizing the following: under cover work, down hand work, assurance that correct material is available on time to support production, material handling/ storage requirements, access of the supply of material to the worker, opportunities for standardized parts and assemblies, and maximize responsibility / problem solving down to the worker level. The shipyard aggressively tries to eliminate all instances of non-value labor costs and minimizing the number and complexity of parts used in construction.

These practices can be seen in the increased outfit and equipment modules, which in turn lead to more outfitted assemblies, blocks and grand blocks.

Figure 72 Outfitted Hull Block

An element of "On unit outfit" may be as small as a single piece of equipment mounted on its foundation and ready to install on block or on board or "on unit outfit" can be a complex assembly of equipment, piping, electrical and other systems all premounted on a support structure. The expanded applications of ship modules have been successfully developed by various European shipbuilding companies including Thyssen Nordseewerke, Schelde Naval Shipbuilding, Blohm & Voss Gmbh, and Abeking & Rasmussen.

f. Benefits to the Shipbuilder

The benefits are broken up into new construction and ship based (maintenance, operation).

- New Construction Benefits
    - Shorten ship construction time with modules built in parallel
    - Shortened time saves cost with lower overhead and less impact of inflation
    - Mass production of modules saves costs from learning effects
    - Modules can be built by a competitive industry that does not rely on a fully integrated shipyard which may be less productive… more opportunities for smaller business
    - Lead ship costs should be lower because the modular approach is less inter-dependent on other systems and less subject to change orders
    - Lower cost means more products can be built with available funds

- Ship Maintenance Benefits
  - Modules can be easily removed from onboard and repaired in shop
  - Less costly to upgrade, repair or replace (on-shore work is less costly than on-board)
  - Faster turn-around time to repair/replace modules
  - Even faster turn around with Swap-out/ Swap – in scenario of selected modules
  - Increase fleet operation time
  - Decrease time in shipyard

- Ship Operations Benefits
  - Modules provide more flexibility for a standard ship platform
  - Modules allow more focus of purpose for specific operation requirements
  - Modules may minimize need for incorporating unnecessary systems

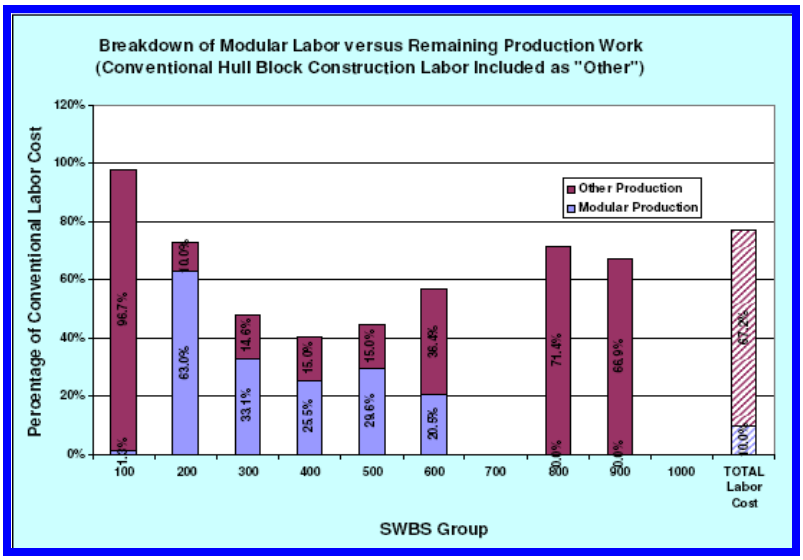

Figure 73 Cost Breakdown in SPARS

Other industries have long exploited the benefits of modular construction. These include aerospace where modularization began with the F4 and continued all the way through the extensive use of modules on the new F35 plane. The automotive field has applied the concept with standardized parts and components, often interchangeable between different models. There are precautions that must be taken in order to minimize failures in applying modular construction techniques however. The process requires intensive engineering, quality assurance and a higher level of design standards to minimize interferences and disconnects. As Modules become more and more standardized, still more cost and schedule benefits can be garnered as efficiency increases from repetitive manufacturing. Use of standard modules can also reduce the non-recurring cost and schedule impacts associated with ship design and engineering.

VIII. International Shipyards Presentation, I - Deltamarin

Deltamarin emphasized the importance of supply chain integration. Rather than standardization, Deltamarin suggested that Marine Highways requires optimized concepts fit for customers' business with high degrees of performance and safety. Representatives from Deltamarin indicated that they found the market is changing, with owners taking a bigger share of overall responsibility before and after contract award. There has been a major shift from typical projects with the bulk of the work performed by one shipyard toward broader subcontracting arrangements. Deltamarin stressed the importance of product modeling before and after contract award. Deltamarin uses product modeling and review to optimize the design, improve decision making, and facilitate development of the build strategy. The importance of product modeling from Deltamarin's perspective provides several key cost reduction opportunities including:

- Optimised use of space, arrangement and materials
- Visualization of spaces especially in complicated or densely packed areas
- Concurrent Engineering, Build Strategy development and Scheduling
- Definition of modules and pre-fabricated packages
- Accurate basis for Procurement
- Material estimation, weight control and centers of gravity
- Better early phase information for production organization
- Functionality, Maintainability

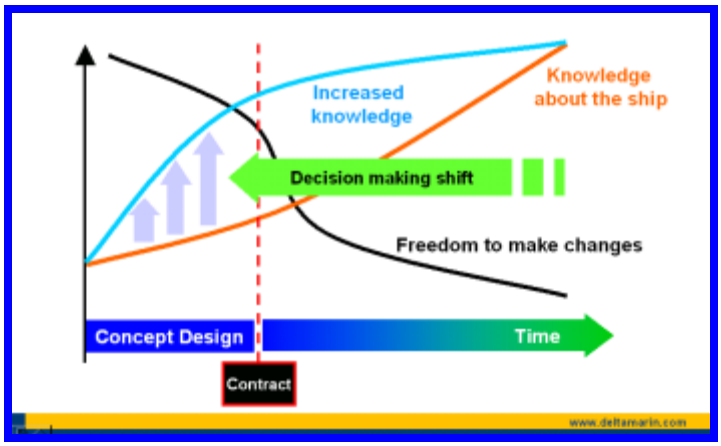

Figure 74 Decision Making at Deltamarin

Advanced information management systems are required to enable partnerships, concurrent engineering and open and online interfaces required for product information exchange with suppliers and partners located around the world. The supplier industry has a key role, and requires greater emphasis on quality control and risk management, vendor performance verification, and change management.

Deltamarin stressed that reduced lead times lead to reduced costs. Project management and coordination has become paramount as project schedules have been compressed and more work is done in parallel rather than in series.

IX. International Shipyards Presentation, II - Fincantieri

Representatives of Fincantieri presented best practices and insights. Fincantieri emphasized the importance of defining requirements with owners for specific routes and markets. Rather than series production of identical vessels, the presenters suggested that their success was instead based on a volume of vessels of similar types and a long history. Experience, corporate culture, and a sizeable database of vessels permit:

- Rapid development of designs tailored to specific owners
- Accurate definition of the engineering and production process
- Rapid demonstration of vessel feasibility
- Rapid and accurate estimation of costs

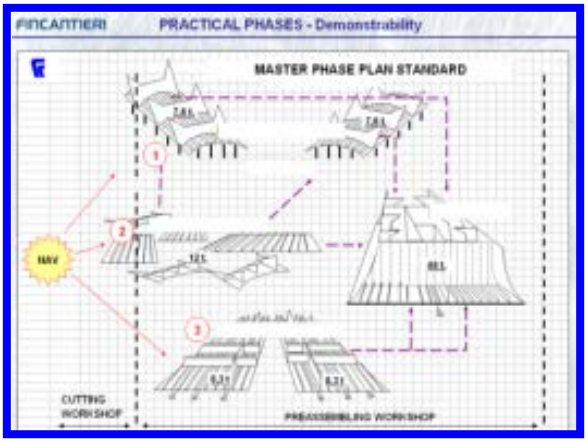

Figure 75 Standardized Assemblies

Fincantieri stressed the importance of the engineering process and the ability to integrate all engineering and planning functions effectively. Although many of their vessels are different, they are all built with standard components and structure assemblies. Supplier involvement, relationships and subcontract management were presented as critical to their success.

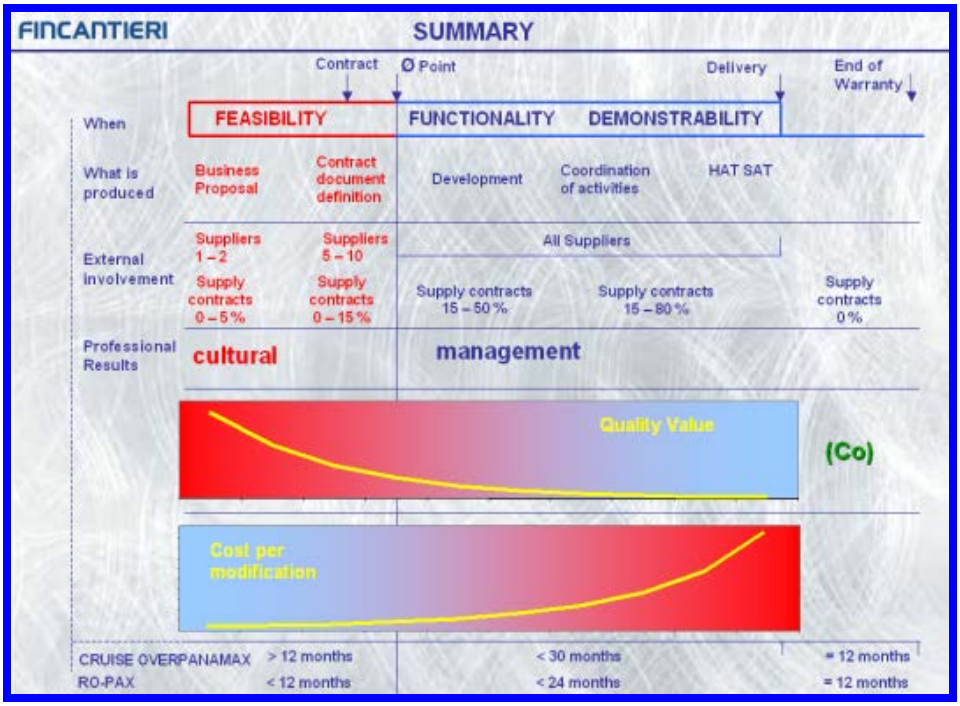

Figure 76 Engineering Processes at Fincantieri

X. Maritime Administration- Marine Highway Review

Sean Connaughton, Maritime Administrator gave the workshop attendees an overview of the legislation that was passed that created the "Marine Highway System." The legislation was passed under the Energy Independence and Security Act of 2007. The Marine Highway system or what was previously called Short Sea Shipping is now on the same tier as surface roads when funding is put forward. The Maritime Administration's change from Short Sea Shipping to "Marine Highways" was made to better describe the method of transportation, but also to increase the visibility of the mode and include it in future legislation that affects surface transportation.

