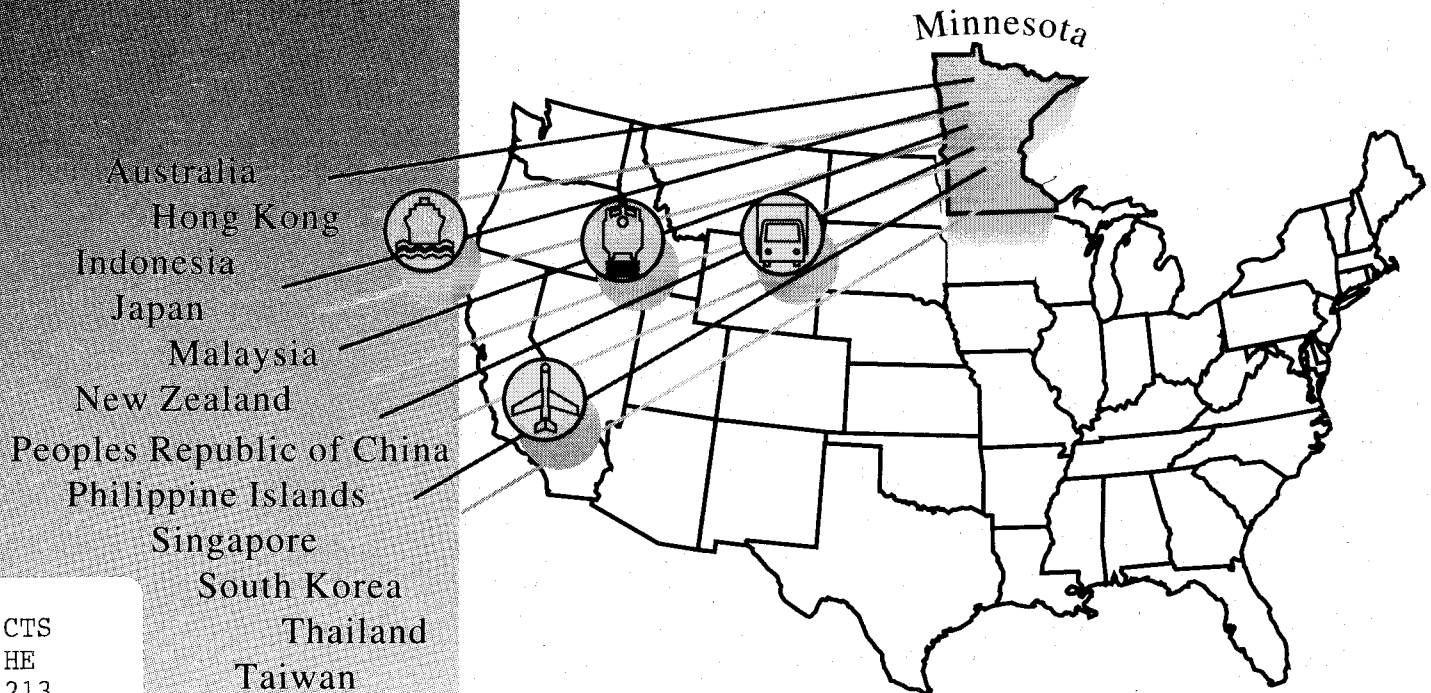




Transportation Facilities and Services Available to Minnesota Exporters to Serve Pacific Area Markets



CTS
HE
213
.M6
H37
1993

ACKNOWLEDGEMENT

Philip T. Evers, Ph.D. candidate in the Carlson School of Management, served as the principal Research Assistant on the project, assisting with the mail study sample design, questionnaire development, data analysis, and report editing. Grant R. Company and Judith A. Price, MBA students in the Carlson School, contributed substantially to the project by conducting many of the personal interviews with third parties and carriers.

Financial support for the study was provided by the Minnesota Department of Transportation and the Center for Transportation Studies at the University of Minnesota.

Report Documentation Page

1. Report No. MN/RC-93/13	2.	3. Recipient's Accession No.	
4. Title and Subtitle Transportation Facilities and Services Available to Minnesota Exporters to Serve Pacific Area Markets		5. Report Date July 1993	6.
7. Author(s) Professor Donald V. Harper		8. Performing Organization Report No.	
9. Performing Organization Name and Address Curtis L. Carlson School of Management University of Minnesota 1235 Management and Economics Building Minneapolis, Minnesota 55455		10. Project/Task/Work Unit No.	
12. Sponsoring Organization Name and Address Minnesota Department of Transportation Office of Research Administration 200 Ford Building, 117 University Avenue Saint Paul, Minnesota 55155		11. Contract(C) or Grant(G) No. (C)MN/DOT 68816-70 (G)	
15. Supplementary Notes		13. Type of Report and Period Covered FINAL REPORT	
16. Abstract (Limit: 200 words)		14. Sponsoring Agency Code	
<p>The transportation facilities and services available to Minnesota exporters to export to Pacific area countries were identified. This included the modes of transportation, individual carriers, third parties, and ocean ports and airports available to Minnesota shippers. The service provided was evaluated as were its accessibility to Minnesota exporters and the ability of the system to handle a substantial increase in exports from Minnesota. Included were international water and air transportation and domestic railroad, motor truck, and intermodal railroad-truck transportation.</p> <p>The conclusions drawn were that (1) the transportation service from Minnesota to the Pacific area is sufficient in quantity and quality in all modes, with some problems with lack of enough air freight service at Minneapolis-St. Paul; (2) the transportation service is satisfactory in terms of cost for water and motor truck service, with less satisfaction with the cost of the other modes; (3) the transportation service is generally accessible to Minnesota exporters; and (4) the transportation system for the most part should be able to handle a major increase in the quantity of exports to the Pacific region from Minnesota, the possible exception is air freight transportation in terms of both carrier capacity and airport capacity.</p>			
17. Document Analysis a. Descriptors international export facilities services Pacific		18. Availability Statement No restrictions. This document is available through the National Technical Information Services, Springfield, Virginia 22161.	
19. Security Class (this report) Unclassified	20. Security Class (this page) Unclassified	21. No. of Pages 234	22. Price

**TRANSPORTATION FACILITIES AND SERVICES AVAILABLE TO
MINNESOTA EXPORTERS TO SERVE PACIFIC AREA MARKETS**

Final Report

Prepared by

Donald V. Harper
Professor and Chair

Department of Marketing and Logistics Management
Curtis L. Carlson School of Management
University of Minnesota

July, 1993

Submitted to

Minnesota Department of Transportation
Office of Research Administration
200 Ford Building, 117 University Avenue
St. Paul, Minnesota 55155

This report represents the results of research conducted by the author and does not necessarily reflect the official views or policy of the Minnesota Department of Transportation. This report does not contain a standard or specified technique.

SUMMARY

PACIFIC AREA DEFINED

For purposes of this study, the Pacific area was defined to include all of the countries in what is commonly referred to as the "Pacific Rim" plus those in the southwest and south Pacific regions. A total of 29 countries were included, although most Minnesota exports are shipped to the Pacific Rim countries of Australia, Hong Kong, Indonesia, Japan, Malaysia, New Zealand, People's Republic of China, Philippines, Singapore, South Korea, Thailand, and Taiwan. The Pacific area is the second largest market (after Western Europe) for Minnesota manufactured goods exports.

PURPOSE OF THE STUDY

The purpose of the study was to identify the transportation facilities and services available to Minnesota exporters to export goods to Pacific region countries. This included the modes of transportation, individual carriers, third parties, and ocean ports and airports. The service provided was evaluated as were its accessibility to Minnesota exporters and the ability of the system to handle substantial increases in exports from Minnesota.

METHODOLOGY USED IN THE STUDY

The methodology used included an extensive search of the literature, personal interviews among executives of 25 carriers

and third parties involved in Minnesota's foreign trade and two government agencies, and a mail questionnaire study among Minnesota manufacturers identified as exporters to the Pacific region. The return rate of usable questionnaires was 27.1 percent.

The Minnesota-Pacific region transportation system includes international water and air transportation and domestic railroad, motor truck, and intermodal railroad-truck (IRT) service. These alternative modes involve third parties, mainly freight forwarders, as well as carriers. All of these modes were examined in the study.

CONCLUSIONS

International Water Transportation

International water transportation dominates overseas transportation from Minnesota in terms of weight carried. The number of ocean carriers available to serve the Pacific area and the amount of carrier and freight forwarder service available is adequate. In fact, there is a general overcapacity situation in the industry. There are no carrier accessibility problems. Respondents in the study indicated satisfaction with the service provided.

The west coast ocean ports studied have made available sufficient service to Minnesota exporters. There have been no port capacity or accessibility problems. Respondents in the

study indicated a positive reaction to the quality of the service provided at the ports.

It is probable that there will be sufficient water carrier and ocean port capacity to handle additional Minnesota exports to the Pacific area in the foreseeable future.

International Air Transportation

International air transportation accounts for a large share of Minnesota's exports to the Pacific region in terms of the value of the goods carried. The total number of carriers available to serve Minnesota exporters in reaching Pacific markets is adequate, and the amount of carrier, freight forwarder, and local pickup trucking service available to Minnesota exporters is satisfactory. There is, in fact, overcapacity in the industry. For the most part, there are no carrier accessibility problems. Respondents in the study indicated satisfaction with the air freight service received.

United States airports studied have adequately served Minnesota exporters. However, there have been congestion problems at Los Angeles and a lack of enough total air freight service available at Minneapolis-St. Paul. There is an accessibility problem for exporters located some distance from the Twin Cities in reaching Minneapolis-St. Paul International Airport. On the other hand, respondents in the study had a generally positive perception of the service provided at most of the seven airports studied and, in particular, Minneapolis-St. Paul.

Because of possible problems associated with bilateral agreements among countries, a more balanced traffic flow in the Pacific trades, a decreasing number of air freight carriers, and possible inadequate capacity and resulting congestion at some airports, air transportation might present a capacity problem if Minnesota exports to the Pacific area increase substantially in the near future.

Railroad Transportation

Straight railroad transportation is involved in only a limited way in the export of manufactured goods from Minnesota to the Pacific area. The amount of service available is adequate in terms of the number of carriers, freight forwarders, and frequency of service. There are no capacity shortage problems; in fact, there is excess capacity. But, there are accessibility problems for exporters located in Minnesota that have lost their rail service. Minnesota exporters viewed the railroad industry less positively than the other four modes studied.

There is no reason to expect any kind of straight railroad capacity difficulty in the event that Minnesota exports of manufactured goods to the Pacific region increase greatly in the next few years, despite a possible problem of having a smaller number of rail carriers in business.

Motor Truck Transportation

Intercity motor trucking is involved in much of the export trade of Minnesota to the Pacific region by connecting exporters

with ocean ports or with distant airports. There is plenty of service available, including less-than-truckload (LTL), truckload, freight forwarder, and broker service. In fact, the industry suffers from chronic excess capacity. Motor trucking is the most accessible of all modes. Minnesota exporters in the study expressed considerable satisfaction with motor trucking service.

Should a substantial increase in Minnesota exports to the Pacific region occur, the capacity of the intercity motor trucking system should be able to successfully handle the increase.

Intermodal Railroad-Motor Truck Transportation

Intermodal Railroad-Motor Truck (IRT) service has become important in international trade, connecting exporters and importers with ocean ports. The service it provides to Minnesota exporters is plentiful in terms of its component parts: the rail service, the motor trucking drayage operations, and the services of shippers' agents. Again, an overcapacity situation prevails. IRT service is nominally available at all locations in the state but, in practice, most IRT users are located near one of the limited number of IRT terminals in the area. Minnesota exporters perceived IRT service less positively than water, air, and motor truck transportation service, but better than straight rail service.

The IRT system in the United States will be able to adjust to an increase in exports from Minnesota to the Pacific region should it occur.

Summary of Conclusions

The basic conclusions to be drawn from this study are that the transportation service from Minnesota to the Pacific area is generally sufficient in quantity, quality, and cost in all modes, with some problems with lack of enough air freight service at Minneapolis-St. Paul and with the cost of air freight, straight railroad, and IRT transportation. The transportation service is generally accessible to Minnesota exporters, with some exceptions, and the transportation system for the most part should be able to handle a major increase in the quantity of exports to the Pacific region from Minnesota; the possible exception is air freight transportation in terms of both carrier capacity and airport capacity.

