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Ocean Transportation Serving Pacific Northwest Agriculture

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OCEAN TRANSPORTATION SERVING PACIFIC NORTHWEST AGRICULTURE

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INTRODUCTION

International trade profoundly influences the agricultural economy of the Pacific Northwest. A number of PNW agricultural products rely on the export market as a principal outlet. For example, more than 90 percent of wheat produced in the region is exported. Also, international markets for potato products, apples, pears, cherries, and livestock are becoming increasingly important to PNW producers. Continued economic and population growth in Pacific Rim nations, which accounts for more than 60 percent of PNW agricultural exports, foretells further expansion of export market demand.

International trade also provides the region's agricultural producers with access to relatively low cost production inputs. Fertilizers, chemicals, and petroleum products are imported through PNW ports.

Beyond the benefit to agriculture, international trade, with agricultural trade a significant component, has a wide range of impacts on the broader economy of the PNW. Trade stimulates economic activity which creates jobs and income. It is estimated, for example, that for each 100 persons employed by a Washington State maritime port district, 150 to 170 jobs are generated in the aggregate economy.[1/] In the Portland metropolitan area, roughly one of 20 jobs is related to economic activity at the Port of Portland.[2/] In addition, state and local taxes are generated by port revenues and incomes. The strong performance of Puget Sound and Lower Columbia River maritime ports in recent years has been a major factor in enabling the PNW to maintain a relatively constant rate of growth. The performance of the ports is directly tied to the level and nature of international trade.

1/ Washington Public Ports Economic Study, Washington Public Ports Association, December 1978.

2/ Community Economic Impact of the Marine Terminals of the Port of Portland, Economic Research Associates, May 1976.

Ocean transportation plays a critical role in international trade in the PNW. Steamship rates, the supply of shipping capacity, and the quality of service all have impact on the competitive position of the PNW in world markets. Ocean transportation is particularly critical to producers of exportable agricultural products in the region since the price received by farmers equals the final market price minus the cost of marketing. In most cases, transportation accounts for the largest share of the total cost of export marketing, and, in general, the lower the cost of ocean transport services, the higher the price received by farmers. Moreover, transportation costs create a natural tariff that can curtail the volume of trade. When transportation costs are lowered, or held at a relatively low level, producers have the ability to gain access to new markets.

Considering the important implications ocean transportation has for agriculture in the PNW, relatively little is known about the workings of the international shipping system. This report is intended to contribute to a more complete understanding of the ocean freight industry which serves the region. It is hoped that through greater understanding of international shipping, private and public decision makers will be better able to pursue policies and develop planning to improve the use of this service.

The report is divided into four sections. The first section briefly reviews historic and projected levels of PNW agricultural trade. It is included to give a perspective of the demands which have been and will be placed on the transportation and logistics system which links the region to its principal world markets. The second section provides a description of Pacific Coast maritime commerce, regulation, the U.S. Flag Merchant Fleet, and ocean freight rates. The third section discusses physical characteristics of ocean vessels now in service and emerging technology in ocean transportation. The final section presents potential implications on agricultural trade from the PNW of likely forthcoming events and policy changes in ocean shipping. Among the topics addressed in this last section is the regional impact of the changing ownership and management of the Panama Canal. Finally, a listing of various shipping and ocean transportation terms is presented in Appendix A. Appendix B lists oceanborne foreign trade over essential U.S. West Coast trade routes.

INTERNATIONAL AGRICULTURAL TRADE FROM THE PACIFIC NORTHWEST

Three major factors have contributed to the recent increase in agricultural trade from the Pacific Northwest. First, there has been a steady growth in world demand for food, particularly in regions most directly served by PNW ports. Population and income increases in Japan, South Korea, Thailand, the Philippines, Singapore, and other Pacific Rim countries have led to this growth in demand. Second, agricultural production in the PNW has risen steadily. Consequently, large quantities of exportable surplus have been available. Finally, the volume of transshipped agricultural exports handled by PNW ports has risen substantially in the last few years. This has occurred largely because congestion at other major ports has persisted. Capacity constraints at the Gulf, and labor problems at Duluth-Superior, have resulted in a shift in agricultural export traffic, particularly grain, to the PNW.

The continued viability of the PNW in agricultural exports has meant that surpluses in agricultural trade for the region have served partially to offset deficits in nonagricultural trade. Table 1 shows the Pacific Coast trade balances for 1976. Although this represents the trade in a single year, the relationship between agricultural and nonagricultural imports and exports, over the long term, is nearly identical.

Table 1. Agricultural, Nonagricultural, and Total Trade on U.S. Pacific Coast Trade Routes (Trade Routes 23 through 29), 1976 (millions of dollars)

	Exports	Imports	Trade balance
Agricultural........	$2,668	$ 847	$1,821
Nonagricultural.....	7,329	16,000	-8,671
TOTAL...............	$9,997	$16,847	-$6,850

Source: United States Oceanborne Foreign Trade Routes, U.S. Department of Commerce Federal Maritime Administration, March 1978.

Table 2. Value of Export Shares of U.S. Agricultural Commodities, by State and Region, October to September 1971 to 1977[a/]

State and year ended June 30	Wheat and flour	Total feed grains	Fruits and preparations	Vegetables and preparations	Meats and products including poultry	Hides and skins	Lard and tallow (edible & inedible)	Nuts and preparation plus dairy and other	Total
	million dollars								
IDAHO:									
1971	37.5	7.6	0.5	26.0	1.8	4.1	3.6	15.9	97.0
1972	31.3	4.7	0.9	24.3	2.2	5.6	3.4	18.7	91.1
1973	66.3	8.3	0.7	34.3	3.3	11.1	3.7	20.6	148.3
1974	134.3	18.2	0.8	53.3	4.1	11.4	7.5	28.4	258.0
1975	180.3	13.9	1.1	77.6	3.3	10.6	5.9	24.2	316.9
1976	133.8	9.1	1.3	73.2	5.2	16.4	6.9	23.4	268.9
1977	89.4	23.8	1.7	84.1	5.5	20.5	9.3	19.5	253.8
OREGON:									
1971	22.7	4.0	4.6	3.9	2.0	4.1	3.1	16.1	60.5
1972	22.1	2.6	5.9	4.3	2.2	5.3	2.7	19.5	64.6
1973	55.1	3.2	8.2	6.9	2.9	9.4	2.5	22.3	110.5
1974	98.2	6.6	12.3	10.6	3.9	11.3	6.0	31.1	180.0
1975	154.3	4.8	12.8	12.3	3.0	9.2	3.8	17.4	217.6
1976	127.7	3.0	16.2	20.9	5.0	14.9	4.3	18.3	210.3
1977	94.2	5.8	15.9	21.8	5.8	17.8	6.5	14.9	182.7
WASHINGTON:									
1971	79.3	6.2	7.9	20.9	1.8	4.2	2.2	33.6	156.1
1972	76.1	5.0	9.0	21.9	2.0	5.4	2.1	41.5	163.0
1973	182.4	6.2	15.1	39.2	2.6	8.4	2.1	47.2	303.2
1974	248.1	14.2	19.8	56.4	3.5	9.5	4.7	52.2	408.4
1975	356.3	10.0	23.7	62.5	3.1	8.9	3.7	43.1	511.3
1976	322.3	9.0	28.6	85.5	4.8	13.2	3.7	53.1	511.2
1977	224.1	19.2	32.1	82.7	5.8	18.0	5.7	36.5	424.1
TOTAL PNW:									
1971	139.5	17.8	13.0	50.8	5.6	12.4	8.9	65.6	313.6
1972	129.5	12.3	15.8	50.5	6.4	16.3	8.2	79.7	318.7
1973	303.8	17.7	24.0	80.4	8.8	28.9	8.3	90.1	562.0
1974	480.6	39.0	32.9	120.3	11.5	32.2	18.2	111.7	846.4
1975	690.9	28.7	37.6	152.4	9.4	28.7	13.4	84.7	1045.8
1976	583.8	21.1	46.1	179.6	15.0	44.5	14.9	94.8	990.4
1977	407.7	48.8	49.7	188.6	17.1	56.3	21.5	70.9	860.6

[a/] Based on State's portion of U.S. production of individual commodities that go into export.

Source: Foreign Agricultural Trade of the United States (FATUS), November 1974, February 1978, and March/April 1979.

The value by major categories of agricultural commodities exported from the U.S., attributed to Pacific Northwest production, is shown in Table 2. With the exception of 1977, which was a drought year, the total value of U.S. production attributed to the region, which goes into export, increases every year. From 1971 to 1976, the dollar value of these exports from the PNW more than tripled.

Data available for 1977 show that from 50 to more than 80 percent of the year's total production and carryover of Kentucky bluegrass seed, lentils, hop extract, bentgrass seed, wheat, dry peas, canned sweet cherries, and peppermint was exported.[3/] Fifty-five agricultural commodities grown in the region were identified as depending in part on overseas markets. The most important export crop in dollar terms in the Northwest is wheat, specifically white wheat.

Wheat exports from PNW ports are shown for 1955 through 1977 in Table 3. The volume of these exports has increased in most of those years, especially in the 1970s. Table 4 gives an approximate breakdown of grain movements in 1976 from Pacific Northwest ports to overseas regions.

Table 3. Pacific Northwest Wheat Exports (1,000 short tons)

Year	Columbia River	Puget Sound	Total
1955	1,246	528	1,774
1960	3,024	1,255	4,279
1965	4,120	1,092	5,212
1970	5,572	1,450	7,022
1971	4,040	1,143	5,183
1972	4,809	1,510	7,319
1973	7,200	2,307	9,507
1974	6,995	1,421	8,416
1975	6,622	1,787	8,409
1976	8,684	2,481	11,165
1977	7,830	1,681	9,511

Source: Waterborne Commerce of the United States, U.S. Army Corps of Engineers.

[3/] Hallett, Edward. Politics in Marketing: Case Studies in Overcoming Trade Policies that Restrict PNW Agri-Exports. Oregon Department of Agriculture, December 1978, p. 18.

Table 4. Grain and Feed Grain Exports from PNW Ports, 1976

PNW exporting port	Million long tons	Importing port zone	Million long tons
Portland..................	4.2	West Asia	1.2
		East Asia	2.6
		Rest of world	0.4
Longview..................	1.6	West Asia	0.6
		East Asia	0.9
		Rest of world	0.1
Seattle...................	1.0	East Asia	0.5
		Rest of world	0.5
Tacoma....................	1.0	West Asia	0.4
		Rest of world	
Other.....................	1.7		
Total PNW exports.........	9.5		

Source: National Technical Information Service, Washington, D.C. Development of a Standardized U.S. Flag Dry-Bulk Carrier: Phase 1 Final Report, PB-292269. Prepared for U.S. Department of Commerce Maritime Administration. New York: M. Rosenblatt and Son, Inc., January 1979, p. 65.

It is estimated that 10.2 to 13.9 million metric tons of white wheat will be needed to meet export demands by 1990, and 14.3 to 23.5 million metric tons will be needed to meet export demands by the year 2000.[4/] The Federal Maritime Administration has made a somewhat more conservative forecast. However, both projections indicate that export activity will increase.

A 1977 study providing projections of traffic flows through Pacific Northwest ports through the year 2000 was conducted by the U.S. Department of Commerce Maritime Administration.[5/] The study of major export and import groups included forecasts for 1980 through 2000 (Table 5). These

[4/] O'Rourke, A. Desmond. "Projecting Export Demand for Pacific Northwest Wheat." Working draft, Table 10, page 20. Department of Agricultural Economics, Washington State University, 1979.

[5/] U.S. Department of Commerce Maritime Administration. "A Long-Term Forecast of U.S. Waterborne Foreign Trade, 1976-2000." Three-Digit World, Regional and Coastal Route Forecast, Vol. 2, No. PB 274-602. Springfield, Virginia: U.S. Department of Commerce, November 1977, pp. 180-187.

Table 5. Projected Agricultural Product Traffic Flows Through Pacific Northwest Ports (long ton thousands)

Agricultural exports	1973 actual	1974 actual	1975 actual	1980 projected	1990 projected	2000 projected
Wheat, unmilled..................	8,477	7,468	7,459	8,723	10,731	13,451
Barley, unmilled.................	675	613	276	282	346	442
Corn, unmilled...................	16	24	1	12	16	21
Other unmilled cereals...........	59	12	5	17	22	29
Wheat flour, etc.................	111	78	33	32	51	105
Cereal and flour preparations.....	109	51	85	117	157	221
Feeding stuff....................	56	57	107	118	197	342
Fruits, fresh....................	47	40	43	60	76	92
Meat, fresh, chilled, frozen......	12	5	10	9	13	
Vegetables, fresh, chilled, frozen	175	133	133	174	215	276
Vegetables, preserved............	8	10	14	11	13	17
Hides and skins..................	43	51	64	66	83	96
TOTAL EXPORTS (including agricultural and nonagricultural).....	29,206	27,591	25,955	36,195	58,275	97,351
TOTAL IMPORTS....................	11,958	14,414	14,833	18,194	25,639	39,662
TOTAL TRAFFIC....................	41,164	42,005	40,788	54,389	83,914	137,013

Source: U.S. Department of Commerce Maritime Administration. "A Long Term Forecast of U.S. Waterborne Foreign Trade, 1976-2000," Three-Digit World Regional and Coastal Route Forecast, Vol. 2. pp. 180-187.

data include imports into the region and agricultural exports through Northwest ports that originate outside the region. It is necessary to consider these as well as nonagricultural commodities, since the total flow of traffic through the region's ports will determine what capacity must be available to meet the region's international transportation needs. Major trade routes of commerce to West Coast ports in 1976 are broken down in Table 6.

Given the dynamics of increasing foreign demand for agricultural products in the Pacific Rim countries by expanding populations and incomes and an improved political climate in the case of the U.S.-Sino trade, it seems reasonable to conjecture that these markets will play an even more important role in the future. Consequently, events which influence the performance of the international transportation system will have important implications for the economic viability of the PNW agricultural sector.