Under this new program, MARAD and DOT will designate and establish corridors "as an extension of the surface transportation system." It has been understood that the movement of goods by water is key particularly during a time of emergency. Key surface features like bridges and tunnels can fail or be disrupted by man or nature. Hurricane Katrina and the bridge collapse in Minnesota have clearly proven the need for effective options other than road or rail. The stated purpose of the Program is to mitigate landside congestion by designating projects that will provide the greatest benefit to the public.

The program's corridor designation requires sponsors to be public entities like Municipal Planning Organizations or MPOs. Mr. Connaughton stressed that MPOs could help both in the funding requirements for port infrastructure and also to mediate talks with unions and port authorities.

As the industry moves forward with the establishment of the Marine Highway System, Mr. Connaughton urged everyone that the vessels would be as "green" as possible. The Shipbuilding industry needs to work with the owner operators to show how environmentally friendly maritime transportation is compared to other modes. All the attendees had viewed of the railroad industry advertisement that touts that a railroad is able to move one ton of freight, 400 miles on a gallon of fuel. Few people knew the Barge traffic on the Mississippi could move that same ton of freight 530 miles with one gallon of fuel.

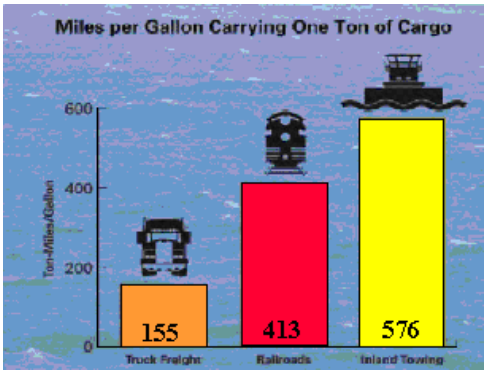

Figure 77 Miles/Gallon per Ton of Cargo

There were discussions on the new Marine Highway system along I-64 corridor that has begun trade. This corridor uses an inland barge for transporting containers between the Port of Richmond and the Port of Hampton Roads. Mr. Connaughton was excited for the future of the Marine Highway System and wanted everyone to continue their hard work so that this concept could be converted into a reality in the shortest possible time.

http://www.marinelog.com/DOCS/NEWSMMVII/2008dec00014.html

Agenda-Day Two: Wednesday, October 22, 2008

America's Marine Highways Workshop

Location: ATI, Trident Research Center, Charleston, SC

0730-0800	Registration and Breakfast	Meeting Room
0800-0815	Overview of the Day's Agenda	Malone
0815-0845	U.S. Navy Interest in Marine Highways	Divens
0845-0925	U.S. Shipbuilder Panel Discussion	Carter/ Walpert
0925-1005	Opportunities for Vessel Financing	Cook
1005-1035	Break & Networking	
1035-1150	International Shipyards Presentation, III	Boesche
1150-1305	Lunch & Speaker S3 and Strategic Sealift	Kaskin
1305-1345	Government Panel Discussion	Divens/ Kaskin/ Bohnert/ Walpert
1345-1500	International Shipyards Presentation, IV	Van Schuppen
1500-1530	Break & Networking	
1530-1615	International Partnerships Overview	Carter
1615-1630	Wrap- Up	Malone
1630-	Free Evening- No Scheduled Events	

Meeting Review - Day Two:

I. Short Sea Shipping -A Valuable Capability for the U. S. Navy

Art Divens, Executive Director of Amphibious and Auxiliary Sealift the US Navy Program Executive Office (PEO) Ships, discussed how U.S. Navy currently views S3 vessels as a valuable capability for the U.S. Navy. The Navy considers the purpose of S3 and Marine Highway vessels are similar to other vessels that provide the ability to transport combat ready units rapidly over intra-theater distances without reliance on shore based infrastructure and in austere environments.

The Navy has leveraged commercial developments to further the Joint High Speed Vessel (JHSV) program. The program is a result of a merger between the separate Army Theater Support Vessel (TSV) and Navy High Speed Connector (HSC) Programs. The merger was accomplished to take advantage of inherent commonalities between the programs, and to leverage the Navy's core competency in ship acquisition. The mission statement of the vessels includes intra-theater littoral maneuvers and sea-basing support.

The value of Short Sea Shipping to the U. S. Navy can be shown through the following:

- DoD High Speed Vessel Operations
- Joint High Speed Vessel (JHSV)
- DoD Technologies with Potential Application to Support Short Sea Shipping
- Improvements in intra-theater sustainment

- Enhances the movement of equipment and cargo within the theater of operations
- Enhances the movement of supplies to support sea-basing operations
- Enhances Humanitarian Aid Operations

- Shallow draft RO/RO enables Austere Port access

viii. DoD High Speed Vessels (HSV)

Mr. Divens provided a list of the S3 type vessels used under the HSV program.

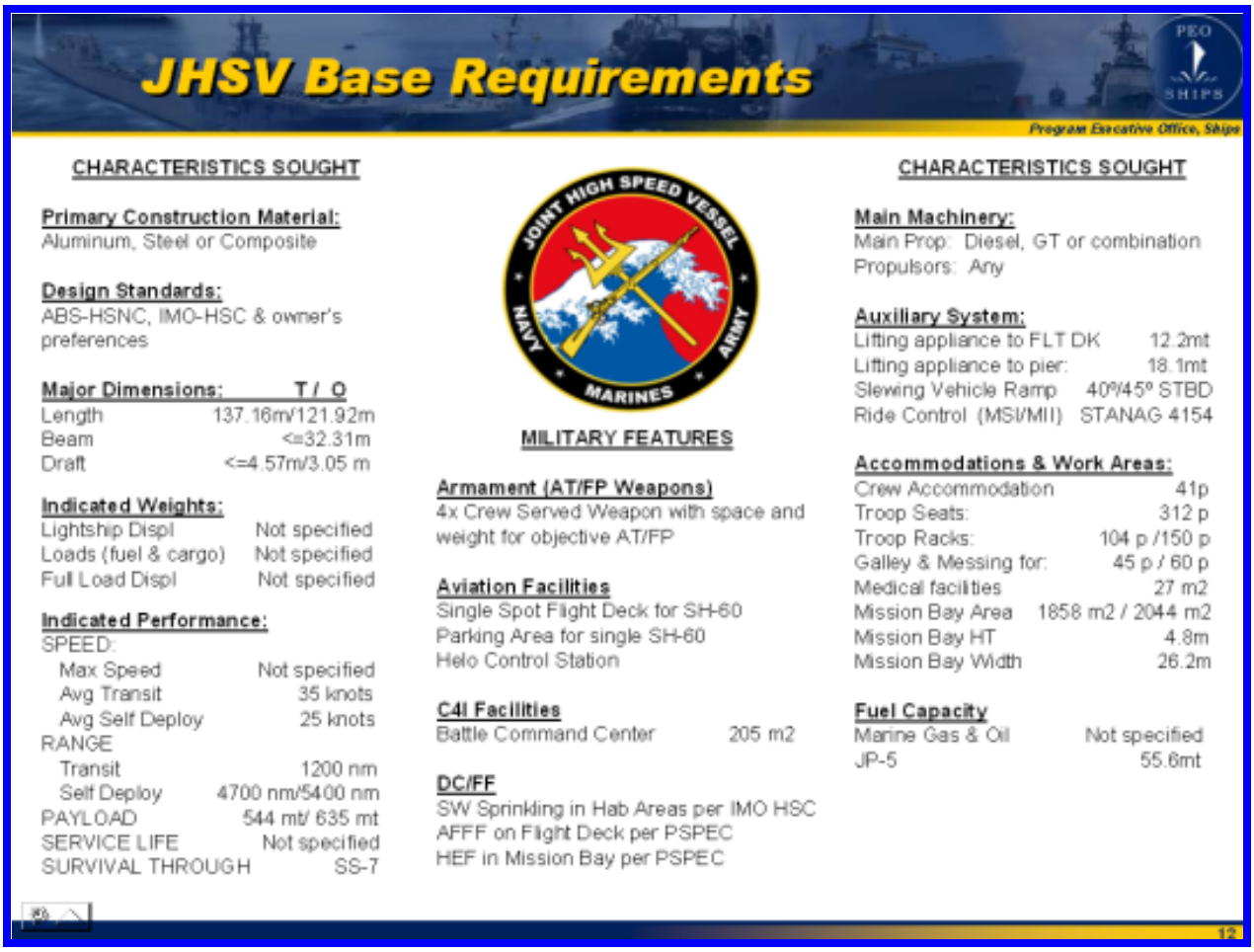

Figure 78 JHSV Base Requirements

ix. Westpac Express

-Originally chartered in 2001
-Leased for III MEF intra-theater lift missions
-Only DoD HSV time charter
-Operated by commercial crew

Figure 79 Westpac Express

x. Joint Venture

- Experimentation platform used by: MCCDC, NWDC
- Originally chartered in 2001
- Deployed to PACOM and SOCOM for proof-of-concept
- Combined Navy, Army crew

Figure 80 Joint Venture

xi. Spearhead

- Originally chartered by Army from 2003-05 as Advanced Concept Technology Demonstration (ACTD) platform
- Army crew

Figure 81 Spearhead

xii. Swift

- Originally chartered in 2003
- Used as Naval experimentation platform
- EUCOM, CENTCOM and PACOM deployments
- Navy crew

Figure 82 Swift

xiii. HSV(s) deployments

An HSV(s) has been deployed in support of every major contingency since the beginning of the first charter. Those deployments include the following:

- Operation Iraqi Freedom (OIF)
- Operation Enduring Freedom (OEF)
- Unified Assistance
- KATRINA Relief Operations
- Lebanon Support
- Special Operations Command Global War on Terror (SOCOM GWOT) missions
- Exercises in all Combatant Command (COCOMs)
- Joint logistics over the shore (JLOTS)
- At Sea ship-to ship transfer
- Roll-On/Roll-Off Discharge Facilities (RRDF) Operations

- Austere port operations
  - East Timor (degraded port operations)
  - Kenya- Joint Task Force Horn of Africa (JTF HOA)

Figure 83 Kenya and East Timor Operations

xiv. Advanced Transfer Systems

There were a few discussions on the new developments of at sea transfer systems under DoD. Each of the different concepts has applications within S3 and Seabasing.

