
Transpacific Vessel Deployment Options with an Expanded Panama Canal

A Financial Benchmarking Exercise
&
Strategic Assessment

Updated Report

Prepared on behalf of:



The Autoridad Del Canal de Panama

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June 10, 2004

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Background

It is the intent of the Panama Canal Authority (ACP) to undertake a significant capital investment and construction plan to add a second set of locks permitting post-Panamax vessel transits by 2013.

R. K. Johns & Associates (RKJA) has been engaged by the ACP to investigate the options under consideration by leading container carriers as to their plans for deploying post-Panamax ships in the various transpacific trade routes, including all-water service to the U.S. East Coast via the Canal.

Methodology

RKJA is conducting private discussions with key executives at three of the largest global container carriers that utilize the Panama Canal. These discussions focus on two critical components of a carrier's vessel deployment planning:

- A financial breakdown of the comparative operating and capital costs of deploying a 4,000, 6,000 and 8,000 TEU vessel string in the three transpacific routes to the U.S. – a direct Asia to West Coast service, a direct Asia to East Coast all-water service via the Panama Canal and an all-water service to the East Coast via the Suez Canal (with at least one port call in the Mediterranean).
- A subjective assessment of the strategic decisions and timing issues for deploying post-Panamax ships in the transpacific trades.

It should be noted that the financial exercise employed in this study is focused only on vessel costs and routings. This is not a formal Return on Investment (ROI) analysis, as that would require many more assumptions, and a more extensive accounting of inland costs, backhauls, etc. A formal ROI analysis would generally be conducted for the entire fleet and require a complete accounting for all trade services.

This updated report includes the findings from two container carriers, due to time limitations on compiling the requested data. A final report will be issued the week of June 14th to include all three carriers' information.

The questionnaire used in these private carrier discussions is attached as Appendix I.

Updated Findings

Contrary to various published reports that conjecture as to the cost savings achievable with larger vessels, two carriers have estimated that there are significant economies of scale in terms of reduced unit slot costs as vessel size increases. Not surprisingly, both carriers' cost estimates, on a similar scale, yield nearly identical savings as vessel size increases.

Both carriers expressed their intentions to deploy larger, post-Panamax vessels as soon as the Canal constraints are removed. Quoting directly, both carriers independently said that the 8,000 TEU vessel is "ideally designed" for the all-water trade.

The table below displays the overall operating cost savings for these two carriers in an all-water Asia-US East Coast service via the Panama Canal for various ship sizes. To obtain an accurate comparison, costs are calculated in an indexed format (where the costs for a 4,000 TEU vessel provides the base case equal to '100').

Indexed Comparison of Vessel Operating Costs Asia to US East Coast via Panama Canal

(per TEU slot*)		4,000 TEU ship	6,000 TEU ship	8,000 TEU ship
Capital Cost	Carrier #1	100	97	91
	Carrier #2	100	78	75
Operating Cost	Carrier #1	100	89	81
	Carrier #2	100	104	88
Total Voyage Cost	Carrier #1	100	91	84
	Carrier #2	100	93	83

* Based on round-trip TEU slots available, not necessarily utilized.

Total voyage cost savings, in percentage terms, are nearly identical for both carriers. Deployment of 8,000 TEU vessels in the all-water service will generate a 16-17% per TEU unit slot cost savings compared to a Panamax vessel of 4,000 TEUs.

There is a noticeable difference in cost savings between carriers as to allocated costs for fixed capital and variable operating expenses. This is most likely a definitional issue based on experience and not a competitive market advantage or disadvantage. One carrier has already deployed a significant number of +7,500 TEU vessels in various trades, while the other expects its first deliveries this year.

On a percentage basis, the unit cost reduction decreases somewhat as ship size increases, but remains material in dollar terms. According to one carrier, they could save \$136 per TEU on a round trip basis by replacing Panamax ships with 8,000 TEU vessels. Expressed annually for one vessel string, economies of scale between a 4,000 TEU and 8,000 TEU ship deployment would produce \$28 million in cost savings.

**Percentage Savings in Total Round-Trip Slot Costs
(Base Case: 4,000 TEU vessel string, weekly service)**

		Shift to 6,000 TEU ships	Shift to 8,000 TEU ships
Asia-US East Coast via Panama	Carrier #1	9%	16%
	Carrier #2	7%	13%
Asia-US West Coast	Carrier #1	6%	15%
	Carrier #2	10%	19%
Asia-US East Coast via Suez	Carrier #1	7%	17%

The second carrier did not provide cost savings estimates for deploying larger ships on the Asia to US East Coast service via the Suez Canal. That stated, “It is not relevant to us to talk about a China or North Asia to East Coast trade via the Suez”. This carrier restricts Suez service to Southeast Asia only.