Table 6. Oceanborne Foreign Trade of U.S. West Coast Ports, 1976[a]

Trade route[b]	Exports: Total	Exports: Agriculture	Imports: Total	Imports: Agriculture
	long tons			
TR23 Pacific-Caribbean & East Coast of Mexico	135,367	69,951	2,021,430	26,008
TR24 Pacific-East Coast of South America	90,224	19,701	122,347	47,836
TR25 Pacific-West Coasts of South & Central America and Mexico	893,160	384,243	4,288,121	590,029
TR26 Pacific, Alaska, & Hawaii - Western Europe	3,883,096	843,978	982,852	-
TR27 Pacific - Australia, New Zealand	1,062,392	34,145	2,542,636	143,657
TR28 Pacific - S.W. Asia, Red Sea, & Gulf of Asia	3,651,739	3,383,721	17,550,514	26,652
TR29 Pacific, Alaska, & Hawaii - Far East	34,375,273	7,802,980	7,242,980	463,544
	$ values (millions)			
TR23 Pacific-Caribbean & East Coast of Mexico	$ 105.7	$ 28.7	$ 185.7	$ 8.2
TR24 Pacific-East Coast of South America	72.6	8.6	128.1	92.5
TR25 Pacific-West Coasts of South & Central America and Mexico	258.5	85.4	497.9	277.0
TR26 Pacific, Alaska, & Hawaii - Western Europe	1,236.5	379.7	1,375.2	-
TR27 Pacific - Australia, New Zealand	754.2	28.5	560.1	229.3
TR28 Pacific - S.W. Asia, Red Sea, & Gulf of Asia	897.0	531.6	1,663.8	42.1
TR29 Pacific, Alaska, & Hawaii - Far East	6,672.0	1,604.6	12,438.9	193.8

[a] Includes Washington, Oregon, and California coastal districts.

[b] Trade routes are shown on Figure 2, p. 21.

Source: United States Oceanborne Foreign Trade Routes. U.S. Department of Commerce, Maritime Administration, 1978.

DESCRIPTION OF MARITIME COMMERCE OF THE PACIFIC NORTHWEST AND U.S. WEST COAST PORTS

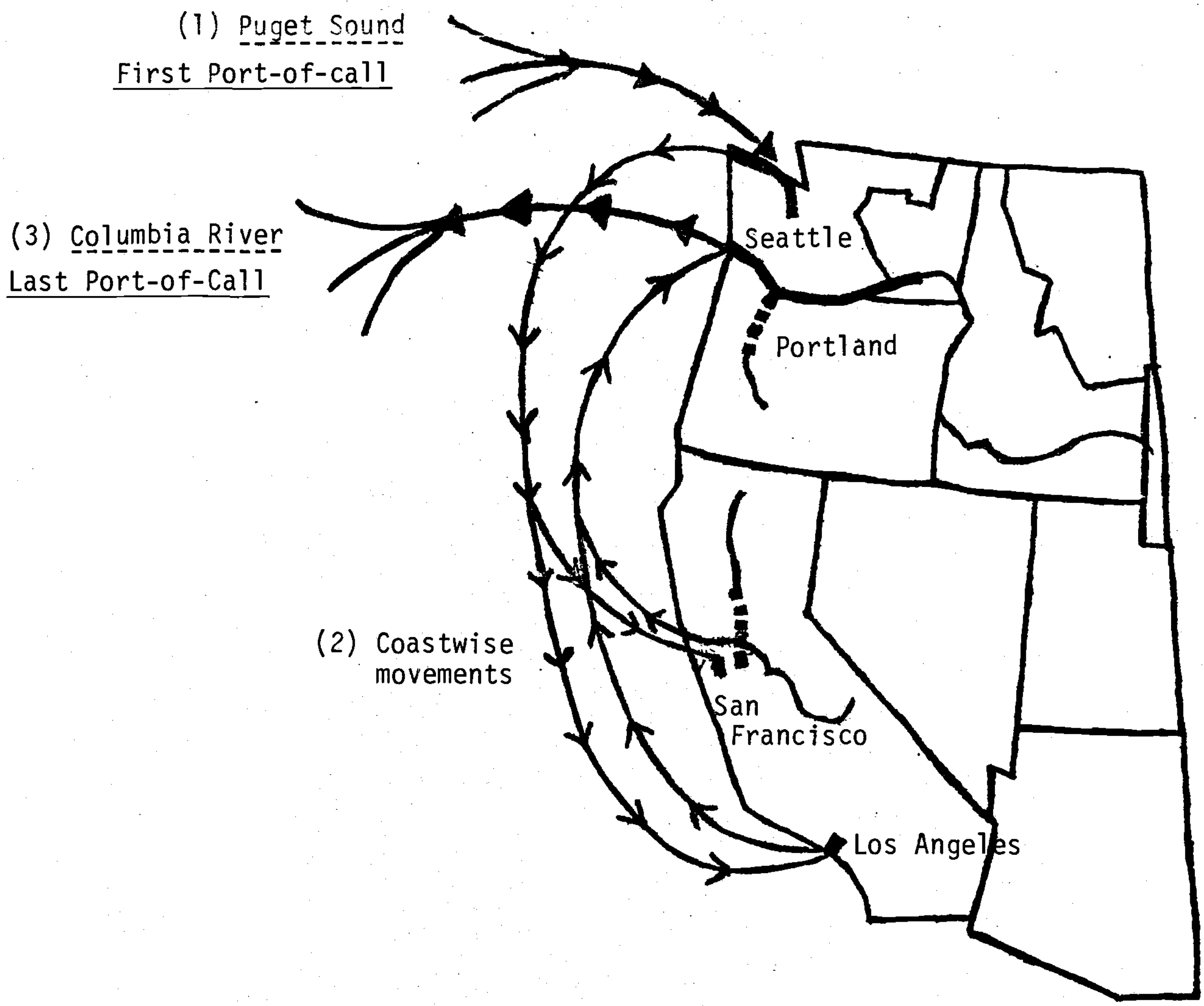
To fully appreciate the role of ocean transportation on the PNW and its agricultural sector, an understanding of maritime commerce and the ocean vessel system which serves the nation and the region is necessary. This section describes the ocean transportation system serving the Pacific Northwest. The maritime commerce of the Pacific Northwest and its relation to U.S. total maritime commerce are summarized. Maritime regulations, U.S. Flag Merchant Marine Fleet, and ocean freight rates will be discussed.

The Port-of-Call Rotation of Pacific Northwest Ocean Vessel Service

As discussed earlier, the balance and volume of imports and exports influence, and are influenced by, the availability of ocean vessel service to the Pacific Northwest. Seattle, because of its greater population, industrial development, and landbridge[6/] service to the U.S. Midwest and eastern cities, is the major import port for the Pacific Northwest. Portland and the other Columbia River ports account for 70 percent of the oceangoing freight leaving the Pacific Northwest. Thus, for steamships serving the U.S. West Coast, Seattle is often the first port-of-call, and Portland the last. For instance, vessels arriving from the Far East unload cargo in Seattle, go to San Francisco and Southern California to unload and load additional cargo, then proceed to Portland (Figure 1).

This flow of commerce has a direct effect on development of Puget Sound and Columbia River ports. It hinders Seattle's efforts to increase the amount it exports and it constrains Portland's ability to increase imports. Certainly many other factors will affect the import/export situation of each West Coast port. However, Seattle's status as the first port-of-call, and Portland's as the last, represents an interesting aspect of commerce flow and must be considered in port development and internal logistics planning.

[6/] Arrangement for surface transport to Midwest, Gulf Coast, and eastern U.S. destinations (see glossary of terms in Appendix).



For steamships serving the North Pacific ports:

(1) Seattle is frequently the first port-of-call.

(2) Coastwise commerce to load and unload cargo at San Francisco and Los Angeles often occurs.

(3) Portland is the last port-of-call before returning voyage to the the Far East.

Figure 1. Pattern of vessel service through North Pacific ports.

Maritime Commerce

Washington and Oregon ports accounted for only 7 percent of U.S. oceanborne trade in 1976, with Gulf and North Atlantic ports dominating with 39 and 34 percent, respectively (Table 7). However, North Pacific ports have shown the largest growth increases in recent years, nearly 21 percent in 1976 alone. Much of this increase can be attributed to increased grain shipments, primarily out of Portland, Seattle, and more recently, Tacoma (Table 8).

Table 7. U.S. Oceanborne Foreign Trade by Coastal District Ranked by Total Tons; All Services, Calendar Year 1976

Rank	Coastal district description	Tons[a]		Dollar value[b]	
		Total	U.S. Flag	Total	U.S. Flag
1	Gulf	272,383	10,693	41,368	5,356
2	North Atlantic	238,956	11,477	59,348	11,936
3	California	58,220	3,390	21,007	4,769
4	Washington/Oregon	49,665	4,234	9,850	2,360
5	Great Lakes	28,519	1,262	3,876	211
6	South Atlantic	25,628	1,509	9,448	1,452
7	Puerto Rico	17,024	987	2,396	226
8	Hawaii	5,058	142	664	97
9	Alaska	3,310	102	442	32
TOTAL		698,763	33,796	148,399	26,439

a/ Thousands of long tons.

b/ Millions of dollars, dollar value equals the weighted average market price per ton times the number of tons.

Source: U.S. Department of Commerce Maritime Administration. United States Oceanborne Foreign Trade Routes, March 1978.

California ports handle 8 percent of total U.S. oceanborne trade. Nearly 62 percent of California's trade in 1976, in tons, was tanker imports of petroleum and petroleum products. Table 9 summarizes U.S. Pacific Coast (Washington-Oregon-California) trade with regions of the world. Agriculture's share of imports and exports in each region is shown. More detailed description of Pacific Coast trade over major shipping routes is provided in Appendix B.

Table 8. Oceangoing Wheat Shipments (Foreign Imports/Exports and Coastwise) (short tons)

PNW Maritime Ports	1970	1971	1972	1973	1974	1975	1976	1977[a]
Lower Columbia River:								
Portland	2,338,023	1,664,280	2,795,087	3,868,445	4,125,588	3,943,095	4,534,852	3,935,093
Vancouver	939,483	971,583	963,033	1,042,705	525,195	711,749	1,186,867	1,125,309
Kalama	781,538	625,503	911,157	758,875	720,928	810,914	935,609	1,077,882
Longview	1,297,467	613,707	883,682	1,123,734	1,384,952	1,048,916	1,880,401	1,557,996
Astoria	215,855	165,200	256,387	406,717	238,014	107,447	146,655	133,494
TOTAL	5,572,366	4,040,273	5,809,346	7,200,476	6,994,677	6,622,121	8,684,284	7,829,774
Puget Sound:								
Seattle	1,068,615	796,891	960,242	1,634,928	966,047	1,006,199	1,223,584	790,000
Tacoma	381,449	345,721	549,729	671,680	454,965	780,915	1,257,794	891,300
TOTAL	1,450,064	1,142,612	1,509,971	2,306,608	1,421,012	1,787,114	2,481,378	1,681,300
PNW TOTAL	7,022,430	5,182,885	7,319,317	9,507,084	8,415,689	8,409,235	11,165,762	9,510,774

[a] Army Corps of Engineers' data for 1977 were revised for this publication after communication with the research divisions of the different ports indicated inconsistencies.

Source: Waterborne Commerce of the U.S., U.S. Army Corps of Engineers.

Table 9. Value of Pacific Coast Trade over Major International Shipping Routes and Percentage of Total that is Made up of Agricultural Products, 1976.

Trade Route	Value of Exports	Value of Imports	Balance
	(Million dollars)		
Caribbean and East Coast of Mexico	105.7	185.8	(80.100)
% Agricultural	27.2%	4.4%	
East Coast of South America	72.6	128.1	(55.500)
% Agricultural	8.6%	72.2%	
West Coast of South and Central America and Mexico	258.5	497.9	(239.400)
% Agricultural	33.0%	55.9%	
Western Europe 1/	1,236.5	1,375.1	(138.600)
% Agricultural	30.7%	0%	
Australia and New Zealand	754.2	560.1	(194.100)
% Agricultural	3.8%	40.9%	
Southwest Asia, Red Sea and Gulf Aden	897.2	1,663.8	(766.600)
% Agricultural	59.3%	2.8%	
Far East 1/	6,672.0	12,439.0	(5.767)
% Agricultural	24.0%	1.6%	

1/ Imports and Exports for Alaska and Hawaii are included with Pacific Ports.

Source: U.S. Department of Commerce, Federal Maritime Administration United States Oceanborne Foreign Trade Routes, March 1978.

Trade with the Far East -- primarily Korea, Japan, Taiwan, and Hong Kong -- dominates West Coast shipping. More than 75 percent of West Coast exports, in tons, and 62 percent of agricultural exports go to the Far East. Of the remaining agricultural exports in 1976, 26 percent went to India, Pakistan, Burma, and countries on the Persian Gulf and Red Sea, 7 percent to Western Europe. The remainder was divided among Oceania, South America, Africa, and the Mediterranean.

U.S. Government Administration of Maritime Policies

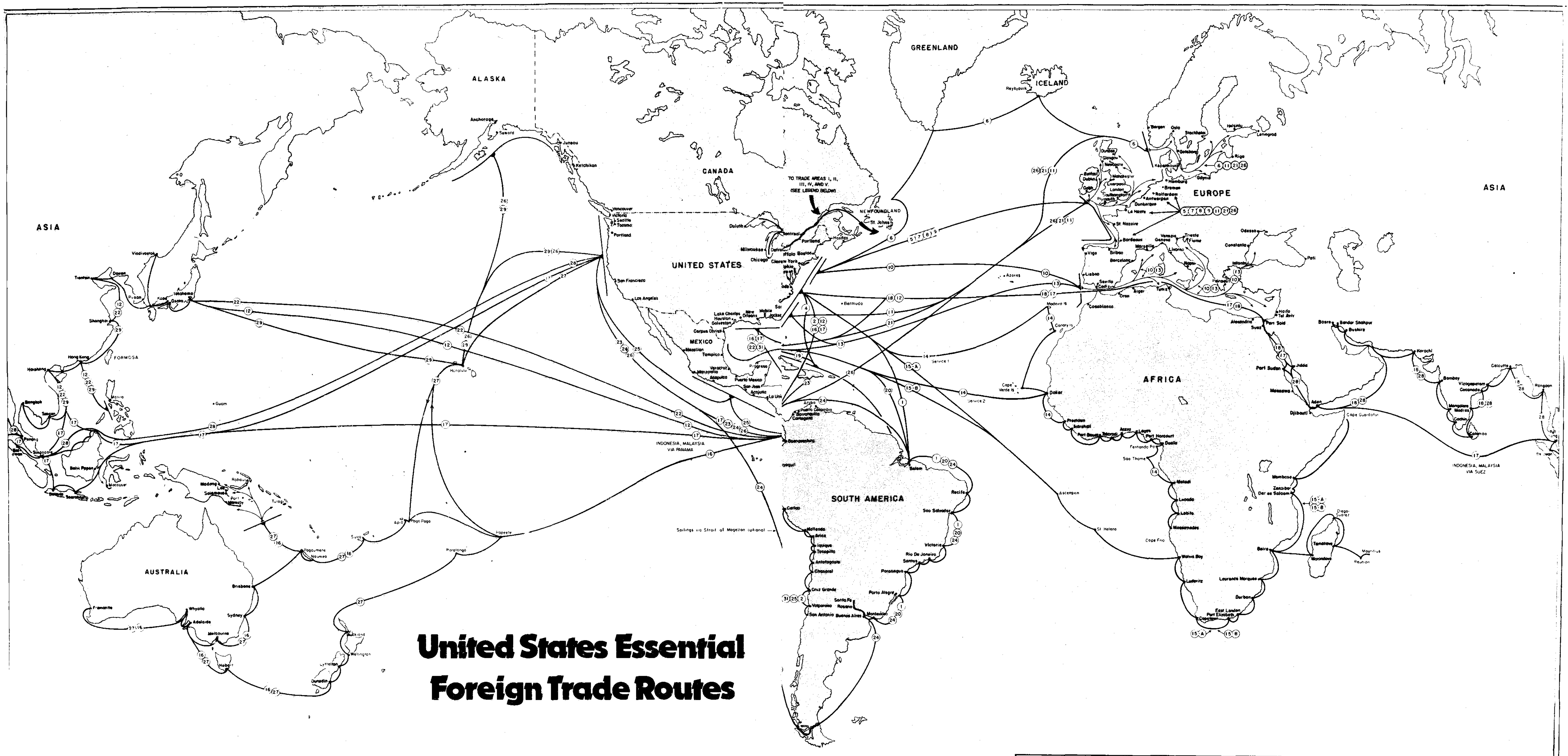
The U.S. government's relationship with the shipping industry has evolved into two separate programs. The first is through regulation, which is administered by the Federal Maritime Commission. The second is promotional, which is handled by the Federal Maritime Administration. The following sections will characterize the nature of these two bodies' activities and briefly discuss national maritime policies that directly or indirectly affect shipping in the Pacific Northwest.