- Enable vehicle transfer at-sea in up to sea state three conditions
- Sea State 3 Pendulation Control System (PCS) Crane
  - Developed under ONR ATD
  - A variety of ship speeds, headings, and wave conditions through sea state three have been tested
  - Alternative payload motion sensing systems evaluated
- Sea State 4 LVI LO/LO Crane
  - Developed by ONR Seabasing Future Naval Capabilities Program
  - Large scale at-sea test planned for FY10

Figure 84 Seabasing Possibilities

Art Divens believes there are excellent opportunities in Short Sea Shipping vessels as demonstrated through the JHSV program. Furthermore he encouraged the workshop attendees to explore the use of National Defense Feature (NDF) to incorporate commercial concepts like the self-deployable ramp on the new Hawaiian Super ferry that also have a very clear military use. He made it clear that the benefit of having access to a S3 type vessel is largely minimized if the vessel can't deploy in unimproved environments. The Navy often will not have the time or funding to create port infrastructure where the operation is occurring and must use and adapt to what is available. This thought process is in line with smaller more versatile S3 operations.

II. U.S. Shipbuilder Panel Discussion

Brian Carter of NASSCO and Harvey Walpert of Bender both provided brief presentations on shipbuilder perspectives on Marine Highways that initiated participant discussion around the following questions:

1. Do you believe Marine Highways represents a market for US Shipbuilders? What conditions must exist for US Shipbuilders to realize this market?

2. What actions are US Shipbuilders taking to manage costs, especially for Marine Highways types of vessels?

Brian Carter presented a brief overview of the shipbuilding outlook for NASSCO and U.S. Shipbuilders, and the potential that Marine Highways might have for shipbuilders. The U.S. shipbuilding industry faces substantial challenges:

- The U.S. accounts for less than 1% of the world's shipbuilding output. In the global marketplace, U.S. shipbuilders do not represent a significant market for suppliers and U.S. shipbuilders are not competitive for commercial shipbuilding internationally.
- The recent backlog of shipbuilding orders has been the result of OPA 90 replacements, and this backlog drops off after 2011. Even with potential containerships, shuttle tankers, Ro-Ro replacements, and Alaska Crude (in 2020), there is a substantial U.S. shipbuilding gap from 2014 to 2020.
- Six to eight Navy ships are being built a year in the U.S., which may result in a 240 ship fleet (below the stated goal of 313 vessels). This is a substantial decline from the approximately 600 ship Navy in the 1980's.
- The USN shipbuilding plan has been changing year to year making long term planning for facility investments challenging for U.S. shipyards

A two-part plan was offered to address these challenges. First, the Title XI loan guarantee program must be reinvigorated. This program provides competitive financing for ship owners, reducing debt service and financing. Commercial ship construction and expansion of the Jones Act fleet has relied on Title XI, especially in the dry cargo market where the underlying economics may not be viable without such loan guarantees. Only two container or Ro-Ro vessels have been built in the U.S. for private sector purchasers without Title XI loan guarantees. Second, the Marine Highways system must be developed and incentivized. Marine Highways vessels represent a growth opportunity that could help to fill in orders as OPA 90 replacements are completed to sustain U.S. shipbuilding. Marine Highways could help to stabilize the industry. It was recommended that a Title XI program be developed in parallel with the existing program specifically for Marine Highways.

Harvey Walpert of Bender Shipbuilding presented a mid-tier shipyard perspective. Mid-tier shipyards view Marine Highways as a potential growth opportunity and viable market. Bender Shipbuilding's perspective on workshop goals and objectives was to facilitate:

- Partnering with owners, operators, and foreign shipbuilders and designers to adapt proven designs for marine highways applications
- Encouraging domestic yards to cooperate in virtual shipbuilding arrangements
- Encouraging U.S. designers to adapt foreign technology and building techniques
- Developing realistic pricing parameters for short sea shipping
- Providing a basis for U.S. policy maker support
- Supporting U.S. Navy efforts to lower costs by building Navy vessels using Virtual Shipbuilding concepts

There was consensus among survey respondents that Marine Highways represents a substantial potential market for U.S. shipbuilders. However certain conditions must exist in order to realize this market:

- Shipper acceptance
- Port infrastructure availability and cost reduction
- Development of a low cost design applicable to multiple markets
- Active participation by federal and state agencies, as well as Congress, to promote marine highways
- Reduction of vessel costs through teaming and partnering, and completion of designs prior to start of construction
- Improved access to financing and loan guarantees
- Incentives for shippers
- Increased public awareness and desire for congestion relief and "green" alternatives
- Increased congestion to justify modal shift
- Increased truck rates to justify modal shift
- Aggressive shipyards that make the decision to pursue the market and develop designs attractive to operators

There was consensus that the approach of developing low-cost designs in cooperation with potential owner/operators that would then be applied to multiple markets would further the Marine Highways Program. There was broad agreement that several success stories will be required to demonstrate the reliability of the concept to potential shippers.

III. Opportunities for Vessel Financing

H. Clayton Cook of Seward and Kissel LLP provided an update on both the Title XI loan guarantee program and the Capital Construction Fund (CCF). There was consensus that the Title XI loan guarantee program must be reinvigorated. The Title XI program provides competitive financing for ship owners, thereby reducing debt service and financing cost. Commercial ship construction and expansion of the Jones Act fleet has relied on Title XI, especially in the dry cargo market where the underlying economics may not be viable without such loan guarantees.

It was noted that only two container or Ro-Ro vessels have been built in the U.S. for private sector purchasers without Title XI loan guarantees.

Container and Ro-Ro vessels engaged in Marine Highways operations now qualify for Capital Construction Fund benefits to assist owners and operators in accumulating capital for modernization and expansion. Using the CCF, an owner can reduce the fully financed vessel cost by substantial percentages.

When the CCF and Title XI program are used in combination, the 20 or more year Title XI term loans provide an extended period for the operation of the CCF tax deferral investment income shelter and the vessel financing cost reductions become more significant.

Using the CCF, an owner can reduce its fully financed vessel cost by substantial percentages, as illustrated in the following example. Assume a U.S. citizen purchaser-owner's acquisition of a small Ro/Ro carries a sticker price of $80 million. Our purchaser-owner can make full, current use of the new vessel's scheduled depreciation (using an assumed effective tax rate of 25% rather the statutory 35%), and finance the debt portion of the shipyard sticker price with MARAD 20-year term, level principal, 5.1% coupon debt (for 87.5% of the MARAD "actual cost"). This purchaser-owner's full cash cost over the financing life is estimated at $125 million. If the purchaser-owner adds the CCF sinking fund feature, this will generate an independent income stream with the measure depending upon the CCF portfolio yield. Mr. Cook's CCF model suggests:

(a) If that yield is 7.0%, the addition of this feature will reduce the purchaser-owner's out of pocket expenditures cost to about $72.6 million (or $7.4 million less than the shipyard sticker price); and

(b) If that yield is 14.0%, the addition of this feature will reduce the purchaser-owner's out of pocket expenditures cost to about $57.7 million (or $22.3 million less than the shipyard sticker price).

While there will be an additional purchaser-owner investment commitment during the initial transaction years (because of the contributions to the CCF sinking fund), at the conclusion of the financing transaction, the purchaser-owner will have acquired the vessel with an out of pocket expenditure that will have been substantially less than the shipyard sticker price.

	12-year Commercial Financing	20-year Commercial Financing	20-year Title XI Financing
% Advantage of Title XI & CCF (7% CCF ROI)	17.4%	17.2%	15.7%
% Advantage of Title XI & CCF (14% CCF ROI)	29.8%	29.6%	28.3%

Figure 85 Title XI & CCF Combined Financing

IV. International Shipyards Presentation, III – Flensburger

Flensburger (FSG) produces 25,000 tons of steel a year, which equates to three and a half (40,000 deadweight) vessels. Between 70 and 80 percent of the vessels are produced by subcontractors. FSG focuses primarily on steel fabrication and system integration. In efforts to maintain their goals, FSG employs a large engineering/design department that has minimal outsourcing. The department consists of 88 employees where 71 personnel are Naval Architects and Mechanical Engineers with 110 CAD workstations. To ensure the high level efforts, FSG also retains a permanent research and development team that consists of 25 personnel.

The R&D work that FSG has accomplished has made them one of the leaders in the shipbuilding industry. Most of the R&D work is based in simulation, which incorporates panel lines activities through transport movements, of which include port logistics.