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
Acknowledgement	i
Summary	ii
Pacific Area Defined	ii
Purpose of the Study	ii
Methodology Used in the Study	ii
Conclusions	iii
International Water Transportation	iii
International Air Transportation	iv
Railroad Transportation	v
Motor Truck Transportation	v
Intermodal Railroad-Motor Truck Transportation	vi
Summary of Conclusions	vii
Part 1: Introduction	1
Pacific Area Defined	1
Minnesota Exports to the Pacific Area	2
Part 2: Purpose of the Study	6
Objectives	6
Part 3: Methodology Used in the Study	7
Literature Search	7
Personal Interviews	7
Mail Questionnaire Study	8
The Mail Sample	8
The Mail Questionnaire	9
Questionnaire Returns	10

TABLE OF CONTENTS (continued)

<u>Section</u>	<u>Page</u>
Characteristics of Responding Exporters to the Pacific Region	10
Part 4: Findings of the Study	17
The International Transportation System	17
Carriers	17
Third Parties	18
Factors Affecting the International Transportation System	19
Government	19
Other Factors	20
International Water Transportation	20
Importance of Water Transportation in Overseas International Trade	20
Kinds of Carriers and Vessels	21
Ownership of Carriers	25
Westbound Pacific Carriers	26
Shipping Conferences	30
Transportation in the Foreign Country	34
The Nature of Westbound Pacific Traffic	35
Ocean Carrier Capacity	37
Third Parties	40
Ocean Ports	45
Port Capacity	50
Barriers to International Water Transportation	57
Overall Capacity of the Water Transportation System	59

TABLE OF CONTENTS (continued)

<u>Section</u>	<u>Page</u>
The Use of Water Transportation by Minnesota Exporters to Pacific Area Countries	60
International Air Transportation	75
Importance of Air Transportation in Overseas International Trade	75
Air Freight Carriers	78
Kinds of Aircraft Used	82
Ownership of Air Freight Carriers	83
United States-Pacific Area Air Carriers	84
Bilateral Agreements	88
Pricing of Air Freight Service	90
Air Freight Carrier Capacity	92
Freight Forwarders and Local Trucking	95
Overall Carrier and Third Party Capacity in the Air Transportation System	99
Airports	101
Barriers to International Air Freight Transportation	119
Overall Capacity of the Air Transportation System	123
The Use of Air Transportation by Minnesota Exporters to Pacific Area Countries	123
Railroad Transportation	129
Importance of Railroad Transportation in Overseas International Trade	129
Kinds of Carriers and Equipment	130
Ownership	131

TABLE OF CONTENTS (continued)

<u>Section</u>	<u>Page</u>
Traffic Carried	131
Pricing of Railroad Service	134
Westbound Railroads	135
Westbound Railroad Traffic	136
Railroad Capacity	136
Third Parties	138
Perceptions About Railroad Service	138
Motor Truck Transportation	139
Importance of Motor Truck Transportation in Overseas International Trade	139
Kinds of Carriers	140
Ownership	144
Traffic Carried	145
Pricing Motor Trucking Service	149
Westbound Motor Truck Traffic	150
Motor Truck Capacity	151
Third Parties	153
Perceptions About Motor Truck Service	155
Intermodal Railroad-Truck Transportation	155
Intermodal Railroad-Truck Service Defined	155
Advantages of Intermodal Railroad-Truck Service	156
Disadvantages of Intermodal Railroad-Truck Service	157
Importance of Intermodal Railroad-Truck Service in Overseas International Trade	159

TABLE OF CONTENTS (continued)

<u>Section</u>	<u>Page</u>
Kinds of Carriers	160
Ownership	164
Traffic Carried	165
Pricing Intermodal Railroad-Truck Service	166
Intermodal Railroad-Truck Facilities in Minnesota	167
Minnesota Traffic Volume	174
Kinds of Traffic Carried	175
Shippers' Agents	176
Capacity	177
The Use of Intermodal Railroad-Truck Service by Minnesota Exporters to the Pacific Region	179
Part 5: Conclusions	184
Importance of the Pacific Region to Minnesota Manufacturers	184
International Water Transportation	184
Ocean Carriers	184
International Surface Freight Forwarders	186
West Coast Ports	186
Overall Water Transportation Capacity	187
International Air Transportation	187
Air Carriers	187
International Air Freight Forwarders	189
Local Trucking Companies	190
Airports	190

TABLE OF CONTENTS (continued)

<u>Section</u>	<u>Page</u>
Overall Air Transportation Capacity	192
Railroad Transportation	193
Rail Carriers	193
International Surface Freight Forwarders	194
Overall Railroad Transportation Capacity	195
Motor Truck Transportation	195
Motor Truck Carriers	195
International Surface Freight Forwarders	196
Truck Brokers	196
Overall Motor Truck Transportation Capacity	196
Intermodal Railroad-Motor Truck (IRT) Transportation	197
Rail Carriers	197
Shippers' Agents	198
Local Trucking Companies	198
Overall IRT Capacity	198
Summary of Conclusions	198
References	200
Appendix A Mail Study Questionnaire	A1-A8

LIST OF TABLES

<u>Table</u>	<u>Page</u>
Table 1: Pacific Area Countries Importing Manufactured Goods from Minnesota, 1990	4
Table 2: Commodities Exported to Pacific Area Countries from Minnesota, 1990	5
Table 3: Annual Sales of Pacific Region Exporting Respondents	12
Table 4: Number of Employees of Pacific Region Exporting Respondents	13
Table 5: Annual Sales Volume of Exports Shipped to Pacific Region by Respondents	16
Table 6: Westbound Pacific Liner Carriers, 1993	27
Table 7: Number of Loaded International Containers Handled at West Coast Ports, 1990	49
Table 8: Pacific Area Ports Served from West Coast Ports	51
Table 9: International Modes of Transportation Used by Respondents to Export to the Pacific Region	63
Table 10: Criteria Considered by Respondents when Selecting the Mode(s) of Transportation (Both Domestic and International) Used to Export to the Pacific Region	65
Table 11: Origin Points of Exports to Pacific Region Countries by Respondents	67
Table 12: Most Important Pacific Region Countries Exported to by Respondents	69
Table 13: Ports Used by Respondents to Export to the Pacific Region and Average Respondent Rating of Ports	71
Table 14: Companies Used by Respondents when Arranging for Transportation to the Pacific Region	74
Table 15: Average Respondent Rating of Service Provided by Modes of Transportation to the Pacific Region	76
Table 16: Leading United States Air Freight Carriers, 1991	85

LIST OF TABLES (continued)

<u>Table</u>	<u>Page</u>
Table 17: Air Cargo Carriers Serving Between the United States and Pacific Area Countries, 1993	87
Table 18: United States Airports Available to Minnesota Exporters to Reach Pacific Area Countries, 1993	103
Table 19: Major Combination and All-Cargo Carriers Serving Minneapolis-St. Paul International Airport, 1993	105
Table 20: Summary of Service to the Pacific Area from Seven United States Airports	116
Table 21: Airports Used by Respondents to Export to the Pacific Region and Average Respondent Rating of Airports	127
Table 22: Revenue of Class I Railroads	132
Table 23: Revenues of Largest For-Hire Interstate Truckload Trucking Companies, 1991	142
Table 24: Revenues of Largest For-Hire Interstate Less-Than-Truckload Trucking Companies, 1991	143

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
Figure 1: Burlington Northern System Map	168
Figure 2: The Soo Line System Map	169
Figure 3: Location of Intermodal Terminals In or Near Minnesota	172

PART 1 INTRODUCTION

Transportation is a vital part of international trade, frequently involving very long distances and high transportation costs. Transportation can be a great stimulus to trade when it operates effectively and efficiently and is available to exporters and importers. Conversely, transportation can be a barrier to international trade if it does not perform at a satisfactory level and reasonable cost or when it is not accessible to exporters and importers.

PACIFIC AREA DEFINED

For purposes of this study, the Pacific area is defined to include all countries in what is commonly referred to as the Pacific Rim plus those in the southwest and south Pacific regions. The countries included are, in alphabetical order, American Samoa, Australia, Cambodia, Cook Islands, Fiji, French Polynesia, Guam, Hong Kong, Indonesia, Japan, Malaysia, Mariana Islands, Marshall Islands, Micronesia, New Caledonia, New Zealand, Okinawa, Papua New Guinea, People's Republic of China, Philippines, Russia (Pacific imports only), Singapore, Socialist Republic of Viet Nam, South Korea, Tahiti, Taiwan, Thailand, Tonga Islands, and Western Samoa.

The main countries involved are what can be called the "Pacific Rim" countries of Australia, Hong Kong, Indonesia, Japan, Malaysia, New Zealand, People's Republic of China, Philippines, Singapore, South Korea, Thailand, and Taiwan.

MINNESOTA EXPORTS TO THE PACIFIC AREA

Experts in the field of foreign trade consistently predict that, as their economies develop and their populations continue to increase, the Pacific area countries have the greatest potential for future growth in exports from the United States. Indeed, these countries have already exhibited rapid growth. Laura Tyson, head of the President's Council of Economic Advisers, has said, "The Pacific remains the most important economic region in the world."¹ Trade analyst Michael Schlar stated that Asia will emerge as a steady export market for American products. "Corresponding with their own manufacturing growth, the newly industrialized economies will have a consumer class demanding more sophisticated products from the United States and Europe."²

Therefore, the Pacific region will be of increasing importance in the lives of Americans and to American manufacturing companies and promises to be a growing market for Minnesota's manufactured goods. The Pacific area was already the second largest market (after Western Europe) for Minnesota manufactured goods exports in 1990, totalling about \$1.8 billion. This was roughly 31 percent of Minnesota's total manufactured goods exports of almost \$5.9 billion in that year. In the mail study described below, of 55 Minnesota manufacturer-exporters, 45

¹"Trade Analysts and Authors Agree: No End in Sight for Pacific Rim Boom," Pacific Shipper, December 7, 1992, p. 43.

²Ibid., p. 40.

said they expected their exports to the Pacific Rim to increase in the next three years.

Table 1 shows the Asian countries that imported significant amounts of manufactured goods from Minnesota in 1990 and the dollar value of those imports. Japan accounted for nearly one-half of the exports; South Korea was a distant second with about thirteen percent. A listing of commodities exported to the Pacific region in 1990 is shown in Table 2.

The study reported on here dealt with the transportation system available to Minnesota manufacturers to export to the Pacific area. Parts 2 and 3 of the report include the objectives of the study and the methodology used, respectively. Part 4 contains the findings of the study, and the conclusions may be found in Part 5.

Table 1
Pacific Area Countries Importing Manufactured
Goods from Minnesota, 1990

<u>Country</u>	<u>Value of Exports (in thousands)*</u>	<u>Share of Exports</u>
Japan	\$836,550	47.3%
South Korea	227,627	12.9
Australia	149,009	8.4
Taiwan	108,928	6.2
Hong Kong	94,117	5.3
Singapore	88,463	5.0
Malaysia	79,780	4.5
Thailand	59,190	3.4
People's Republic of China	25,925	1.5
Indonesia	22,950	1.3
New Zealand	22,889	1.3
Philippines	18,831	1.0
Other [#]	<u>33,294</u>	<u>1.9</u>
Total	1,767,553	100.0

*1990 dollars.

[#]Some of the other countries include French Polynesia, Western Samoa, Fiji, Marshall Islands, New Caledonia, Papua New Guinea, Socialist Republic of Viet Nam, Cook Islands, and Tonga Islands. Each of these imported less than \$250,000 worth of manufactured goods from Minnesota in 1990. Exports to India are included in the "other" category, but are not considered to be Pacific area exports in this study.

Source: U.S. Department of Commerce and University of Massachusetts. Obtained from Minnesota Trade Office.

Table 2
Commodities Exported to Pacific Area Countries
from Minnesota, 1990

<u>Commodity</u>	<u>Value of Exports (in thousands)*</u>	<u>Share of Exports</u>
Industrial Machinery	\$889,100	50.3%
Scientific Instruments	207,904	11.8
Electronic Equipment	135,440	7.7
Food and Kindred Products	118,398	6.7
Chemicals and Allied Prods.	82,383	4.7
Paper and Allied Products	74,859	4.2
Rubber and Misc. Plastic	71,833	4.1
Fabricated Metal Products	45,079	2.5
Stone, Clay, Glass Prods.	34,981	2.0
Transportation Equipment	25,821	1.5
Textile Mill Products	18,307	1.0
Other [#]	<u>63,448</u>	<u>3.5</u>
 Total	 1,767,553	 100.0

*1990 dollars.

[#]Other includes Apparel, Lumber and Wood Products, Furniture and Fixtures, Printing and Publishing, Petroleum Refining Products, Leather and Leather Products, Primary Metal Products, and Miscellaneous. Each of these accounted for less than one percent of exports to the Pacific region.

Source: U.S. Department of Commerce and University of Massachusetts. Obtained from Minnesota Trade Office.

PART 2
PURPOSE OF THE STUDY

OBJECTIVES

Although Pacific area markets account for a large part of Minnesota's exports and promise to grow in the future, there has been no comprehensive study made of the transportation system used to serve those markets. In fact, there have been no studies of any of the several parts of the state's international transportation system or of the system as a whole. In order to plan for the future, it is necessary to know what the present Minnesota-Pacific area transportation system consists of and what its capabilities are to handle the increase in traffic expected to occur.

The purpose of the study discussed in this report was to identify the transportation facilities and services available to Minnesota exporters to export goods to Pacific area countries. This included the modes of transportation as well as individual carriers, third parties, and ports (both water and air) available to Minnesota shippers. An attempt was made to determine the number of carriers involved, the amount of service available, the transit times available, the rates charged, the quality of service provided, the accessibility of the system to Minnesota shippers, and the capacity of the system in general terms. Also included was a study of the system's ability to adapt to increases in Minnesota exports.

PART 3
METHODOLOGY USED IN THE STUDY

LITERATURE SEARCH

An extensive search of the literature was made to determine if any previous studies had been made of Minnesota's export transportation system and to obtain information on Minnesota's export trade to the Pacific region and the kinds of transportation facilities and services used. It was determined that no previous studies of Minnesota's export transportation system in total or in part had previously been made. There were few published sources dealing with Minnesota's system, although there were many publications of various kinds related to United States export transportation in general. Numerous citations to the literature are made in this report. Of particular value was a 1991 study dealing with intermodal railroad-truck transportation facilities and services in Minnesota.³

PERSONAL INTERVIEWS

A combination of personal interviews and a mail questionnaire study conducted in 1992 was used to provide the information needed to reach the objectives of the study.

