



**Study of the Conventional Bulk-
Refrigerated (Non-Containerized)
Cargo Market Segment –
Conventional Reefer Ships**

**Estudio del Segmento de Mercado de
Carga a Granel Refrigerada (No
Contenerizada) Convencional –
Buques Refrigerados
Convencionales**

Global Insight Co.

9 de marzo de 2004

Contrato No. 111916

Resumen Ejecutivo

FINAL REPORT

**STUDY OF THE CONVENTIONAL BULK-REFRIGERATED
(NON-CONTAINERIZED) CARGO MARKET SEGMENT
CONTRACT SAA-154968**

Volume I – Conventional Reefer Ships

PREPARED FOR:



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9 March 2004

Executive Summary

Global Insight, in conjunction with LauritzenCool, initiated this study of the Conventional Bulk-Refrigerated (non-containerized) Cargo Market Segment on July 1, 2003. This report covers the long-term forecast for this segment in terms of cargo demand, Canal transits and revenue, and the conventional reefer ship fleet.

Global Trade Outlook – Reefer Products

Global international trade in perishable products requiring refrigeration totaled 60.7 million metric tons in 2003, up 7 % from the previous year. The long-term forecast, however, calls for slower average annual growth of 2.4% through 2025, reaching 103 million metric tons in the final year. This forecast is in line with population and income growth expected in the major consuming regions of the world. The study analyzed the outlook for 9 major reefer product categories:

- Bananas
- Seafood
- Other Deciduous Fruit
- Citrus Fruit
- Meat
- Vegetables
- Poultry
- Apples
- Dairy

Each product was separately modeled and projected by route, using the Global Insight World Trade Model as the basis of the demand projections.

Bananas, the highest-volume segment of the international reefer trades, is projected to grow more slowly than the group's overall average, at 2.1% annually. However, the second-largest commodity, seafood, is projected to post average growth.

Canal Traffic – Conventional Reefer Ships

The percentage of Canal reefer tonnage that transits on conventional reefer ships has been declining, from 73% in FY1995, to 55% in FY2003. While the new reefer ships are larger in capacity, they have lost market share to reefer containers which are preferred by many importers, especially in the U.S., and which also provide flexibility for inland distribution.

Canal transits by reefer ships were 2,199 in FY2003, down from 2,578 in FY1995, implying an average annual decline of 2.0%. Transits hit a low of 2004 in the year 2000; since 2000 transit growth averaged 3% per year. Total Canal revenues over the 1997-2003 period increased 1.9% per year, reaching \$37.1 million last year (2003).

In reefer ships, the Canal handled 9.1% of the world trade in refrigerated commodities in 2003, down from 14.2% in 1995. The largest reefer ship to transit the Canal (2003) was 16,000 deadweight tons, and the average ship was 10,000 DWT. In cubic feet capacity, these figures translate to 766,000 cubic feet for the largest ship, and 455,000 for the average.

Forecast Summary

The Panama Canal Reefer Model developed by Global Insight produces annual forecasts through 2025 for Canal transits, revenues, PCUMS, and cargo long tons. The forecasts are consistent with the trade flows assumptions from the World Trade Model, expectations of toll rates over time, changes in the reefer fleet including competition from containers, and route-switching costs. A summary of the forecast, including two years of history, is shown below.

**Table ES.1
Panama Canal Forecast Summary**

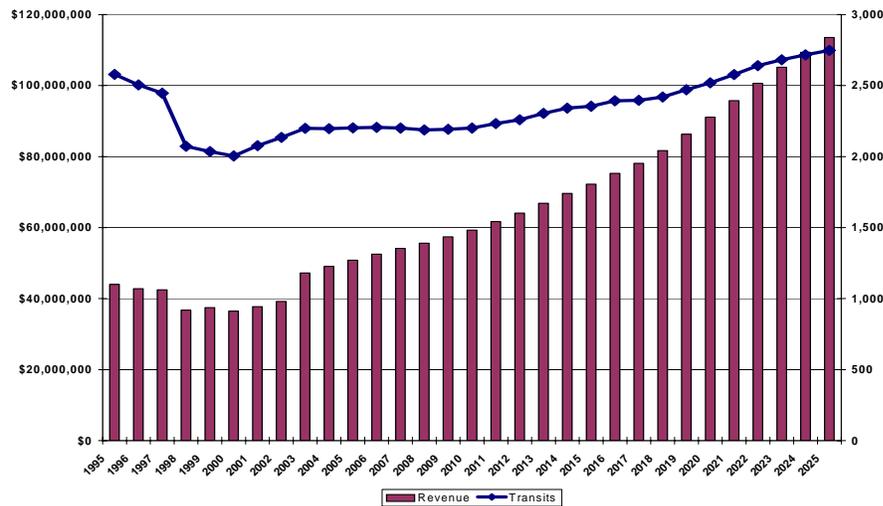
	1995	2000	2003	2010	2025	1995-2003	2003-2025
Transits	2,578	2,004	2,199	2,184	2,702	-2.0%	0.94%
Revenue	\$43,989,924	\$36,492,142	\$47,649,198	\$58,428,957	\$111,701,847	1.0%	3.95%
PCUMS	18,084,297	15,193,581	17,206,497	17,447,873	23,055,322	-0.6%	1.34%
Cargo	5,781,014	4,781,539	5,453,194	5,570,923	7,038,681	-0.7%	1.17%
World Inflation (1997=100)	104.9	96.0	103.8	125.8	181.3	-0.1%	2.57%

