Port Competitiveness in the New Global Economy

Executive Management Conference for Latin America and the Caribbean

Conferencia sobre Administración Ejecutiva para América Latina y el Caribe

February 22, 2006
Renaissance Houston Hotel
Port & Intermodal Development In the Face of The Impending Trade “Tsunami”

M. John Vickerman
Principal
TRANSystems
Norfolk, Virginia
Agenda

- Port & Intermodal External Industry Pressures
- International Maritime Cargo Demand Trends
- The Growing Asian Import Trade Challenge
- Can North America Handle the Forecasted Volumes?
- International Port Productivity Comparisons
- Maritime Vessel Technology Trends
- North American Domestic Truck Growth
- North American Class I Rail & Intermodal Growth
- Growing Environmental Concerns for Marine Vessel Emissions
- Emerging Information Technologies (IT) - Example
Global Trade: Current Course & Direction?

Cargo Demands, Capacity, Funding, Port Productivity & Environmental Challenges

North American Port Gateways
Vessel Cargo Handling Circa 1950
Cargo Handling Circa 2005
US Navy Fast Frigate Circa 2035
What We Know
Today... Will Be
Surely Be Different
Tomorrow!
To Be Competitive Today...

Marine/Intermodal Terminals Must **Reduce Throughput Cost & Increase Cargo Velocity** Securely and as Stewards of the Environment
Port & Intermodal External Industry Pressures
The North American Freight Paradox: The Nation’s Ports and Their Intermodal Linkages are Experiencing the “Best of Times and the Worst of Times” in Terms of Growth and Demands on Capacity
We do not have an “intermodal system” as such. Rather we have an aggregation of multiple, private and public modes, each of which are “stove-piped” within their own individual areas of interest with little or no true cross communication and collaboration.
Poll of the Top 1000 “Blue Chip” Multinational Shipper Priorities

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

“The customer wants more and is willing to pay less for it.”
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
Ports are Experiencing Dramatic Surges in Seaport Security Costs

Port of Miami’s Security Costs Today are 600% Higher Than that of 2001
US Port Security Breach: Supply Chain Disruption

PORT SECURITY WAR GAME—ECONOMIC IMPACT

Exhibit 4

Day 1: Ports of Los Angeles and Savannah shut down
Day 4: Customs closes all ports and border crossings
Day 12: U.S. ports reopen
Day 20: Railcar explodes in Chicago; 24 hour stand-down
Day 26: Ports return to normal schedule, inspection rate

$60 Billion Loss
Cargo Backlog Cleared in 60 Days

Source: Booz Allen Hamilton

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TRANSYSTEMS CORPORATION
International Maritime Cargo Demand Trends
World Bank’s 2010 “Global Economic Prospects”

World Output will Increase 33% in 10 years

- 2000: $30 Trillion
- 2010: $40 Trillion
World Container Forecast to 2024 in TEUs
(186% Increase in Next 20 Years)

Growth Rate (CAGR)
1994 to 2004: 8.3%
2004 to 2014: 6.1%
2014 to 2024: 5.0%

Source: Global Insight, 2004
2003 World Container Gateways
“The World’s Top 10 Gateways”

Hong Kong Alone is Equal to the Top 15 US Container Ports

<table>
<thead>
<tr>
<th>Rank</th>
<th>TEUs in Millions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20.42</td>
</tr>
<tr>
<td>2</td>
<td>18.41</td>
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<tr>
<td>4</td>
<td>11.28</td>
</tr>
<tr>
<td>5</td>
<td>10.65</td>
</tr>
<tr>
<td>6</td>
<td>10.36</td>
</tr>
<tr>
<td>7</td>
<td>8.84</td>
</tr>
<tr>
<td>8</td>
<td>7.11</td>
</tr>
<tr>
<td>9</td>
<td>6.17</td>
</tr>
<tr>
<td>10</td>
<td>5.45</td>
</tr>
</tbody>
</table>

Source: Port Engineering Management, Vol. 22- Issue 6 - December 2004

POLA + POLB

US Ports

31 M TEUs by 2011

Source: Port Engineering Management, Vol. 22- Issue 6 - December 2004
### Global Market Economic Shifts (Country GDP Rank)