Personal interviews were conducted among executives of four steamship lines, three railroads, two motor trucking companies,

³Donald V. Harper and Philip T. Evers, An Analysis of Intermodal Railroad-Truck Facilities and Services in Minnesota (Minneapolis: Center for Transportation Studies, University of Minnesota, 1991). See also Donald V. Harper and Philip T. Evers, "Competitive Issues in Intermodal Railroad-Truck Service," Transportation Journal, Spring 1993.

four airlines, eleven international freight forwarders, one public warehouse, and two governmental offices dealing with Minnesota's international trade. In some cases, multiple interviews were held with personnel from the same organization. The persons interviewed were selected on the basis of their importance in and knowledge of the export of manufactured goods to Asia. These interviews provided important specific Minnesota-oriented information that was then augmented by the mail questionnaire study among exporters.

MAIL QUESTIONNAIRE STUDY

The Mail Sample

Mail questionnaires were sent to Minnesota companies having manufacturing facilities in Minnesota. They were selected from the Directory of United States Exporters.⁴ This directory contains a list of approximately 19,000 United States exporters, organized by state, along with information about products exported and other operating statistics. The information is collected by the publisher via questionnaires, United States Department of Commerce information, and other methods on a regular basis.

The selection of firms to include in the sample was based on two criteria. One, that the firm was identified in the directory as a manufacturer; and two, that the firm exported to Pacific

⁴Directory of United States Exporters, 1992, (Phillipsburg, NJ: The Journal of Commerce, 1992).

area countries or exported "world wide," which could include the Pacific region. This enabled an isolation of those manufacturers that were or could be exporters to the Pacific area. All Minnesota manufacturers listed in the directory that had these characteristics were included in the study--there was no "sample" to be drawn. The entire universe was included. This involved a total of 339 firms.⁵

The Mail Questionnaire

The mail questionnaire (see Appendix) was designed to identify manufacturers that export to Pacific area countries and then to ask in some detail questions about their use of transportation to reach Asia. In the mail questionnaire, the Pacific area was defined as including Australia, Hong Kong, Indonesia, Japan, Malaysia, New Zealand, Papua New Guinea, People's Republic of China, Philippines, Russia (Pacific ports only), Singapore, South Korea, Taiwan, and Thailand. Those manufacturers in the study that did not export to the Pacific region (i.e., those that were recorded in the directory as shipping "world wide" but, in fact, did not ship to the Pacific area) were asked to answer only several demographic questions. The number of questions asked of exporters to the Pacific region was a maximum of 24 if they used both water and air transportation and a minimum of twenty if only one of these two modes was used. Eighty percent of the questions could be

⁵An additional seven were eliminated because of inaccurate addresses shown in the directory.

answered by a check mark or circle. Respondents were encouraged to provide comments on every question.

Questionnaire Returns

Of the 339 firms on the modified mailing list, 92, or 27.1 percent, returned a usable completed questionnaire. Of the 92 usable responses, 55 were from firms that reported to the Pacific area; 37 respondents did not export to the Pacific area. The return rate of 27.1 percent is considered good for a study of this kind. Despite the good rate of return, there is a deficiency that is found in all mail surveys caused by the fact that it is not known how the non-respondents would have answered the questions. What bias this may have caused is difficult to predict. However, exporters to the Pacific countries may have been more likely to respond than non-exporters to the Pacific area, because of lack of interest or because they believed they had nothing to contribute to the study, thereby causing an under representation of the latter. The letter that accompanied the questionnaire encouraged a response even if the firm did not export to the Pacific region. The fact that so many non-Pacific area exporters did respond (37 firms) indicates that this problem was minimized.

Characteristics of Responding Exporters to the Pacific Region

Size of Firms

Pacific area exporters returning a usable questionnaire represented a wide variety of firm sizes, as measured by annual

sales and number of employees, with smaller firms accounting for a substantial share of the total. Table 3 shows the breakdown of these exporters by annual sales. Of the 51 exporters providing revenue information, almost all had sales of at least \$1 million. The largest group were the 22, or 43 percent, having annual sales of between \$1 million and \$10 million. Ten percent had sales between \$10 million and \$25 million. Some larger firms were also included. About twelve percent had sales between \$25 million and \$50 million while approximately eighteen percent had sales between \$50 and \$100 million; almost sixteen percent had sales of \$100 million or more.

The sizes of the 54 exporters that answered the question in terms of their number of employees are shown in Table 4. A wide range of sizes were involved, with the largest group (22.2 percent) having fewer than fifty employees. One-half had less than 100 employees. However, a substantial number of larger firms were involved with about eleven percent having between 250 and 499 employees, thirteen percent having between 500 and 999 employees, and approximately nine percent having 2000 or more employees.

Fields of Respondents

The fields worked in and/or the titles of the persons that filled out the mail questionnaire for exporters to the Pacific area included president and/or chief executive officer (8), executive vice president (1), vice president (1), general manager (2), controller (1), regional manager (2), director or manager of

Table 3
Annual Sales of Pacific Region Exporting Respondents

<u>Annual Sales</u>	<u>Number of Exporters</u>	<u>Share of Exporters</u>
\$499,999 and under	0	0.0%
\$500,000 to \$999,999	1	2.0
\$1 million to \$9,999,999	22	43.1
\$10 million to \$24,999,999	5	9.8
\$25 million to \$49,999,999	6	11.8
\$50 million to \$9,999,999	9	17.6
\$100 million and over	<u>8</u>	<u>15.7</u>
Total	51*	100.0

*Four respondents did not answer the question.

Table 4
 Number of Employees of Pacific Region Exporting Respondents

<u>Number of Employees</u>	<u>Number of Exporters</u>	<u>Share of Exporters</u>
49 and under	12	22.2%
50 to 74	10	18.5
75 to 99	5	9.3
100 to 249	9	16.6
250 to 499	6	11.1
500 to 999	7	13.0
1000 to 1999	0	0.0
2000 and over	<u>5</u>	<u>9.3</u>
Total	54*	100.0

*One respondent did not answer the question.

marketing and/or sales (15), export manager or director (6), traffic or distribution manager (8), operations manager (1), director of human resources (1), manager of business administration (1), planning administrator (1), salesperson (2), and secretary (1). Four persons were not identified as to title.

Products Produced

A wide variety of products were produced by the 55 firms that exported to the Pacific region. They included, among many others, acoustical panels, angioplasty catheters, books, computer chips, conveyor systems, digital controls, drinking water filters, furniture, hearing aids, industrial vacuum cleaners, insect repellents, leather tanning machinery, office supplies, painting tools, portable pumps, and wood windows.

Location of Respondents

The 55 exporters had manufacturing facilities in twenty different locations within Minnesota, with the seven-county Minneapolis-St. Paul (Twin Cities) Metropolitan Area⁶ counted as one location. Some respondents had facilities in more than one location. The remaining nineteen non-Twin Cities locations were fairly well distributed throughout the state, although eleven of them were within 100 miles of the Twin Cities. Almost 75 percent

⁶Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, and Washington counties.

of the respondents had facilities in the Twin Cities. The location of Minnesota exporters is discussed further below.⁷

Pacific Rim Sales Volume

Annual sales volume to Pacific Rim countries reported by the Minnesota manufacturer-exporters in the mail study ranged from a few thousand dollars to well over \$50 million for the 52 exporters that answered the question. The data are shown in Table 5. Many respondents had fairly small sales to the Pacific area; eighteen, or 34.6 percent, had less than \$250,000 per year and thirty, or almost 58 percent, had less than \$1 million. However, some Minnesota exporters had substantial sales volume in the Pacific area countries; thirteen, or 25 percent, had between \$1 million and \$10 million and nine, or about seventeen percent, had over \$10 million per year.

⁷See pp. 64-66 and Table 11 on p. 67.

Table 5
Annual Sales Volume of Exports Shipped to
Pacific Region by Respondents

<u>Sales Volume</u>	<u>Number of Exporters</u>	<u>Share of Exporters</u>
\$249,999 and under	18	34.6%
\$250,000 to \$499,999	3	5.8
\$500,000 to \$749,999	5	9.6
\$750,000 to \$999,999	4	7.7
\$1 million to \$9,999,999	13	25.0
\$10 million to \$19,999,999	3	5.8
\$20 million to \$29,999,999	1	1.9
\$30 million to \$39,999,999	2	3.8
\$40 million to \$49,999,999	0	0.0
\$50 million and over	<u>3</u>	<u>5.8</u>
Total	52*	100.0

*Three respondents did not answer the question.

PART 4
FINDINGS OF THE STUDY

THE INTERNATIONAL TRANSPORTATION SYSTEM

Carriers

International freight transportation service is provided by five modes of transportation--water, railroad, motor truck, pipeline and air. Some of the carriers involved operate only in international service, such as many ocean water carriers, or only in domestic service, such as most motor trucking companies; others operate in both domestic and international service, such as many airlines. In the case of Minnesota exports of manufactured goods to the Pacific area, pipeline transportation is not involved, but the other four modes are. Most shipments to Pacific countries from Minnesota involve multi-modal service, meaning that more than one mode of transportation is involved in the move.

The basic transportation alternatives available to Minnesota exporters to reach Pacific area countries are (1) rail to United States ocean port, then water to Pacific country ocean port--the shipment may or may not be containerized (containerization is discussed below); (2) intermodal railroad-motor truck (IRT) to United States ocean port (motor truck to rail to United States ocean port in a container handled as a single transaction), then water to Pacific country ocean port; (3) motor truck to United States ocean port, then water to Pacific country ocean port--the shipment may or may not be containerized; (4) motor truck to

United States airport, then air to another United States airport, and then air to Pacific country airport--the shipment may or may not be containerized; and, lastly, (5) motor truck to United States airport, then air to Pacific country airport--the shipment may or may not be containerized.

Third Parties

In addition to carriers, there are several kinds of transportation middlepersons or third parties that can have a role in the movement of goods to Asia. The more important third parties include international freight forwarders,⁸ non-vessel operating common carriers (NVOCC's),⁹ shippers' agents,¹⁰ and truck brokers.¹¹ International shipments can also involve banks, insurance companies, and various governmental agencies of the exporting and importing countries.

⁸International freight forwarders arrange transportation for exporters and may also provide various ancillary services such as obtaining export licenses and insurance.

⁹NVOCC's assemble (consolidate) less-than-container shipments, handle some full-container shipments, quote rates in their own names, and arrange transportation with ocean carriers.

¹⁰Shippers' agents are intermediates between railroads and shippers when intermodal railroad-truck transportation is used.

¹¹Truck brokers serve as intermediaries between for-hire trucking companies and shippers.

FACTORS AFFECTING THE INTERNATIONAL TRANSPORTATION SYSTEM

Government

The several modes and dozens of carriers involved are, in some countries, government owned; in others, they are privately owned. Still other countries have a combination of the two kinds of ownership. In the United States, all of the modes and carriers within them operating for-hire transportation service are privately owned, as are all private carriers (where shippers provide their own transportation service).¹²

In addition to direct ownership of some carriers in some countries, governments in all countries, including the United States, participate in various kinds of promotional programs (including subsidies) to assist their domestic and international transportation systems. Much of this includes a special emphasis on promoting and subsidizing international water and air carriers in various ways.

Government affects the international transportation system also via economic regulation (regulation of the business of transportation including regulation of entry and exit, rates, quality of service, mergers, and so on) and regulation of safety and other aspects of transportation.

These various government involvements in transportation have an effect on the number of carriers, the locations served, the

¹²Governments at all levels in the United States operate vehicles for various purposes, i.e., the United States Postal Service operates thousands of motor trucks. These are a form of private carriage but are not usually included in discussions of the United States freight transportation system.

traffic carried, the rates charged, the quality of service provided, the flexibility to handle increased or different kinds of traffic, and other aspects of carrier operations.

Because a discussion of these matters can be involved and extensive, it is beyond the scope of this study and will not be considered herein. The point is that the international transportation system discussed in this report is not one of complete free enterprise, although there is a substantial element of it present.

Other Factors

In addition to government, other exogenous factors that affect international transportation include world-wide and regional economic conditions, political relations between countries, shifting locations of business, trade agreements between individual countries and groups of countries, trade barriers between countries, changes in the cost of production around the world, development of new products, fluctuations in currency exchange rates, and so on. These factors are also beyond the scope of this study and not discussed further.

INTERNATIONAL WATER TRANSPORTATION

Importance of Water Transportation in Overseas International Trade

Most overseas international trade is carried by ocean vessels. Comparing international water and air transportation, in 1991 over 99.0 percent of the weight carried in United States

overseas international trade was carried by water, often in conjunction with other modes for domestic moves. The balance was carried by air. However, the goods carried by water amounted to only approximately 68.0 percent of the value of the goods moved in overseas international trade of the country.¹³

Kinds of Carriers and Vessels

Liners

The ocean transportation fleet of the world numbers about 25,000 vessels, exclusive of seagoing barges and very small vessels. Of these, about sixty percent are "liner" ships; about forty percent are "tramp" vessels.¹⁴ Liner companies are for-hire carriers that operate over regular routes and between specific points on a scheduled and regular basis. They primarily carry general cargo, which is non-bulk freight and usually containerized. Liner container vessels are the most likely to carry Minnesota's manufactured goods to the Pacific region.

Containerization

Containerization is the use of a large box or "container" made of steel, fiberglass, or other durable material into which

¹³Calculated from data in U.S. Bureau of the Census, Statistical Abstract of the United States: 1992, 112th edition (Washington, DC: U.S. Government Printing Office, 1992), p. 632. A good review of international water transportation can be found in Frederick J. Stephenson, Transportation USA (Reading, MA: Addison-Wesley Publishing Company, 1987), Chapter 9.