Outsourcing as stated above accounts for the majority of the vessels. The work that is outsourced includes the superstructure, all the electrical, all the piping, the passenger accommodations and painting.

The best practices presented at the workshop include:

- Develop and maintain a well educated and competent R&D, design, engineering and production analysis group that does all pre-detail design in-house
- Develop extensive planning and production tools (leverage simulation)
- Early simulation of ship performance and ship construction
- Extensive production planning as early as possible by defining structure in 3D and employing automatic man-hour estimation
- Follow through initial production simulation into detail design stage with 3 to 4 simulations
- Extensive communication between engineering and production
- Use of simulation and visualization to facilitate communication and understanding of methods of production
- Obtain clear class approval process and requirement understanding in contract and functional design to avoid delay during detail design
- Concentrate on core competencies of steel work and integration within the shipyard
- In case of late delivery of components, simulation can be used to re-plan and minimize the impact upon schedule

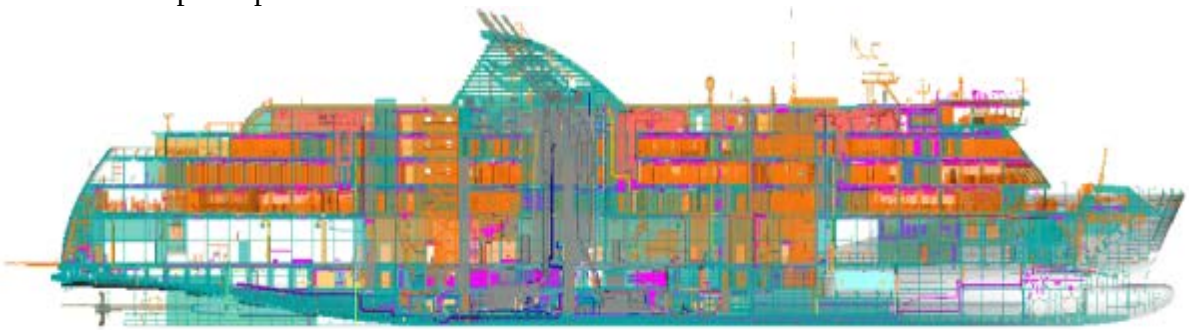

Figure 86 FSG Product Model

V. America's Marine Highways and Strategic Sealift Mobility Capabilities Study (MCS)

Jon Kaskin, Director of Strategic Mobility and Combat Logistics Office of CNO (N42), discussed the U.S. Navy's interest in Marine Highways and Short Sea Shipping. Mr. Kaskin pointed out the Strategic Sealift policy, requirements, and sources show a positive indication for the need of a robust Marine Highway system. He also gave a review of his thoughts for the future needs of Sealift and how National Defense Features (NDF) can be a part of that goal.

Mr. Kaskin stressed the importance of the following National Security Sealift Policy. "…First, the U.S.-owned commercial ocean carrier industry, to the extent it is capable, will be relied upon to provide sealift in peace, crisis, and war. This capability will be augmented during crisis and war by reserve fleets comprised of ships with national defense features that are not available in sufficient numbers or types in the active U.S.-owned commercial industry…" -*NSDD Oct 1989*

The MCS study provides the Secretary of Defense an idea for what could be needed with a proposed level of threats and number of theaters. The projected capabilities are adequate to achieve U.S. objectives. The programmed organic Sealift, which is combined with current commercial agreements, provides sufficient capacity. Further analysis will investigate the following topics: operational impacts of the containerization required to assess impact of using containerships to transport unit equipment, and to determine if the projected tanker fleet can satisfy inter-theater demand without continued reliance on foreign-owned assets. Their study will examine alternatives in mobility capabilities, sources (military/commercial), forward basing, pre-positioning, air refueling, deployment/ employment capability, advanced logistics concepts, and destination theater austerity.

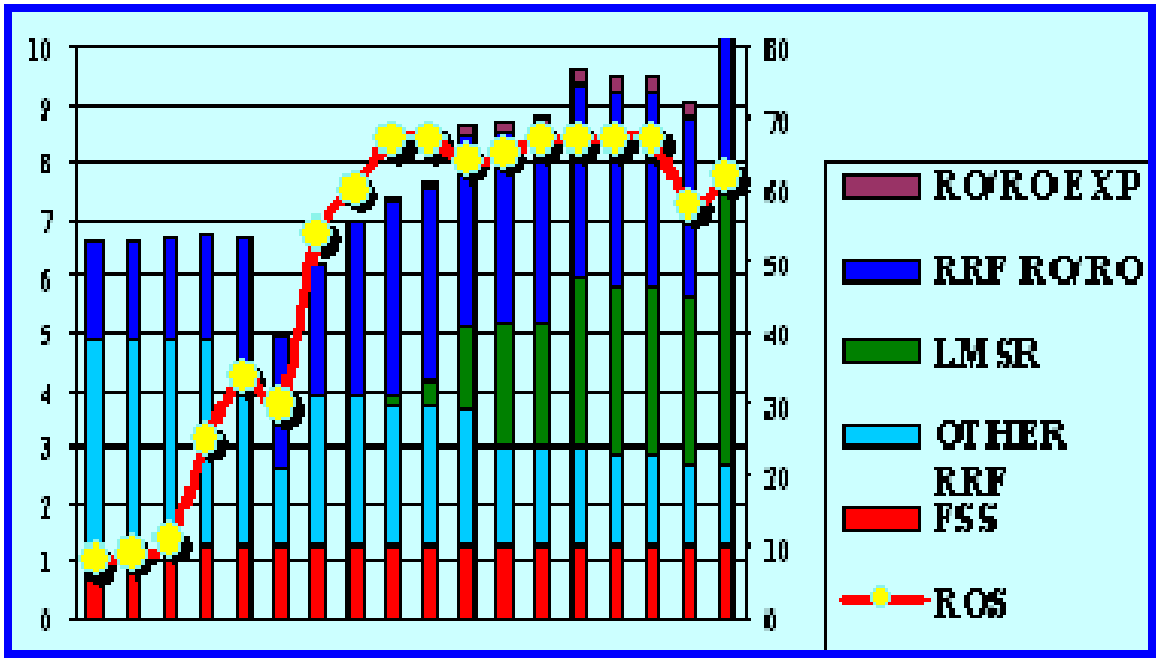

Figure 87 SURGE Program for Pre-Postioning

xv. Overarching Objectives of the Study

Determine the Joint Deployment Distribution Enterprise (JDDE) needed to support the National Defense Strategy (NDS) in 2016 timeframe. Identify the capabilities and requirements to deploy, employ, sustain and retrograde joint forces in support of the NDS. Determine capability gaps/overlaps associated with the programmed mobility force structure. Provide a risk assessment. Provide study insights and recommendations to support the upcoming QDR and future defense programs.

xvi. Mobility Challenge

Mr. Kaskin explained to the group the many issues that he faces in retaining mobility and responsiveness of the Strategic Sealift during the current activities all over the world. Sealift currently balances its need through two capabilities: Commercial and Organic.

a. Commercial Capability

When a vessel charter as required, the U.S. cost is limited only to actual use of the ship. However, the commercial capability may not match the need of the military. There is typically a delay in access to commercial assets as well.

b. Organic Capability

Using vessels through the organic capability of the Navy allows for immediate access to the capability. The Navy specified vessels include unique capabilities not available in commercial sector craft. However, having an organic capability requires large capital investments and ongoing requirements to fund operations and maintenance of vessels.

c. Strategic Sealift Programs

Planning for surge and afloat pre-positioning of vessels that are sized to meet the strategic sealift requirements for 1 Multi Theater War (MTW). The Surge Program can lift the army objective force of four divisions within 30 days.

d. Ready Reserve Force

The Ready Reserve Force (RRF) Ro/ Ro capacity ranges in age from 40 to 50 years old and Sealift is looking into recapitalization. The reinvestment includes extending the RRF service life and examining opportunities to partner with commercial shipping.

e. Voluntary Intermodal Sealift Agreement (VISA)

Sealift has been using VISA to further the partnerships between DoD, DOT and U.S. flag Sealift industry. The program was originally targeted to DoD sustainment shipping, which includes up to 2 million square feet of surge sealift capability and working with industry to increase the availability of cargo. VISA is a contractual arrangement for obtaining time-phased access to militarily useful U.S. flag commercial dry cargo sealift capacity, infrastructure and intermodal capability to support DoD contingency requirements. The contingency demand is driven by stage such as: stage I - 15%, stage II - 40%, and stage III - 50%. To receive preference for DoD peacetime cargo business, a carrier must enroll 50% of its U.S. capacity in VISA. The Maritime Security Program (MSP) participants must enroll 100% of ships' capacity. Sealift currently is funding 59 ships, which receive $2.9 million dollars per year.