<table>
<thead>
<tr>
<th>Year</th>
<th>2000</th>
<th>2010</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
</tr>
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<tbody>
<tr>
<td>#1</td>
<td>USA</td>
<td>USA</td>
<td>USA</td>
<td>USA</td>
<td>USA</td>
<td>CHINA</td>
</tr>
<tr>
<td></td>
<td>Japan</td>
<td>Japan</td>
<td>CHINA</td>
<td>CHINA</td>
<td>CHINA</td>
<td>USA</td>
</tr>
<tr>
<td></td>
<td>Germany</td>
<td>Germany</td>
<td>Japan</td>
<td>INDIA</td>
<td>INDIA</td>
<td>INDIA</td>
</tr>
<tr>
<td></td>
<td>UK</td>
<td>UK</td>
<td>Germany</td>
<td>INDIA</td>
<td>Japan</td>
<td>Japan</td>
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<tr>
<td></td>
<td>France</td>
<td>CHINA</td>
<td>UK</td>
<td>Russia</td>
<td>Russia</td>
<td>Brazil</td>
</tr>
<tr>
<td></td>
<td>Italy</td>
<td>France</td>
<td>INDIA</td>
<td>UK</td>
<td>Brazil</td>
<td>Russia</td>
</tr>
<tr>
<td>#7</td>
<td>CHINA</td>
<td>Italy</td>
<td>France</td>
<td>Germany</td>
<td>UK</td>
<td>UK</td>
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<td>#8</td>
<td>Brazil</td>
<td>INDIA</td>
<td>Russia</td>
<td>France</td>
<td>Germany</td>
<td>Germany</td>
</tr>
<tr>
<td>#9</td>
<td>INDIA</td>
<td>Russia</td>
<td>Italy</td>
<td>Brazil</td>
<td>France</td>
<td>France</td>
</tr>
<tr>
<td></td>
<td>Russia</td>
<td>Brazil</td>
<td>Brazil</td>
<td>Italy</td>
<td>Italy</td>
<td>Italy</td>
</tr>
</tbody>
</table>

Source: Global Insight, 2005
The Growing Asian Import Trade Challenge
Global Interdependent Economics Have Resulted in a Major Product Sourcing Shift to Asia

Source: Clarkson Research Studies
China – US 25 Year Trade Growth
(Billions US $)

1979: $2.5 B
2004: $40.8 B

1,532 % Increase
Trans-Pacific box volumes from Asia to the US have continued to expand rapidly, largely on the back of exports from mainland China.

Westbound volumes have remained fairly static.

Source: Clarkson Research Studies
China-US: Twin Engines of the World

Population:
US: 298 million
China: 1,307 million
(1/5 World)

The number of Chinese children in elementary school is equivalent to the total US population.
China is Leading a Global Economic Rebound Becoming the World’s Manufacturing Powerhouse

- Global manufacturing is now centered in China.
- **GDP will double by 2010 and quadruple by 2020.**
- By 2008... the second largest global trading country.
- China’s cargo is **70% of the total Pacific cargo flows.**
- China’s container volumes will increase from **60 million TEUs** to over **100 million TEUs** by 2010.
Mainland China Container Port Growth
(Compound Annual Growth Rates)

Mainland China Container Port Throughput

5 Yr Average = 27.2%
Increased Volume

Port Throughput ,000TEU
China’s Ministry of Railways Signed a 5 year Cooperation Agreement with the US BNSF Railroad for Intermodal Rail Development

- Develop China’s high volume efficient intermodal network
- $242 billion program to 2020
- On-dock & near-dock intermodal transfer yards at ports
- Ministry to build 18 mega-terminals with 7 at seaports, 40 smaller Intermodal terminals
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
Shanghai Close-Port New City

New Port City

A new city Integrating global freight logistics
Prince Rupert Port Authority
the new world port
opening a new world of opportunity

[Map showing rail routes between China, Canada, and the U.S. with labeled cities and rail lines.]
Major West Coast Mexican Port Developments Planned To Avoid Port of LA/LB Congestion

$1.2 Billion in Port Infrastructure
Can North American Marine Terminals Handle the Forecasted Freight Volumes ?...
By 2020 Most US Container Port Gateways Will Double or Triple in Volume
U.S. International Trade Growth

Current and Future

Today

2020

Exports

Imports

Source: USDOT Forecast figures based on 6-year linear regression
U.S. Maritime Container Trade Growth

Current and Future

(TEUs in thousands)