Source: History from ACP. Forecast based on study results

Transits Forecast

The Panama Canal Reefer Model predicts that transits will increase slowly through 2025, averaging only 1% per year and reaching 2,702 in the final year of the forecast. This forecast is based on global projections for reefer trade flows, an expected growth in the average size of reefer ships over time, the impact of continued containerization in the reefer sector, and Canal tolls that increase annually over the forecast with the world inflation rate. The revenues, therefore, reflect the growth in transits and an assumed increase in toll rates, under the current PCUMS-based structure. The forecast also incorporates the decision rules for selecting by-pass alternatives based on total origin-destination costs and the time costs associated with financing the cargo and possible product deterioration. The transits and revenue forecasts are illustrated in the figure below.

**Figure ES.1
Canal Revenues & Transits**



Source: History from ACP. Forecast based on study results

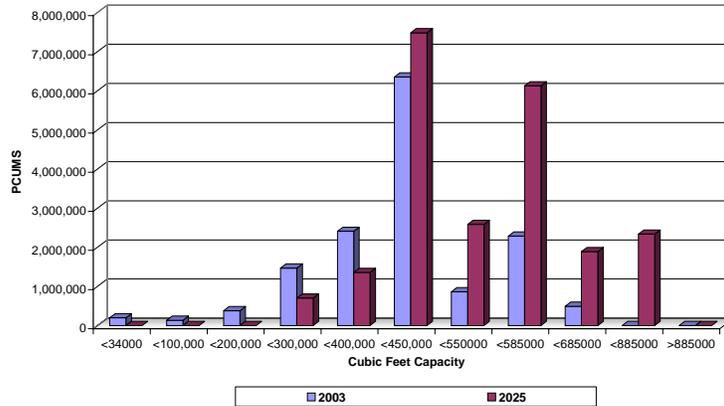
Revenue Forecast

Revenue is forecast through 2025 based on a PCUMS-based toll that increases annually at the rate of world inflation of 2.6%. The shift to larger reefer ships over time has a dampening effect on revenues because toll rates decline as the PCUMS of the ship increases. On average, revenues grow by 4.0% per year, climbing from \$47.6 million in 2003 to \$111.7 million by 2025. Revenues increases are consistent with a 2.6% average annual increase in toll revenues and a 1.3-1.4% increase in PCUMS discussed below. We assume that service revenues hold the same proportion to tolls revenue, therefore also increasing at the world inflation rate.

PCUMS Forecast

The average PCUMS of Canal-transiting reefer ships is projected to grow from 1.3 million to 2.0 million. This is consistent with the expected growth in the size of reefer vessels over time, coupled with the scrapping of older, smaller vessels. This change can be seen in the figure below. In total, the PCUMS associated with reefer ships transiting the Canal is projected to rise from 17.2 million PCUMS in 2003 to 23.1 million PCUMS by 2025, representing a 1.34% average annual growth rate.

**Figure ES.2
PCUMS Changes, 2003-2025**



History from ACP. Forecast based on study results

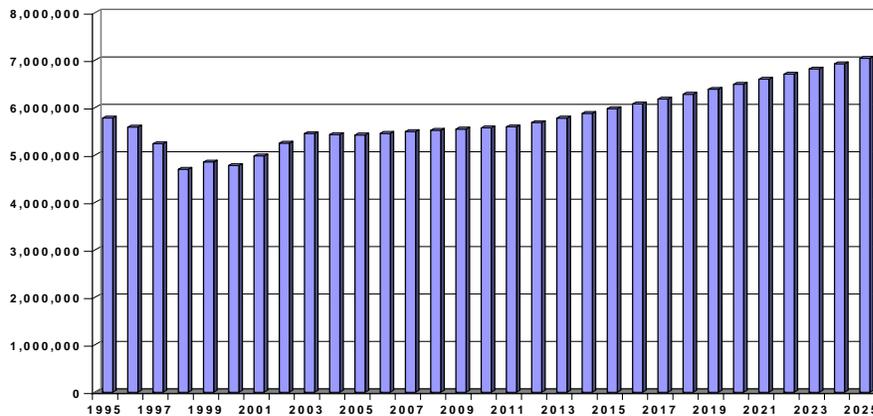
Source:

Cargo Forecast

The reefer cargo forecast incorporates global trade (demand) projections for reefer products and the expected changes in the reefer fleet over time. Fleet changes include slightly larger ships, more containerization of reefer cargos, and fewer additions to the fleet when compared with history. The cargo projections also reflect the rise in tolls, at the rate of world inflation.