Federal Maritime Commission

The Federal Maritime Commission was established as an independent regulatory agency on August 12, 1961, as successor to the Federal Maritime Board, to administer the regulatory provisions of the Shipping Act of 1916. The Commission is entrusted with regulating the activities of U.S. Flag-competing carriers and ensuring that common carrier treatment of the shipping public is fair and equitable. Two types of statutory provisions regulate common carrier conduct as it affects the shipping public. One deals with the regulation of ocean freight rates, and the other relates to the prevention of discriminatory or preferential policies.

The Commission's main responsibilities include:

1. The regulation of ocean carrier rate making in U.S., foreign, and domestic offshore trades;
2. Investigation of discriminatory rates and practices among shippers, carriers, terminal operators, and freight forwarders;
3. Licensing of independent freight forwarders;
4. Passenger vessel certification;



United States Essential Foreign Trade Routes

TRADE ROUTE	U.S. COASTAL AREA	FOREIGN AREA
1	Atlantic	East Coast South America
2	Atlantic	West Coast South America
4	Atlantic	Caribbean
6	North Atlantic	Scandinavia and Baltic
5	North Atlantic	
7	North Atlantic	United Kingdom and Continent
8	North Atlantic	
9	North Atlantic	
10	North Atlantic	Mediterranean and Black Sea
11	South Atlantic	United Kingdom and Europe North of Portugal
12	Atlantic	Far East
13	South Atlantic and Gulf	Mediterranean and Black Sea
14	Atlantic-Service 1	West Africa
14	Gulf-Service 2	West Africa
15-A	Atlantic	South and East Africa
15-B	Gulf	South and East Africa
16	Atlantic and Gulf	Australia-New Zealand
17	Atlantic, Gulf and Pacific	Indonesia-Malaysia
18	Atlantic and Gulf	India, Persian Gulf, and Red Sea
19	Gulf	Caribbean and East Coast Mexico
20	Gulf	East Coast South America
21	Gulf	United Kingdom and Continent
22	Gulf	Far East
23	Pacific	Caribbean and East Coast Mexico
24	Pacific	East Coast South America
25	Pacific	West Coast South America, Central America, and Mexico
26	Pacific	Western Europe
27	Pacific	Australia-New Zealand
28	Pacific	Southwest Asia, Red Sea and Gulf of Aden
29	Pacific	Far East
31	Gulf	West Coast South America

TRADE AREA	U.S. COASTAL AREA	FOREIGN AREA
I	Great Lakes	Western Europe
II	Great Lakes	West, South and East Africa
III	Great Lakes	Caribbean, East and West Coasts South America
IV	Great Lakes	Mediterranean, Red Sea, India, and Pakistan
V	Great Lakes	Far East, Indonesia-Malaysia, Australia, and New Zealand

5. Certification of vessels to ensure fiscal responsibility in the case of oil pollution, or pollution by hazardous substances.

Liners (common carriers) in foreign trade are regulated by the Federal Maritime Commission, tramp or bulk carriers in the foreign trade are not regulated, and common carriers in the domestic trade (coastwise and intercoastal) are regulated by the Interstate Commerce Commission. Ocean trade with the United States' possessions (Puerto Rico, etc.) also is regulated by the Federal Maritime Commission.[7/]

In foreign commerce, international regulation is not a feasible option. Even the United States, with its high propensity to "when in doubt, regulate," has not attempted to regulate foreign flag ships. However, the United States has established moderate regulations on its own flag ships which, together with the advent of the conference system of ocean freight rate making, has become the dominate rate-determining structure in ocean shipping.

Steamship conferences were first created in the late 1800s, in an industry effort to deal with serious overcapacity and increasingly frequent rate wars on most major trade routes. This intense competition stemmed from the technological changeover from sailing vessels to steamships and the associated increase in available steamship tonnage. To minimize competition and increase stability, shipping lines formed associations known as shipping conferences.

The conferences eliminated freight rate competition among member lines, standardized shipping practices, and provided regularly scheduled

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[7/] The normal classifications of oceangoing ships are: passenger liners, combination freight and passenger ships, general cargo freighters, container ships, dry bulk carriers, and tankers. For shipments of agricultural goods, three types of services are generally offered: liner, tramp (non-liner), and industrial. Ships operating as liners are common carriers of the ocean, offering a regularly scheduled service along fixed routes. Tramps, on the other hand, are available for hire at any time and will call at any port that the charterer dictates. Industrial carriers correspond to the private carriers of ICC jurisdiction. They are involved in coastal and intercoastal trade which is restricted to U.S. flag ships; foreign flag vessels are prohibited from entering this trade.

service between designated ports. The conference system spread rapidly, so that by the time (early 1900s) the operations and practices of the conferences came under government scrutiny, both in the United States and abroad, the system was firmly established on most of the world's trade routes. Now there are approximately 120 conferences in the ocean trade of the United States. Primary conferences serving the Pacific Northwest ports are:

1. Pacific Westbound Conference
   Outbound conference which serves Pacific Coast
2. Trans Pacific Freight Conference
   Inbound conference which serves Pacific Coast

The Shipping Act of 1960, which evolved from a 1912 Congressional investigation of shipping conferences, remains today, as amended, the guiding legislation of the Federal Maritime Commission. The act exempted certain anticompetitive agreements of steamship conferences from the antitrust laws.

Two principal advantages for the shipper generally attributed to the conference system are regularity of service and rate stability. This stability allows the shipper to plan the size and frequency of his shipments with the assurance that his ocean transportation needs will be met.

Two principal disadvantages are elimination of competition and exclusive patronage arrangements. Many critics maintain that the level of ocean freight rates is higher than it would be if the forces of competition were freely at play.

Exclusive patronage arrangements, such as the dual rate contract in the United States and deferred rebating in foreign countries, reduce alternatives available to shippers by obligating them to a particular conference. The dual rate contract is an arrangement whereby a shipper, in exchange for committing all or a fixed portion of his shipments to vessels of a given conference, is granted a rate that may be as much as 15 percent below the published tariff rate that applies to shippers who do not sign exclusive patronage contracts.

The deferred rebate is an arrangement whereby the conference returns to the shipper a portion of freight charges in exchange for the shipper pledging all or most shipments to the conference over a specified period of time (usually six months). The rebate is not paid to the shipper until the end of the specified time period. The deferred rebate system is illegal in U.S. foreign commerce. However, it is generally accepted in the ocean trade of most foreign countries.

Steamship lines, or conferences of steamship lines, serving U.S. foreign trade as common carriers are required to file their tariffs with the Federal Maritime Commission. The Commission may disapprove any rate which, after a public hearing, it finds to be so unreasonably high or low as to be detrimental to the commerce of the United States. Also prohibited are rates which the Commission determines to be unjustly discriminatory between shippers or ports, or unjustly prejudicial to exporters of the United States, compared to their foreign competitors. The Commission is authorized to investigate any questioned practice and, if violations are found, to issue appropriate cease-or-desist orders.

Federal Maritime Administration and the U.S. Merchant Marine

The Maritime Administration of the Department of Commerce (MarAd) is charged with the development, subsidization, and promotion of the U.S. Merchant Marine Fleet. MarAd's responsibilities include:

- Administering financial assistance programs for ship builders and ship operators.
- Sponsoring cost-shared research and development to advance the technology, competitiveness, and productivity of the marine industry.
- Developing promotional programs to generate shipper support for U.S. Flag vessels.
- Promoting port development, domestic shipping, and minority business enterprise in the maritime industry.
- Negotiating international maritime agreements and participating in international maritime forums.
- Operating a reserve fleet of merchant vessels for defense mobilization purposes on the East Coast, at the Gulf, and on the West Coast.

United States' oceanborne foreign trade tonnage has increased steadily over the years. Table 10 lists U.S. oceanborne foreign trade for 1956

Table 10. United States Oceanborne Foreign Trade and Share Carried by U.S. Flagship Fleet, 1956-1979

	Thousands of long tons		Millions of $ value	
Year	Total	U.S.%	Total	U.S.%
1956	260,045	20.7	20,674	33.8
1957	289,280	17.6	22,862	32.1
1958	253,332	12.2	20,865	28.6
1959	257,036	10.2	22,802	26.1
1960	277,893	11.1	24,771	26.4
1961	272,364	9.7	24,699	25.6
1962	296,784	10.0	25,888	25.1
1963	311,577	9.2	27,543	25.1
1964	332,832	9.2	30,003	25.8
1965	371,285	7.5	32,455	21.4
1966	404,022	7.2	36,455	22.5
1967	387,586	5.3	36,629	21.7
1968	418,622	6.0	41,064	20.7
1969	427,279	4.6	41,895	19.3
1970	473,246	5.3	49,682	20.7
1971	457,434	5.3	50,425	19.6
1972	513,566	4.6	60,529	18.4
1973	631,572	6.3	84,006	18.9
1974	628,922	6.5	124,210	17.7
1975	615,567	5.1	127,508	17.5
1976	698,763	4.8	148,399	17.8
1977	773,332	4.5	171,178	16.4
1978	775,649	4.1	195,841	15.7
1979*	823,306	4.3	242,054	14.7

Source: U.S. Department of Commerce Maritime Administration
*Preliminary data.

through 1979, and the percentage of the total trade carried by United States' Flag Merchant Marine vessels. The U.S. flag share has declined sharply over the last 20 years. The growth in world trade and an increase in the number of foreign national flag fleets have contributed to the declining share of the U.S. Major merchant fleets of the world are listed in Table 11.

Traditionally, one of the keys to national power was considered to be national control of shipping services. For this reason, the maritime policies of the United States have been those of heavy subsidization, regulation, and government management. The Merchant Marine Act of 1936 is the primary legislation covering the development and maintenance of the American Flag Merchant Marine.

Table 11. Major Merchant Fleets of the World -- December 31, 1977

Country	No. of ships [a/]	Rank by No. ships [b/]	Dwt. [c/] (thousands)	Rank by Dwt.
Liberia................	2,627	1	157,788,300	1
Japan..................	1,846	5	62,455,300	2
Norway.................	978	7	52,568,600	3
United Kingdom.........	1,377	6	51,105,500	4
Greece.................	2,379	3	49,825,000	5
Panama.................	2,041	4	31,250,500	6
France.................	415	-	20,815,100	7
U.S.S.R................	2,456	2	20,480,500	8
Italy..................	603	8	17,858,100	9
U.S. (privately owned).	571	11	17,321,400	10
Germany (West).........	592	9	14,664,400	11
Spain..................	479	13	12,195,200	12
Sweden.................	286	-	11,965,000	13
Singapore..............	574	10	11,889,800	14
India..................	363	-	8,890,600	15
All others d/..........	6,509	-	100,235,200	--
TOTAL..................	24,096	--	641,308,500	--

Source: MarAd '78, U.S. Department of Commerce Maritime Administration.

a/ Oceangoing merchant ships of 1,000 gross tons and over.

b/ By number of ships. Cyprus ranks 12th with 502 vessels aggregating 3,638,300 dwt., the People's Republic of China ranks 14th with 462 vessels aggregating 6,476,600 dwt., and the Netherlands ranks 15th with 443 vessels aggregating 7,666,500 dwt.

c/ Deadweight ton equals 2,240 pounds.

d/ Includes 269 U.S. government-owned vessels of 2,650,300 dwt.

Under this Act, the Federal Maritime Administration is responsible for investigating and determining ocean services, routes, and lines essential to develop and maintain the foreign trade of the United States, and the type, size, speed, and other requirements of ships to provide adequate service on such routes. The U.S. flagships operating on these essential trade routes are eligible for guaranteed loans and mortgages and two specific types of subsidies: the construction-differential subsidy and the operating-differential subsidy. Figure 2 shows the United States essential trade routes.

The construction-differential subsidy is a payment by the U.S. government to shipbuilders for the difference between the American cost of constructing a ship and the estimated cost of building that ship to similar plans and specifications in a representative foreign shipbuilding center. The operating-differential subsidy is granted to operators of U.S. flagships to place them in a position of parity with their foreign competitors. In 1978, nearly $800 million in direct subsidies was paid to U.S. steamship lines and shipyards in construction and operating-differential subsidies.

Of greater importance to agricultural interests and the financial status of the Merchant Marine is a third form of subsidy -- cargo preference laws. The Cargo Preference Act (Public Law 83-664) requires that at least 50 percent of all government-generated cargo tonnage be shipped on privately owned U.S. flag commercial vessels, tf such vessels are available at fair and reasonable rates.

Cargo preferences naturally tend to increase freight rates because the eligible supply of ship space is reduced to a dimension far below the size of the world fleet. It is reduced to the size of the American fleet. The combination of heavy shipments restricted to a small body of the highest cost tonnage in the world is almost automatically inflationary on rates.

The U.S. Department of Agriculture and the Agency for International Development are the predominant shippers of government-sponsored cargoes. In recent years, USDA Public Law 480 grain shipments have failed to meet the minimum 50 percent U.S. flag requirement of the Cargo Preference Act. As of December 31, 1977, there were 4,932 bulk carriers in the world fleet. Only 18 vessels, with a median age of 25 years, carried the U.S. flag.