¹⁴Roy J. Sampson, Martin T. Farris, and David L. Schrock, Domestic Transportation: Practice, Theory, and Policy, 6th edition (Boston: Houghton Mifflin Company, 1990), p. 109.

the items of a shipment (cartons, crates, bags, pallets, and so on) are loaded, usually at the shipper's door. The container is then turned over to the carrier and is delivered intact to the receiver, without being opened en route. It may have been carried by two or more carriers and modes.

When available, containerization reduces the loading and unloading time at ports, reduces the associated costs, and decreases the time a ship must spend in port. It also reduces the amount of theft and damage and makes interchange of freight between carriers of different modes much easier and cheaper. Where the originating carrier or third party controls the entire movement from origin to destination, containerization also facilitates "seamless" service (i.e., the exporter deals with only one carrier or third party at the origin point, although two or more carriers are involved in the haul). The shipper avoids having to make decisions regarding which connecting carriers and routes to use, and how to ensure efficient cargo transfer from one carrier to another. In addition, the amount of documentation is generally much less. For inexperienced shippers, containerized intermodal land-water service offers a way to ship products without having to acquire expertise in international transportation matters.

Prior to the mid-1960's, international general cargo moved primarily in break-bulk freighters, where goods were handled individually in cartons, bags, pallets, etc. Containerization in international trade began in the mid-1960's when Sea-Land's

Malcolm McLean converted a conventional freighter into a containership for trans-Atlantic service. Containers had previously been used in United States domestic and Caribbean water commerce for about ten years. Since the 1960's, containerization has become the dominant method of moving general cargo in international trade¹⁵ and ninety percent of today's liner trade is carried by container.

Containerization has had a profound effect on ships, ports, and domestic transportation.¹⁶ As time passed, ships became much larger, as did the containers they carried, and the kinds of products carried in containers increased to include liquid products and refrigerated cargo, among others. Today, a ship may carry several thousand containers whose sizes are usually twenty feet or forty feet in length (other lengths sometimes used are 45 feet and 48 feet).¹⁷ For example, recent additions to the fleet of Hyundai Merchant Marine Company are capable of carrying 4,410 twenty-foot containers.¹⁸ As a result of these changes, the container capacity in the westbound Pacific trade increased over

¹⁵Joseph Bonney, "Like Columbus Discovering America," American Shipper, May 1991, p. 34.

¹⁶For a brief account of this, see Robert P. James, "The Container Revolution Swept Away All Companies Slow to Accept Its Terms," Traffic World, May 27, 1991, p. 34.

¹⁷The most commonly used containers in international water transportation have outside dimensions of about eight feet wide by about eight feet high and twenty or forty feet in length. A twenty-foot container can hold about forty tons, assuming one ton is equal to forty cubic feet.

¹⁸Robert P. James, "Hyundai Shipping Unit Faces Hurdles on Marketing and Political Fronts," Traffic World, April 27, 1992, p. 44 and Erik S. McMahon, "Hyundai Launches Giant Ships, Describes Ambitious Vision of Role in Trans-Pacific," Pacific Shipper, September 7, 1992, p. 7.

time, from about 2,400,000 twenty-foot container equivalent units (TEU's) in 1985 to about 4,200,000 in 1990.¹⁹

Roll-On-Roll-Off Vessels

A variation of containerization is the roll-on-roll-off (RORO) ship, to which access is achieved via ramp. Such vessels carry truck trailers, buses, wheeled machinery, and other wheeled-freight. They are often used to carry oversize machinery (such as construction equipment).

Break-Bulk Vessels

Although a very large share of international general cargo, including manufactured goods carried by water, is carried in container vessels, conventional break-bulk freighters are still used in the less-developed United States international trades, where there is less traffic density and where ports are not well-equipped to handle containers. Because they carry their own self-loading/unloading equipment (booms, rigging, and winches), break-bulk ships can work ports that lack shore-based cranes and can handle cargo of almost any size in their holds or on deck. However, loading and unloading can be extremely slow, taking several days at each port of call, and represents a costly and unproductive use of capital--a problem that helped bring about containerization in international transportation.²⁰

¹⁹E.J. Muller, "Ocean Carriers Are Holding Their Own," Distribution, July 1992, p. 56.

²⁰Frederick J. Stephenson, op. cit., p. 234.

Tramp Vessels

Tramp vessels are for-hire ships that go where and when there is traffic available to be carried, with no regular routes, points, or schedules.²¹ They carry principally large shipments of bulk traffic, such as grain, iron ore, and oil, that are loaded and unloaded by mechanical means. They are not likely to be important in carrying Minnesota's exports of manufactured goods, although they are very important in carrying Minnesota's grain exports.

Ownership of Carriers

Although the United States is the world's largest trader, only a small proportion of the world's 25,000 ocean-going vessels are registered in the United States. The reasons are many, but most important are the cost disadvantages associated with United States registry. In October 1992, there were only 348 active privately owned ocean going vessels of all kinds--liner and tramp--registered in the United States; of these, only 142 operated in international trade.²² According to the United States Maritime Administration, the United States flag share of

²¹In addition to for-hire liner and tramp vessels, there are private or "industrial" vessels that are ships owned or leased and operated by the owner of the freight carried. These ships are especially important in the transportation of oil, lumber, and automobiles.

²²U.S. Department of Transportation, Maritime Administration, U.S. Merchant Marine Data Fleet, January 7, 1993, p. 3.

the country's foreign trade tonnage was only 4.8 percent in 1990.²³

This means that United States exporters often use ships registered elsewhere. As of 1989, the leading countries in terms of the number of ships registered were Greece, Commonwealth of Independent States (CIS),²⁴ Liberia, Panama, Japan, the People's Republic of China, and Cyprus.²⁵ The ships' owners are not necessarily citizens of the country of registration--indeed, many are United States citizens.

Westbound Pacific Carriers

Carriers and Traffic Carried

The Pacific Ocean is often referred to as the world's premium trade route. There are over thirty ship lines of all kinds working the trans-Pacific trade. The dominant carriers in the United States to Asia trade are Japanese, Taiwanese, South Korean, and United States companies. In 1993, there were eight major liner carriers belonging to the dominant east-to-west shipping conference, the Transpacific Westbound Rate Agreement. The carriers and their country of ownership are shown in Table 6 along with their 1991 ranking in container traffic handled by all

²³Erik S. McMahon, "An Agency's Annual Analysis," Pacific Shipper, June 11, 1992, p. 2.

²⁴The CIS countries have begun to register some of their ships elsewhere because of the inability to raise capital if registered in CIS countries. Robert P. James, "Former Ocean Shipping Lines Sailing Unchartered Free-Market Waters," Traffic World, January 20, 1992, p. 33.

²⁵U.S. Bureau of the Census, op. cit., p. 637.

Table 6
Westbound Pacific Liner Carriers, 1993

<u>Steamship Line</u>	<u>1991 Ranking in Containerized TEU's* Through All U.S. Ports</u>
Conference Carriers:#	
A.P. Moeller Maersk Line, Denmark	4
American President Lines, United States	3
Kawasaki Kisen Kaisha (K Line), Japan	8
Mitsui O.S.K. Lines, Japan	9
Neptune Orient Lines, Singapore	20
Nippon Yusen Kaisha (NYK Line), Japan	5
Orient Overseas Container Line (OOCL), Hong Kong	6
Sea-Land Service, United States	1
Independent Carriers:@	
Evergreen Marine Corporation, Taiwan	2
Hanjin Shipping Company, South Korea	7
Hyundai Merchant Marine Company, South Korea	11
China Ocean Shipping Company (COSCO), People's Republic of China	10
Cho Yang Line, South Korea	24
YangMing Marine Line, Taiwan	12

*TEU = twenty-foot container equivalent unit.

#Members of Transpacific Westbound Rate Agreement (TWRA). Carriers belonging to TWRA also belong to the Asia North America Eastbound Rate Agreement.

@Not members of any conference.

Source: Various. Rankings based on Journal of Commerce PIERS Port Import/Export Reporting Service information as cited in E.J. Muller, "Ocean Carriers Are Holding Their Own," Distribution, July 1992, p. 58.

United States ports. In addition, there are a number of important liner carriers that operate independently of any conference. The more important ones are also shown in Table 6.

In westbound trade to Pacific Rim countries from the United States, the top five container lines measured by the number of TEU's carried in 1990 were American President (228,874 TEU's; 13.4 percent of total westbound movements), Evergreen (166,201; 9.8 percent), NYK (156,247; 9.2 percent), K Line (143,881; 8.5 percent), and Sea-Land (132,760; 7.8 percent). The total for all container carriers was 1,693,582.²⁶ These numbers indicate that there is some concentration of the traffic in a small number of carriers with these top five accounting for 48.8 percent of the total.

The carriers that serve westbound also serve eastbound. More than sixty percent of their revenues come from high-value eastbound cargoes such as electronic components and automobiles, whereas westbound traffic consists largely of scrap and raw materials transported at lower rates. Manufactured goods moving westbound are less than eight percent of total westbound traffic.

The fastest port-to-port transit times from west coast ports to ports in the Pacific area vary depending upon the carrier, ship, and ports involved. Since a ship calls at several Asian ports on the same run, direct non-stop service occurs only for the first port of call. This adds considerably to the overall

²⁶E.J. Muller, "Ocean Shipping Gets Rational," Distribution, July 1991, p. 46 based on Journal of Commerce PIERS Port Import/Export Reporting Service data.

transit time between the origin point in the United States and the destination point in the Pacific country. For example, Sea-Land's vessel scheduled to leave Long Beach on February 4, 1993, was to arrive at Tokyo, Japan on February 15, at Kobe, Japan on February 16, at Hong Kong on February 19, and Singapore on March 5.²⁷ On a direct voyage from a west coast port to a port in the Pacific Rim, the elapsed time ranges from ten to about 22 days, depending on the port involved.

The overall elapsed time, including the domestic leg from Minnesota to the west coast port, depends on the domestic mode and carrier used. For example, using its IRT service, American President's schedule calls for an overall elapsed time from St. Paul to Yokohama of fourteen days; to Kobe, sixteen days; to Kaohsiung (Taiwan), twenty days; Hong Kong, 22 days; and Manila, 26 days.²⁸ Sea-Land reported an overall elapsed time of fifteen days from Minnesota to Japan, eighteen to 22 days to South Korea, Hong Kong and Taiwan, and 24 to 26 days to the Philippines, Thailand, and Singapore, using IRT service.²⁹

Carrier Activities in the United States

Pacific Ocean ship lines have increasingly become involved in IRT service in the United States, primarily to move imports into the country, but also, as a direct result, in outbound

²⁷Sea-Land schedule published in Pacific Shipper, January 25, 1993, p. 110.

²⁸American President Lines.

²⁹Sea-Land Service.

service for United States exporters to the Pacific region. Such steps include establishing their own intermodal units and other inland services in the United States. This is usually performed by establishing subsidiary companies. In some cases, they own the rail cars used in IRT double-stack operations³⁰ over United States railroads and operate terminals at ocean ports.³¹

For example, NYK is the largest Japanese carrier in the United States Pacific trade. It owns five percent of the parent company of the Southern Pacific railroad (SP) which handles the domestic railroad leg of its traffic, and it has several high-tech container terminals on the west coast of the United States, including at Los Angeles and Oakland.³² American President Lines has container terminals at Los Angeles, Oakland, and Seattle.³³

Shipping Conferences

Nature of Conferences

An unusual aspect of the ocean liner industry is that carriers are permitted by United States law to belong to "conferences," which are trade associations that have the

³⁰Double-stack allows two layers of containers to be carried on rail cars. It requires a different kind of rail car, new kinds of containers (that can be stacked and locked together), and different handling equipment. Hence a considerable investment is needed. See the section on intermodal railroad-truck transportation below.

³¹Rose A. Horowitz, "Ocean Carriers Intermodal Subsidiaries Give Them Important Competitive Edge," Traffic World, May 27, 1991, p. 38.

³²Richard Knee, "NYK Gets Ocean Terminal at Oakland," American Shipper, January 1992, p. 61.

³³Richard Knee, "APL to Expand Seattle Terminal," American Shipper, January 1993, p. 27.

authority to establish rates and publish tariffs for their members with anti-trust immunity. "Independent" liner companies are not members and operate outside the conference system, frequently competing against the conference carriers. Non-conference carriers' rates are normally lower than conference rates. Some tramp vessels compete against both conference and independent liner carriers. There are about 300 water carrier conferences around the world having different jurisdictions. Approximately 200 liner conferences serve United States ports.³⁴

Changes in the ability of conferences in United States trades to control rates have occurred since the federal Shipping Act of 1984 was enacted. For example, individual carriers can now file rates independently of the conference. In addition, shippers are permitted to form shippers' associations that consolidate traffic of their members for shipment via conference carriers and deal as a group with carriers. The Act also authorizes conferences to enter into long-term service agreements (time/volume agreements) with individual shippers and shippers' associations.

The two principal conferences operating in the Pacific region are the Transpacific Westbound Rate Agreement (TWRA) and the Asia North American Eastbound Rate Agreement. The membership of these conferences is shown above in Table 6. The membership of TWRA includes United States and foreign carriers originating freight at Pacific Coast ports bound for Pacific area countries.

³⁴Frederick J. Stephenson, op. cit., p. 238.

Conference carriers' share of the Pacific liner market has decreased substantially in recent years. In westbound trade, the conference share in north Pacific traffic dropped from about 82 percent to 65 percent between 1985 and 1990. In the south Pacific, the drop was from ninety percent to 35 percent.³⁵ In the early 1990's, TWRA carriers had only fifty to sixty percent of total westbound general cargo market.

