Hydrographic Services Review Panel
HSRP NY/NJ Public Meeting
Grand Hyatt New York       February 25, 2014

Current & Future Trade & Transportation Trends for Global Shipping

M. John Vickerman

Williamsburg, Virginia
Have the HSRP Public Meeting Audience…

“See Into the Future of the MTS”

RDML Gerd Glang
NOAA Director, Office of Coast Survey
405 Years Ago
A Voyage of Three Vessels
Created the First Permanent English Port in Jamestown, VA

13 Years Before the Pilgrims Landed at Plymouth,
Three Brigantine - Barque Vessels
(Forerunners of the Deep Water Cargo Vessel)
of the Virginia Company
of London Landed in Jamestown, Virginia
Godspeed Brigantine, Circa 1607
Deadweight Tonnage: 40 tons - LOA: 88 feet; Crew: 13
What We Know Today... Will Surely Be Different Tomorrow!
The Evolution of Today’s Global Shipping Lanes
The World’s Primary Shipping Routes

The Marine Silk Road
The Maritime Silk Road Replaced the Overland Silk Road as the Primarily Trading Route Across Eurasia After the Yuan Dynasties (618 to 907)
The Marine Silk Road was a Precursor to:

Today’s Modern supply chain logistics, distribution and shipping transportation networks
The World’s Largest Ports Are Connected Via The Marine Silk Road

KEY
WORLD'S LARGEST PORTS (BY CARGO VOLUME PER YEAR)
- 10 MILLION TONS
  • 500
  • 100

WORLD'S LARGEST PORTS (BY CARGO VOLUME PER YEAR)
- 10 MILLION TONS
  • 500
90% of Global Trade is Carried Out by Shipping

The Majority of Today’s Ocean Trade is Conducted on the Marine Silk Road
Indian Ocean Electric Blue Shipping Lane Trails
From the Marine Silk Road
Shorter – Faster Arctic Ocean Route

2+ Months A Year Using Convoys

Half the Time & Distance
International Port External Industry Pressures Driving Today’s Logistics
More than 98% of everything we consume, wear, eat, drive and construct is brought to us via ships through the North American port system.
Growth in GDP and World Trade

World trade will grow by 73% in the next 15 years. With merchandise trade volumes in 2025 hitting $43.6 trillion compared to today's $27.2 trillion.

Source: Oxford Economics 2013
Continuing Economic Global Growth

International trade is set to significantly grow despite current economic uncertainty in the U.S. and elsewhere around the world.

Source: TD Economics Forecast as of March 2013
To Be Competitive Today...

Marine/Intermodal Terminals Must Reduce Throughput Cost & Increase Cargo Velocity Securely and as Stewards of the Environment
Cargo Will Flow “Downhill” to the “Lowest Cost - Best Service Levels” (Total Logistics Costs From Origin to Destination)

More Competitive Regions will End up with the Cargo
Poll of the Top 1000 “Blue Chip” Multinational Shipper Priorities

- Competitive Freight Rate: 38%
- Schedule Reliability & Consistency: 43%
- Transit Time & Speed: 12%
Today’s Logistics Truth:

“The customer wants more and is always willing to pay less for it.”
International Maritime Cargo Demand Trends
Global Shipping Routes Plotted by AIS GPS

2010 Busiest Routes:
(1) Panama Canal, (2) Suez Canal, (3) Shanghai Port

Historical Global Container Market Demand (Millions of TEUs)

Source: Drewry Shipping Consultants

North American Growth Lags Other Global Regions

2009 Recession

Source: Drewry Shipping Consultants
2025 World Container Port Market Demand
(Millions of TEUs)

10% CAGR from 1990 - 2008
(9.1% ) global volume loss for 2009
Recovery in 2010 with 14.8% growth
50% projected rise 2009-2015

Source: Drewry Shipping Consultants October 2011
Southeast Asian Manufacturing Centroid Shift

Current Inbound U.S. Cargo Flow

U.S. Intermodal Rail Flow

Eastbound: All Water Flow
Eastbound: US Intermodal Rail Flow

Western Centroid Shift

Expanded Asian Panama Canal 2014 Flows
With Manufacturing Centroid Shifts Into Vietnam and/or India, The North American East Coast will See Dramatically More Westbound Suez Traffic.
Suez Canal Container Vessel Convoy Traffic

(Ships Currently Transit the Suez Canal in 3 Daily Convoys)
A Turning Point in Global Economic History

The Advanced Economies Will Decline From 2/3 share of the Global Economy to a 1/3 Global Share. The Global Economy Will See Higher Average Pace of Growth in the Future…

Source: IMF - Forecast by TD Economics, December 2009
The Growing Asian Import Trade Challenge
Of the 10 busiest ports in the world in 2011, Nine are in Asia; of the top 10, Six are on the Chinese mainland. The Port of Shanghai is No. 1, and the Port of Singapore is No. 2. These Two Ports are Larger Than All North American Ports Combined.
China-US: Twin Engines of the World

Population:
US: 314 million
China: 1,344 million
(1/5 World)