When a Public Law 480 grain shipment goes by U.S. flagship, the Department of Agriculture pays the difference to the American carrier between its rate and the prevailing foreign flag rate for the same shipment. The American flag tramp rate, for example, may be $26 per metric ton to ship grain from the U.S. North Pacific to Asia; the prevailing foreign flag tramp rate may be about $14. Therefore, the USDA pays the shipper the $12 differential between the foreign flag rate and the American flag rate.

It is interesting to note that the rate differential exists largely because American flagships have much higher wage costs than their foreign competitors. Many of our subsidized ships are receiving this payment at the same time they are receiving a direct operating differential subsidy from the Federal Maritime Administration to put them on a cost parity with foreign flagships.[8/] This system provides windfall gains for the few eligible shipowners at the expense of the Agriculture Department.

Nongovernment-sponsored exports of grain are not subject to the requirement that 50 percent of the grain be shipped on American vessels. As mentioned, U.S. flagships have higher operating costs than most foreign flag vessels. Consequently, they cannot compete at prevailing market rates. Thus, most grain and other agricultural commodities exported from the United States are transported in foreign flag tramp vessels. However, some provisions have been negotiated in a recent sales agreement with the USSR that allow U.S. ships to participate in transporting grain to the importing country. In 1977, grain cargoes to the USSR totaled 7,415,600 metric tons; U.S. flag vessels carried 29 percent. The agreement calls for one-third of U.S. grain shipments being hauled in U.S. ships, but capacity has not been available. Initially, a rate of $16 per ton was negotiated and recently this was increased to $25.25 per ton. In spite of this, U.S. flagshippers have received about $250 million in U.S. taxpayer subsidies. This subsidy payment is in addition to income from rates, and U.S. flag rates are above competitive world rates.

Negotiated cargo preference laws of this version potentially can damage the competitive world rates. Momentum for such laws could gain because of financial difficulties of U.S. flag carriers and a tendency to adopt or advocate similar bilateral shipping arrangements to elsewhere in the world community. Third World countries, through the forum of the United Nations Liner Code, have advocated such agreements for years, and in the recent United Nations Conference on Trade and Agricultural Development in Manila, a proposition to extend such policy to dry bulk trade was made. The loss of shipping flexibility and associated higher rates that would come as a result of cargo preference would have a negative impact on the agricultural export position of the Pacific Northwest.

[8/] Casavant, Kenneth L. U.S.A. Maritime Legislation: A Review. Unpublished working paper, Washington State University, Pullman, 1970.

Ocean Freight Rates for Grain

Ocean freight rates for grains are negotiated between shipowners and grain shippers through shipbrokers. The range in which negotiated rates fall is largely a function of competitive factors. That is, relationships between the short-term supply and demand determine the approximate level of rates. In the short term, the supply of shipping capacity tends to be fairly stable. Demand, on the other hand, can vary substantially. Consequently, the existing level of demand for service is of primary importance in determining short-term rates. Over the last several years, charter rates on bulk dry freight have fluctuated widely. This reflects the continual changes in levels of the world grain trade.

Average quarterly charter rates for grain being shipped from Pacific Northwest ports to India, Japan, and Korea are listed in Table 12. Strong export demand for grains has caused rates to increase in recent months. The fall of 1979 saw a tight supply of tramp bulk carriers at North Pacific ports. This situation has led to some significant rate increases. Ocean freight rates for transporting grain likely will remain relatively high since 1980 has the potential to be a record year for grain exports.

A study by Harrer and Binkley attempts to identify the major factors which determine longer-term movements in international transport rates for grain.[9/] Their analysis suggests that the following variables significantly influence rates: distance shipped, size of vessel, volume of trade, terms of shipping (who pays loading and unloading expense), and season of the year.

In general, the Harrer and Binkley study suggests that transport costs increase at a decreasing rate as distance shipped increases. This is not to suggest that long haul costs are actually lower than short haul costs, but rather, the cost per ton per unit of distance declines with longer hauls. Rates reflect these costs in the longer term. The study also found that there are some economies of scale in ship size.

9/ Harrer, Bruce, and James Binkley. International Transport Rates for Grain and Their Determinants, Department of Agricultural Economics, Agricultural Experiment Station Bulletin 264, Purdue University, West Lafayette, Indiana, December 1979.

Table 12. Average Quarterly Charter Rates Per Metric Ton for Bulk Grains, 1973-1979 a/

Year	Quarter	U.S. North Pacific Ports to: India	Japan	Korea
1973..........	1st	$17.57	$13.78	NA b/
	2nd	NA	16.88	NA
	3rd	29.13	16.96	NA
	4th	NA	28.97	NA
1974..........	1st	NA	21.55	NA
	2nd	15.78	18.95	NA
	3rd	NA	25.55	NA
	4th	44.78	18.50	NA
1975..........	1st	26.99	NA	NA
	2nd	23.28	14.76	NA
	3rd	20.47	23.63	NA
	4th	22.86	14.04	NA
1976..........	1st	17.71	12.71	$12.12
	2nd	24.85	14.17	14.42
	3rd	23.08	13.62	16.00
	4th	NA	14.01	15.27
1977..........	1st	NA	12.31	13.85
	2nd	NA	12.61	13.40
	3rd	NA	11.84	13.59
	4th	NA	11.84	13.59
1978..........	1st	23.15	10.11	13.31
	2nd	27.51	12.69	13.43
	3rd	NA	12.81	16.13
	4th	36.03	15.19	16.79
1979..........	1st	NA	12.59	16.87
	2nd	NA	15.64	19.57
	3rd	NA	22.39	28.24
	4th			

a/ Average of rates for individual cargoes weighted by volume.

b/ None reported.

Source: FATUS, U.S. Department of Agriculture

However, these economies are limited. Transportation economies gained in shipment sizes in excess of 50,000 dwt. are offset by diseconomies in storage, handling, loading, and unloading at ports. Moreover, the ability to take advantage of large ship economies is constrained by the limited number of world ports which have the capacity to accommodate long, deep draft vessels.

Again, according to Harrer and Binkley, constantly high volumes of trade tend to lower rates at any particular port. This results from a willingness on the part of a large number of tramp vessel operators to call on ports where demand for their service is reliable and layover time is minimal. Essentially, then, consistent demand tends to attract a rate-reducing supply of service.

The Harrer and Binkley analysis also detected rather large seasonal swings in ocean freight rates for grain. Rates reach an annual peak from October through December and decline sharply between January and March. Grain shippers in the PNW may be able to benefit from cyclical rates since monthly marketings of soft white wheat have evened out in recent years. Continued expansion of both on-farm and commercial storage capacity may permit exporters to more fully take advantage of low seasonal rates.

Finally, this study suggests that U.S. cargo preference regulations adversely affect rates paid by U.S. shippers in at least two ways. First, the cost of shipping via U.S. flagship is substantially greater than the cost of shipping on non-U.S. tramp vessels. Second, even though required, shipments are subsidized by the U.S. government. The preference laws serve to dissuade tramp operators from calling on some U.S. ports, thereby reducing the available supply of capacity. However, the continued decline in the U.S. flagship fleet may render cargo preference regulations effectively unimportant in future years.

OCEAN TECHNOLOGY

Size and Types of Vessels

The ocean shipping fleet may be divided into several different types of vessels, including container ships, bulk carriers, RO/RO (roll-on/roll-off) vessels, tankers, general purpose freighters, and combination passenger and cargo vessels. Of prime importance to Pacific Northwest agriculture are bulk carriers and container ships. Some grain is shipped as backhaul in tankers; however, this is a very small portion of total grain shipments.

Grain Shipments

For grain shipments, dry bulk carriers transport most of the tonnage. There were 4,932 bulk carriers (as of December 31, 1977) in the world fleet. Liberia is the major country of registry with 1,037 bulk carriers, Greece follows with 691 vessels, Japan has 590, Panama has 325, the United Kingdom has 322, and Norway has 320 ships. In 1977, there were 18 bulk carriers under the U.S. flag. High construction and operating costs are prime factors for the small number of U.S. flagships. Foreign flag fleets, such as those of Liberia and Greece, enjoy much lower labor expenses and are subject to fewer regulatory constraints. Others, notably the Japanese, receive extensive government promotion and assistance. The U.S. government does offer subsidies (described in previous section); however, American flag vessels remain at a competitive disadvantage, largely because of high labor costs.[10/]

Vessels in the world's dry bulk carrier fleet range in size from 10,000 to more than 175,000 deadweight tons. The fleet is broken down by size groups in Table 13. The majority of the tonnage falls within the range of 20,000 to 70,000 deadweight tons (dwt.), with the average bulk carrier being roughly 35,000 dwt. (about 1 million bushels of wheat), and having an average speed of 15 to 16 knots. Most grain shipments from the Pacific Northwest are in the smaller sizes of bulk carriers, 20,000 to 35,000 dwt. class. Very large shipments of the 100,000 dwt. class are in tankers, which may be quickly cleaned for grain shipments by using detergents and steam jets. However, such large shipments are relatively rare.

[10/] Federal Maritime Commission. North Pacific Trade Study, A Staff Report, 1978.

Table 13. Size Distribution of Dry Bulk Carrier Fleet, 1977
(Ships of 10,000 dwt. and over)

Size group (in thousands dwt.)	Existing fleet (000's dwt.) Combination carriers	Other dry bulk carriers	Total
10-20	73	15,932	16,005
20-30	290	32,387	32,677
30-50	823	30,474	31,297
50-70	2,215	24,225	26,440
70-100	9,060	8,822	17,882
100-125	8,923	9,973	18,896
125-175	17,275	5,676	23,051
Over 175	9,334	-	9,334
Total, end-1977	48,093	127,489	175,582
Total, end-1976	46,558	112,043	158,601
Total, end-1975	43,299	101,995	145,294

NOTE: Excluding Great Lakes fleets.

Source: H. P. Drewry, Ltd. (shipping consultants).

Combination carriers are ships specifically designed to carry both liquid and dry bulk cargoes. Their advantage is that they allow oil to be carried in one direction and dry bulk in the other. Most of these vessels fall within the 50,000 to 200,000 dwt. range. Ore has been the primary bulk commodity carried by combination carriers. The carriers tend to be dedicated to a specific trade route between a particular mine and a particular steel mill. Some grain is exported from Pacific Northwest ports via combination carriers or oil tankers. However, the quantity is a small percentage (roughly 4 percent in 1976) of the total exported.

Containers and Ocean Shipping

Shipping containers are metal, rectangular, weatherproof boxes with double doors on one end. Each container is 8 feet wide, 8 to 9.5 feet high, and 20, 24, or 40 feet in length. Electric-powered refrigeration units on some containers allow for shipment of perishable cargo. Fresh and processed fruits and vegetables, meat and fish products, alfalfa cubes and pellets, frozen and dehydrated potato products, lentils, grass seeds, hides, skins, and soybeans are some of the agricultural products transported by container. The main potential for containerization of non-bulk agricultural shipments is because of logistics. Inbound container traffic far exceeds outbound traffic. In an attempt to better balance this flow, carriers are trying to fill westbound containers with commodities that may be only marginally suited for containerization. This situation presents significant potential for small consignment, non-bulk shipments of agricultural produce.

In 1960, the first full-container vessel, capable of carrying 400 containers, was introduced. Today, most major shipping companies serving the Pacific Northwest, as elsewhere in the world, have become fully "containerized." Liner carriers sering the U.S. West Coast are listed in Table 14. The containerships these companies operate generally range from 600 to 900 feet in length and are capable of carrying 1,000 to 2,000 TEUs (20 foot equivalent units). Some are capable of speeds of 30 knots. In addition to the liner operators listed in Table 14, there are several tramp and semi-liner operators who compete for inbound and outbound West Coast container and break bulk traffic.

Available containership tonnage on the Pacific-Far East trade route has increased by 50 percent since 1977. Excess ship capacity is a potentially serious problem for carriers on this route. Because of the strong intramodal competition, rate increases may be limited to the amount necessary to recover cost increases. However, the rapidly growing container traffic may make any excess container ship capacity situation a relatively short-term phenomenon.

New Ocean Technology

The future flow of Pacific Northwest grain and other agricultural produce, whether via Puget Sound or Columbia River ports, will be influenced by changes and innovations in the present system of ocean transportation. Technological change can affect the efficiency of transport and influence the present traffic pattern in new directions.

Table 14. Capacity of Major Liner Operators in the U.S. West Coast/Japan-Korea Trade, 1977[a/]

Carrier	Minibridge	Service	Annual TEUs	Conference member Inbound	Conference member Outbound
APL	yes	container	142,104	yes	yes
Barber Blue Sea (inbound only)	no	semi-container	4,200	yes	yes
CSC Line	no	container	16,200	no	no
East Asiatic Company	yes	semi-container	7,476	yes	yes
Evergreen	yes	container	40,800	no	no
Fesco	yes	container/semi-container	36,996	no	no
Hapag-Lloyd	yes	container	57,200	yes	no
Japanese Consortium[b/]	yes	container	259,200	yes	yes
Knutsen Line	yes	semi-container	7,200	yes	yes
Maersk Line	yes	container	52,000	yes	yes
Neptune Orient Line	no	container	31,920	no	no
OOCL/KSC[c/]	yes	container	76,800	yes	no
OOCL-Pacific Northwest	no	container	8,592	yes	no
Pacific Far East Line	yes	container/lash	50,700	no	no
Phoenix Container Lines	yes	container	8,814	yes	yes
Sea-Land	yes	container	110,880	yes	yes
Seatrain Lines	yes	container	76,500	no	yes
Seaway Express	no	container	18,168	no	no
States Line	no	Ro-Ro/semi-container	30,324	no[d/]	no[d/]
United States Lines	yes	container	60,480	yes	yes
Zim Container Service	yes	container	42,821	yes	yes
TOTAL......			1,139,375		

[a/]Capacity calculations are for actual or announced intentions as of October 1977. Other data are as of May 1978.

[b/]The members of the Japanese Consortium are: Japan Line, "K" Line, Mitsoi O.S.K., Nippon Yusen Kaisha, Shova Line, and Yamashita-Shinnihon.

[c/]Korea Shipping Corporation has a space-charter agreement with Orient Overseas Container Line in the California/Far East Service.

[d/]States Line withdrew its conference membership on June 19, 1978.

Source: Federal Maritime Commission, Office of Economic Analysis.

Maritime transportation technology has undergone change at an unprecedented rate since World War II. The extent and nature of this change were noted in a study by a panel on future port requirements in the United States.