Despite some deterioration in their ability to control competition and the fact that conferences currently account for a smaller share of the traffic carried in the Pacific area than in the past, conferences are still an important part of the rate making process.

Pricing of Liner Service

Conferences are permitted to follow a "dual-rate" system, whereby they charge shippers who use only member carriers a lower rate ("contract rates," usually fifteen to twenty percent lower) than they charge other shippers who do not exclusively use conference carriers ("non-contract rates"). The Act of 1984 permits ship lines to establish through rates involving both ocean and inland movements, as opposed to the port-to-port rates required prior to 1984.

Ocean carrier rates are United States port-to-Pacific region port rates or door of exporter-to-Pacific region port rates. The rates usually do not cover the movement beyond the Pacific port.

³⁵E.J. Muller, "Ocean Carriers are Holding Their Own," op. cit., p. 56.

Liner break-bulk rates (not containerized) are generally published according to either weight or measure, meaning that a charge is made per weight, per measure, or both. In the latter case, the method providing the greater revenue for the carrier is used. Weights used are short tons (2,000 pounds), long tons (2,240 pounds), or metric tons (2,204.6 tons). Measures used are United States cubic ton (forty cubic feet) or metric cubic ton (35.314 cubic feet).³⁶

Liner container rates are quoted per container and based on the weight of the loaded container or are quoted as a flat rate per container, regardless of weight. Rates sometimes reflect the particular commodity being shipped; sometimes they are freight all kinds (FAK) rates, meaning that the contents of the container do not have a bearing on the rate charged.

Rates to Pacific region ports from west coast ports can range from \$1,200 to \$3,000 per forty-foot container, depending upon the specific destination and product shipped. Overall cost from a Minnesota origin point to a Pacific region port can be \$4,000 or more. One liner ocean carrier representative interviewed stated that the average rate charged to move a forty-foot container from Minnesota to a Pacific Rim port is \$3,500 to \$3,800. Another liner carrier representative estimated that the average transaction would involve, for a forty-foot container, \$95 for local drayage to an IRT terminal in Minnesota, \$1,300 to

³⁶For an example, see John E. Tyworth, Joseph L. Cavinato, and C. John Langley, Jr., Traffic Management: Planning, Operations, and Control (Prospect Heights, IL: Waveland Press, Inc., 1991), pp. 390-391.

ship the container by rail to a west coast port, and \$2,000 for the ocean carrier service, for a total of \$3,395.

Liner rates are found in tariffs published by the carrier or by the conference.

Conferences ordinarily have dealt with rates on an across-the-board basis, meaning that rates are adjusted for everything, perhaps with a few exceptions, on a percentage basis. TWRA followed this practice for some time but, in 1991, changed to a system whereby rates are adjusted on an individual commodity basis, basing rate changes on the kind of goods being shipped and when they are being transported. This has the effect of making rate increases larger on higher-value commodities than on lower-value commodities.³⁷

Tramp ship rates are more directly influenced by the forces of supply and demand; tramp rates fluctuate with the amount of ship capacity available relative to the demand for service.

Transportation in the Foreign Country

The exporter can control whatever part of the transportation that is desired. When control is maintained as far as the port in the other country, the shipper must decide whether or not to extend control all the way to the consignee by handling customs processing and arranging transportation to the consignee's door.

³⁷Robert P. James, "Major Shift in Maritime Economics Induces Most Carriers to Raise Rates," Traffic World, April 8, 1991, p. 222; Richard Knee, "TWRA Plans More Commodity Rate Hikes Sept. 1," American Shipper, September 1991, p. 16; and Richard Knee, "TWRA Plans Rate Hikes This Month," American Shipper, January 1993, p. 15.

However, it is often difficult to arrange transportation in foreign countries because of different transportation, regulatory, and political environments. The best policy often is to leave the local transportation decision to the buyer or local customs broker. Therefore, in many or perhaps most cases, responsibility for delivery of goods to the consignee in a foreign country is transferred to the buyer, the buyer's agent, or a customs house broker at the destination port. In such situations, title to the goods is passed at the destination port.

Freight forwarders and carriers interviewed in the study usually withdrew from responsibility for the goods upon arrival at the foreign port, leaving customs processing and local delivery to the consignee or an agent of the consignee. In other words, the freight forwarders' and carriers' service normally ends at the destination port.

However, when the exporter has promised door-to-door service to the customer, this sometimes requires that the shipper or third party maintain control beyond the destination port in order to ensure that prompt and efficient service is provided. The shipper or third party may appoint an agent to arrange the local transportation or may choose to deal directly with the carriers.

The Nature of Westbound Pacific Traffic

In 1991, United States liner exports to Asia totalled about 25.5 million metric tons with a total value of about \$45 billion. Westbound cargo is mainly lower-value commodities including heavy

raw materials.³⁸ Manufactured goods make up only six or seven percent of the total export volume shipped from the United States to Asia, according to the managing director of the Transpacific Westbound Rate Agreement.³⁹ A very wide variety of goods are moved westbound on liner vessels. They include air conditioners, aircraft parts, animal feeds, apparel, asbestos, ash, beef, beverages, borates, caffeine, ceramic products, chemical feedstocks, coffee, computer equipment, cotton, dried vegetables, dyes, fertilizers, float glass, footwear, fresh meat, frozen vegetables, glassware, glue, grain, hay, hides, lumber, meat products, medical equipment, metals, oils, ores, paints, paper, pharmaceuticals, photographic equipment, plastic, poultry, pulp, rawhide, resins, rubber, sanitary ware, seeds, skins, slag, soap/cleaners, spices, scrap metal, sporting goods, synthetic rubber, tea, textile fibers, tin plate, tobacco, tools, toys, vegetable oils, waste paper, wood products, and yarn.

The average value of freight in a westbound container in 1992 was \$33,000; the average value eastbound was \$160,000, according to TWRA. According to Sea-Land Service, Inc., the top products by volume carried westbound by liner carriers in 1991 were resins (172,000 forty-foot container equivalent units [FEU's] or eleven percent of traffic), waste paper (168,000 FEU's or eleven percent), other forest products (125,000 FEU's or eight

³⁸Ronald G. Gottshall, "Firm but Fair," Traffic World, May 25, 1992, p. 43.

³⁹Rose A. Horowitz, "Ocean Carriers Expect Import Drops to Drive Price War, Space Sharing," Traffic World, December 31, 1990, p. 30.

percent), and lumber (107,000 FEU's or seven percent). In addition, volumes (and percentages) of a variety of higher-value manufactured goods and agricultural items increased from previous years.⁴⁰

Ocean Carrier Capacity

Balance of Traffic

The balance of water carrier traffic between eastbound and westbound in the Pacific fluctuates over time. When eastbound traffic to the United States from the Pacific area is heavy and westbound exports to the Pacific area are low, an overcapacity problem develops on the westbound (export) side. The opposite would take place if conditions were reversed. There is also the possibility of general over or undercapacity in both directions simultaneously, depending on the total demand for transportation service in the Pacific. In general, there usually is not a shortage of capacity in the Pacific area that persists for any length of time. The ocean carrier industry is able to allocate vessels to different routes in order to carry available traffic when necessary, taking advantage of the general overcapacity condition that persists in the industry. Excess capacity in the industry in general or on specific trade routes in particular can persist for a considerable length of time, especially when economic conditions are poor over large areas of the world.

⁴⁰"Intra-Asia: Biggest Market of All," American Shipper, July 1992, p. 50.

In the case of the Pacific market, for years eastbound traffic (imports to the United States) bore a more than proportionate burden of the revenue contribution to liner carriers. In recent years, however, as imports to the United States have flattened, westbound traffic has begun to carry a larger share of the load.⁴¹

Capacity Limitation Agreements

Indeed, in the early 1990's, eastbound carriers operating in the Pacific have had an overcapacity problem which caused eastbound carriers to enter into a stabilization agreement allowing for specific reductions in overall capacity. Westbound carriers also adopted a stabilization agreement, encouraging better utilization of capacity and adjusting capacity to fit demand, but not having as its avowed purpose a reduction in capacity. The westbound agreement among conference and some independent carriers is called the Transpacific Space Utilization Agreement.⁴²

In addition, there have been "vessel sharing agreements" between two or more carriers. These agreements allow their members to book space on each other's ships (even the entire ship). They combine schedules and agree to carry each other's cargo while eliminating duplicate port calls and sometimes

⁴¹Robert P. James, "Shippers Complaining of New Rate Hikes as Asia-Trade Space Crunch Deepens," Traffic World, June 10, 1992, p. 10.

⁴²See Richard Knee, "Outbound-Pacific Stabilization Pact," American Shipper, May 1991, p. 38.

combining port operations. Ostensibly, the agreements are intended to alleviate capacity or equipment shortages or problems associated with sailing schedules and to reduce costs while enhancing the service to the customer. These service alliances have been entered into by westbound carriers Sea-Land Service and A.P. Moeller-Maersk Line;⁴³ K Line and Mitsui O.S.K Lines;⁴⁴ American President Lines and OOCL;⁴⁵ and NYK Line and Neptune Orient Lines.⁴⁶ These four agreements involve all eight members of TWRA and account for fifty to sixty percent of westbound general cargo traffic.

A potential problem for shippers is that these agreements can be used to reduce capacity and competition between sharing carriers, eventually causing rates to rise. Consequently, there is the possibility that, in the future, artificial capacity restrictions such as these could negatively affect Minnesota exporters.

Because there is often an oversupply of ocean vessels, it is probable that there will be enough capacity to carry additional traffic in the foreseeable future, despite the capacity problems

⁴³Elizabeth Canna, "The Maersk/Sea-Land Deal," American Shipper, May 1991, p. 43.

⁴⁴Elizabeth Canna, "'K' Line, MOL in Transpacific Space Charter," American Shipper, May 1991, p. 46 and Elizabeth Canna, "MOL, 'K' Line Set Service Details," American Shipper, June 1991, p. 60.

⁴⁵Elizabeth Canna, "APL, OOCL to Share Ships in the Pacific," American Shipper, September 1991, p. 36.

⁴⁶Robert P. James, "Shippers Warn of Long-Term Effects of Liner Vessel-Sharing Deals," Traffic World, June 1, 1992, p. 35.

discussed above. In fact, total container capacity on the westbound Pacific route has been forecast to increase by six percent between 1992 and 1996.⁴⁷ Personal interview respondents in the study believed that there would be no capacity difficulties caused by an increase of twenty or 25 percent in Minnesota traffic destined for Pacific area destinations.

Third Parties

As noted earlier, third parties serve as intermediaries between shippers and carriers. The activities they perform include arranging transportation, consolidating shipments received from two or more shippers, and providing various support services.

International Surface Freight Forwarders

The more important third parties are international surface freight forwarders⁴⁸ who arrange transportation for exporters and provide various ancillary services, such as obtaining export licenses and insurance.⁴⁹ International surface freight forwarders earn income from fees charged for providing ancillary services to shippers, from carrier commissions, and from price

⁴⁷Forecast made by Drewry Shipping Consultants, Inc. and reported in Elizabeth Canna, "Hyundai to Share Ships in Europe-Asia Trade with Sea-Land," American Shipper, July 1992, p. 54.

⁴⁸International surface freight forwarders in some instances also serve as international air freight forwarders.

⁴⁹Among the various services freight forwarders offer are quoting steamship rates, preparing commercial invoices, obtaining export licenses, issuing export declarations for the shipper, preparing certificates of origin, obtaining and preparing consular invoices, obtaining insurance, obtaining dock receipts, obtaining port warehouse space, and tracing shipments in transit.

differences between the rate it quotes the shipper and the lower rate it pays to the carrier.

Forwarders arrange domestic transportation to the ocean port with motor trucking companies or railroads and international transportation to the Pacific country port with the ship lines. Forwarders sometimes physically collect the shipments and then turn them over to the trucking company or railroad. Where shipments are small, they combine them with shipments of other exporters into larger shipments that could range from a single container up to an entire shipload. Consolidation of Minnesota shipments is usually done in the Twin Cities. According to personal interviews with international freight forwarders, however, small shipments are sometimes sent to Chicago or Los Angeles for consolidation with other shipments into container loads.

Although exporters of all types use forwarders and most exporters rely upon forwarders, they are of particular use to smaller exporters and to firms that are not familiar with international shipping. Ship lines are also heavily dependent upon forwarders to market their services. One large ocean carrier reported that ninety percent of its Minnesota traffic is generated by forwarders. An exception to the dependence upon forwarders arises when Sea-Land is the carrier because Sea-Land sells its services directly to the shipper.

In the late 1980's, there were at least 1,000 international surface freight forwarders in the United States.⁵⁰ There are at least two dozen international surface freight forwarders operating in Minnesota. They include Alliance Shippers, Inc., ASG Forwarding, Inc., Danzas Corp., Intertrans Corp., Global Transportation Services, Inc., Norman G. Jensen, Inc., Professional Export Services, Svensson Shipping Agency, Inc., U.S. Group Consolidator International, and Yusen Air and Sea Services, Inc., among others. International surface forwarders are regulated by the FMC as to what activities they can be engaged in. Although they must be licensed by the FMC and post a bond, there is no entry control (limiting the number of forwarders) or regulation of prices.

Domestic Surface Freight Forwarders

Domestic freight forwarders can be involved in overseas international ocean shipments, by arranging railroad or motor truck transportation to the ocean port, but not beyond.⁵¹ However, for a Minnesota exporter, their use would mean that the shipper or another intermediary (international freight forwarder or NVOCC) would have to arrange the ocean transportation part of the trip and perform or arrange for ancillary services, such as documentation. The trip would be considered as consisting of two

⁵⁰Roy J. Sampson, Martin T. Farris, and David L. Schrock, op. cit., p. 119.