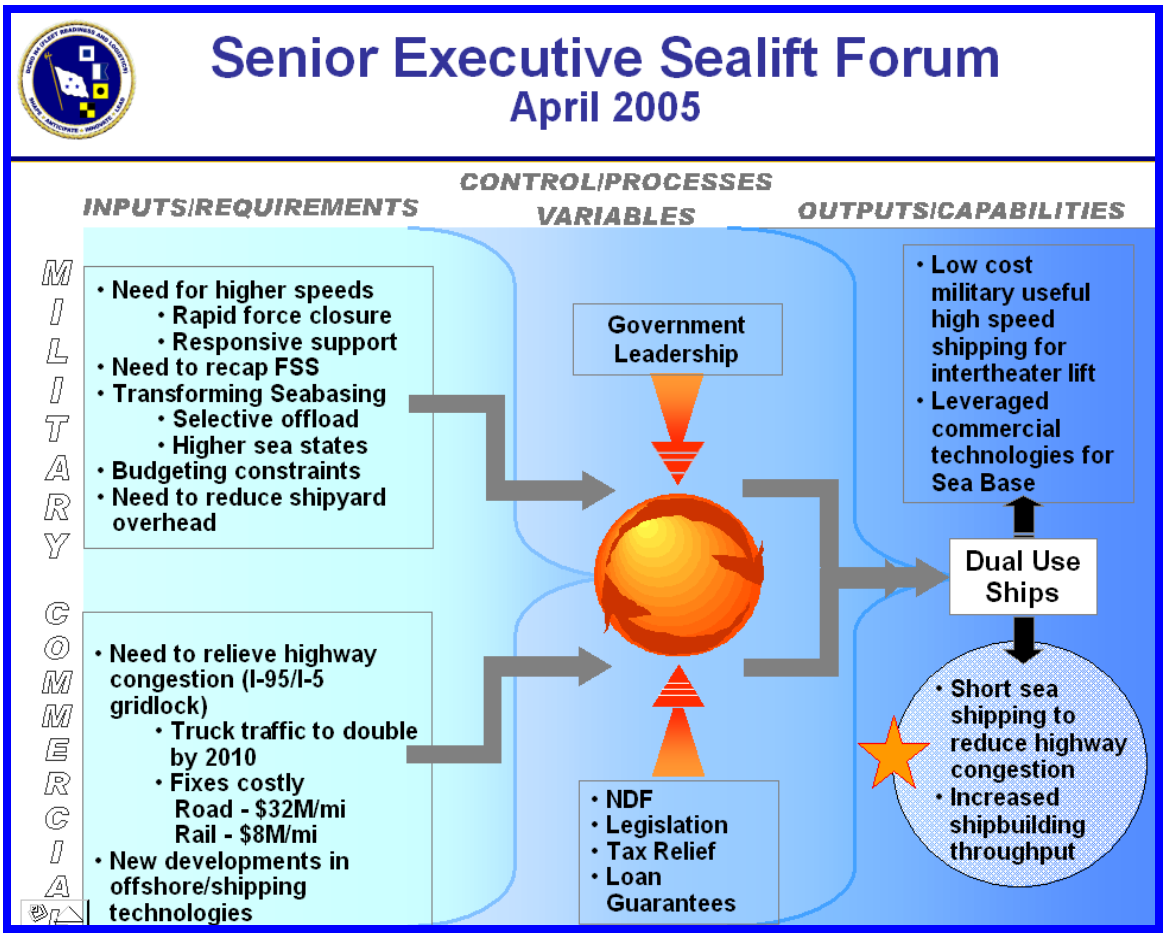

Figure 88 Executive Sealift Forum Conclusions

xvii. National Defense Features (NDF)

This option is based on privately owned and operated merchant ships that are crewed by U. S. merchant seamen. The vessels are built in U.S. shipyards and built with navy funded NDFs for military cargo. The vessels would be recallable for military contingencies. There will be $5 million dollars per year available beginning in FY10 for NDF. Some examples of NDF are:

- Deck strengthening and hoistable decks for pure car & truck carriers
- Self-sustaining features such as cranes or provisions for their rapid installation on container ships
- Increased speed
- Convertible container / RO/RO cargo holds

a. NDF Military Benefits

NDF could be used to deploy follow-on unit equipment and sustainment. A vessel enrolled in the NDF could provide a partial offset to surge and sustainment shipping requirements. Enrollment also depends on the ship speed and availability. The use of NDF could provide an alternate to RRF recapitalization (RRF-10). The NDF would create a pool of ships that could be responsive to a crisis. The enrollment also increases pool of U.S. merchant mariners to crew

sealift ships. However, the current NDF program is unattractive due to limiting the funding to: Features, Installation, Maintenance, and Advance Payments for future NDF operating and support costs.

The Navy is looking into restructuring the NDF program to attract participants and expand the program to allow shipping companies to receive compensation for higher capital construction costs (e.g. MSP tanker construction subsidy). The Navy would also like to combine the NDF with other legislative changes/incentives (e.g. HMT elimination, Title XI, CCF, Marine Highway Corridor/Projects)

xviii. Conclusions

The CNO will chair a government and industry executive steering group to explore commercial options in the Marine Highway system. The steering group charter would be to evaluate Navy/ DoD requirements against commercial capabilities and determine government support (NDF, R&D, financing, legislative changes, etc) to incentivize the industry to provide dual-use vessels. The charter should coordinate and untangle R&D initiatives to focus the available resources on the highest priorities while experimenting and testing commercial technologies to support military requirements.

The Navy should lead the efforts because the Navy has most to gain and the paybacks far outweigh investments. Commercial construction and operation of higher speed ships will result in significant cost savings to the Navy. The economics of commercial shipping will not produce Seabasing optimized ships without government involvement. Potential sealift enhancing technical solutions combined with private capital investment exists within the commercial sector. The timeframe between now and 2017 permits joint commercial-military demonstration and development. The joint demonstrations allow for incremental improvements, transitional implementation, and near term capability to meet today's war needs. Further government and industry discussions will result in enhanced industry support of the Sea Basing efforts.

VI. Senior Government Panel Discussion

During this session Art Divens, Jon Kaskin and Roger Bohnert, joined in an open discussion in which they provided the group incredible insight into the views that their respective organizations have regarding Marine Highways. The most significant development was the passage of the Energy Independence and Security Act of 2007. The Congressionally mandated program establishes a framework to conduct research, but it does not currently provide funding. This legislation encourages the use of marine highways through the development and expansion of documented vessels, shipper utilization, port and landside infrastructure, and marine transportation strategies by State and local governments.

Under this program, MARAD and DOT will designate and establish corridors "as an extension of the surface transportation system." Corridor Sponsors must be Public entities. The stated purpose of the Program is to mitigate landside congestion by designating projects that will provide the greatest benefit to the public. The project sponsor (Public Entity) applies for designation as a Marine Highway Project.

MARAD has established the Office of Marine Highways and Passenger Vessel Services to focus on the development and expansion of the marine transportation system. This office creates ten Gateway offices at key U.S. ports including New York, Norfolk, Miami, Chicago, St. Louis, New Orleans, Houston, Seattle, San Francisco, and Long Beach.

Mr. Kaskin continued to discuss National Defense Features like the Self-deployable ramp on the Hawaiian super ferry. The Navy could be interested in providing funds for engines with more power to increase speed depending on the circumstances.

VII. Facilitated Discussion

The previous day the suggestion was made to put a panel discussion together that included Jon Kaskin Roger Bohnert, Art Divens and Harvey Walpert. John Malone provided a few questions to start the session off.

The round of talks revolved around the ports. It began with a question of dual use ports. The concept is good considering that many larger ports already have most of the infrastructure. However, many larger ports are over capacity currently and could not take on new services. MARAD has been working with Alaska, Hawaii and Guam with improving their port infrastructure and ports in general to prepare for planned activity in the future. The Navy has formed a small group called High Speed Sealift. This group has focused on agile port concepts with TRANSCOM and the Army. The results gathered by the group have been used for guidance for CCDOT projects. Currently the main focus has been on the ports in the Pacific Northwest.

The Military Surface Deployment and Distribution Command (SDDC) report is evaluating ports and related issues that need to be addressed for National Security concerns. They are distinguishing Ports into two categories, Strategic and non-Strategic. Once the report is done it will give guidance to MARAD into possible opportunities. The SDDC is also looking into Base closings as an opportunity for increasing port access like in the 6,400 acres of former Naval Weapons Station Seal Beach real estate property next to the Military Ocean Terminal Concord (MOTOC) in Concord, Calif. As many studies show, the ports being used for freight are typically at capacity and could not accept the increase with S3 operations. With the critical ports near capacity, the next option is to look at the smaller non-strategic ports.

The move to look at the smaller non-strategic ports will help improve an element of national security and require the versatile. The general discussion shifted to S3 vessels having to be flexible. They need to be able to take advantage of the non-strategic ports with their lower levels of traffic. Once the service is sustained than improvements could be made to the port infrastructure. Requiring the vessels to be flexible, demands that they become more generic to better fit the many different options.

Art Divens provided the concept of using a JHSV program as a starting point for the Marine Highway System. The JHSV could carry more cargo by just reducing the range required. It would be a true dual use vessel. Jon Kaskin added that with National Defense Features being able a portion for the installation of features, it also could include up to15 years funding for maintenance for the feature.

The closing statement from Mr. Kaskin was that the RRF fleet needs replacement due to age and the VISA program looks to very tight with Jones Act Tankers. As well as the answers will not come from a single entity and that many groups together will help provide the answers.

VIII. International Shipyards Presentation, IV - Damen

Damen tracks its emergence in the shipbuilding industry to 1927 and represents the traditions of Dutch steel boat building. Since that time, the company has grown into several yards all over the world with gross revenue of 1.5 billion Euros annually. They have a vast range of products from sailing craft to Navy and Mega yachts.

The key to Damen's success is built on standardization. Standardized designs have resulted in delivery time reduction, risk reduction, cost savings, and ease of financing. The process allows for reduced costs in research & development, engineering, purchasing (Damen is the largest customer of Caterpillar Marine) and specialization of shipyards. Damen claims that they reduce the costs by 20 percent through this process as seen in the Figure below.

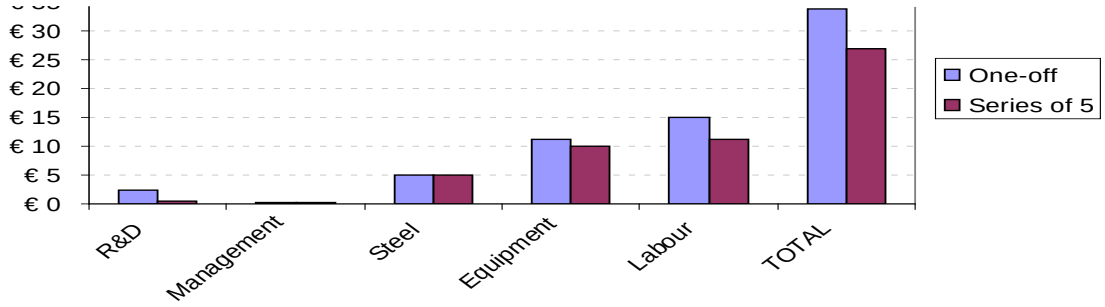

Figure 89 Damen Reduced Costs

The Damen product has seen higher resale values and Damen has a unique buy back policy to reduce the risks for banks. In Damen's markets, customers demand short turn-around and Damen's strategy was to develop standard vessels on speculation. This eventually led to families of Damen production lines with customization options based on stock hulls.