> Not since the replacement of sails by steam in the nineteenth century has shipping been subject to such a radical change. In liquid bulk transport, the supertanker has produced significant cost savings in economies of scale. In transport of dry bulk commodities, the increase in ship size and the consequent savings in transportation costs have been scarcely less spectacular. In the movement of general cargo, the technological revolution has been even greater with the widespread development of containerization, roll-on/roll-off (RO/RO) ships, and barge-carrying ships such as LASH and Seabee.11/

This rapid pace of technological change has resulted in shifts of traffic flows and utilization of different transport modes; plus, it has necessitated large outlays for investments in new port facilities and reorganization of other aspects of the total transportation system, including inland transportation systems.

Containerization of cargo has made many general cargo piers obsolete and required revamping of many of the port facilities in the Pacific Northwest. Most of the anticipated technological changes of the post-World War II era are already implemented in varying degrees. Much of the implementation of the new technology occurred during the mid-1970s. However, projections suggest that further, though less dramatic, changes will be encountered over the rest of the century. The major shock that could generate a new cycle of innovation in ocean vessel technology is rising energy costs, and the ironical twist to this could be the reappearance of sailing vessels in the ocean trades by the 21st Century.12/

Increase in Ship Size

As indicated previously, bulk carriers and tankers carry grain from the Pacific Northwest into international commerce. In recent years,

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11/Panel on Future Port Requirements of the United States, Maritime Transportation Research Board, National Research Council. Port Development in the United States. Washington, D.C.: National Academy of Sciences, 1976.

12/"Experts Propose Return of Sail Power for Good Part of Merchant Marine," Journal of Commerce, July 24, 1979, p. 33.

there has been a strong upward trend in size of tankers and combined carriers; however, the size of bulk carriers has remained fairly consistent. Economies of scale, combined with physical limitations, typically those of harbors and canals (most importantly the Panama Canal), influence changes in ship size.

Most of today's tanker tonnage is in vessels of 200,000 to 300,000 ton range. Some vessels in the 400,000 ton range are used primarily in the Persian Gulf/Europe and Persian Gulf/Japan trades. Supertankers serving the Pacific Northwest are mostly in the 110,000 to 130,000 ton class. These vessels, in addition to smaller conventional tankers, at times are available for grain cargoes.

General purpose bulk carriers serving the Pacific Northwest range from 15,000 to 60,000 dwt. The smaller ships in the 8,500 to 12,500 dwt. range are becoming increasingly rare. A limit to the size of bulk carriers is created by the Panama Canal. Most carriers feel the advantage of being able to offer passage through the Panama Canal outweighs any potential advantages of greater size. The maximum ship size for passage through the Panama Canal is 80,000 dwt. There may be some upward shift in bulk carrier size toward the 80,000 Panamax Limit.[13/] However, at this time, there is little incentive to put larger size vessels into service.[14/]

In a recent study commissioned by the Maritime Administration, the Pacific Northwest grain trade by vessel size was forecast (Table 15).[15/] Although total movements projected for 1980 and 2000 showed an increase from 41.8 to 65.6 thousand ton miles, the relative percentage shipped in vessels of less than 80,000 dwt. remains constant at roughly 75 percent. Eight percent of grain ton-mile movements in the year 2000 are expected to be carried by bulk vessels of 100,000 dwt. and over. Because of the

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13/ Panamax - Limit to size of vessel which can pass through Panama Canal.

14/ Port System Study for the Public Ports of Washington State and Portland, Oregon. Prepared for Washington Public Ports Association, Port of Portland, and U.S. Maritime Administration, Vol. II, Part 5, March 1975.

15/ National Technical Information Service, Washington, D.C. Development of Standardized U.S. Flag Dry-Bulk Carrier: Phase I Final Report, PB-293 369. Prepared for U.S. Department of Commerce Maritime Administration. New York: M. Rosenblatt and Son, Inc., January 1979. pp. 2-41.

inability of overseas ports to handle such large vessels, no dramatic shift to larger vessel sizes is expected by the end of the century.

Table 15. Forecast of PNW Trade in Grain by Vessel Size (billion long-ton miles)

Vessel size (dwt.)	1980	1990	2000
20,000-34,999	9.5	9.5	8.2
34,000-49,999	10.4	15.7	20.4
50,000-79,999	10.1	25.5	21.0
80,000-99,000	6.2	5.5	5.9
100,000 +	3.1	4.7	10.1
Others	2.5	1.6	0.0
TOTAL	41.8	52.5	65.6

Source: See footnote 15.

Most container ships are in the range of 500 to 2,000 TEUs (20 foot equivalent units). Frequency of service is an important factor to the success of containerized general cargo service. Superior productivity from higher speeds, faster turnaround, and greater cubic capacity per ton of deadweight, is the container ship's main advantage. The larger the ship, the less frequent the service necessary to carry a given flow of cargo. Thus, very large container ships may be subject to diseconomies of size. For this reason, container ship capacity is not expected to increase significantly.

In addition, the importance of the Panama Canal to container ship trade creates a size constraint similar to that for bulk carriers. The Panamax limit is roughly 3,000 TEUs. Container ship capacity is expected to remain within this limit for the next several years; however, by the year 2000, ships on the transAtlantic, transPacific, and Japan/Europe via Suez routes could possibly reach 10,000 TEUs. While this size ship is technically feasible, its economic soundness is as yet unknown.[16/] If containerships of this larger size do come into use, the economies would discourage multiple port calls and favor the "load-center" principle of calling at as few major ports as possible. This circumstance

[16/] See footnote 15.

would probably favor Puget Sound (notably Seattle) ports over Lower Columbia River ports.

Roll-On/Roll-Off Ships

Roll-on/Roll-off (RO-RO) vessels are designed to carry any type of road vehicle -- truck-trailer, rail car, etc. The ship acts as a ferry. RO-RO ships have been used to a limited extent in transAtlantic trade, New York to Puerto Rico trade, and West Coast-Hawaiian and Alaskan trade.

The major disadvantage of RO-RO vessels is that they use cargo space inefficiently. A container ship can be loaded more tightly and is far more economical for long ocean voyages. However, for shipments of 1,000 to 2,000 miles or fewer, the RO-RO concept has been successful. Its major potential lies with domestic coastwise shipments. With the recent energy price increases, it may become more economical to transport trailers by coastwise shipments than by highway truck. For instance, truck-trailers headed for Southern California could be placed on a RO-RO vessel in Seattle and moved coastwise to Long Beach Harbor where truck-tractors would distribute them to their final destinations. This is similar to what now occurs in the Washington/Alaska trade.

Feeder Vessel Services

Expensive modern container ships create incentives for steamship lines to practice the "load-center" principle. To enable smaller ports in the region to still function in container traffic, feeder services have been initiated. With this service, smaller vessels pick up containers at the feeder port and concentrate them at Puget Sound or other load-centers for transshipment to large transoceanic container ships. One handicap is that the Jones Act requires the feeder equipment to be constructed in the United States. This could increase equipment cost and reduce its competitiveness.

Barge-Carrying Ships

A relatively new concept, the barge-carrying ship is designed to combine the advantages of unitization and intermodalism with those of river barge movements. With this system, relatively small barges (lighters) are brought by tug boat to a mother ship where they are lifted aboard by a shipboard crane. At the destination port, the loaded barges are discharged in a similar fashion. Advantages of this system include:

- Swift port turnaround time because dockside loading and unloading are eliminated.
- Faster cargo delivery reduces inventory costs.
- Underdeveloped areas with poor port facilities can be adequately serviced.
- Cargo handling is independent of ship operations, thus allowing greater flexibility and efficiency.
- Barges can carry many types of cargo and offer good protection for the cargo.
- The barge carrier system eliminates some or all of the intermediate cargo handling.
- Integration of inland/ocean and inter-island waterborne transportation.

Although these advantages seem substantial, barge carriers have played a minor role in comparison to containerships. The barge carrier system is most efficient when both the origin and destination ports link with an inland river system or an island nation. Some successful barge carrier services have been operated, particularly from the Gulf Coast. However, their potential for service to and from Pacific Northwest ports appears limited for the immediate future, especially relative to containerized and dry bulk shipping methods.

Barge-carrying vessels now handle barges that often are too small for efficient shipment of grains unless small consignments (mini-bulk) or bagged shipments are involved. At the same time, the consignment size associated with shipborne barges has been too large for typical dry pea and lentil shipment. This may be true for other fruits and vegetables shipped from the Pacific Northwest as well. Another constraint limiting barge-carry shipping in the Pacific Northwest is limited service availability. The major agricultural export markets served by the region are not called on by barge-carrying ships, though this situation could be altered if the unique advantages of the system prove to be adapted to needs of the Far East. Finally, the cost advantage of barge-carrying ships relative to container ships at ocean ports has been more than offset by higher loading/discharging costs where the cargo does not originate and/or terminate at a point situated adjacent to an inland coastal waterway.[17/]

Ocean-Going, Tug-Barge Systems

Another concept that could offer economies of movement for Pacific Northwest grain is that of oceangoing barges. Grain could be loaded at an upriver location, e.g., Lewiston, Idaho, and with the barge unit intact, delivered to the importing country. The simplicity of this movement appears to yield possible low costs of operation. The main economic advantage of the tug-barge system arises from the ability to free the relatively more costly propulsion unit (tug) from the less costly element (barge) while the latter is idle.

Ocean transportation in large barges is used in coastwise trade between West Coast ports and Alaska. However, these barges operate close to shore and are not "true" oceangoing vessels. One major peculiarity of coastwise barging is that, because of steering problems, the tugs cannot push the barge and must take them in tow. This presents several problems: first, in narrow channels, the barge has little maneuverability; and second, in high seas and storms, to avoid collision between tug and barge, some tugs have had to drop the tow line and follow the free-moving barge which does not always drift in the desired direction.

Despite the physical difficulties, the technology for transPacific tug-barge oceanic movement is available. But, although it is technically feasible, it does not appear to be economically viable. Self-propelled bulk vessels now operate efficiently and profitably in the grain trade. On long ocean voyages, the tug-barge system's main advantage, the interchangeability of the tug between many cargo-carrying units, is minimized. Also, the barges used in offshore transport are of such size and draft that they cannot be used on the Columbia/Snake inland river portion of the journey. Hence, unless an unexpected technological breakthrough occurs, oceangoing barges do not appear to be an important

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[17/] Detailed analyses of the potential for barge-carrying ships in the Pacific Northwest agricultural export distribution systems are included in two studies recently conducted at the University of Idaho. The studies referred to are Jones, The Columbia/Snake Navigation System's Role in Intermodal Ocean Transportation, and Belcher, Jones, Lindeborg, Inland Waterway/Ocean Movement of Pacific Northwest Dried Pea and Lentil Shipments, Alternatives and Potential.

element in the Pacific Northwest grain transportation system of the future.[18]

Multipurpose Ship Design

Flexibility in handling cargo for ships involved in coastwise, intercoastal, and transocean transport may provide a distince physical and economic advantage within the next few years. Multipurpose ships designed to carry and handle general, container, and RO-RO cargo are being developed. This flexibility would enhance the vessel's ability to use its capacity more efficiently.

This ship's design will provide both RO-RO and lift-on/lift-off access to all cargo areas of the vessel, enabling everything from small breakbulk lifts to as much as 140 ton-heavy lifts to be handled. To speed up the load discharge time and enhance the handling of mechanized vehicles, sideports and a slewing stern ramp have been incorporated into the design. Containers will be handled in cells, as on container ships, or the same spaces can be used for RO-RO cargoes.

The Federal Maritime Administration is developing a multipurpose ship design. The emphasis is to develop a modern, standby ship for rapid construction in a national emergency. There is favorable potential for commercial use of a multipurpose ship design.[19]

Catamarans

Catamaran and semi-submerged catamaran ships are of increasing interest. Such vessels now are used primarily for research work. Commercial catamaran-style vessels are still in the developmental stages. However, transocean catamaran cargo and passenger carriers of about 10,000 dwt. are expected within the next several years. Their high volume and deck area-to-displacement ratio and low resistance at high speeds (30 to 35 knots, plus), with the associated fuel efficiencies, make catamarans attractive vessels for containerized cargo and other trades.[20]

18/ Casavant, Kenneth L. An Economic Evaluation of the Competitive Position of Puget Sound Ports Versus Columbia River Ports for Pacific Northwest Wheat Exports. Unpublished Ph.D. thesis, Department of Agricultural Economics, Washington State University, Pullman, 1971.

19/ MarAd'78. U.S. Department of Commerce Maritime Administration, 1978.

20/ Frankel, Ernst G., and Henry S. Marcus. Ocean Transportation. The MIT Press, 1973, p. 75.

IMPLICATIONS OF CHANGES IN
INTERNATIONAL TRANSPORTATION ON PACIFIC NORTHWEST
AGRICULTURAL TRADE

It is important to understand the relationship between the supply, and thus the rates, of ocean transportation and agricultural trade activities in the Pacific Northwest. Ocean shipping is a highly competitive, market-responsive industry. When supply increases, relative to demand, rates tend to rise. Events which increase the supply of shipping to the Pacific Northwest, therefore, contribute to expansion of agricultural trade from the region.

Several factors influence and are influenced by ocean transport activity in the PNW:

(1) Inbound/outbound traffic balance - Obviously, the level of inbound traffic at any port directly influences the availability of outbound traffic. In the past, rates on outbound agricultural shipments (predominately grain) from Columbia River ports have been high relative to other U.S. ports because of a lack of inbound traffic. Ships calling on Columbia River ports often must travel empty from other ports. Their rates reflect the cost of empty movements. The growth of inbound traffic through the Puget Sound ports has aided in creating a general downward pressure on outbound rates for shippers in the Pacific Northwest.

Moreover, the continued development of intermodal container transport techniques, such as landbridge, should enhance the ability of West Coast ports, including PNW ports, to attract inbound freight traffic.

(2) Fuel supplies and costs - The availability and price of bunker fuel influence the dynamic capacity of the total ocean transport system. With rising fuel costs, as a result of tight fuel supplies, ship operators conserve fuel by reducing operating speeds thereby effectively decreasing the supply of shipping capacity. Also, shipping firms may seek to minimize transit distances by calling at fewer ports. If this occurs, it will be the smaller ports that will hurt the most. For PNW as a whole, trade activity with Pacific Rim countries should benefit from shipping firms' efforts to minimize distance traveled. It is roughly 5,000 nautical miles from the West Coast to the Far East (Yokohama), as compared to

more than 9,000 nautical miles from Gulf, or East Coast ports. However, PNW ports may lose traffic to relatively distant markets, such as Europe and North Africa.

Recent energy price increases also may spur development of greater coastwise shipments, primarily with roll-on/roll-off type vessels. The energy efficiency of such shipments may present transport cost advantages. An example, as mentioned earlier, would be the coastwise movement of truck-trailers from Seattle to Los Angeles, where tractors would distribute the trailers to their final Southern California destination.