⁵¹Domestic surface freight forwarders were completely deregulated by Congress in 1986 under the Domestic Freight Forwarders Deregulation Act.

segments; domestic railroad or truck transportation and international water transportation. Obviously, it is more convenient to deal with one third party for the entire trip. That some domestic surface freight forwarders are both domestic and international avoids the problem for this shipper.

Non-Vessel-Operating Common Carriers

Non-vessel-operating common carriers (NVOCC's) or consolidators assemble (consolidate) and disperse less-than-container shipments and move them as full-container shipments by water carrier. They also handle full-container shipments. A major activity of NVOCC's is to solicit traffic to fill containers that otherwise would move empty, for example, from an inland point in the United States to a west coast port. In addition to consolidation and dispersion, NVOCC's provide pickup and delivery services, stuff (fill) containers, and prepare export documents. A unique feature is that they quote transportation rates in their own name and file rate tariffs with the FMC; in other words, they quote a rate to the shipper and then buy the transportation service from a domestic carrier (if necessary) and an ocean carrier at lower rates. Many of them operating in the United States are foreign owned. They are required to post a \$50,000 surety bond or evidence of insurance with the FMC to handle liability claims against them.

Around the world, NVOCC's account for about nine percent of the ocean containers moved--this is also the case in the Pacific trades. A small number of NVOCC's account for most of the

worldwide traffic; one study showed that 14.7 percent of the 1,290 NVOCC's studied accounted for 81.2 percent of the cargo during 1991.⁵² The usage of NVOCC's varies by individual ocean carrier. For example, in 1991, of the carriers listed in Table 6, above, the share of the carrier's total United States container traffic on all trade routes arranged by NVOCC's varied from a low of four percent for American President Lines to a high of 27 percent for Hyundai Merchant Marine Company.⁵³

In addition to various third parties and others involved on the United States side of the export of goods, there are customhouse brokers in foreign countries which facilitate the movement of goods through the importing country's customs. The primary function of the customhouse broker is to see that goods move through customs, paying the smallest applicable duty.⁵⁴

Capacity of Third Parties

Because of the small capital investment required for entry and lack of specific education, training, or experience needed to enter, the third party field generally has more companies in it than needed. Thus, a shortage of third parties should export traffic increase substantially in the future is not likely.

⁵²Journal of Commerce PIERS Port Import/Export Reporting Service data reported in Robert P. James, "Proposal to Modify Tariff Filing Raises Ire of Carriers, Some Shippers," Traffic World, July 20, 1992, p. 32.

⁵³Mark Voorhees, "\$227 Rate Jumped to \$270," American Shipper, January 1993 p. 13. Data from Journal of Commerce PIERS Port Import/Export Reporting Service.

⁵⁴Donald F. Wood and James C. Johnson, Contemporary Transportation, 3rd edition (New York: Macmillan Publishing Company, 1989), p. 483.

Freight forwarders and carriers interviewed in the study agreed that there would be no shortage of freight forwarder services should there be a significant increase in Minnesota exports to the Pacific area.

Ocean Ports

Ownership and Operation

West coast ports in the United States are a key element in waterborne export of goods from the United States to Pacific area countries. Ocean port facilities are usually owned by local and/or state governments and operated by port authorities established by those governments. The jurisdiction of a port authority may include one port or several ports in a state or ports in two adjacent states. Considerable state and local money has been spent to provide terminal facilities at ocean ports. In addition, the federal government has spent huge sums to build breakwaters, dredge channels, and provide navigational aids.

Port authorities operate terminal facilities and/or lease them out to private companies. Whichever method is used, ship lines and shippers are charged for their use of the facilities and services provided. Carriers may be required to pay for loading and unloading and for various services received at a port. In addition, there may be charges for entering a harbor, such as pilotage, mooring, dockage, and harbor master fees.

Shippers and receivers must also pay for whatever services are rendered to them at ocean ports.

Until 1991, the FMC regulated private and public terminal operators, including stevedoring operations. In that year, the FMC ended mandatory public filing of tariffs and agreements by private and public marine terminal operators, making official what had been standard policy for several years.

The Port Selection Decision

A liner carrier's decision to regularly call at a given port is determined by physical factors, such as channel and harbor depths, cargo loading and unloading, and other handling facilities, and by traffic considerations--both the actual and potential amount of traffic originated at and destined for the port. Charges that must be paid to use a port's facilities and services and taxes on fuel and other aspects of ocean carrier operations also affect the ports used by carriers.

Shippers and third parties select ports on the basis of several factors, including cargo loss and damage experience, ship lines serving the port, frequency and timing of ship sailings, loading equipment available, ability to accommodate special handling needs, storage facilities available, cost of domestic transportation to reach the port, domestic carriers serving the port, overall transit time to ultimate destination, and freight handling charges.

Traffic Handled at West Coast Ports

The availability of accurate statistics to compare ocean port traffic volume is limited because port authorities frequently report inflated numbers and because inconsistent terminologies and measurement methods are used among ports.

When compared in terms of the total number of short tons handled in foreign trade, both imports and exports, Long Beach, California was the eighth largest in the country in 1991, Los Angeles, California was ninth, Portland, Oregon was eighteenth, Seattle, Washington was twentieth, and Tacoma, Washington was twenty-first. The California ports of Oakland and San Francisco were not in the top twenty-five ports.

In terms of foreign export tonnage handled, Long Beach was the sixth largest in the country, Portland ninth, Los Angeles twelfth, Tacoma thirteenth, and Seattle fifteenth.

When a comparison was made between seven west coast ports on the basis of the value of the goods exported, Los Angeles was first, followed by Long Beach, Oakland, Tacoma, Seattle, Portland, and San Francisco.⁵⁵

Another method of comparison, which is of particular interest to exporters of manufactured goods, is loaded international container volume (this does not include empty container movements). In that case, four west coast ports were in the top five in 1991, according to United States Census data.

⁵⁵E.J. Muller, "Ports: Development is Stuck in the Mud," Distribution, July 1992, p. 51. Based on United States Bureau of the Census data.

Los Angeles was the busiest international loaded container port in the country, handling 1.5 million TEU's, both imports and exports, followed closely by Long Beach, with 1.4 million. Seattle was fourth in the country with 752,211, and Oakland fifth with 655,465 TEU's.⁵⁶

Loaded international container data--both import and export --for west coast ports in 1990 are shown in Table 7, based on information from the Journal of Commerce. Los Angeles and Long Beach accounted for 56.6 percent of the total for the seven west coast ports.

Pacific Area Ports Served From West Coast Ports

An examination of the sailing schedules of 21 liner carriers of various sizes, some conference members and some not, revealed that collectively they call at all seven of the west coast ports listed in Table 7. Each line studied, except one, makes regular calls at, at least, two of the seven ports; sixteen call at, at least, three of the seven ports. The 21 carriers collectively call at a total of 51 ports in the Pacific area, indicating that there is ample service available for exports to the area. The ship lines examined were American President Lines, Australian-New Zealand Direct Line, Blue Star Line, Cho Yang Line, Columbus Line, COSCO, DSR-Senator, Evergreen Marine Corporation, Hanjin Shipping Company, Hyundai Merchant Marine Company, K Line, Maersk Line, Mitsui O.S.K. Lines, National Shipping Line of the

⁵⁶"Public Ports to Spend \$5.4 Billion for Upgrades Over Next Five Years," Traffic World, December 21, 1992, p. 35.

Table 7
 Number of Loaded International Containers*
 Handled at West Coast Ports, # 1990

<u>Port</u>	<u>Number of TEU's@</u>
Los Angeles	1,454,621
Long Beach	1,213,931
Seattle	767,303
Oakland	578,892
Tacoma	483,319
Portland	111,576
San Francisco	<u>106,306</u>
 Total	 4,715,948

*Includes international traffic only, both import and export.

#Several less-important west coast ports are not shown here because they lack significant containerized movements.

@TEU = twenty-foot container equivalent unit.

Source: Journal of Commerce PIERS Port Import/Export Reporting Service, as cited in "Los Angeles Still Tops Port Ratings; Long Beach Leapfrogs into No. 2 Spot," Traffic World, April 1, 1991, p. 25.

Philippines, NYK Line, Neptune Orient Lines, OOCL, Sea-Land Service, South Pacific InterLine, Westwood Shipping Lines, and YangMing Marine Line. The Pacific area ports served are shown in Table 8.

Port Capacity

Port Development Difficulties

Modern day ocean ports are very much affected by environmental issues when expanding to accommodate growing traffic volume and/or larger ships. This has especially been true in connection with harbor dredging and sediment disposal. In addition, there are problems associated with wetlands, mitigation, and wildlife protection.⁵⁷ Some ocean ports are also encountering financial difficulties because, as publicly-owned facilities, they sometimes become embroiled in state and local revenue problems and are looked upon as a source of revenue to be used for non-transportation purposes by the state or local government. This has been of particular importance in California because of the financial crisis the state has had for several years.⁵⁸

⁵⁷See Robert P. James, "Environment Plays Growing Role in National Ports' Agendas," Traffic World, September 23, 1993, p. 15. The Oil Pollution Act of 1990 and its effect on ship operators and ports is discussed in Robert P. James, "Oil Pollution Law Seen as Onerous to Shipowners and Port Authorities," Traffic World, September 28, 1992, p. 26 and Shari Horn, "Tough Standards Included in Oil Pollution Act of 1990 Challenging Tanker Operations," Pacific Shipper, August 17, 1992, p. 6.

⁵⁸See Caroline Brady, "City of Los Angeles Takes \$44 Million from Port as Industry Officials Howl," Traffic World, February 8, 1993, p. 21. See also E.J. Muller, "Ports: Development Is Stuck in the Mud," op. cit., p. 48. See also Caroline Brady, "California Ports Face Budget Woes as State Government

Table 8
Pacific Area Ports* Served from West Coast Ports#

<u>Country</u>	<u>Port</u>
American Samoa	Pago Pago
Australia	Adelaide, Brisbane, Melbourne, Sydney, Townsville
Fiji	Suva
Guam	Agana
Hong Kong	Hong Kong
Indonesia	Belawan, Jakarta, Semarang, Surabaya
Japan	Hakata, Kobe, Nagoya, Osaka, Shimizu, Tokyo, Yokohama
Malaysia	Kuala Lumpur, Pasir Gudang, Penang, Port Kelang
Mariana Islands	Saipan
New Caledonia	Noumea
New Zealand	Auckland, Lyttelton, Wellington
Okinawa	Naha
Papua New Guinea	Lae, Rabaul
People's Republic of China	Chiwan, Dalian, Huangpu, Qingdao, Shanghai, Tianjin, Xiamen, Xingang
Philippines	Cebu, Manila
Singapore	Singapore
South Korea	Busan, Incheon
Tahiti	Papeete,
Taiwan	Keelung, Kaohsiung
Thailand	Bangkok
Tonga Islands	Naku'alofa
Western Samoa	Apia

*Service to some Pacific region ports is provided by feeder vessel or truck from other ports.

#West coast ports considered are Long Beach, Los Angeles, Oakland, Portland, San Francisco, Seattle, and Tacoma.

Source: Data extracted from sailing schedules of 21 liner carriers published in Pacific Shipper, February 8, 1993, pp. 56-163.

Ends Its Own," Traffic World, September 7, 1992, p. 24 and Patrick Burnson, "California Port Authorities Continuously Eye Options in Dealing with State Tax Plans, Pacific Shipper, November 9, 1992, p. 6.

Despite the difficulties discussed above, because of the rise in traffic handled over the past decade, all major west coast ports were involved in expansion and/or modernization plans of one kind or another in the early 1990's, and progress has been made. Their efforts in this direction are an indication that exporters will have adequate port capacity to use in the future to reach the Pacific region. Examples of expansion and modification plans are briefly discussed below.

On-Dock Rail Facilities

Railroad-port transfer arrangements range from situations where the transfer from railroad to water terminal is made on the terminal property itself (on-dock) to situations where a rail terminal is several miles from the water terminal with the transfer necessitating a motor truck haul between the rail terminal and the port terminal. For example, the SP intermodal yard is about four miles from the port at Long Beach; motor truck service provides the link between the two. At Oakland, the Atchison, Topeka and Santa Fe (ATSF) intermodal yard at Richmond is twenty miles from the port. On the other hand, the SP and Union Pacific (UP) yards are adjacent to the Oakland terminal. A combination of the two approaches is common; a port may have on-dock transfer facilities as well as railroad facilities removed from the port.

When the rail-to-port transfer takes place on port terminal property, it is not usually alongside the ship. Consequently, a short motor truck trip is necessary within the port itself. The

advantage of on-dock transfer is that only one inspection and one set of paper work is needed. On-dock transfers avoid highway truck licensing and weight limits, save time and money, and reduce damage to freight. These transfers also reduce road congestion.

All major west coast ports have at least some on-dock transfer, particularly at northwest and San Francisco Bay area ports, with additional facilities scheduled for construction. There is less chance for this to develop at southern California ports because of lack of available space, although pressure to eliminate highway movements in the area is great because of pollution and traffic congestion problems associated with motor trucks.⁵⁹ However, none of the west coast ports have significant rail-to-port transfer alongside the ship.⁶⁰

Los Angeles and Long Beach

In southern California, a major problem is access to the ports of Los Angeles and Long Beach, which are adjacent to one another. A \$500 million plan to build the 22-mile Alameda Corridor, a rail and truck highway linking the two ports to downtown Los Angeles rail yards, has been delayed. This would consolidate three rail lines into one and remove thousands of

⁵⁹Terry Brennan, "Dockside Rail Flourishes in West; Eastern Ports Find Cost Hard to Justify," Traffic World, January 25, 1993, p. 23 and Jim Shaw, "Development Focus on Container Logistics," Cargonews Asia, May 27, 1991, p. 19.