<table>
<thead>
<tr>
<th>City</th>
<th>2004</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>LA/LB</td>
<td>13,101</td>
<td>59,420</td>
</tr>
<tr>
<td>Oakland</td>
<td>2,043</td>
<td>3,382</td>
</tr>
<tr>
<td>Seattle</td>
<td>1,776</td>
<td>2,557</td>
</tr>
<tr>
<td>Tacoma</td>
<td>1,798</td>
<td>4,396</td>
</tr>
<tr>
<td>NY/NJ</td>
<td>1,809</td>
<td>5,566</td>
</tr>
<tr>
<td>Virginia</td>
<td>1,860</td>
<td>6,639</td>
</tr>
<tr>
<td>Charleston</td>
<td>1,862</td>
<td>9,420</td>
</tr>
<tr>
<td>Savannah</td>
<td>1,798</td>
<td>4,396</td>
</tr>
<tr>
<td>Houston</td>
<td>1,437</td>
<td>6,165</td>
</tr>
<tr>
<td>Miami</td>
<td>1,010</td>
<td>2,152</td>
</tr>
<tr>
<td>Savannah</td>
<td>1,798</td>
<td>4,396</td>
</tr>
</tbody>
</table>

Source: USDOT (Forecast figures based on 6 year linear regression)
75% of the 16 Ports Studied will have Significant Capacity Problems by 2010
Port Authority NY/NJ Long Range Regional Container Forecast (TEUs)

Planning Year

Source: PANY/NJ - TranSystems Data

Current Capacity +212%

Low (40' Channels)
Base (45' Channels)
High (50' Channels)
San Pedro Bay Ports of Los Angeles and Long Beach

Container Growth Implications:

“At current growth and per acre productivity, in 18 years the two Ports will require 3,624 new acres of container terminal”*

* Source: Port of Long Beach
Explosive Southern California Port Container Growth Forecasted


35 million TEUs

44.7 Million TEUs

2030
Capacity vs. Demand Bottom Line: Balancing Capacity and Demand is Both a Public and Private Issue

North America’s future economic and environmental health is at risk as a result of declining transportation efficiency and reliability.
International Port Productivity Comparisons
Global Port Terminal Productivity

North American Ports Are Not As Productive As The Most Productive International Ports By a Factor Of More Than 4 To 1

Source: TranSystems Data
Port Productivity (U.S. vs Asia)

10 GM/Hour Increase

Source: APL, Transportation Research Board
# Global Marine Terminal Productivity Growth

(Circa 1995 to 2003)

(Throughput measured in TEUs/Acre/Year)

<table>
<thead>
<tr>
<th>Region</th>
<th>1995</th>
<th>2003</th>
<th>5YR CAGR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Asian Ports</strong></td>
<td>8,834</td>
<td>18,500</td>
<td>19.9%</td>
</tr>
<tr>
<td><strong>European Ports</strong></td>
<td>2,974</td>
<td>6,800</td>
<td>9.2%</td>
</tr>
<tr>
<td><strong>United States Ports</strong></td>
<td>2,144</td>
<td>3,900</td>
<td>9.0%</td>
</tr>
<tr>
<td><strong>US West Coast Ports</strong></td>
<td>3,567</td>
<td>4,300</td>
<td>10.9%</td>
</tr>
<tr>
<td><strong>US Gulf Coast Ports</strong></td>
<td>2,816</td>
<td>4,000</td>
<td>3.7%</td>
</tr>
<tr>
<td><strong>US East Coast Ports</strong></td>
<td>1,281</td>
<td>3,300</td>
<td>10.3%</td>
</tr>
</tbody>
</table>

Source: 1995 & 2003 CI Yearbooks, Seaports of the Americas, Port Data
2005 International Port Productivity
Top 10 Ports
(in Millions of TEU Throughput)

Source: Computed from Seaports of the Americas – 2005,
Containerization International Yearbook - 2005 and port-provided data bases/interviews
2005 US Port Productivity Top 10 Ports
(in Millions of TEU Throughput)

Source: Computed from Seaports of the Americas – 2005, Containerization International Yearbook - 2005 and port-provided data bases/interviews
West Coast Port Productivity Is A Major Concern

San Pedro Bay Productivity (lifts/gang hr)

Source: APL, Transportation Research Board
Maritime Vessel Technology Trends
April 26, 1956