The volume of reefer cargo grows from the 2003 level of 5.5 million long tons, to 7.0 million in the final year of the forecast, 2025. This represents an average annual growth of 1.2% over the forecast period.

**Figure ES.3
Canal Cargo - Long Tons**



Source: History from ACP. Forecast based on study results

The Reefer and Containership Fleets

At the end of 2003, there were 1,285 conventional reefer ships in operation worldwide, including the fish carriers, and multiple-purpose reefer ships that carry both reefer commodities and general cargo, or passengers, or roll-on/roll-off vehicles, etc. Since 1995, the number of new ships added to the fleet has been less than the number being scrapped; hence, the conventional reefer fleet has shrunk. In 2003, the net change in reefer capacity was a decrease of more than 5.5 million cubic feet. For 2004, only 3 new ships are scheduled for delivery.

While the conventional reefer ship capacity has declined, the container shipping capacity has increased and, therefore, so has the total reefer container capacity. Containership operators realize that the revenue to be earned from the reefer boxes quickly off-sets the investment for the required electricity. The shift to containers is strong and will likely continue, as containers provide the flexibility of delivery needed in many markets. The shift to containers over time, by commodity, is incorporated into the Canal reefer ship transit and revenue model, with the result that the growth in reefer ship cargo is less than overall demand growth for perishable goods.

Whether reefer cargo is shipped on conventional reefer ships or in containers depends not on the freight rates being charged for each mode but rather on the volume of cargo. Based on extensive interviews with exporters, importers, and reefer shipping lines, it is clear that the reefer ships are in highest demand when container capacity on liner services is insufficient to accommodate the demand, and when buyers specify reefer over containers (e.g. Northern Europe).

The conventional future reefer fleet, in the face of a market switch to containers, is likely to continue its decline. We expect the number of ships to decline even as capacity grows slightly, since the few new ships being added are at the large end of the size spectrum.

The current reefer ships transiting the Canal are small in terms of deadweight tons and overall dimensions. Based on the expected growth in reefer demand, we expect the ships to become moderately larger over time, while the number of such vessels declines. The output tables from the Panama Canal model, developed for this project, show that the ***future ship sizes will not be constrained even by the current dimensions of the Canal.***

The strength of reeferships is that they provide cover during peak crop seasons that containerships cannot economically provide. Refrigerating entire holds is considerably cheaper than refrigerating cargo in individual containers, each with its own integral power unit. However, refrigerated cargo shipments are largely one-directional, limiting revenue opportunities on the return legs. Ship designers are still trying to make it easier for reeferships to carry non-refrigerated consumer goods on otherwise dead return legs. The stumbling block is money. The rewards for technological advances are not expected to be sufficient to stimulate significant change. Cargo is king, and increasingly the end-to-end control of the cargo is the key to profitability. Shipping lines are expected to continue to balance smaller reefer ships with larger container ships.

As a result, the forecast of Canal transits is unaffected by the proposal of a larger Canal. The reader is directed to Chapters III and IV.

Economic Value of the Panama Canal

As part of the modeling system for this project, Global Insight developed a model to reflect the value of the Panama Canal route versus bypass alternatives. The model simulates alternative route selection by incorporating distance, operating costs (both fixed variable, such as fuel consumption) and time costs which reflect both the financing of the cargo and the fact that the cargo is perishable. The model uses a 10,000 DWT reefer ship, which is the average ship size transiting the Canal.

The economic value of the Canal is the savings to the shipping line in using the Canal versus the minimum cost alternative bypass.