⁶⁰See David R. McKenzie, Mark C. North, and Daniel S. Smith, Intermodal Transportation--The Whole Story (Omaha, NE: Simmons-Boardman Books, Inc., 1989), pp. 171-172.

trucks from the streets. The project is designed to facilitate access to the ports while mitigating potentially adverse impacts of port growth, including highway congestion, air pollution, vehicle delays at grade crossings, and train noise in residential areas.

The ports at Los Angeles and Long Beach also have plans to triple their capacity by 2020 by dredging 76 million yards from San Pedro Bay and creating 2,600 acres of land fill islands on which 39 new cargo terminals would be built.⁶¹ After considerable delay, a scaled-down first phase of the expansion project was approved by the California Coastal Commission in October 1992.⁶²

San Francisco and Oakland

Bay area ports have the disadvantage of shallow channels and railroad tunnels too small to accommodate double-stack trains. As shown in Table 7 on page 49, together they handled only about fifteen percent of the west coast international container traffic in 1990, while Los Angeles and Long Beach combined handled about 57 percent.

Although the port at San Francisco has land available for expansion, development is hindered because the port cannot sell its own revenue bonds and because construction restrictions are

⁶¹Caroline Brady, "Port Expansions at LA, Long Beach Delayed in Snag with State Regulators," Traffic World, January 21, 1991, p. 36 and Caroline Brady, "Another Setback for Los Angeles in Its Massive '2020' Port Project," Traffic World, August 24, 1992, p. 33.

⁶²Traffic World, October 26, 1992, p. 49.

in place that regulate where and what kinds of buildings can be built in the port area.⁶³ However, the port is currently increasing the capacity and efficiency of its container facilities⁶⁴ and has a program to improve two railroad tunnels in order to accommodate double-stack trains.⁶⁵ While Oakland's port has had management problems that for a time stifled its expansion plans,⁶⁶ it has adopted a five-year capital improvement program.⁶⁷

Tacoma and Seattle

The port of Tacoma's '2010' plan calls for a \$450 million development project providing for eleven cargo terminals, three on-dock rail yards, and numerous other facilities.⁶⁸ Seattle also has ambitious plans to add to the size and capacity of its facilities in order to handle a predicted growth in traffic, particularly containers.⁶⁹

⁶³Robert P. James, "San Francisco Port Loses Twice: Voters Restrict Hotels, Veto Funding," Traffic World, November 19, 1990, p. 36.

⁶⁴"Port of San Francisco's Pier 80 Container Terminal Improvements Ahead of Schedule," Pacific Shipper, December 14, 1992, p. 32.

⁶⁵Robert P. James, "S.F. Port to Alter Two Tunnels for Double-Stacks," Traffic World, April 29, 1991, p. 34.

⁶⁶See Robert P. James, "Oakland Port Commissioners Cut Staff, Refocus Business After Gimpel's Firing," Traffic World, April 22, 1991, p. 25.

⁶⁷"Oakland Lays Out Building Program," American Shipper, September 1991, p. 84.

⁶⁸Robert P. James, "Tacoma Launches \$450 Million Plan to Triple Port Capacity by 2010," Traffic World, January 21, 1991, p. 34.

⁶⁹Robert P. James, "Port of Seattle to Add 339 Acres as Part of 20-Year Expansion Plan," Traffic World, May 13, 1991, p. 42 and Richard Knee, "Seattle's Search for Space," American Shipper, January 1992, p. 62.

Interport Competition

Ship lines and shippers transfer operations to another port when there are cost and/or service reasons to do so, and west coast ports are in competition with one another and with other ports to attract and retain ocean carriers and shippers. Attracting and keeping ship lines is paramount. A recent example indicates the importance of a single carrier to a port. In July 1991, Evergreen Marine Corporation moved from Seattle to Tacoma. In the next four months, Seattle's exports dropped fourteen percent, while exports at other United States ports were increasing.⁷⁰ In late 1992, the port of San Francisco lost a substantial amount of annual revenue when Nedlloyd Lines (Netherlands) decided to stop using the port for transshipments of traffic from Asia to South America and vice versa. It was estimated that the port would lose seventeen percent of its annual maritime revenues and seven percent of its total annual revenues.⁷¹

Despite the difficulties associated with port expansion referred to above, given the intense competition between United States west coast ports and their expansion plans, as well as a possible bid by the port at Vancouver, British Columbia to attract United States traffic, it appears that Minnesota exporters will have adequate ocean port capacity through which to

⁷⁰Robert P. James, "Evergreen's Move Stings Seattle as Export Boom Passes by the Port," Traffic World, February 17, 1992, p. 39.

⁷¹Patrick Burnson, "Port of San Francisco Loses Significant Portion of Top Maritime Client's Business," Pacific Shipper, August 17, 1992, p. 7.

reach the Pacific area in the future, even if there is a significant increase in Minnesota exports. The freight forwarders and ocean carriers interviewed in the study were in agreement that the facilities and services available at west coast ports were good and there were no complaints. Both groups stated that there would be no port capacity problem if exports to the Pacific area substantially increased.

Barriers to International Water Transportation

Unlike transportation between states within the United States, transportation between countries is sometimes subjected to serious artificial barriers which prevent or retard the movement of vessels and the goods carried. These barriers can involve limitations on port access, the levy of discriminatory fees on ship operators, and the barring of ownership of transportation facilities in the country.

A recent example of a barrier that kept United States ships out of a country altogether is the ports that were closed to American ships by the former Soviet Union. These ports are slowly being opened by the successor countries.⁷² Another is the People's Republic of China's refusal until recently to allow United States carriers to operate directly into its ports, instead they had to operate through China's freight forwarders.⁷³

⁷²See "New U.S. Russian Maritime Pact Opens New Ports, Bolsters Trade," Traffic World, May 18, 1992, p. 34.

⁷³"Ocean Carriers Rush to Establish Presence in Growing Trade Lane to China," Traffic World, March 15, 1993, p. 41.

Another example is strict "doing business" rules in the People's Republic of China, Taiwan, and South Korea which bar United States carriers and related companies from such things as operating branch offices, conducting intermodal operations, obtaining truck licenses, registering chassis, operating ship agencies, operating off-dock container terminals, and owning terminals. A final example is port charges imposed on foreign carriers by Japan where the charges are not used for port maintenance or improvement.⁷⁴

Matters such as these are investigated by the FMC, which can take retaliatory action against ship lines of the offending country(s). Penalties imposed by the FMC include levying substantial monetary fines against the offending country's carriers, limiting the number of voyages permitted to the United States, barring them entirely from United States ports, suspending of tariffs filed with the FMC, and suspending and revoking freight forwarder licenses. Usually, the threat of such action causes the offending country to modify or drop the objected to practice.⁷⁵

The problems with Taiwan and Japan were apparently recently resolved,⁷⁶ although a new controversy exists over proposed new

⁷⁴Tony Beargie, "Japan Refutes U.S./EC Charges," American Shipper, June 1991, p. 2.

⁷⁵See Robert P. James, "Sanction Threats Against Chinese Lines Seen as Leverage in Reform Efforts," Traffic World, July 8, 1991, p. 19.

⁷⁶Tony Beargie, "Japanese Concede on Harbor Fee," American Shipper, July 1991, p. 74.

Taiwanese laws that would make it impossible for a United States carrier to provide trucking delivery service from Taiwanese ports.⁷⁷ The problems with South Korea remain unresolved, although intentions to make changes have been indicated by South Korea.⁷⁸

These "doing business" problems are likely to become more frequent if American and other ship lines and freight forwarders seek to control more transportation operations in foreign countries in order to provide a complete "seamless" intermodal service for United States exports and imports.

Overall Capacity of the Water Transportation System

The above discussion of international water transportation indicates: (1) there is a general overcapacity condition in the ocean carrier industry; (2) the usual situation is that there is an imbalance in the Pacific area with more excess carrier capacity available westbound than eastbound, favoring Minnesota exporters; (3) carrier capacity shortages on any trade route do not persist for any length of time--the industry is flexible in moving capacity around; (4) carriers' capacity limitation agreements and vessel sharing agreements could reduce the amount of excess capacity in the industry; (5) international surface freight forwarder capacity should continue to be sufficient; (6)

⁷⁷"FMC Seeks New Data from Four Ocean Lines on Taiwan Trucking Curb," Traffic World, January 4, 1993, p. 26.

⁷⁸Tony Beargie, "Koreans Agree to Concessions," American Shipper, September 1992, p. 20 and Tony Beargie, "APL/Sea-Land: 'Keep the Heat On'," American Shipper, October 1992, p. 80.

United States port capacity is adequate and should remain so as ports continue to expand and modernize; and (7) barriers to international water commerce, such as discriminatory port charges against foreign ships, are not likely to affect overall carrier capacity because, while a barrier is in effect, the traffic can be carried by carriers not being discriminated against, and the barriers are eventually modified by political pressure. With the exception of item four, conditions are favorable for Minnesota exporters regarding water transportation capacity, and it can be concluded that there will most likely be sufficient water carrier and port capacity to handle additional Minnesota exports to the Pacific area in the foreseeable future.

The Use of Water Transportation by Minnesota Exporters to Pacific Area Countries

Products Exported by Water to the Pacific Region

Accurate information on what manufactured goods are exported to what foreign countries by water from Minnesota is difficult to obtain.

In the personal interviews conducted among carriers and third parties, it was determined that a wide variety of goods are sent to the Pacific area from Minnesota by water. They include aeration equipment, acoustical tiles, air filters, air flow blenders, airline maintenance trucks, all-terrain vehicles, audiometers, automobile parts, caffeine, climate control equipment, communications equipment, construction machinery, conveyors, cooling and refrigeration units, diesel engines,

digital scanners, dimension lumber, drink bases, electronic components, float glass, floor maintenance machines, food products, freezers, golf course equipment, granite for tombstones, hair care products, health and fitness equipment, hides, hydraulic pumps, ice making machines, industrial air conditioners, latex gloves, lawn mowers, lawn trimmers, limestone for building facades, logging equipment, lumber, medical devices and other medical products, metalworking machinery, microwave popcorn, office supplies, optical scanners, overhead projectors, packaging equipment, paper, peanut butter, plywood veneers, popcorn, portable toilets, pressure gauges, printed forms, ship unloading equipment, shoes, silo unloaders, slag, snowmobiles, starch, syrups, tape recorders, testing machines, vending machines, wheat germ nuts, windows, wood products, woodworking machinery, and work boots.

Published data for Minnesota exports by water to ten Pacific Rim countries is available in Journal of Commerce reports. One such report covers shipments made during a three-month period in 1991 and includes only shipments made by exporters shipping at least three TEU's in the period.⁷⁹ The data support the conclusion that a wide variety of things are involved. The rather broad categories of goods that are exported to ten Pacific countries by water include automobile batteries, abrasives, adhesives, animal vitamins, building materials, candy and

⁷⁹Data from Journal of Commerce PIERS Import/Export Reporting Service, quarterly report, February 20, 1992.

confectioneries, cheese, canned foodstuffs, citrus juices, egg products, electrical goods, fans and blowers, flat glass, frozen meat, furniture, generators, grocery products, hides and skins, hoists, and cranes, lawn and garden equipment, leadwire and bars, lift trucks, lubricating oil, lumber, measuring equipment, medical equipment, metalware, miscellaneous machinery, pet and animal feed, plastic products, plate and float glass, plumbing supplies, printing machinery, putty and calk, saccharides, soap, soybean products, sporting goods, textiles, vending machines, and wines and spirits. In addition, there is some freight not identified, apparently because it is carried under FAK rates. There are also a fair number of empty containers carried from Minnesota to the Pacific area.

International Modes of Transportation Used

The 55 Minnesota manufacturer-exporters to the Pacific region included in the mail study were asked to indicate the international modes of transportation used to export to Pacific area countries. As shown in Table 9, 32 of the 53 firms that answered the question used both water and air transportation, while seven used only water, and fourteen used only air transportation. The dual use of both water and air transportation indicates that, for many firms, products shipped overseas are amenable to both modes and/or the firms export different kinds of products, some of which are suitable for water transportation and some for air transportation. In certain cases, the use of both modes arises because, although the usual

Table 9
International Modes of Transportation Used
by Respondents to Export to the Pacific Region

<u>Mode</u>	<u>Number of Exporters</u>
Water only	7
Air only	14
Both water and air	32
Number responding	53

mode is water transportation, situations arise in which faster transportation is necessary and air must be used.

The exporters included in the mail study were asked to indicate which criteria are considered when selecting the mode(s) of transportation used to export to the Pacific region. The responses, shown in Table 10, of the fifty firms answering the question indicate that the six most frequently mentioned criteria were cost, reliability of service, availability at origin point(s), availability at destination point(s), frequency of service, and transit time. Cost was the most frequently mentioned factor, demonstrating that, although quality of service has become more important in transportation decision making in recent years, cost is still very significant.