The deck of the *Ideal X* at Port Newark preparing for the historical sailing of the world’s first containership.
World Container Ship Evolution

1st Generation  (Pre-1960 - 1970)
1,700 TEU

2,305 TEU

3rd Generation  (1985)
3,220 TEU

4,848 TEU

5th Generation  (2000 - 2005)
8,600 TEU

Ideal X
Panamax
Post Panamax
Super Post Panamax
Madison Maersk (3,928 TEUs) in the Panama Canal
(Current Max Panamax = 5000 TEUs)
Today’s Mega Ships - Measuring Up

Eiffel Tower – 990 feet

Regina Maersk – 1043 Ft, 140 Ft wide, 6000+ TEUs
### Today’s Mega Ships - Measuring Up

**How Wide, How Deep?**

<table>
<thead>
<tr>
<th>Era</th>
<th>Capacity (TEU)</th>
<th>Containers Wide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-1970</td>
<td>1,700</td>
<td>&lt;10</td>
</tr>
<tr>
<td>1970-1980</td>
<td>2,305</td>
<td>10-11</td>
</tr>
<tr>
<td>1985</td>
<td>3,220</td>
<td>11-13</td>
</tr>
<tr>
<td>1986-2000</td>
<td>4,848</td>
<td>13-17</td>
</tr>
<tr>
<td>2000-2005</td>
<td>8,600+</td>
<td>17-24</td>
</tr>
</tbody>
</table>

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**SEA LEVEL**

- <30'
- 33'
- 38'-42'
- 42'-46'
- >46'

---

[Image of a ship with containers]
## 2005 COSCO Orders Four 10,000 TEU Vessels

<table>
<thead>
<tr>
<th>Specification</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>LENGTH OVERALL</td>
<td>349 M (1145 FT.)</td>
</tr>
<tr>
<td>BREADTH</td>
<td>45.6 M (149.6 FT.)</td>
</tr>
<tr>
<td>MAX. DRAFT</td>
<td>17.2 M (56.4 FT.)</td>
</tr>
<tr>
<td>OPERATING SPEED</td>
<td>25.8 KNOTS</td>
</tr>
</tbody>
</table>

*Source: Lloyd’s Register, February 2005*
The Hatch-Less Container Vessel

Per P&O Nedlloyd:
• 15% Faster Port Productivity
• 84% Less Re-Stows
• Less Damaged Boxes
Containerships & Recent Cruise Vessel Technological Advances...What’s Next?

SSP Propulsor
Schottel / Siemens

Azipod
Eagle Class Cruise Vessel
2001 and 2002 saw large amounts of container capacity delivered, matched by 2004 additions to fleet.

A significant jump in vessel deliveries is expected in 2006.

Source: Clarkson Research Studies

Source: APL, Transportation Research Board
The 15,000 TEU Containership

“...the ship is a flight of fancy... but such a ship is within the current state of the shipbuilder’s art...”

R. G. McLellan, P&O Containers
The 15,000 TEU Containership

LOA. = 400 m (1,312 ft.)
Draft = 14 m (46 ft.)
BEAM = 69 m (226 ft.)

Panamax Dimensions

28 Wide
13 Wide

Panamax Dimensions
Container Ship-in-a-Slip Concept
Emergence of North American Fast Feeder Short-Sea Coastal Vessels

The New Frontier: Transshipment and Short Sea

10,000 to 15,000 TEU Mega Ship

3,000 TEU Feeder Ship
North American Domestic Truck Growth and Congestion
Future US Truck Traffic Growth

Today

2020

Source: USDOT FHWA Freight Analysis Framework
2020 Truck Freight Flows
High-Value & Time Sensitive Products

Source: USDOT FHWA Freight Analysis Framework
2020 NAFTA US Truck Traffic Flows

US/Mexico Truck Traffic
US Highway Network (Tons)

US/Canada Truck Traffic
US Highway Network (Tons)

Source: USDOT FHWA Freight Analysis Framework
North American Class I Rail & Intermodal Growth
North American Intermodal Rail
Freight Movement Trends
The Railroad Industry...
Since the US Staggers Act:

- 35% less track
- 32% fewer locomotives
- 27% fewer railcars
- 60% fewer employees

But:
well over 50% more freight!
Weekly Eastbound Double-Stack Services — April 1984 (1 Set)