Damen provides assistance to shipyards worldwide through a range of partnerships. Damen provides proven designs, partial or complete kits, logistics support, construction assistance, technical support and warranty, where required. In this regard, Damen has considerable experience with international partnerships and suggested that such a model would be practical for advancing Marine Highways in the U.S.

Figure 90 Damen Example of a Standard 800 TEU Container Ship

IX. International Partnerships Overview

The workshop sought to address the following questions through a presentation by Brian Carter on NASSCO's experience with international partnerships:

1. What opportunities exist to partner with international shipyards to reduce the cost of marine highways vessels in the US? What conditions must exist to take advantage of these opportunities?
2. In what ways would international partnerships contribute to reduced costs for marine highways vessels?
3. What are the risks and challenges in implementing international partnerships? What approaches may be taken to mitigate these risks?
4. What steps can be taken to facilitate international partnerships in the US?

Brian Carter presented an overview of recent experience with international partnerships. Three U.S. Shipbuilders have ongoing relationships with international shipyards:

- NASSCO's international partner is DSME/DSEC (Daewoo, Korea) for the production of nine handymax product tankers. Their international partner provided the design and procurement packages.
- Aker Philadelphia is partnered with Hyundai Mipo (Korea) in the production of twelve handymax product carriers. Their international partner provided the design and procurement packages.
- VT Halter Marine is partnered with Uljanik Shipyard (Croatia) in the production of one 4300 unit Pure Car Truck Carrier (PCTC). Their international partner provided the design with limited procurement assistance.

NASSCO's selection of DSME was based on an extensive review of potential partners for strategic fit, procurement cooperation, technical compatibility, and designs. NASSCO wanted a partner with solid experience in international collaborations. A significant advantage of international partnerships is being able to leverage the foreign shipyard's supplier relationships to minimize equipment and material costs and NASSCO desired a partner that could provide that assistance. NASSCO sought a partner that used the same product modeling software (TRIBON) in order to facilitate communication and data management. Finally, NASSCO wanted a partner that could assist them on future projects by leveraging the processes and relationships established on the product tanker project.

The key advantages of international partnerships identified included:

- Proven ship designs from an international partner reduce technical risk.
- Schedule is shortened by reduction of non-recurring engineering effort and elimination of delays and disruptions normally attributed to lead ships. In particular, by having the design complete prior to start of construction, substantial savings are achieved compared to traditional lead ship efforts. On the product tanker program, construction man-hours are projected to be 75% of the bid, with design changes at a level on the lead ship that typically would not be seen until the third ship in a series.

- Procurement savings of over 25% in equipment and material savings. These savings are achieved by obtaining material packages from the international partner that take advantage of that partner's significant purchasing leverage. Recall that U.S. shipbuilders represent less than 1% of the world market. International partners have strong relationships with suppliers, the majority of which are overseas.
- International partners have achieved efficiencies resulting from their substantial volume of work. This volume has led to process improvements, which can be leveraged through technology transfer. International partners may be brought on to consult for facility upgrades and improved facility utilization. NASSCO has implemented several DSEC/DSME recommendations including improvements to the block painting process, dedicated process lanes for pre-outfitting and pre-erection, improved material handling including block transporters and outfit cranes, and improved warehousing.

Figure 91 Recent Trends in International Partnerships

There was consensus among participants that opportunities exist to partner with international shipyards and that the model could be used to reduce the costs of Marine Highways vessels. Proven designs applied to U.S. marine highways combined with partnering with international shipyards for reduced material costs could lead to savings. Potential risks and considerations included:

- Different perceptions of the program resulting from language and cultural differences
- Differences in shipyard construction practices and hardware making it difficult to apply an international design in a different shipyard
- Differences in software and processes making communication of the design and development of production information difficult
- Finding designs that are appropriate to a given market that can be leveraged and are compatible with owner requirements
- International designs may not be directly transferable to U.S. markets but opportunities would exist to partner with international yards for know-how and supplier relationships
- Selecting partners most compatible with the U.S. shipyard and the market being pursued
- The U.S. shipyard must have open -minded management

Agenda-Day Three: Thursday, October 23, 2008

America's Marine Highways Workshop

Location: ATI, Trident Research Center, Charleston, SC

0730-0800	Registration and Breakfast	Meeting Room
0800-0915	U.S. Maritime Administration	Bohnert
0915-1015	Economics of Short Sea Shipping on the U.S. West Coast	Tedesco
1015-1030	Break & Networking	
1030-1200	Facilitated Discussion	Malone
1200-1245	Lunch	
1245-1430	Facilitated Discussion	Malone
1630-1500	Wrap-Up & Adjournment	Malone

Meeting Review - Day Three:

I. U.S. Maritime Administration

Roger Bohnert, Deputy Associate Administrator- Intermodal System Development, for the Maritime Administration brings a diverse maritime, operations, and policy background to the U.S. Department of Transportation's Maritime Administration. A career U.S. Coast Guard Officer and licensed Merchant Mariner, he entered the Senior Executive Service in the Department of Transportation in 2003.

i. Recent Developments

Mr. Bohnert provided a review of the major developments that have transpired in the recent past in regards to Short Sea Shipping and the New Marine Highway system. In January 2008, the Texas Transportation Institute (TTI) published the Urban Mobility Report (UMR), the study compares transportation modes, emissions, energy, safety and strategies to address the mobility problems at hand. Later in March 2008, the Environmental Protection Agency (EPA) significantly tightened air quality standards. The air standards for many urban areas are no longer within attainment. The EPA requirements for attainment mandate investment in improving air quality. The Highway Trust Fund is declining rapidly and may be depleted by 2009. The above developments along with the effects of the dramatic fluctuations in the price of oil have forced everyone to look for more effect ways to move cargo.

ii. Maritime Administration Realignment

MARAD has established the Office of Marine Highways and Passenger Vessel Services to focus on the development and expansion of the marine transportation system. Offices were created at ten key U.S. ports:

- New York
- Norfolk
- Miami
- Chicago
- St Louis
- New Orleans
- Houston
- Seattle
- San Francisco
- Long Beach

Figure 92 Marine Gateway Offices

iii. Energy Independence and Security Act of 2007

Congress established a Short Sea Transportation (America's Marine Highway) Program to be managed by the Maritime Administration through delegation from the Secretary of Transportation. MARAD plans to encourage the use of short sea transportation through the development and expansion of documented vessels, shipper utilization, port infrastructure and incorporating "Marine" transportation strategies from State and local governments.

iv. America's Marine Highway Program

Support the integration of our Nation's coastal and inland waterways into the Surface Transportation System and expand its use to reduce congestion and benefit the public.

- Marine Highway Corridors
- Marine Highway Projects
- Incentives, Impediments and Solutions
- Research

v. Marine Highway Corridors

Designate and establish corridors "as an extension of the surface transportation system." Purpose: Focus public and private efforts and encourage multi-jurisdictional partnerships to relieve landside congestion along Marine Highway corridors. Modeled after landside "Corridors of the Future" offering the maximum potential public benefit in congestion and emissions reduction, energy efficiency, and infrastructure maintenance cost savings. Corridor Sponsor is a Public Entity.

vi. Marine Highway Projects

The designated Marine Highways projects will provide the greatest benefit to the public through congestion relief, improved air quality, reduced energy consumption, infrastructure construction, maintenance savings, improved safety, and long-term economic viability. Project sponsors need to be a public entity to apply for a designation as a Marine Highway Project. A typical applicant would be a MPO.

The pre-application process for projects will include workshops and applicant's toolkit. During the evaluation of project applications, criteria as the overall benefit of the project, and a Return on Investment (ROI)/ Feasibility will determine the chances of the proposal becoming a project. A project's overall benefits should include the scope of how much cargo or passengers would be impacted. The impacts need to be in the critical areas discussed above. The main driver will be based on the public's benefit from the project, which could range from reductions in congestion, energy, and emissions to an increase in safety. Applications should also contain an ROI detailing the cost effectiveness, feasibility and possible offsetting funds. Designated projects may get support from the Department of Transportation through listing a project as a high priority for the transportation infrastructure, and through coordination with ports, state DOTs, MPOs, government.

vii. Impediments, Incentives and Solutions

The Maritime Administration is looking into creating a stakeholder board that will recommend solutions to the many elements blocking the expansion of the marine highway. A potential public or private sector partnership should be created to identify potential short-term incentives. Coordinated efforts should be made with state and regional planners to integrate the Marine Highway in their respective surface transportation planning process.

viii. Research and Capital Construction

Research is a key driver, which includes environmental, transportation benefits, technology, vessel design, and solutions to Marine Highway impediments. Work will go into defining designated Corridors and sub level projects to work within the corridor. Currently the support to Marine Highway research has been accomplished through the venues as seen below:

- $30-60K Air emissions benefits to MPOs (Through MHC)
- $100 K Phase I Maritime Administration Green Program
- $200 K Establish criteria for successful ferry ops (FTA)
- $100 K Research review to identify benefits/barriers (TRB)
- $140 K Geospatial Intermodal Freight Transport model to identify optimal modes for freight movement.

The Capital Construction Fund (CCF) is a vehicle that could be used for vessels that are engaged in Marine Highway operations to qualify for benefits that assist owners and operators in accumulating capital for modernization & expansion of their fleet.

ix. Initial Program Progress

Port of Virginia to Port of Richmond Service

- The Richmond MPO has approved $2.25M in seed money to open an operation that began in December 2008.

Department of Defense to utilize the Marine Highways

- US TRANSCOM and its subordinate commands are developing policies and procedures to use water in shipment of military cargoes where it is feasible. Saved $1-million June 08.