The number of Chinese children in elementary school is equivalent to the total US population.
Shanghai International Shipping Center

Yangshan Deep Port & Logistics Park

- New Port City
- New Logistics Park

20 Mile New Port Access Bridge Constructed in 3 yrs

54 New Berths
Shanghai International Shipping Center
Yangshan Deep Port - 20 Mile Bridge Access

“Second Longest Ocean Bridge in the World”
Shanghai Yangshan Deep-Water Harbour
Yangshan Deep Port – 54 Berths East China Sea
Shanghai International Shipping Center
Yangshan Deep Port & Logistics Park

Shanghai Port Set a 2011 Record by Handling over 30 million TEUs
Maritime Vessel Technology Trends
In 1955 Malcolm McLean, sold McLean Trucking, and secured a bank loan of US$42 million to build the world's first container ship.
World Container Ship Evolution

1st Generation (Pre-1960 - 1970)
- Ideal X

- Full Cellular

3rd Generation (1985)
- Panamax

- Post Panamax

5th Generation (2000 - 2006)
- Super Post Panamax

6th Generation (2006 - 2012)
- Ultra Post Panamax

TEU Capacity
- 101 TEU – (58 - 35 ft Containers)
- 2,305 TEU
- 3,220 TEU
- 4,848 TEU
- 8,600 TEU
- 15,000+ TEU
World Container Ship Evolution
Madison Maersk (3,928 TEUs) in the Panama Canal
(Current Max Panamax Vessel Approx. 4,800 TEUs)
Maersk’s New 30 Vessels (ordered) are 4 Times the Current Size of the Panama Canal & 1.5 times the Size of the Expanded Panama Canal
CMA-CGM’s Marco Polo – 16,020 TEUs
Built by Daewoo Shipbuilding and Marine Engineering (DSME) in South Korea – January 2013

, 396 metres in length, 54 metres in width, and boasts a draft of 16 metres
Global Container Fleet Capacity & Vessel Size

(P.Pmax = Post Panamax Vessel)

Containership Fleet 2000
(4.79 million TEUs)

Containership Fleet 2012
(16.2 million TEUs)

Containership Fleet 2016
(19.7 million TEUs)

Dramatic Increase in Post Panamax Container Ship Sizes

371 Panamax vessels
134 Post Panamax vessels

949 Panamax vessels
1,048 Post Panamax vessels

974 Panamax vessels
1,397 Post Panamax vessels

Source: Clarkson’s Research Studies – December 2012
NYK Super Eco Ship

NYK Super Eco Ship 2030
Green Ship Design for the Future

TOTAL CO₂ reduction 70%

Nominated for the Clean Innovation award at Nor-Shipping 2009

ELOMATIC  NYK Line  Monohakobi Technology Institute  Garroni Design
21,000 TEU Ultra Large Twin Engine Container Ship - 2012

Source: Alphaliner Newsletter Volume 2011 Issue 4
Future Container Vessel Characteristics:

Capacity = up to 22,000 TEUs
Deck Stow: 23 wide & 7-9 Containers above hatch
Length = up to 1,445 ft (4.5 Football Fields)
Beam = up to 194 ft
Deadweight Tonnage = 220,000 Long Tons
Draft = up to 54 ft

Far Exceeds the 2014/15 Panama Third Lane Capacity
Vessel Size Expansion - Terminal Impacts
(Port Terminal Infrastructure & Equipment Geometry Impacts)

Increased Terminal Throughput

Super Post Panamax
18,000 to 22,000 TEU

New Panamax (2014/15)
12,600 TEU

Current Panamax
4,800 TEU

Depths 48 to 54 ft

Storage Area Impacts

Height Above Deck

Source: Georgia Ports Authority and Vickerman & Associates
Port of Amsterdam Ship in a Slip (Ceres Terminal)
Container Ship-in-a-Slip Concept
P3 Operating Alliance Network Carriers: (Maersk Line, Mediterranean Shipping and CMA CGM) Starts 2nd Qtr. 2014

Collective shares across all East-west trades

<table>
<thead>
<tr>
<th></th>
<th>Total teu deployed</th>
<th>Trade share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maersk</td>
<td>1,137,945</td>
<td>15.9%</td>
</tr>
<tr>
<td>CMA CGM</td>
<td>663,488</td>
<td>9.3%</td>
</tr>
<tr>
<td>MSC</td>
<td>889,924</td>
<td>12.4%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>2,691,357</td>
<td>37.6%</td>
</tr>
</tbody>
</table>

Capacity:
Initially 255 vessels of 2.6m teu deployed on 29 routes

Ship contributions:

- MAERSK: 42%
- MSC: 34%
- CMA CGM: 24%

Too big to fall, too big to fight
New Era of LNG Vessels is on the Horizon: Will LNG be the Fuel of the Future for Shipping?
TOTE Orders Two New LNG Powered Container Ships & Two RO/RO Conversions: Largest LNG Powered Ships in the World