(3) Shifting trade patterns- Changes in U.S. import/export patterns affect investment in ocean transportation facilities and the regional allocation of transportation capacity. Projections are that U.S. grain exports to the Pacific Rim countries will continue their strong growth. This will attract ocean freight capacity to the PNW since ships generally can be assured a short turnaround time.

(4) Seasonal patterns in ocean freight rates - The general seasonal patterns in ocean transport rates on grain may provide benefits to grain exporters in the PNW who can time some shipments to take advantage of lower rates which tend to occur between January and March. Storage capacity and the availability of reliable inland barge service should enhance the region's ability to exploit seasonal rate differentials.

(5) Technological change in ocean transportation - Technological advances serve to increase supply and/or reduce operating expenses. Much of the recent technological change in ocean shipping has focused on development of multiple-use equipment. These changes should favorably influence ocean shipping from the PNW since they will improve equipment efficiency and permit inbound capacity to be used for outshipments.

(6) Panama Canal - The signing of the Panama Canal Treaties in the fall of 1978 introduced at least two new considerations into ocean shipping activities, and each has implications for the Pacific Northwest. First, as Panama assumes more control of the Canal, it is certain that toll charges will increase. Major General Harold R. Parfitt, Governor of the Canal Zone, estimated that tolls will increase between 14 and

35 percent over the next 20 years.[21] In some instances, freight that would have been moved west from the Gulf now may be more economically moved from West Coast ports. Likewise, some freight from West Coast ports, normally shipped east via the Canal, now might be more economically moved out of eastern U.S. ports or the Gulf. However, most analyses suggest that such displacements will be minimal.

The uncertainty introduced by the change in control and management is of greater long-term concern. Some shippers believe that Panamanian control strongly increases the probability of a Canal closure. Consequently, plans for landbridge transshipments via West Coast ports are being accelerated.

Beyond the perception of increased risk associated with the U.S. withdrawal from the Canal Zone, the increased size of ocean vessels has tended to make the Canal somewhat obsolete. This, too, may help shift fretght toward the West Coast-based landbridge modal combination. Operating efficiencies, competitive rates, and faster delivery times have made the landbridge shipment an attractive alternative to the Canal.

For the agricultural producers of the Pacific Northwest, an increase in grain traffic flow from the Midwest may present more problems than benefits. During the fall of 1979, PNW port grain facilities were heavily congested as wheat, corn, and soybeans from the Midwest were being routed by rail to Portland and Seattle.[22] This type of congestion hinders the Pacific Northwest grower's ability to market his grain crop. A further increase in Midwest grain shipments through West Coast ports, because of transport problems at the Panama Canal, would only increase port congestion to the detriment of Pacific Northwest grain producers. These recent events may well stimulate new investment in grain handling capacity in the PNW and attract additional ocean freight capacity. Research evidence suggests that high volume ports generally receive relatively low ocean freight rates and this, of course, would benefit PNW grain producers.

21/ Testimony before the U.S. House of Representatives in February 1979.

22/ Closure of the Great Lakes ports of Duluth, Minnesota, and Superior, Wisconsin, because of a strike by the American Federation of Grain Millers, with longshoremen respecting picket lines, was a prime factor for the increased flow of Midwest grain to Pacific Northwest ports. This presents a harbinger of the type of port congestion that could result if there is a closure of the Panama Canal.

CONCLUDING COMMENTS

In the aggregate, the cost to users of international ocean transportation likely will continue to rise over the next several years. Three factors will contribute to rising transportation costs: (a) increased demand for service, (b) reduced or constrained supply of capacity resulting principally from high bunker fuel prices, and (c) general world inflation. This will increase the separation of international markets and dampen trade activity. The impact, however, will influence various trade linkages and exporting regions differently. That is, some market participants will be more severely disadvantaged than others.

Technological advance and improved operational practices, discussed in previous sections of this paper, will mitigate some of the adverse effects of increased fuel, labor, and capital costs in ocean shipping. However, technological development and implementation occur slowly in international transportation. Thus, while the long-run picture looks promising, the short-run situation probably will experience some imbalances as the ocean transport system adapts to change.

It is important to note that users of ocean transportation in the Pacific Northwest in general are better off than those in other U.S. regions. The proximity of the PNW to major growth markets, the potential for expansion of complimentary services and port facilities, the relative efficiency of the region's transportation infrastructure, plus the intensification of trade activities at PNW ports, should work in concert to attract international shipping capacity, and therefore, dampen rate increases to PNW shippers.

Further, the PNW should maintain a comparative advantage over Canadian shippers in competing for westbound markets. The Canadians continue to experience problems with coordination of shipments out of their western ports. Significant improvements in their system are not likely in the short or intermediate run.

On balance, agriculture in the PNW should not be adversely affected, in relative terms, by changes in ocean transportation. With the exception of seasonal fluctuations, the supply of ocean transport capacity should be sufficient to meet the needs of the region's agricultural exports. New investments in port facilities should insure sufficient handling capacity. This will minimize vessel turnaround time and be a positive factor in attaching new shiplines.

Improvements in container handling and management capabilities will improve transport service for the variety of commodities which can be shipped this way. The development of inland container ports on the Columbia/Snake River System will permit more shippers to use this technique.

Although the general outlook for international shippers in the PNW is bright, some problems will persist. Securing a reasonable long-term balance between inbound and outbound ocean freight may be difficult. Lower Columbia River Ports' export tonnage substantially exceeds import tonnage. The reverse situation exists at Port of Seattle. This creates logistical problems for vessel operators. If the United States enacts legislation limiting imports from Japan, the inbound freight volume will decline, which would only worsen the present imbalance. Moreover, the PNW maritime ports will continue to face strong competition for inbound freight from other U.S. West Coast ports, notably Oakland and L.A./Long Beach.

Users of Columbia River ports may be forced to contend with the imposition of user charges aimed at recovering the cost of Army Corps of Engineers' maintenance of the 40-foot channel between the mouth of the Columbia and Portland. This, of course, could adversely affect the competitiveness of ocean freight rates on shipments from these ports.

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APPENDIX A

Glossary of Shipping and Ocean Transportation Terms

Terms Most Frequently Used in Price Quotations

Countries of the Pacific Rim

Glossary of Shipping and Ocean Transportation Terms

Account of Cargo: The actual owner of the cargo.

Ad Valorem: A freight rate set at a certain percentage of the value of an article is known as an ad valorem rate.

Break Bulk: Heterogeneous items of cargo packed on pallets or other similar means of unitizing for lifting on and off a vessel. Does not include dry bulk, liquid bulk, or containerized cargo.

Bulk Carrier: A bulk carrier is a vessel engaged in the carriage of such bulk commodities as petroleum, grain, or ores which are not packaged, bundled, bottled, or otherwise packed.

Bulk/Oil, Ore/Oil (O/O), or Ore/Bulk/Oil Carrier (O/B/O): Multipurpose bulk carriers which can lift combinations of both liquid and/or dry bulk cargoes.

Catamaran: A vessel having twin hulls, which is noted for its speed and safety.

Car Unloading: A charge for unloading a rail boxcar.

Combined Carriers: Ships configured to carry both liquid and dry bulk cargoes.

Container: A rigid, rectangular, boxlike receptacle with dimensions of 8x8x20 feet, or 8x8x40 feet, which is removable from a truck chassis.

Container Freight Station: A terminal facility where containers are stuffed.

Container Stuffing: Loading a container with cargo, includes sealing the container.

Container Yard: The area of the port adjacent to the pier for storing and marshaling containers.

Country of Registry: The nation where a vessel is registered; it sails under that nation's flag.

Customs District: A grouping of nearby ports by the Department of Commerce for export accounting purposes. For example, the Seattle Customs District includes the ports of Tacoma, Bellingham, and Seattle.

Deadweight Tonnage (DWT): The carrying capacity of a vessel in long tons of 2,240 pounds. It is the difference between the light ship weight and the displacement loaded.

Deferred Rebate: A deferred rebate is the return of a portion of the freight charges by a carrier or a conference to a shipper in exchange for the shipper giving all or most of his shipments to the carrier or conference over a specified period of time (usually 6 months). Payment of the rebate is deferred for a further similar period, when the shipper must continue to give all or most of his shipments to the rebating carrier or conference. The shipper thus earns a further rebate which will not be paid without an additional period of exclusive, or almost exclusive, patronage with the carrier or conference. In this way, the shipper becomes tied to the rebating carrier or conference.

Demurrage: Charges incurred by cargo after expiration of "free time" storage.

Dockage: A charge for mooring a vessel at wharf.

Draft: The vertical distance between the waterline and the keel. The draft shown in this report is full load draft, measured in feet.

Dry Bulk: Cargo, generally handled in bulk quantities, consisting of the following example groups: alumina and basic chemicals, fertilizer, metal scrap, building material, forest products including wood chips, and others.

Ex-Ship's Tackle to Post-Ship's Tackle: An ocean freight rate basis which includes the loading of the cargo at ship's side, ocean carriage, and unloading the cargo at ship's side. This could be considered a type of "base ocean freight rate."

Exports: Commodities shipped by a port to foreign countries.

Fighting Ship: A fighting ship is a vessel used in a particular trade by a carrier or conference to exclude, prevent, or reduce competition by driving an independent carrier out of the trade. The fighting ship sails between the same ports and on the same sailing schedules as the independent carrier, while charging freight rates lower than those of the independent. The use of fighting ships in U.S. foreign commerce is illegal.

First Point of Rest: The area of the port terminal facility designated for unloading and receipt of outbound cargo released by the inland carrier.

Free Time: A period of time usually allowed on in-transit cargo awaiting vessel arrival and free of demurrage or storage charges.

General Cargo: Cargo consisting of commodities handled as break bulk or in containers; aggregated into the following example groups: fish and shellfish, agricultural products, steel and ferroalloys, motor vehicles, forest products including lumber, pulp, and paper, and other manufactures.

Gross Tonnage: The internal cubic capacity of the ship expressed in tons (100 cubic feet to the ton) and measured in accordance with the national tonnage regulations.

Hinterland: A region served by a port city and its facilities whose area and extent depend on trade commodities.

Imports: Commodities received by a port from foreign countries.

Inland Carrier: The carrier of cargo from inland source to port of loading.

Lash-Lighter Aboard Ship: Oceangoing vessels carrying cargo in sealed, floatable boxes or barges which are off-loaded and loaded from the ship by cranes aboard the vessel and then towed or pushed to and from the docks.

Liner: A vessel, usually a common carrier, which carries general cargo on a definite route on a fixed schedule.

Loose Stow: Non-containerized, bagged cargo stacked in a truck or boxcar trailer or as put in a ship; synonymous to loose bag or break bulk.

Measurements: LT = long ton (2,240 pounds); ST = short ton (2,000 pounds); MT = metric ton (2,204.62 pounds); CWT = hundredweight (100 pounds).

Measurement Ton: The measurement ton ?also known as the cargo ton or freight ton) is a space measurement, usually 40 cubic feet or one cubic meter. The cargo is assessed a certain rate for every 40 cubic feet of space it occupies.

Neo-Bulk: Largescale movement of a non-containerized, non-bulk cargo, such as automobiles, steel, lumber, logs, etc.

Ocean Steamship Conference: A steamship conference is comprised of ocean carrier firms serving the same route. Common rates and orderly service characterize a steamship conference, although critics contend this is a monopolistic device.

Ore Carrier: A bulk carrier designed to haul heavy ores and minerals.

Palleting: Placing bags on a wooden slat which allows ease of handling.

Panamax: Limit on size of ship which can pass through Panama Canal. Maximum size limits are approximately 975 feet in length, 106 feet in width, and 39.5 feet in draft.

Pilotage: Guiding a vessel in a river channel, for example, from the mouth of the Columbia River to Portland.

RO/RO: Roll-on/roll-off cargo vessel constructed to allow containerized or unitized cargo loading without cranes.

Ship's Side: Cargo physically adjacent to a ship on the dock or pier and within reach of the ship's tackle (hoist equipment).

Speed: One knot indicates a speed of one nautical mile (6,080.27 feet) per hour.

Steamship Company: Same as ocean carrier, liner, or steamship service.

Stevedoring: Handling of cargo through port. Also referred to as handling or drayage.

Storage: A charge for storing cargo if arrangements are made before expiration of free time.

Terminal: The ship berths, loading and unloading facilities, warehouses, and storage yards required to serve a ship; generally, specialized to a type of cargo such as general cargo, grain, or dry bulk.

TEU: Twenty-foot equivalent unit; a standard measure of container capacity (8x8x20 feet).

Ton: Freight rates for liner cargo generally are quoted on the basis of a certain rate per ton, depending on the nature of the commodity. This ton, however, may be a weight ton or a measurement ton.

Tramp: A tramp ship is a vessel that does not operate on a definite route on a fixed schedule but calls at any port where cargo is available.

Unitized Cargo: Cargo packed, such as on a pallet so it can be handled mechanically.

Vessel Charges: Charges accrued by a vessel in port, such as electricity use, supplies of fresh water, dockage, and pilotage.

Weight/Measurement Ton: In many cases, a rate is shown per weight/measurement ton, carrier's option. This means the rate will be assessed on either a weight ton or measurement ton basis, whichever yields the carrier a greater revenue. For example, the rate in the tariff may be stated as a certain rate per 2,240 pounds or 40 cubic feet.

Weight Ton: There are three types of weight ton -- the short ton, 2,200 pounds; the long ton, 2,240 pounds; and the metric ton, 2,204.68 pounds. The metric ton frequently is quoted for cargo exported from Europe.

Wharfage: A general charge for cargo passing through a port.

Terms Most Frequently Used in Price Quotations

FAS--Free Along Side (vessel): An exporter's price to deliver goods to a vessel's side and within reach of its loading tackle. Subsequent risks and expenses are the buyer's responsibility.

FOB--Free On Board (vessel): An exporter's price that includes delivery of goods on board the vessel. Subsequent risks and expenses are for the account of the buyer. The term FOB also may be used in conjunction with an inland shipping point in the country of exportation or an inland point in the country of destination. This means that the expenses up to the point specified are for the account of the seller.

CIF--Cost, Insurance, and Freight: An exporter's price that includes prepayment of freight charges and insurance to an agreed destination.

C&F--Cost and Freight: The same as CIF, except that insurance is arranged by the buyer.