Carrier Observations

Regarding the decision process for using the Panama Canal, these two carriers acknowledge that several factors are inter-dependent, including:

- Customer demand
- Cargo origin/destination
- Vessel speed/size
- Terminal capacity
- Intermodal capacity/competitiveness

The overriding factor is market demand. All-water East Coast services have already experienced a surge in containers in the past two years. Prior to the West Coast port disruption in September – October 2002, many U.S. retailers had begun building import distribution centers in the eastern half of the country in proximity to the market where they were experiencing the fastest growth in new retail store locations. Business

practices were in place to move more North Asian import cargo all-water and the cutoff in access to West Coast ports essentially jump-started that strategy. One carrier summarized the situation very succinctly as, “The driver for all-water routings to the East Coast is the retail customer... our services will be tailored to meet that demand”. They added, “What speaks in favor of increased use of the Panama Canal is the expected growth coming from China and the growing infrastructure issues on the West Coast. The ideal point for 8,000 TEU vessels via the Panama Canal is when the lower slot costs can be achieved under a full vessel scenario”.

This carrier defines a “full vessel scenario” as the reduction or elimination of infrastructure limitations such as port berthing and channel depths. They expect to keep slot costs down by not only deploying larger vessels, but by “minimizing the number of East Coast port calls with the potential to save a vessel in the rotation”. This is a natural extension of the current deployment evolution being experienced on the West Coast, where the 8,000 TEU ships make limited calls due to the extended time it takes to off load 8,000 containers (up to four days and the need for as many as ten dedicated stack trains for just one ship). Similarly, the Grand Alliance recently announced a faster deployment schedule in one of their Far East – Europe strings, which is being achieved by using only seven vessels instead of the traditional eight ships and limiting port calls.

The other carrier supports the position that the importer dictates the need for all-water service. They emphasized that direct service to the East Coast provides an alternative to the congestion at West Coast ports and on the inland U.S. rail network. They said, “There is no doubt that we will grasp the chance to deploy larger vessels through the Canal, of a size that the enlarged locks will allow”.

As previously mentioned, one carrier has no plans to deploy vessels from China to the East Coast via the Suez Canal. The other carrier expressed a similar reservation. They stated, “We do not subscribe to significant capacity for northeast Asia cargoes on Suez strings. Touching many geographies, the Suez allows for other regional cargo revenue opportunities”.

Clearly, the deployment of post-Panamax vessels via the Panama Canal will not be an “off-to-on” switch decision. One carrier pointed out, “Given what is known today, we would foresee a mix of Panamax and traditional post-Panamax vessels worked into our Canal routing”. The other carrier inferred that the timing for implementation of post-Panamax ships would have to allow for the expansion in East Coast port capacity since they intend on continuing to serve all ports in their current rotation.

Financial Comparisons

Below are the detailed “fully utilized” slot cost comparisons for the three vessels sizes being evaluated from North Asia. All assumptions for each carrier are shown after the tables.

It should also be noted that one carrier calculates the equivalent of a company internal time charter rate for vessel capital costs. Many of the larger ocean carriers that own and charter numerous vessels of varying sizes maintain a division within their organization to manage asset costs. This division may indeed be a profit center, capturing the majority of the savings achievable from updating vessel fleets. Each operating division for that carrier is given a vessel cost allocation that equalizes the actual fleet costs across all operating units.

Additionally, future Canal charges are estimated using the current toll structure.

Carrier #1

1. North Asia to USEC over Panama

	<u>Vessel Type (TEUS)</u>		
	4,000	6,000	8,000
Total operating cost US\$ million	172.8	236.7	288.9
Round Trip Slot cost US\$/TEU	829	757	693
Cost for providing 4,000 TEUS US\$ mn.	172.8	157.8	144.5
Savings vs 4,000 TEUS US\$ million	0	15.0	28.3

2. North Asia to USEC over Suez

	<u>Vessel Type (TEUS)</u>		
	4,000	6,000	8,000
Total operating cost US\$ million	222.3	309.9	369.4
Round Trip Slot cost US\$/TEU	1,069	993	887
Cost for providing 4,000 TEUS US\$ mn.	222.3	206.6	184.7
Savings vs 4,000 TEUS US\$ million	0	15.7	37.6

3. North Asia to USWC direct

	<u>Vessel Type (TEUS)</u>		
	4,000	6,000	8,000
Total operating cost US\$ million	95.3	134.2	162.7
Round Trip Slot cost US\$/TEU	457	429	390
Cost for providing 4,000 TEUS US\$ mn.	95.3	89.5	81.4
Savings vs 4,000 TEUS US\$ million	0	5.8	13.9

Service description

1. Service: North Asia to USEC over Panama

Vessels: 8

Rotation: Yantian, Hong Kong, Kaohsiung, Yokohama, Panama Canal, Charleston, Norfolk, Newark, Charleston, Panama Canal, Yokohama and Yantian.