These ships will be the largest ships in the world powered primarily by Liquefied Natural Gas (LNG).
TOTE Orders Two New LNG Powered Container Ships & Two RO/RO Conversions: Largest LNG Powered Ships in the World

Two 839-foot Orca-class vessels to liquefied natural gas-diesel dual fuel operation for Seattle-Alaska service and two 764-foot new-builds for the Florida-Puerto Rico trade
Kawasaki Heavy Industries
9,000 TEU container ship Fuelled by LNG

A new type of LNG tank that provides more space for container cargo.
Germanischer Lloyd (GL) & IHI Marine United Inc. (IHIMU)
Concept Study 13,000 TEU Container Vessel Fuelled by LNG

The eFuture 13000C design (©IHIMU)
LNG Vessel Bunkering: *North American Ports Are Not Prepared…*
Shell’s FLNG
The Largest Floating Structure in the World
Shell’s Floating Liquefied Natural Gas Facility,
Panama Canal Expansion: New Capacity
Panama Canal Route

Map showing the Panama Canal with major routes and key locations such as Colón, Panama City, Balboa, and Gatún.
Panama Canal Third Lane Expansion
Circa Late 2015 – Early 2016

The Autoridad Del Canal de Panama
Panama Canal Third Lane Expansion

A $5.25 Billion Investment - 16% of Panama’s National GDP

New Lane

Existing Lanes
Panama Canal Historical Tonnage Traffic

Source: ACP Data
A Larger Share of Other Vessels Will be Able to Transit the Canal - Fully Loaded

**Crude Oil** - 0% to 42%

**LNG** - 10% to 90%

**Dry Bulk** - 55% to 80%
Panama Canal Third Lane Expansion Capabilities

2011: 4,800 TEU

2014-2015: 12,600 TEU

Source: ACP Expansion Project
January 6, 2014: “Panama Canal Contractor Accused of Slow-Down Tactics”

*Grupo Unidos por el Canal (GUPC)*
(current $3.2 billion fixed-price contract):

- January 19, 2014: Suspension of Work if GUPC is not reimbursed $1.6 billion in cost overruns
Emerging New Caribbean Transhipment Center
Panama Ports Annual *Transhipment Growth*

Proposed New Port Projects Would More Than Double the Total in 5 Years
Panama Ports Container Transhipment Growth

6.8 Million TEUs – 18.5 % Growth Rate
Non-Transit Panama Canal “Feeder Services” May Be the Real Boom from the Canal Expansion

Weekly Through Transits
Feeder Services – No Transit

Source: ACP and Compare, 2008 Data
The Panama Canal Expansion Will Move the Caribbean Transhipment Center Point to Panama
New Panama Canal Pacific Entrance Ports

More Capacity than all of the Port of Los Angeles
PSA Panama International Terminal (PPIT) Western Entrance Conceptual Site Plan, Phase I + II

2 Million TEUs Roughly Equivalent to the Entire Port of Virginia
Corozal Oeste Container New Transhipment Terminal Panama Canal Western Entrance - Phase I & II

5.5 Million TEUs Roughly Equivalent to the Entire Port of New York & New Jersey

Source: ACP Expansion Project – Rodolfo Sabonge AAPA January 24, 2013
Corozal Oeste Container
New Transhipment Terminal
Panama Canal Pacific Entrance - Phase I & II

Terminal: 116 hectares (286.6 acres)

Source: ACP Expansion Project – Rodolfo Sabonge AAPA January 24, 2013
New Panama Canal Atlantic Entrance Port

More Capacity than all of the Port of Houston

The Autoridad Del Canal de Panama
Panama Colon Container Port
(New $600 Million Container Port
Panama Canal Atlantic Entrance)

The terminal, with an initial capacity of two million TEU, will be constructed by a consortium of Asian developers under the name Panama Colon Container Port LLC (PCCP)
Panama Canal Expansion Impacts
Panama Canal Vessel Deployments Will Determine New US Logistics Patterns

The Distance to New Orleans and Savannah Via the Panama Canal

A Competitive & Robust Landside Access to the Gateway Port’s Inland Market will be a Key Success Factor!
The Primary North American Competitor to the Panama Canal is the Class I Rail Intermodal System (Potential Increased Service Offerings and System Capacity)

Source: USDOT Maritime Administration (MARAD) 2009
US States Affected By The Panama Canal Expansion – Containerized Cargo

Source: USDOT Panama Canal Expansion Study – November 2013
Dramatic US Market Penetration after 2015

Panama Canal Economies of Scale with permit
deeper market penetration into the US

Reachable Market:
46% of US Population

Reachable Market:
63% of US Population

4,000 TEU ship, all-water.

8,000 TEU ship, all-water.

West Coast Cost Advantage

East Coast Cost Advantage

Source: PB Consultants - CSX Transportation May 12, 2011 - Director of Strategic Analysis
Dramatic US Market Penetration after 2015

Panama Canal Economies of Scale with permit
deeper market penetration into the US

Source: ACP Expansion Project – Rodolfo Sabonge AAPA January 24, 2013