Maritime Administration is working with stakeholders on other proposed projects to include:

- New York to Bridgeport\Stockton to Sacramento
- East Coast service – NY/NJ to Southern New England
- Expansion of existing East and West Coast Services

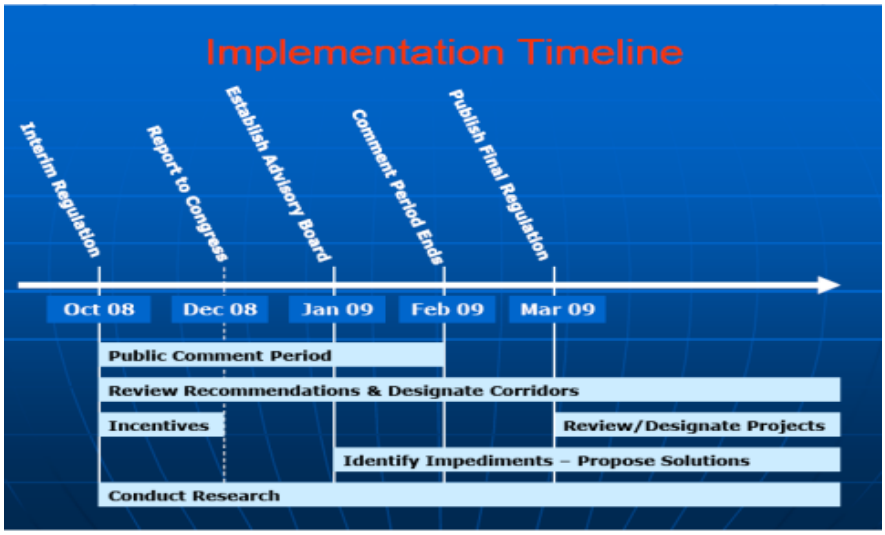

Figure 93 Maritime Administration Implementation Timeline

II. Wrap-Up

Mr. Bohnert stated that mainstream use of America's Marine Highways is closer now than ever before. Until now, Marine Highway research and design has been an ad-hoc effort across several entities. The Congressionally mandated program has established a framework to conduct research and vessel design specifically for Marine Highways. The new EPA air quality standards and an increased sensitivity to energy use, may increase the demand for new, purpose built, efficient and environmentally responsible U.S. flag vessels and can offer opportunities to reduce the cost of designing producing them at home. Dual use Marine Highway vessels may help make the future possible. This requires Navy, TRANSCOM and MARAD coordination.

III. Economics of Short Sea Shipping on the U.S. West Coast

Dr. Matthew Tedesco presented results from a CCDoTT study, "Operational Development of Short Sea Shipping to Serve the Pacific Coast", that reinforced the discussion of operator perspectives and Marine Highways Economics. The project team consisted of TranSystems, CDI Band Lavis Division, Westar Transport, and Matthew Tedesco. The project explored the available market volume, logistics company perceptions, simulation models for Marine Highways, and the economics of Marine Highways. It was estimated that 10% of the 2012 eligible market in LA to San Francisco was over 2500 truckloads in each direction, justifying multiple sailings each day. In the California to Pacific Northwest markets, approximately 20% market share would justify a daily sailing in each direction for a smaller 200 trailer vessel. Interviewed logistics and trucking companies made the following observations:

- Marine Highways service is more appropriate for distances greater than 700 or 800 miles for non-time-sensitive cargo
- Transits of 1 to 2 days between LA and SF and 2 to 3 days between LA and Seattle would be required
- Discounts of 20% to 30% off trucking costs may be sufficient to compensate for transit time increase of one day for longer short sea transits assuming reliable service
- Daily sailings are desired
- Respondents had concerns that drayage, the movement of cargo between ocean ports, to and from the port in addition to voyage sailing time would result in total door to door transit times that were too long
- Non-time-sensitive, low value cargo that are either being used for warehouse replenishment or materials for manufacturing where longer transits are built into the supply chain may be the most eligible for Marine Highways
- Marine Highways is more viable for large trucking companies with broad geographic scope with tractors in both origin and destination
- The Pacific Northwest freight imbalance may create the need to re-position trailers empty
- Economics and cost savings are the key considerations when considering a coastwise service. External benefits are acknowledged but are not critical to decision making.
- There are concerns that diverting more trucks to port areas for Marine Highways would compound traffic issues around ports.

Dr. Tedesco presented a discrete event in-port model and voyage analysis that may be used to evaluate the required vessel speed for a given service in combination with other parameters such as the number of drayage tractors, yard tractors, trailer capacity, gates and gate delays, drayage distances, dead-head distances, vessel loading and unloading throughput, and other service parameters. A variety of platforms were explored with trailer capacities of 150 trailers, 450 trailers, and 700 trailers. Economic analysis was presented for a 450 trailer vessel in the LA-SF route. It was determined that the Marine Highways cost per trailer in this challenging market (short next-day route) were too high relative to current truck rates. The capital cost of the vessel itself, while high, was not the real driver of cost per trailer.

Conclusions and Recommendations

The workshop brought individuals from a wide spectrum of industries involved with Marine Highways to help determine what opportunities are available. During the discussions, Mr. Wilber stated that this whole issue is like the causality dilemma of "what came first, the Chicken or the Egg?" It seems that shippers will not shift their cargo to a S3 service unless the service can prove itself as a reliable. Shippers know that it is difficult to operate a reliable service without cargo. So what comes first the Cargo or the Service? International Shipholding Corporation (ISC) was able to weather the startup phase and today operates at full capacity and has actually increased their capacity in the last few years to handle the increased demand. The "chicken or the egg" phrase was used several times from people like Eric Johnsen, Mark Younge, and Roger Bohnert. The consensus of the group was that the ISC model is the reality of what S3 needs to base its future on. The idea of the 700 foot 40 knot super vessel has come and is now determined to be unattainable in the current market conditions. The group consensus was to keep it simple and as time passes the designs and vessels will evolve into a more refined product as seen in Europe. To help further the communication within the group a survey was given to all attendees to fill out during the Workshop. The results from the survey will help guide future work on the subject.

The sections below present results from the workshop survey, which asked participants to identify what they perceived as success factors for international shipyards. Participants perceived the international shipyards to have competitive advantages resulting from:

- A more effective design process with greater emphasis on design for production, design strategy, reduced complexity, design optimization, and strong in-house engineering resources.

- Strong supplier relationships and supply chain management with considerable buying power.

- A high level of expertise in the shipyard, unencumbered by unions.

- A high degree of pre-planning with a considerable percentage of the design completed before start of construction including early 3D product models.

- Strong and capable management, with high degrees of upper management attention on both engineering and production.

- Use of information technology, including design and production simulation.

- A consistent volume and history of vessels to draw upon.

Participant Perspectives on International Shipyards

When asked what distinguishes international shipyards' approaches to supply chain management and what lessons learned may be applicable in the U.S., there was a consensus among participants that the relatively large volume of commercial foreign shipbuilding was a significant factor. The large volume leads to excellent vendor and subcontractor relationships, which lower procurement costs as compared to U.S. procurement. Opportunities to leverage these vendor relationships could be sought by U.S. shipyards.

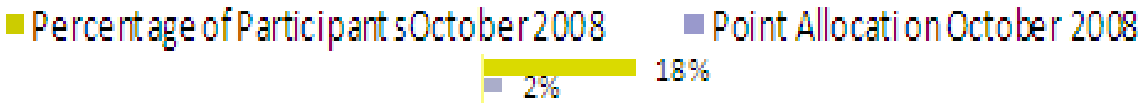

Figure 94 Greater Willingness to Conduct R&D

Figure 95 Relationships with Universities and R&D Organizations

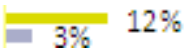

Figure 96 Government Support

Figure 97 Increased Competition for Global Markets

Figure 98 Difference in Attitude

Figure 99 Strong & Capable Management, Management Attention, and Attention

Figure 100 Maturity of Design, Pre-planning and Extend of Design Completed before Beginning Construction

Figure 101 Fewer Manufacturing Delays

Figure 102 Series vs. One – Off Design Production, History of Similar vessels, Constant Volume

Participant Perspectives on International Shipyards - continued

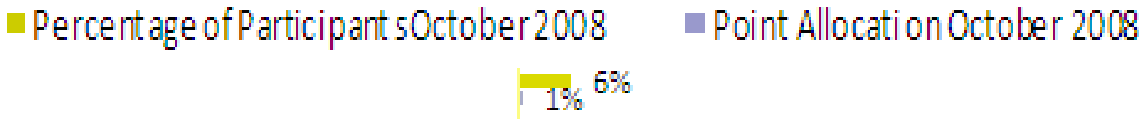

Figure 103 Automation

Figure 104 Use of Information Technologies, Including Design and Production Simulation

Figure 105 Workforce: High Level of Expertise in the Yard, Lack of Unions

Figure 106 Standardization and "Design Library"

Figure 107 Modularization

Figure 108 More Effective Design Process, Emphasis of Design for Production

Figure 109 Strong supplier relationships and Supply Chain Management – Buying Power

Figure 110 Willingness to bid market prices (lower profit Motive)

Figure 111 Strong Customer Coordination, Understanding of Customer Requirements

Figure 112 Specialized Facilities

Figure 113 Ability to Subcontract Effectively and Extensive Subcontracting

While participants recognized that there had been progress in U.S. shipyards applying international best practices, key differences between the international shipyards and U.S. yards were perceived by participants including:

- Strong in-house engineering capability in international yards, doing a high volume of concept and contract designs
- Strong expertise in early stage design, complemented by accurate estimating
- Strong vendor/supplier/subcontractor relationships with a focus on long term relationships
- Suppliers and subcontractors take greater responsibility for doing the design of their systems within the boundaries of the overall ship design with interfaces carefully managed
- Just in time (JIT) applied extensively due to lack of staging/storage space
- Extensive simulation-based design and planning
- Shipyards specialize by ship type
- Senior management tends to be drawn from technical backgrounds

Some participants believed that there were not substantial differences between U.S. and international shipyards in adoption of best practices, but that volume was the key enabler for international shipyards, especially with respect to supplier relationships. In order to leverage the experience of international shipyards, partnerships need to be formed to take advantage of this volume, experience and relationships. Participants believed that a reasonable expectation of substantial ship construction would lead to the formation of partnerships. Adequate financing was believed to be a pre-requisite for international partnerships.