2. Service: North Asia to USEC over Suez

Vessels: 10

Rotation: Kaohsiung, Hong Kong, Yantian, Singapore, Colombo, Jeddah, Suez, Gioia Tauro, Algeciras Halifax, Newark, Norfolk, Charleston, Newark, Algeciras, Gioia Tauro, Suez, Jeddah, Colombo and Kaohsiung.

3 Service: North Asia to USWC

Vessels: 5

Rotation: Yantian, Hong Kong, Kaohsiung, Yokohama, Los Angeles, Oakland, Yokohama, Kobe, Kaohsiung and Yantian.

Cost assumptions

Vessel cost: 4,000 TEUS: US\$ 33,000/day (US\$ 8.25/TEU)
6,000 TEUS: US\$ 48,000/day (US\$ 8.00/TEU)
8,000 TEUS: US\$ 60,000/day (US\$ 7.50/TEU)

Panama Canal cost: 4,000 TEUS: US\$ 140,000
6,000 TEUS: US\$ 175,000
8,000 TEUS: US\$ 210,000

Bunker consumption: 4,000 TEUS: 100-125 tons per steaming day depending on speed
6,000 TEUS: 144-165 tons per steaming day depending on speed
8,000 TEUS: 174-199 tons per steaming day depending on speed

Bunker cost: US\$ 170/tons

Carrier #2

All-water Asia - U.S. East Coast via the Panama Canal

Vessel size	Panamax 4250 TEUS		Panamax 5600 TEUS		Post Panamax 6500 TEUS		Post Panamax 8200 TEUS
Vessel capacity through Panama / TEUS	4000		4600		6400		8100
Capital cost per TEU	100		96		78		75
Operating cost per TEU	100		103		104		88
Cost per TEU	100		100		93		83
Yearly capacity	100		115		160		202

Moves per voyage	10000		11500		16000		19500
Average berth productivity / moves per hour	60.5		61.5		70.5		81.5
Service speed / knots	22.0		22.5		23.5		23.5
Fuel per day at service speed / tons	135		160		245		255
Buffer days at service speed	2.8		2.8		3.0		3.3

Rotation / 56 days
XIAMEN YANTIAN HONG KONG PANAMA CANAL KINGSTON PORT EVERGLADES SAVANNAH NEW YORK NORFOLK KINGSTON PANAMA CANAL XIAMEN

Traspacific Asia - U.S. West Coast Direct

Vessel size	Panamax 4250 TEUS		Post Panamax 6500 TEUS		Post Panamax 8200 TEUS
Vessel capacity / TEUS	4000		6400		8100
Capital cost per TEU	100		78		75
Operating cost per TEU	100		104		87
Cost per TEU	100		90.5		81
Yearly capacity	100		160		202

Moves per voyage	9500		14500		18000
Average berth productivity / moves per hour	73		97		101
Service speed / knots	20.5		21.5		22.5
FO per day at service speed / tons	110		200		220
Buffer days at service speed	2.7		3.1		3.0

Rotation / 35 days
XIAMEN HONG KONG YANTIAN PUSAN LONG BEACH OAKLAND XIAMEN

Industry Benchmarks

There is no single answer to the complex issue of when larger ships create sufficient economies of scale to warrant a continued movement to post-Panamax deployments in such trade routes as the all-water Panama Canal service to East Coast ports from North Asia. Certainly, actual carrier cost models and their planned strategies indicate that as new 8,000+ TEU vessels are built, there will continue to be a cascading of smaller ships into the larger demanding trades. Today, the top four carriers serving the East Coast of the U.S. via the Panama Canal account for 61% of all 8,000+ TEU vessels to be delivered by 2007.

Carriers with the largest expected delivery of 8,000+ TEU vessels by 2007			
	Share of all-water Canal trade from North Asia	Number of 8,000+ TEU vessels Deployed by 2007	% of order/delivery book of 8,000+ TEU vessels
Maersk	13%	36	20%
Med Shipping	6%	29	16%
CMA-CGM	3%	17	10%
China Shipping Container Line	4%	15	8%
COSCO	7%	13	7%
Others	67%	68	39%

Sources: PIERS for Q1 2004 trade data shares, BRS Alphaliner for vessel orders

Lloyd's Register recently concluded that "larger ships offer reduced costs, even taking into account the additional time spent in port". This finding has been echoed by other consultants, vessel operators, ship builders and financial market analysts. In the February 2003 preliminary report of the Port of New York & New Jersey "Comprehensive Port Improvement Plan", specific reference was made to the combined conclusions of two reputable maritime consulting companies as follows:

"Regarding the phasing in of larger containerships, both Ocean Shipping Consultants and Drewry Shipping Consultants consider that vessels in excess of 8,000 TEU will continue to be ordered and commissioned during this decade, Drewry envisaging that vessels of between 8,000 and 10,000 TEU would be the workhorses of the main east/west trades by the end of the decade, and Ocean concluding that vessels of between 10,700 and 12,500 TEU would be commissioned within the next five to ten years".