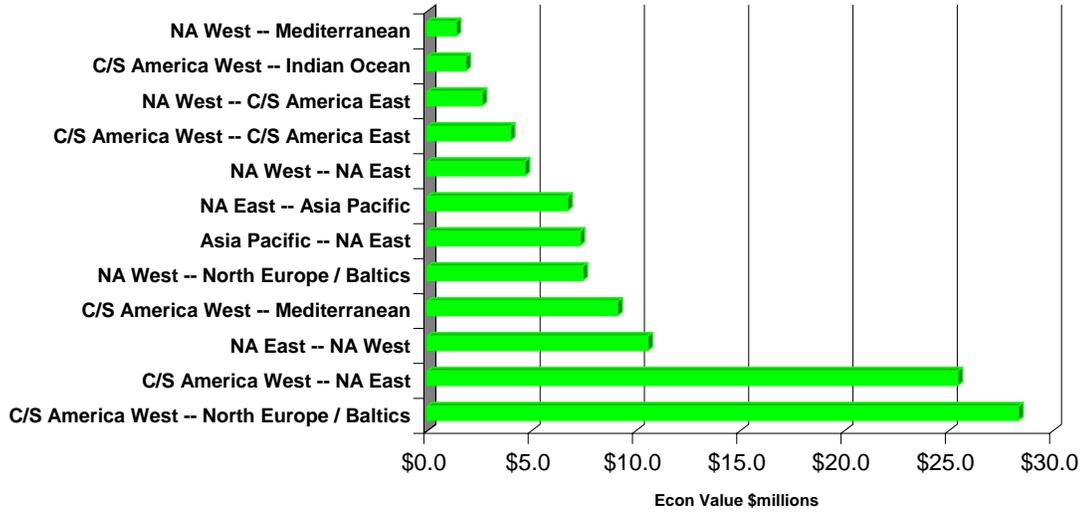
The economic value including both operating savings and time cost savings is \$113 million , or \$20 per metric ton. By commodity, the value is highest for bananas by a large margin, as shown in the table below. For bananas, the value is \$65 million or \$24.07 per metric ton, or \$.41 per cubic foot, or \$14.65 per cubic meter. Other deciduous fruit is a distant second with economic value of \$17 million. Table ES.2 identifies the economic value associated with each of the nine refrigerated products analyzed in the study.

**Table ES.2
Economic Value of the Panama Canal by Commodity**

Commodity	Net Value of the Panama Canal		
	US Dollars	US Dollars per Ton	% of Total
Meat	\$2,673,313	\$12.75	2.40%
Poultry	\$2,252,178	\$16.70	2.00%
Dairy	\$468,797	\$9.35	0.40%
Seafood	\$14,463,969	\$19.32	12.80%
Vegetables	\$3,575,599	\$20.09	3.20%
Citrus	\$2,118,674	\$22.38	1.90%
Bananas	\$64,857,077	\$24.07	57.50%
Apples	\$5,146,704	\$11.17	4.60%
Other Deciduous	\$17,171,205	\$16.16	15.20%
Total:	\$112,727,515	\$20.01	100.00%

When the economic value is calculated by route, it is clear that the West Coast of Central And South America generates the highest source of economic value, with destinations in the US East Coast and Northern Europe. This is shown in the chart below, where each of the major routes is displayed in terms of the Canal’s economic value.

Figure ES.4
Economic Value of the Canal, by Route



Marketing Strategy Recommendation

Global Insight developed a pricing model, delivered to the ACP in December 2003, designed to test the initial impact of changes in toll levels and toll structures, including different toll rates by PCUMS. Because reefer ships are grouped into a relatively small PCUMS category, we divided the ship transits into new PCUMS groupings in order to refine the tolls by PCUMS category. We also examined the discount provided to ballast vessels, and the rate of "other service revenue" which stems from non-toll activities during the transit.

Based on the economic value of the Panama Canal (\$113 million) for the conventional reefer ship market segment, Global Insight examined three pricing options designed to capture approximately 50%, 60%, and 70% of the value through new toll levels and structures. Each marketing (pricing) strategy is summarized in the table below, showing the resulting revenues. It should be noted that each of the pricing scenarios was run through the demand and transit model in which there is a pre-calculated toll and service charge elasticity. Therefore, the revenues quoted here reflect this elasticity of demand.

**Table ES.3
Canal Marketing Strategy Options**

Element	Current Plan FY2003	50% Plan FY2004	60% Plan FY2004	70% Plan FY2004
Laden tolls				
First 3500 PCUMS	\$2.96	\$3.40	\$4.10	\$6.00
Next 3000 PCUMS	\$2.96	\$3.30	\$3.90	\$4.00
Next 3000 PCUMS	\$2.90*	\$3.20	\$3.75	\$3.50
Remaining tons	\$2.85	\$3.10	\$3.45	\$3.50
Ballast discount	20.6%	20.6%	15%	15%
Service revenue	\$.28 per PCUMS	\$.28 per PCUMS	\$.28 per PCUMS	\$.28 per PCUMS
"Lost" Transits		17	47	53
Net Revenue (\$MM)	\$47.6	\$55.6	\$65.3	\$78.0
Target Rev (\$MM)		\$56.5	\$67.8	\$79.1

Conclusions

The outlook for the conventional bulk reefer ship sector calls for steady but slow growth, with little loss of cargo to alternative routes, even under considerable toll increases. Given the shift to containers and the expected slow growth in bulk reefer ship capacity, the outlook will not place any strain on the existing Canal. In short, an expanded Canal will not be viewed as a major benefit by this market segment.