Financing

The group looked into multiple ways to help get the Marine Highways up and going. The main focus was on funding and most likely sources. Mr. Cook gave an excellent presentation on CCF and title XI funding to help support the construction and financing of vessels. The key factor in obtaining financing is to have a service and trade already established. This is where both the Navy and MARAD can help since both can assist in finding future work for an SSS type vessel.

Navy - JHSV

The Navy may, consistent with its mission requirements, be another avenue for providing input and possible funding streams for S3 type vessels down the road. The Navy has a few different ways to help S3 become reality. One of the latest acquisition programs for the Navy is the Joint High Speed Vessel (JHSV). The JHSV has many features compatible with the goals and needs of an optimized SSS vessel and operation. This vessel's pedigree arises from a commercial Ro/Pax ferry, which was adapted to meet Navy's needs. The parent design is operating effectively and is well tested over the last few years.

The JHSV design has been refined. There are detailed cost estimates for construction and for maintenance as well as lifecycle needs. The Navy can provide funding for National Defense

Features like a self-sustaining ramp that can be used in unimproved ports. The JHSV parent vessel seems to be a good fit for a majority of applications. Once the route becomes viable, the port infrastructure can be improved which could lead to more typical European styled S3 vessels or other new designs making their way into the design and production cycle. The Navy's VISA plan can also help offset operating expenses to reduce the load on the operator.

Maritime Administration

MARAD is a key to ensuring the successful implementation of Short Sea Shipping. MARAD has a mandate for action with the Marine Highway Program within the Energy Bill. Congress determined that the Maritime Administration (through delegation from the Secretary of Transportation) is to manage a Short Sea Transportation (America's Marine Highway) Program.

MARAD plans to encourage the use of short sea transportation through the development and expansion of documented vessels, improved shipper utilization, port infrastructure and incorporation of "Marine" transportation strategies from State and local governments. The mission of the new Marine Highway program is to support the integration of our Nation's coastal and inland waterways with the Surface Transportation System and expand its use to reduce congestion and provide direct benefit to the public. The designated and established corridors, which are an extension of the surface transportation system, will help provide the needed cargo and routes required to start the financing. MARAD will continue to lead research and development of America's Marine Highways and assist in design development support. A broader view of the role of marine highways as part of a sustainable, safe, and secure intermodal system should be taken rather than strict focus on reducing congestion on traditional modes. Opportunities exist for the Workshop participants to form or join coalitions led by public entities like the MPO, which may result in creating corridors and projects with the Marine Highway system. Progress is being made toward further development of America's Marine Highways.

Figure 114 American Marine Highways

Green

In early March 2008, the Environmental Protection Agency (EPA) significantly tightened air quality standards, and mandated investment in improving air quality. The Marine Highway system is one means by which the MPOs may, at least partly to address the pollution issues because of potential reductions in congestion and emissions, improved energy efficiency, and infrastructure maintenance cost savings. Industry needs to ensure that the vessels put into the Marine Highway system are as green as possible.

Recommendations

As illustrated in Figures below, project participants made a wide range of recommendations. There was broad support for establishing and prioritizing vessel requirements tied to customer needs, development of concept designs for multiple markets that satisfy economic needs, and facilitating partnerships with international shipyards.

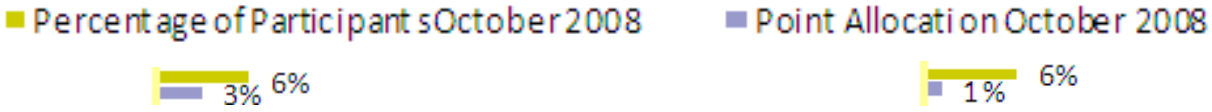

Figure 115 Focus on Simplicity

Figure 116 Facilitate Development of Supplier Network

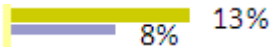

Figure 117 Fund R&D Projects that Reduce Operating Costs

Figure 118 Analysis of Operation Costs

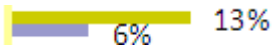

Figure 119 Facilitate Cost Reduction in Yards

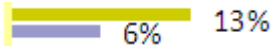

Figure 120 Develop Environments of Willingness to Change

Figure 121 Work with Strategic Sealift and MARAD

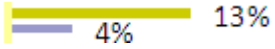

Figure 122 Encourage Shipyard Improvement and Infrastructure Investment

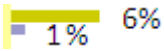

Figure 123 Promote Awareness

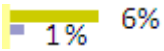

Figure 124 Facilitate Communication with Customers

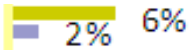

Figure 125 Work to Get RRF (USN) Input

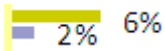

Figure 126 Sharing Technology Developments

Figure 127 Establish and Prioritize Marine Highways Vessel Requirements tied to…

Figure 128 None – Promotion of Marine Highways should come from Other Funding

Recommendations – continued

As illustrated in Figures below, project participants made a wide range of recommendations. There was broad support for establishing and prioritizing vessel requirements tied to customer needs, development of concept designs for multiple markets that satisfy economic needs, and facilitating partnerships with international shipyards.

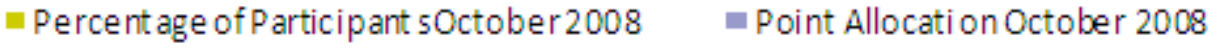

Figure 129 Green (Design, Systems, Equipment, Materials)

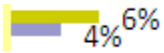

Figure 130 Jones Act Reform

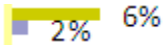

Figure 131 Establish Commercial Ship R&D Organization/ Program

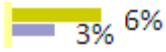

Figure 132 Establish a separate funding line from DOT

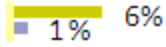

Figure 133 Develop Advanced production planning and Construction Simulation Capability

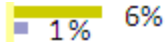

Figure 134 Integrate Early Stage Design with Production Engineering

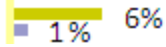

Figure 135 Create In-House early design Staff or Get it From Design Agent

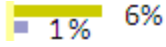

Figure 136 Develop Dedicated Competitive yards for Marine Highway Market

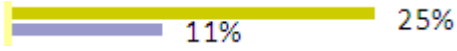

Figure 137 Facilitate Partnerships with International Yards

Figure 138 Develop Credible Cost Estimates for Concept Designs

Figure 139 Develop Concept Designs for Multiple Markets (Solicit RA Level Projects)

Project Website Updates

The project has made use of two separate websites for listing information about the project. NSRP continues to host a site for all Short Sea Shipping based information. The team used the site to house the documentation from the Workshop. Late in the project, it was suggested that the workshop be Webcast like the "S3 Round Table" meeting held a few months earlier. Bender Shipbuilding and ATI worked together to ensure the meeting was captured on video and posted.

Workshop Webcast

Similar to the NSRP site for Short Sea Shipping, there is a section at TV Worldwide that just covers the events in U. S. Maritime Industry, which is named Maritime TV. The site is open for viewing by all interested parties. The link is as follows:

http://www.tvworldwide.com/events/maritimetv/nsrp/081021/

Figure 140 Webcast Page

Realized Benefits to Industry and Navy

The shipbuilding industry and Ship Owner/ Operators can benefit from NDF and the possible use of the JHSV (or similar) design specification as a guide for kicking off the Marine Highway system in the U.S. The Navy is benefiting by focusing industry wide attention on concerns such as how to link MARAD's Marine Highway system with the needs to offset the requirements on the Ready Reserve Fleet.

Technology Transfer

The project provided presentations at the following NSRP PDMT events:

1. June 4-5 2008 in Seattle, WA.
2. September 3-4, 2008 in Bath, ME.
3. Joint Panel Meeting, December 10-11, 2008 in New Orleans, LA.

Project Summary

The Project has come to completion and the goal of this project was to accelerate the shipbuilding opportunities associated with potential U.S.-based Short Sea Shipping (S3) operations has been achieved. The objectives of continuing the NSRP engagement with Short Sea Shipping, know termed the Marine Highway, encompassed the focus on reducing the costs of constructing S3 vessels in the U.S. while facilitating a consortium (owners, operators, U.S. shipyards, partnered foreign shipyards, suppliers and technical support companies). The project addressed four of the top six recommendations that were outputs of the NSRP-sponsored S3 Workshop in Orlando, FL on April 19-20, 2007. The FY07 recommendations that were addressed are the application of the "Virtual Shipyard" concept, including lessons learned overseas, while leveraging partnerships between U.S. and foreign shipyards included: construction methods, supply chain practices, and applicable designs for S3.

A phenomena experienced in the industry closely matches that of the Chicken and the Egg. Mr. Johnsen of International Shipholding Corporation, explained the way he had to prove to the shippers that his company could be reliable before they would move their freight over to his service. Many workshop attendees looked for a way for the Navy to subsidize possible service, until the cargo comes. Currently the only Navy funding that is available is through National Defense Features or through VISA.

A very interesting point that emerged from the workshop was that the cost of shipbuilding is not the root-cause for the lack of Marine Highway operations. For the American Marine Highway to succeed, it needs to start with a basic and flexible vessel that can be operated on multiple routes. Most, if not all of the routes will be located between smaller non-Strategic ports that don't have much infrastructure. This concept and the funding available from the Navy make vessels like the Joint High Speed Vessel more applicable.

With the newly established Marine Highway system starting up and the new demand for infrastructure improvement, the future of the Marine Highway market looks positive. Shippers, Owners/ Operators and Builders need to unify and begin talks with local MPOs and MARAD to setup Marine Highway Corridors and then Marine Highway Projects.