Source: Mercer Management Consulting
Weekly Eastbound Double-Stack Services
April 1993 (241 Sets)

Source: Mercer Management Consulting
U.S. Double-Stacked Train System

East-West 10,000 ft Train Bypass
Emerging New North-South Double Stack Intermodal Rail Corridors

Existing Port Intermodal Volumes

4.1 Millions of TEUs

Existing Rail Flow


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Deteriorating West Coast Rail Performance

(Average Velocity - MPH)

Source: Credit Suisse First Boston
The Emerging CN Transcontinental Land Bridge

Prince Rupert

Transit Times

Initial Transit Times
Chicago 107 hours
Toronto 108 hours
Montreal 115 hours
Memphis 135 hours

Better grades across CN network
Unconstrained, fluid rail line
22 hours shorter by rail to Chicago than Vancouver (CP)
A 10,000 TEU Mega-Container Vessel Can Produce High Intermodal Rail Volumes (One Weekly Vessel Call)

Vessel Capacity
10,000 TEU
(5,892 Units)

13.4 Double Stacked Trains

75% Intermodal Split
Growing Environmental Concerns for Marine Vessel Emissions
Global Freight Energy Use is on the Rise

Source: 2005 Haagen Smit Worldwide Emissions Overview & NRDC “Harboring Pollution”
Global Diesel PM & NOx Baseline Projections

Land Based Pollutants Have Declined with Regulation, but the Unregulated Marine Based Pollutants are Increasing

Absent New Standards and Regulations the Pollutant Baselines Are Forecast to Rise
Pollution Sources
US Ports vs Other Industries…
We Need To Do Better

Source: 2005 Haagen Smit Worldwide Emissions Overview & NRDC “Harboring Pollution”
Transportation Diesel Pollutants are Putting Our Health in Jeopardy

Progress has stalled and diesel emissions from ships, locomotives and port complex are projected to increase.

Source: SCAQMD, Multiple Air Toxics Exposure Study II, March 2000
Cost-effective Air Quality Emission Reduction Improvement Measures

- Modernize truck fleet:
  - Scrap dirty old trucks
  - Retrofit all other pre-2007 trucks

- Upgrade all cargo handling equipment with electric equipment or clean fuels

- Use clean marine fuels
  - Provide onshore electric power for ships at berth (Cold Iron)

- Replace locomotives with cleaner technologies, fuels, and explore rail electrification

Source: Southern California Association of Governments
Emerging Information Technologies (IT)
The Agile Port Example
The Burden of Paper...

“Loading and discharging a 5,000 TEU ship involves close to 40,000 documents and some 6,000 to 7,000 customs transactions…”

“The average F.O.B. value is U.S. $60,000 per TEU”

C. C. Tung
Chairman and CEO
Orient Overseas Ltd. (OOCL)
USDOD Agile Port
Information Technology (IT) Developments
IT Data/Information Integration

Consist Data

Container Vessel

Data/Info Management

Consist Data

Double Stacked Train

Major Terminal & Systems Benefits
The Agile Port Concept is not a new technology...

...it is a way of managing and organizing information to reduce container port terminal dwell time & increase terminal capacity.
Agile Port Concepts

Integrating Vessel and Rail Information Systems
USDOD Agile Port Technology
Full Scale IT Demonstration Project

Hyundai Terminal
Washington United Terminals
Port of Tacoma
July 2003

Potential: Doubling the Terminal Capacity without Building Anything
Container Dwell: The Average Length of Time an Average Container Remains on the Terminal

U.S. Marine Container Terminal Dwell: 6 to 8 Days (Average)
U.S. Intermodal Rail Terminal Dwell:

1 1/2 - 2 Day (Average)

When You Reduce Terminal Dwell by One Half

You Double the Terminal Throughput…without Building!
Port Competitive Mandates

• Ports & intermodal linkages must change the current cost versus value relationship in the logistics chain. Become Value Added Multipliers...

• Successful ports & intermodal terminals in the next decade must invest in and leverage technology to improve terminal productivity, cost, effectiveness and reliability for all modes of transportation…securely as environmental stewards.
Port Competitiveness in the New Global Economy

Thank You

Executive Management Conference for Latin America and the Caribbean
Conferencia sobre Administración Executiva para América Latina y el Caribe

Thank You