This same strategic document for the leading East Coast U.S. port points out that even if the ports deepen channels to depths of 50 feet, they will lose vessel calls from Asia if the Panama Canal is not expanded. Explicitly, if the Canal Panamax ship restriction remains in place in 2020, the number of all-water calls (and related Canal transits) will drop for all ship sizes up to the limiting 5,000 TEU vessel size.

Conclusions and Recommendations

It is the conclusion of R. K. Johns & Associates that global container carriers will deploy post-Panamax vessels in their all-water North Asia to U.S. East Coast service as quickly as the Canal's expansion and port developments permit. The explicit operating cost savings defined by the two carriers surveyed for this project validate that 8,000 TEU vessels are both economically efficient and the preferred choice for an all-water service.

The industry consensus is that the 8,000 TEU vessel will become the standard for major trade lane services. Charles deTrench, analyst for Smith Barney-Citibank Global Markets has praised OOCL's leadership in deploying 8,000 TEU vessels where possible today. He said, "The new vessels have resulted in cost per slot falling by as much as 30% compared to a 5,500 TEU vessel and if OOCL maintains its high utilization, it would provide an edge in driving down costs compared to major competitors".

We believe that three key events already in place today in the transpacific trades combine to provide the environment in which carriers would benefit from deployment of both 6,000 and 8,000 TEU vessels via a Panama Canal that is not restricted by ship size:

- Strong market demand for an all-water East Coast service from Asia by the major American retailers, aligned with their distribution center and store expansion plans
- Competitive advantages presented by the introduction of larger vessels with economies of scale
- Progressive strategic plans by the leading carriers to cascade post-Panamax vessels into trade lanes that exhibit strong, sustainable growth

The financial analysis and strategic plans of the two carriers interviewed for this report validate this conclusion.

We recommend that further investigations be conducted exclusively and confidentially with other key container carrier executives to corroborate the financial results presented here for just two carriers.

CARRIER QUESTIONNAIRE

All discussions and financial analysis related to the responses obtained from the following questions will be held in the strictest confidence by RKJ&A and will be utilized by the ACP for internal planning purposes only.

For the following, please assume that the transpacific eastbound container trade from North Asia to the U.S. will continue to exhibit steady, robust growth especially from China. Overall volumes are projected to grow from today's level of approximately 7.5 million TEU to above 20 million TEU by 2025, equaling an annual average compound growth rate of 5%.

1. If the Panama Canal expands capacity to handle post-Panamax ships by 2013, what capacity vessels would you initially deploy through the Canal?

By 2020?

By 2025?

2. Using current or estimated costs, please break out the one-way (eastbound) vessel operating cost per TEU for these different size vessels and trade lanes:

This requested information would preferably be provided in detail on an EXCEL spreadsheet format.

NE Asia –to- U.S. East Coast via the Panama Canal			
Vessel Size	- - - Cost per TEU - - -		
	Operating cost	Capital cost	Total cost
4,500 TEU			
6,000 TEU			
8,000 TEU			

NE Asia –to- U.S. West Coast			
Vessel Size	- - - Cost per TEU - - -		
	Operating cost	Capital cost	Total cost
4,500 TEU			
6,000 TEU			
8,000 TEU			

NE Asia –to- U.S. East Coast via the Suez Canal			
Vessel Size	- - - Cost per TEU - - -		
	Operating cost	Capital cost	Total cost
4,500 TEU			
6,000 TEU			
8,000 TEU			

Please identify your assumptions in calculating these costs (number of port calls & related charges, vessel speeds and related fuel costs, container costs, ship utilization rates, etc.) by vessel size.

3. What criteria do you use to decide the vessel size to be deployed on each transpacific trade lane?

Direct service to the West Coast U.S.

All-water service via the Panama Canal

All-water service via the Suez Canal

4. At what point would an 8,000 TEU vessel be the “ideal” ship size to be deployed to serve all-water U.S. East Coast trade via the Panama Canal?

5. If the Panama Canal expansion in 2013 permitted more vessel voyages, but restricted ship size to the current Panamax configuration (approximately 4,500 – 5,000 TEU vessels), how would you deploy your transpacific services?