Countries of the Pacific Rim

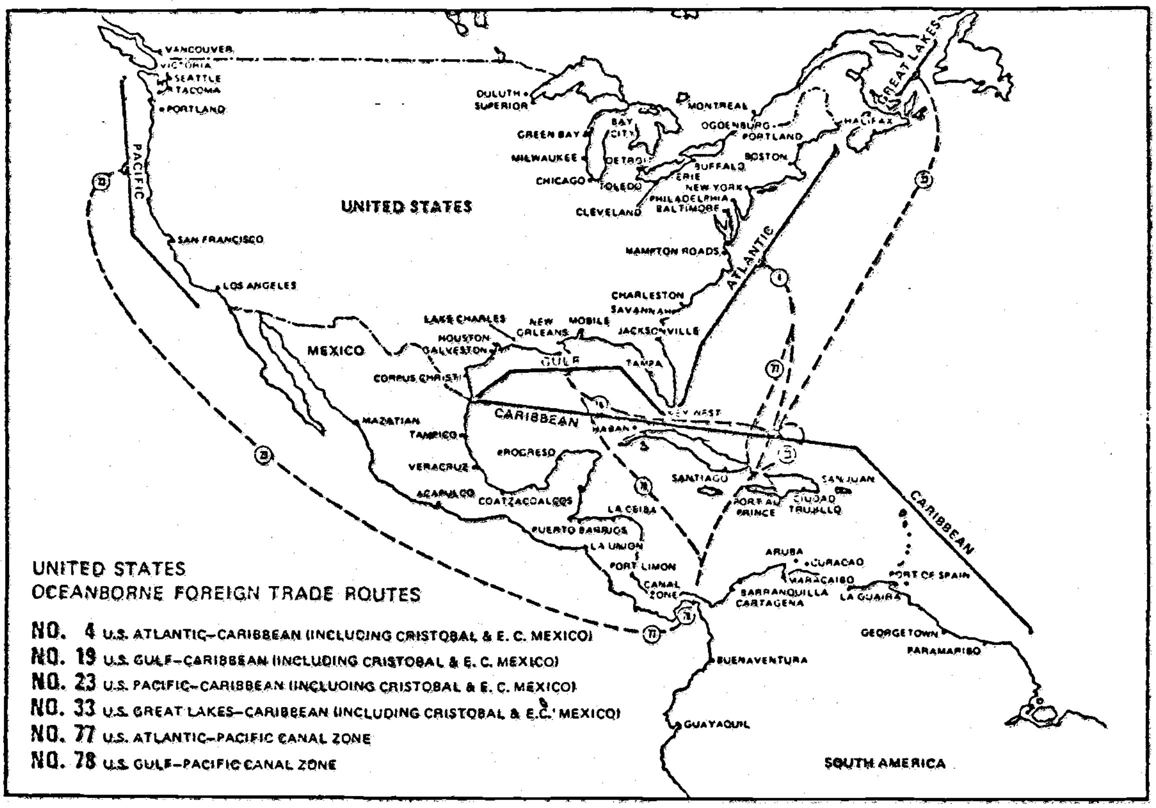
The Pacific Rim countries include: Japan, Free East Asia (includes Hong Kong, Republic of Korea, Macao, and Taiwan); Southeast Asia (includes Burma, Cambodia, Idonesia, Laos, Malasia, the Philippines, Singapore, and Thailand); and Communist East Asia (includes the People's Republic of China, North Korea, Mongolia, and Vietnam).

APPENDIX B

Major Ocean Shipping Routes from

Pacific Coast Ports

U.S. PACIFIC–CARIBBEAN (INCLUDING CRISTOBAL & E.C. MEXICO)



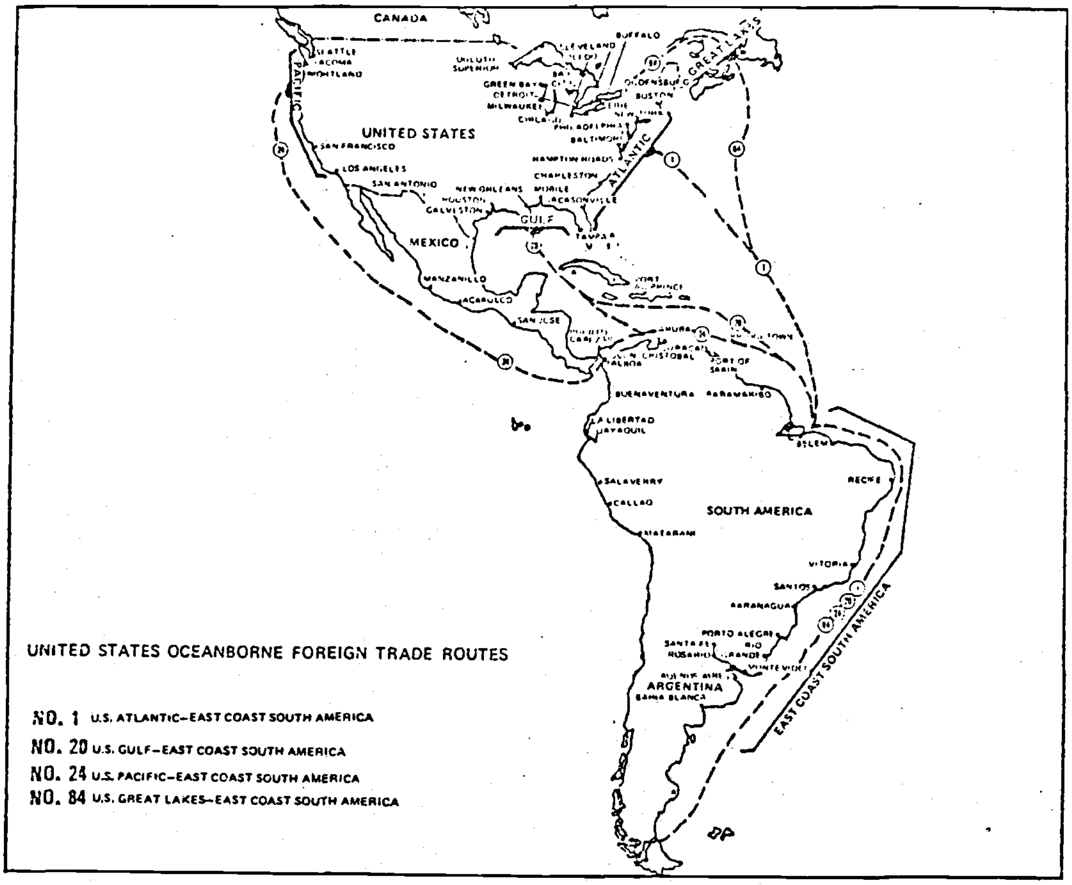
1976 TRADE ON "PACIFIC - CARIBBEAN & EAST COAST OF MEXICO" ROUTE								
TRADE ROUTE 23	EXPORTS				IMPORTS			
	Tons (000)		Value (Million $)		Tons (000)		Value (Million $)	
	Total	Agri	Total	Agri	Total	Agri	Total	Agri
Total Trade	135.4	70.0	105.7	28.7	2,021.4	26.0	185.8	8.2
Percent	100%	52%	100%	27%	100%	1.3%	100%	4.4%
Percent of Total Volume (Imports & Exports)	6.3%	3.2%	36.3%	9.8%	93.7%	1.2%	63.7%	2.8%

All tonnage is in long tons.

Source: United States Oceanborne Foreign Trade Routes, U.S. Department of Commerce, Maritime Administration, March 1978.

Figure A1.

U.S. PACIFIC–EAST COAST SOUTH AMERICA



1976 TRADE ON "PACIFIC - EAST COAST OF SOUTH AMERICA" ROUTE

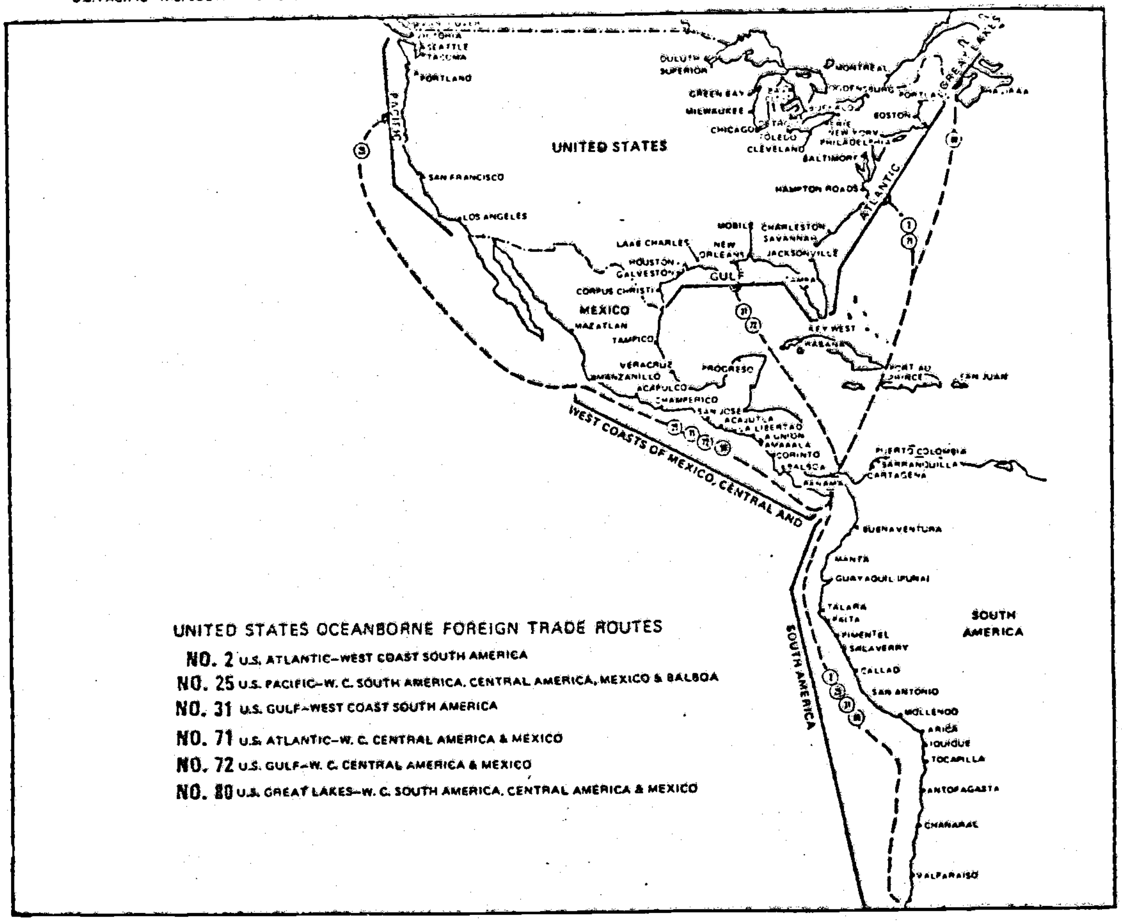
TRADE ROUTE 24	EXPORTS				IMPORTS			
	Tons (000)		Value (Million $)		Tons (000)		Value (Million $)	
	Total	Agri	Total	Agri	Total	Agri	Total	Agri
Total Trade	90.2	19.7	72.6	8.6	122.3	47.8	128.1	92.5
Percent	100%	21.8%	100%	11.8%	100%	39.8%	100%	72.2%
Percent of Total Volume (Imports & Exports)	42.4%	9.3%	36.2%	4.3%	57.6%	22.5%	63.8%	46.1%

All tonnage is in long tons.

Source: United States Oceanborne Foreign Trade Routes, U.S. Department of Commerce, Maritime Administration, March 1978.

Figure A2.

U.S. PACIFIC - W.C. SOUTH AMERICA, CENTRAL AMERICA, MEXICO & BALBOA



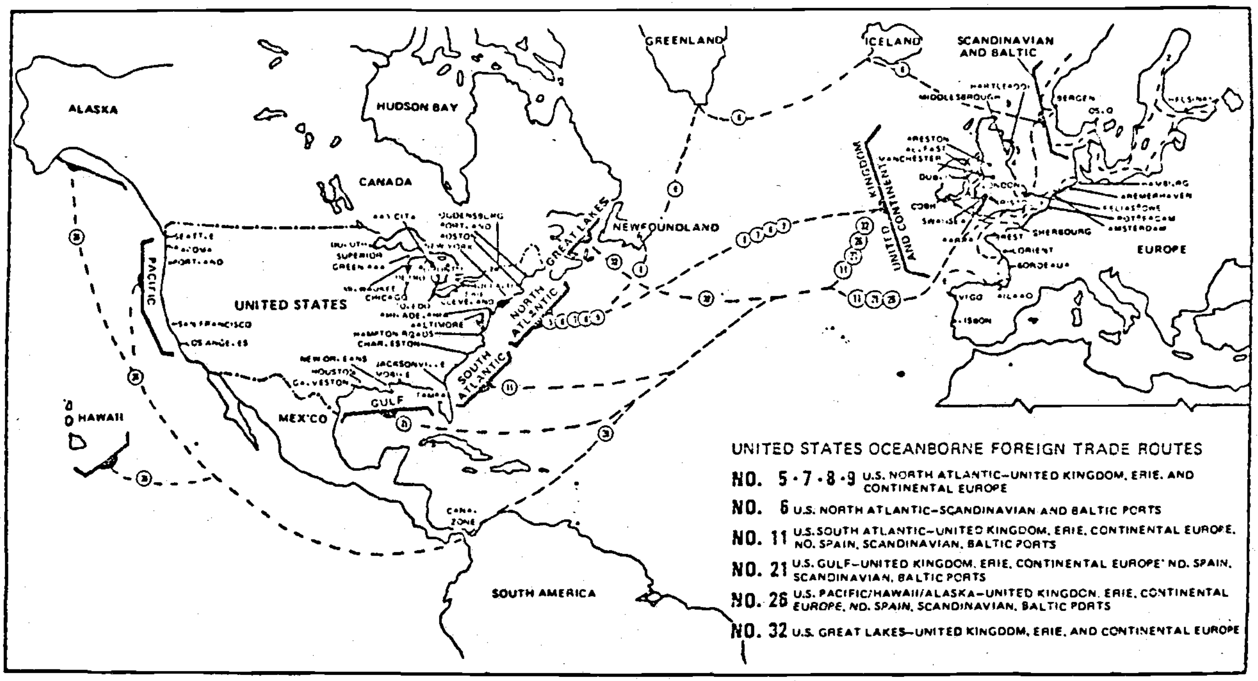
1976 TRADE ON "PACIFIC - WEST COAST OF SOUTH & CENTRAL AMERICA & MEXICO ROUTE								
TRADE ROUTE 25	EXPORTS				IMPORTS			
	Tons (000)		Value (Million $)		Tons (000)		Value (Million $)	
	Total	Agri	Total	Agri	Total	Agri	Total	Agri
Total Trade	893.2	416.2	258.5	85.4	4,288.1	590.0	497.9	277.0
Percent	100%	46.6%	100%	33.0%	100%	13.8	100%	55.6
Percent of Total Volume (Imports & Exports)	17.2%	8.0%	34.2%	11.3%	82.8%	11.4%	65.8%	36.6

All tonnage is in long tons.

Source: United States Oceanborne Foreign Trade Routes, U.S. Department of Commerce, Maritime Administration, March 1978.

Figure A3.

U.S. PACIFIC/HAWAII/ALASKA–UNITED KINGDOM, ERIE, CONTINENTAL EUROPE, NO. SPAIN, SCANDINAVIAN, BALTIC PORTS



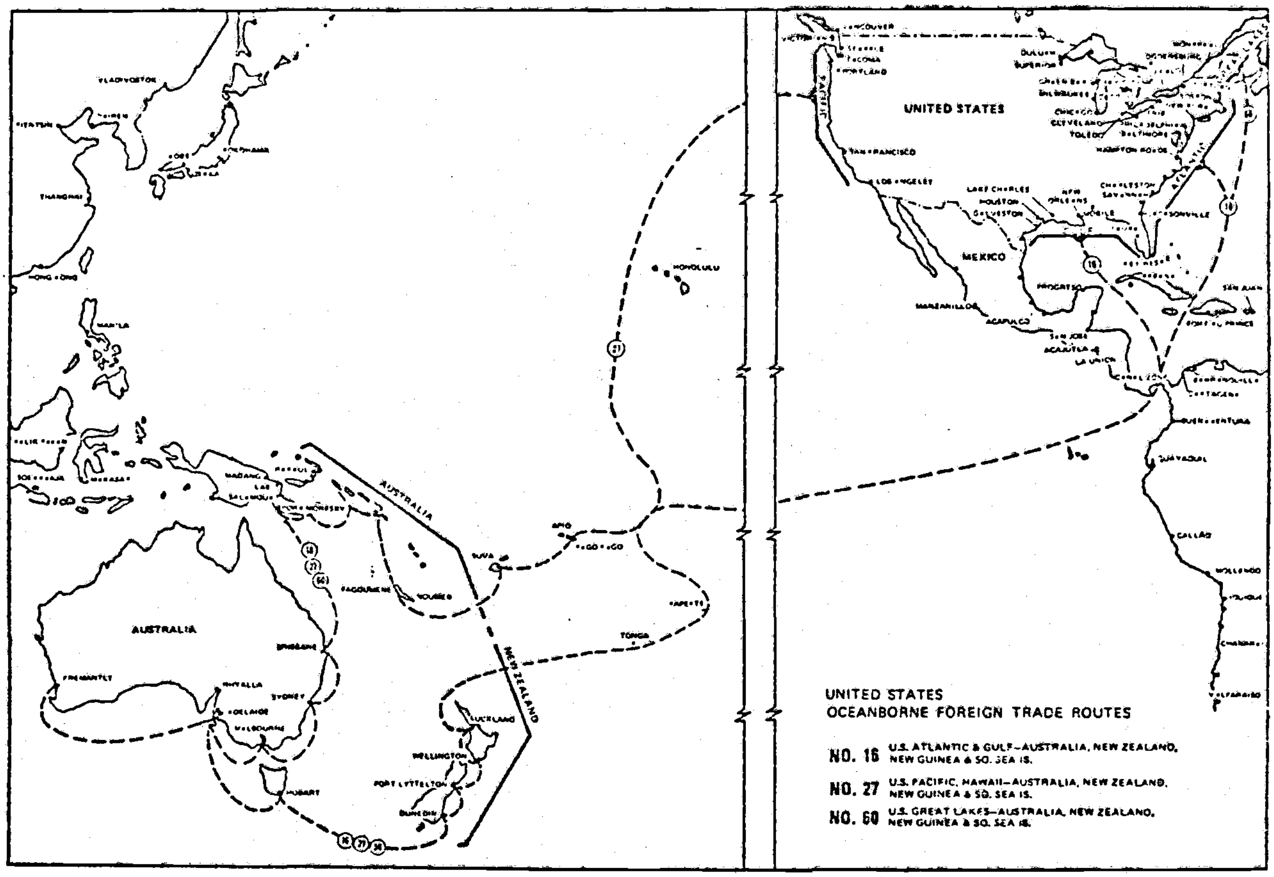
1976 TRADE ON "PACIFIC, ALASKA, & HAWAII – WESTERN EUROPE" ROUTE								
	EXPORTS				IMPORTS			
TRADE ROUTE 26	Tons (000)		Value (Million $)		Tons (000)		Value (Million $)	
	Total	Agri	Total	Agri	Total	Agri	Total	Agri
Total Trade	3,883.1	844.0	1,236.5	379.7	982.8	0	1,375.1	0
Percent	100%	21.7	100%	30.7	100%	0%	100%	0%
Percent of Total Volume (Imports & Exports)	79.8%	17.3%	47.3%	14.5%	20.2%	0%	52.7%	0%

All tonnage is in long tons.

Source: United States Oceanborne Foreign Trade Routes, U.S. Department of Commerce, Maritime Administration, March 1978.

Figure A4.

U.S. PACIFIC, HAWAII—AUSTRALIA, NEW ZEALAND, NEW GUINEA & SO. SEA IS.



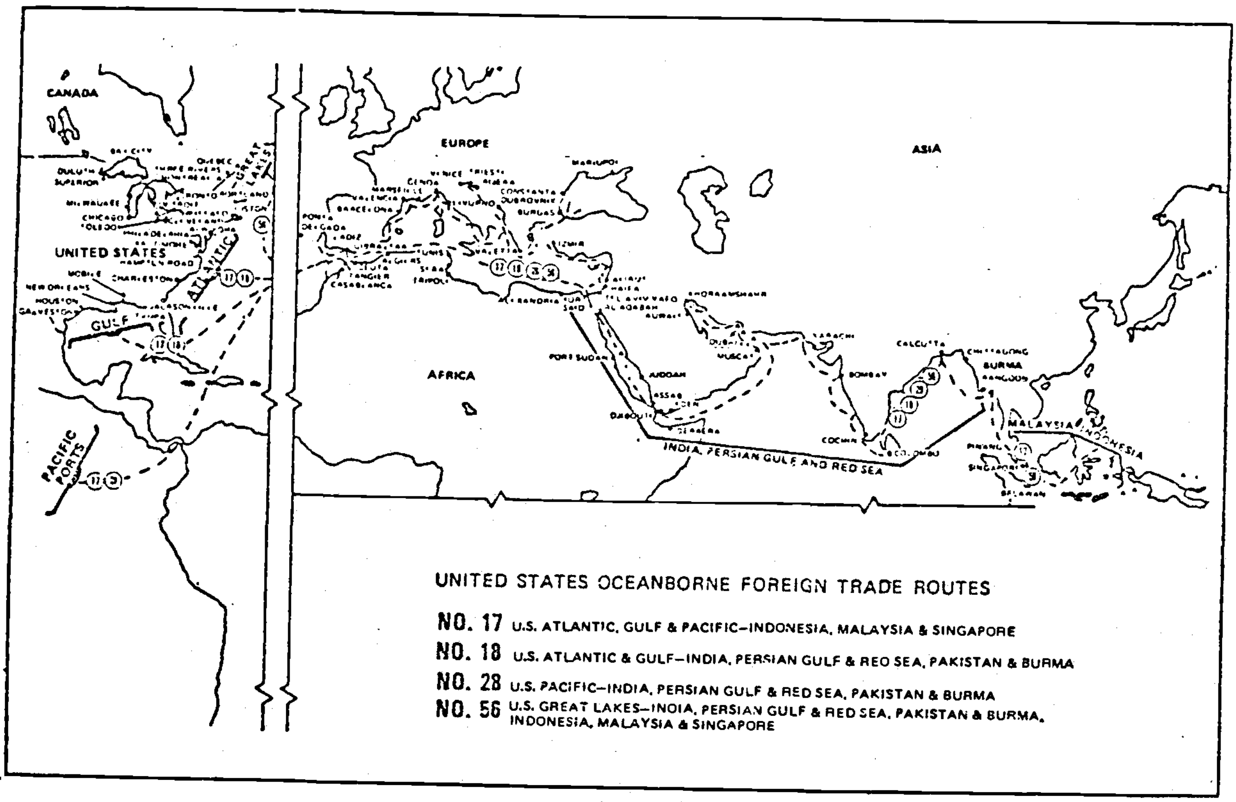
1976 TRADE ON "PACIFIC - AUSTRALIA, NEW ZEALAND" ROUTE								
TRADE ROUTE 27	EXPORTS				IMPORTS			
	Tons (000)		Value (Million $)		Tons (000)		Value (Million $)	
	Total	Agri	Total	Agri	Total	Agri	Total	Agri
Total Trade	1,062.4	34.2	754.2	28.6	2,542.6	143.7	560.1	229.3
Percent	100%	3.2%	100%	3.8%	100%	5.7%	100%	40.9%
Percent of Total Volume (Imports & Exports)	29.5%	1%	57.4%	2.2%	70.5%	4.0%	42.6%	17.4%

All tonnage is in long tons.

Source: United States Oceanborne Foreign Trade Routes, U.S. Department of Commerce, Maritime Administration, March 1978.

Figure A5.

U.S. PACIFIC–INDIA, PERSIAN GULF & RED SEA, PAKISTAN & BURMA



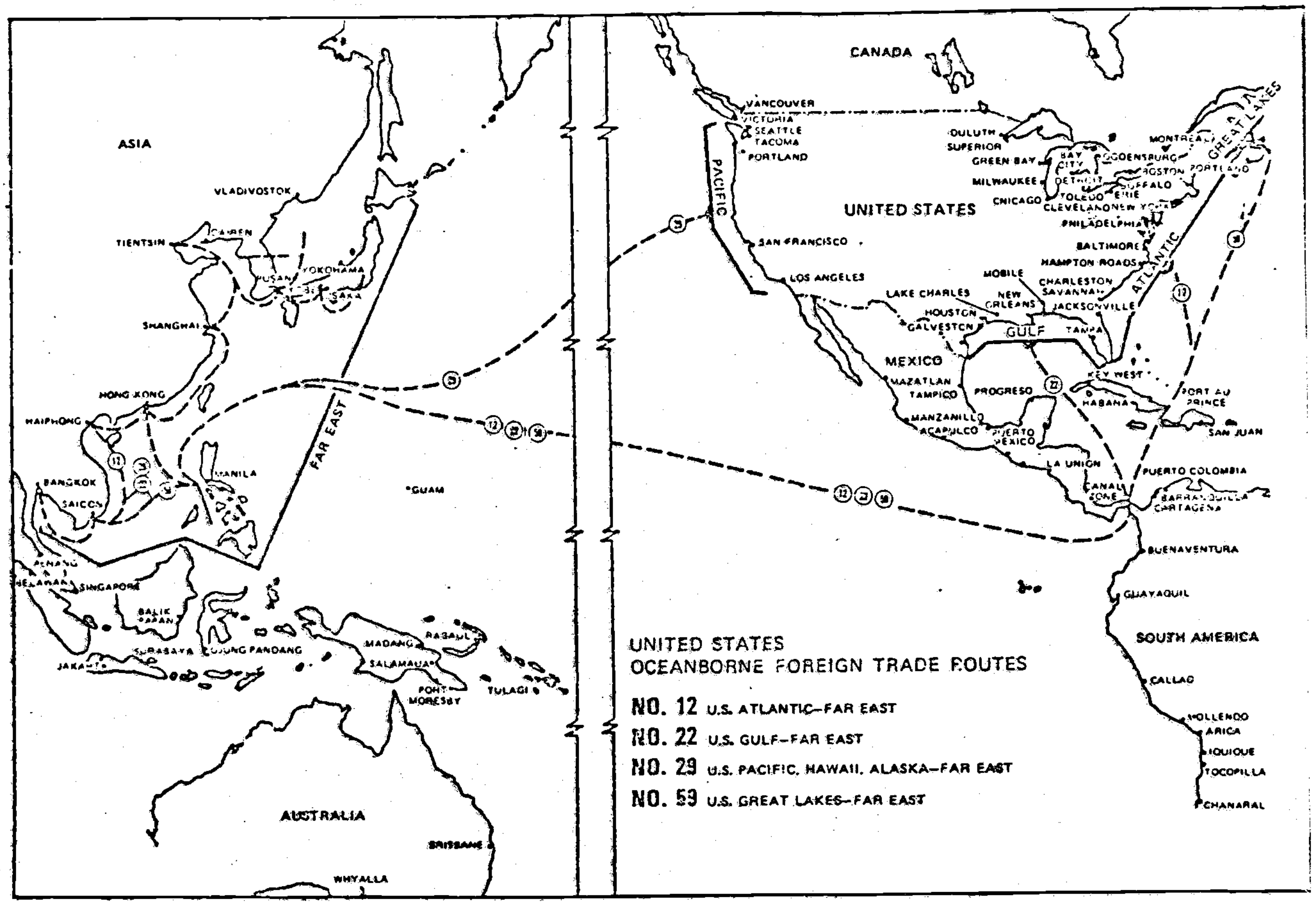
1976 TRADE ON "PACIFIC - SOUTHWEST ASIA, RED SEA, & GULF OF ADEN" ROUTE								
	EXPORTS				IMPORTS			
TRADE ROUTE 28	Tons (000)		Value (Million $)		Tons (000)		Value (Million $)	
	Total	Agri	Total	Agri	Total	Agri	Total	Agri
Total Trade	3,651.7	3,383.7	897.2	531.6	17,550.6	26.7	1,663.8	47.1
Percent	100%	92.7%	100%	59.3%	100%	0.1%	100%	2.8%
Percent of Total Volume (Imports & Exports)	17.2%	16.0%	35.0%	20.8%	82.8%	0.1%	65.0%	1.8%

All tonnage is in long tons.

Source: United States Oceanborne Foreign Trade Routes, U.S. Department of Commerce, Maritime Administration, March 1978.

Figure A6.

U.S. PACIFIC, HAWAII, ALASKA–FAR EAST



1976 TRADE ON "PACIFIC, ALASKA, & HAWAII - FAR EAST" ROUTE								
TRADE ROUTE 29	EXPORTS				IMPORTS			
	Tons (000)		Value (Million $)		Tons (000)		Value (Million $)	
	Total	Agri	Total	Agri	Total	Agri	Total	Agri
Total Trade	34,375	7,802	6,672	1,604	7,243	464	12.439	104
Percent	100%	22.7%	100%	24.0%	100%	15.6%	100%	1.6%
Percent of Total Volume (Imports & Exports)	82.7%	18.7%	34.9%	8.4%	17.3%	1.1%	65.1%	1.0%

All tonnage is in long tons.

Source: United States Oceanborne Foreign Trade Routes, U.S. Department of Commerce, Maritime Administration, March 1978.

Figure A7.