Origin Points in Minnesota

There were 24 Minnesota origin points involved in the water carrier shipments included in the Journal of Commerce report previously discussed. They were divided almost equally in number between the Twin Cities Metropolitan Area and the rest of the state. However, most of the non-Twin Cities points were within a radius of 75 miles of the Twin Cities. A few were beyond that range, the farthest being Deer River about 160 miles north of Minneapolis-St. Paul. Most of the tonnage originated in the Twin Cities area.

The 55 exporters included in the mail study had manufacturing facilities in twenty different locations in Minnesota from which products were exported to the Pacific area,

Table 10
 Criteria Considered by Respondents when Selecting the
 Mode(s) of Transportation (Both Domestic and International)
 Used to Export to the Pacific Region

<u>Criterion</u>	<u>Number of Exporters</u>
Availability at origin point(s)	33
Availability at destination point(s)	25
Availability of equipment	5
Suitability for commodity(s) to be carried	18
Suitability for shipment size(s)	18
Adequacy of capacity	5
Reliability of service	40
Frequency of service	23
Pickup times	7
Transit times	23
Cost	43
Amount of loss and damage	10
Processing of loss and damage claims	5
Communication (tracing, notification)	21
After-sale service	4
Other	2
Number responding	53

counting the Minneapolis-St. Paul Metropolitan Area as one location. Some respondents had facilities in more than one location. The twenty locations are shown in Table 11. It can be seen that a large share of the 55 firms named locations that were in the Twin Cities--a total of 42, or roughly 75 percent. The remaining nineteen locations were named by a total of 23 firms, or about 42 percent, and were dispersed throughout the state, although eleven of them were within 100 miles of the Twin Cities. These eleven were named by fourteen, or 25 percent, of the 55 firms. The farthest locations from the Twin Cities were Warroad (about 300 miles) and East Grand Forks (about 270 miles). Because 39 of the 53 exporters whose modal choice was identified used water transportation, it can be assumed that these data for all exporters in the study apply to exporters by water.

Therefore, the data contained in the Journal of Commerce report and that gathered in the mail study indicate that most exporting to the Pacific area by water is done by firms in or near the Minneapolis-St. Paul Metropolitan Area. This conclusion was confirmed in personal interviews with freight forwarders and carriers which indicated that most exporters to the Pacific area are located in or near the Twin Cities Metropolitan Area.

Destination Countries

In the Journal of Commerce report, the destination countries of the shipments by water were Hong Kong, Indonesia, Japan, Malaysia, People's Republic of China, Philippines, Singapore, South Korea, Taiwan, and Thailand. The countries receiving the

Table 11
Origin Points of Exports to Pacific
Region Countries by Respondents

<u>Origin Point</u>	<u>Number of Exporters</u>
Akeley	1
Austin	1
Blomkest	1
Blooming Prairie	1
Dassel	1
Duluth	2
East Grand Forks	1
Harmony	1
Hibbing	1
Madelia	1
New Prague	1
Owatonna	3
Red Wing	1
Sacred Heart	1
St. Cloud	1
St. James	1
Sartell	1
Twin Cities Metropolitan Area	42
Warroad	1
Willmar	2
Number responding	55

largest share of the export shipments were Japan, with 24 percent of the shipments, Taiwan, with fifteen percent, and Singapore, with fourteen percent. The smallest share of the shipments went to Indonesia, with less than two percent.

The 39 Minnesota exporters in the mail study that used water transportation were asked to indicate the most important Pacific area countries shipped to by water. The data are shown in Table 12. For the 34 firms that answered the question, Taiwan, Japan, and Australia were the top three countries, although water shipments were made to nine other Pacific Rim countries as well.

A large international freight forwarder interviewed in the study reported that it handled shipments to thirteen different Pacific area countries in 1991 with Japan and Hong Kong being the most important. Another forwarder said that Japan, with thirty percent, and Hong Kong, South Korea, and Taiwan, with 35 percent between them, were the most important in 1991.

Based on these different sources, it is apparent that Australia, Hong Kong, Japan, Singapore, South Korea, and Taiwan are the most important Pacific countries for Minnesota manufacturer-exporters.

The most important countries shipped to by air are also shown in the table. These shipments show a pattern similar to that for shipments by water. The differences are mainly that Australia, Hong Kong, Japan, and Singapore were more frequently mentioned, while Indonesia and the Philippines were less frequently mentioned.

Table 12
 Most Important Pacific Region Countries
 Exported to by Respondents

<u>Country</u>	<u>Water Transport Number of Exporters</u>	<u>Air Transport Number of Exporters</u>
Australia	14	18
Hong Kong	6	9
Indonesia	4	0
Japan	17	20
Malaysia	4	3
New Zealand	4	4
People's Republic of China	5	6
Philippines	8	3
Singapore	9	13
South Korea	14	14
Taiwan	19	18
Thailand	2	3
Number responding	34	33

Ports Used

Of the water shipments examined in the Journal of Commerce report, roughly 37 percent were sent through Seattle, nineteen percent through Tacoma, fourteen percent through Portland and fourteen percent through Los Angeles, nine percent through Long Beach, five percent through Oakland, and two percent through San Francisco.

The west coast ports most frequently used by the Minnesota exporters included in the mail study were Seattle and Los Angeles. Important usage was also made of the ports at Long Beach and Portland. The utilization of west coast ports is shown in Table 13.

Most freight forwarders and carriers interviewed in the study reported that Seattle and Tacoma were the most frequently used ports for Minnesota exports, with Los Angeles and Long Beach also being important. A major ship line reported that seventy percent of its Minnesota export volume goes through Seattle and the balance through Los Angeles. However, a large forwarder said that, in 1991, the number of full containers it sent through Pacific coast ports was Los Angeles, 42; Portland, 38; Tacoma, 28; Seattle, 25; Oakland, twelve; and Long Beach, eight.

Burlington Northern (BN) IRT freight tends to go to Seattle and Tacoma; Soo Line IRT freight tends to go to Los Angeles and Long Beach. It should be expected that a large amount of Minnesota exports would move through Seattle, Tacoma, and Portland because of the advantage of a direct single-carrier

Table 13
Ports Used by Respondents to Export to the Pacific Region
and Average Respondent Rating* of Ports

<u>Ocean Port</u>	<u>Number of Exporters</u>	<u>Rating</u>
Long Beach	14	3.54 (13) [#]
Los Angeles	20	3.22 (16)
Oakland	7	3.60 (5)
Portland	11	3.89 (9)
San Francisco	6	3.40 (5)
Seattle	21	3.79 (19)
Tacoma	9	3.15 (8)
Other [@]	3	4.00 (2)
Don't know	5	
Number responding	38	

*All ratings are on a scale of 1 to 5, where 1 = poor, 2 = fair, 3 = average, 4 = good, 5 = excellent.

[#]The number in parenthesis is the number of exporters providing a rating.

[@]Non-west coast ports.

route available via BN IRT service in addition to the shorter distance when compared with the other west coast ports, regardless of mode used to reach the port. However, although the above discussion indicates that those three ports handle a lot of Minnesota westbound traffic, other ports, in particular Los Angeles and Long Beach, also participate fairly heavily in Minnesota originated traffic.

In the mail study, Minnesota exporters were requested to indicate their overall perception of the service provided at several west coast ports. Table 13 shows the average perception given. All ports had above average perception ratings with Portland and Seattle having the highest ratings and Los Angeles and Tacoma the lowest. These data indicate a general satisfaction with west coast ports.

Ocean Carriers Used

A total of nineteen different steamship lines were involved in the shipments included in the Journal of Commerce report. The top ten in terms of the number of shipments carried were (in order) COSCO, Evergreen, NYK, Maersk, APL, Mitsui O.S.K., OOCL, Hyundai, Hanjin, and Sea-Land. The top five accounted for over 59 percent of the shipments made. Six of the top ten carriers were conference carriers. Freight forwarders interviewed in the study stated that most shipments to the Pacific region are carried by conference carriers. Many of these same carriers were identified as being used by the Minnesota exporters responding to the mail questionnaire.

Use of Third Parties

The Minnesota exporters included in the mail study relied heavily upon third parties, especially freight forwarders, in making shipments to the Pacific area. Table 14 shows that, of the 46 firms that provided information, only sixteen dealt directly with the carriers, while 41 used freight forwarders and a smaller number used brokers, NVOCC's, and shippers' agents. Although this data was not broken down by the international mode (water or air) used, it is clear that freight forwarders are very important to exporters using either mode.

The 38 Minnesota exporters that evaluated the service of the freight forwarders used gave them an average rating of 4.16 on a five-point scale, where 1 equaled poor and 5 equaled excellent. This indicated that there is considerable satisfaction with the service received.

Size and Frequency of Shipments

The size of shipment by water to the Pacific region varied among the 55 Minnesota exporters in the mail study from a few hundred pounds to shipments well over 40,000 pounds.

The frequency of shipments by water to the Pacific area varied from one per year to over one thousand per year. However, most exporters reported rather infrequent shipments to the Pacific area, i.e., less than one per month, indicating that exporting to the Pacific area is not a dominant part of the business of many Minnesota companies included in the study.

Table 14
Companies Used by Respondents when
Arranging for Transportation to the Pacific Region

<u>Company</u>	<u>Number of Exporters</u>
Carrier	16
Freight Broker	4
Freight Forwarder	41
NVOCC	4
Shippers' Agent	4
Other	4
Number responding	46

Perceptions About Water Carrier Service

Minnesota exporters that participated in the mail study were asked to indicate their perceptions of the service provided by the several modes of transportation available to them to ship to the Pacific area with which they had some familiarity. The results are given in Table 15.

The table indicates that water transportation was perceived positively by the respondents, with the average ratings on most items well above the average of 3.00 and with an average overall perception rating of 3.62. The importance of suitability of water transportation for the shipment sizes carried and the adequacy of water carrier capacity are indicated by the high average ratings on those items of 4.00 and 4.32, respectively. The exporters also gave water transportation a relatively high rating of 3.50 on cost. In terms of overall perception, water transportation's average rating of 3.62 was much better than that received by railroads (2.89) and intermodal rail-truck transportation (3.00), but somewhat below that received by motor trucking (3.86) and air transportation (3.75).

INTERNATIONAL AIR TRANSPORTATION

Importance of Air Transportation in Overseas International Trade

Air cargo includes freight, express, and mail traffic. The term "air freight" is ordinarily used to include freight and express, but not mail. "Heavy freight" is considered here to be

Table 15
Average Respondent Rating* of Service Provided
by Modes of Transportation to the Pacific Region

	<u>Water</u>	<u>Air</u>	<u>Motor Truck</u>	<u>Railroad</u>	<u>Intermodal Rail-Truck</u>
Availability at origin point(s)	3.42 (26)#	4.10 (29)#	4.29 (17)#	3.93 (14)#	3.50 (10)#
Availability at destination point(s)	3.74 (19)	4.04 (25)	3.30 (10)	2.17 (6)	3.17 (6)
Availability of equipment	3.45 (20)	4.00 (22)	4.08 (12)	2.43 (7)	3.43 (7)
Suitability for commodity(s) carried	3.67 (21)	3.78 (23)	3.92 (12)	4.13 (8)	3.85 (7)
Suitability for shipment size(s)	4.00 (23)	3.84 (25)	4.23 (13)	3.50 (10)	3.78 (9)
Adequacy of capacity	4.32 (19)	4.00 (24)	4.29 (14)	3.80 (10)	3.78 (9)
Reliability of service	3.57 (21)	3.88 (25)	3.79 (14)	2.75 (8)	3.22 (9)
Frequency of service	3.28 (18)	4.09 (22)	4.38 (13)	3.00 (10)	3.38 (8)
Pickup times	3.72 (18)	4.00 (24)	4.13 (15)	3.50 (10)	3.50 (10)
Transit time	3.50 (20)	4.08 (25)	4.00 (15)	3.30 (10)	3.11 (9)
Cost	3.50 (22)	3.00 (25)	3.60 (15)	2.90 (10)	3.00 (9)
Amount of loss and damage	3.75 (20)	3.96 (24)	3.75 (12)	3.13 (8)	3.50 (6)
Processing of loss and damage claims	3.35 (17)	3.76 (21)	3.33 (12)	3.13 (8)	3.67 (6)
Communication	3.45 (20)	4.12 (26)	3.46 (13)	2.50 (10)	2.88 (8)
After-sale service	3.11 (18)	3.21 (19)	3.30 (10)	2.85 (7)	3.00 (6)
Overall perception	3.62 (21)	3.75 (24)	3.86 (14)	2.89 (9)	3.00 (7)

*All ratings are on a scale of 1 to 5, where 1 = poor, 2 = fair, 3 = average, 4 = good, 5 = excellent.

#The number in parenthesis is the number of exporters providing a rating.

anything that exceeds the weight and size limitations of express carriers.

As noted earlier, air transportation is involved in only a small part of the total overseas international trade of the United States, when measured in terms of weight carried--it accounts for less than one percent. However, when measured in terms of the value of the goods carried, it was about 32 percent of the total in 1991. This reflects the fact that higher-value manufactured goods predominate in the traffic carried in international air transportation. As a general rule, shippers and receivers of goods that are of high value per unit of weight prefer to use a fast mode of transportation in order to minimize the cost of owning the goods while in transit. Other reasons for using a fast form of transportation include the need for small and frequent shipments, emergency situations, perishability of the products transported, and susceptibility to loss and damage. Examples of the kind of products shipped by air are high value items such as electronic equipment and medical devices; perishables, such as cut flowers and live seafood; and time sensitive spare parts. In return for the benefits of air transportation, the shipper must pay rates that are considerably higher than water transportation rates.

As to the speed factor, unlike domestic air freight where next-day delivery is common, overseas international trade delivery of heavy freight (as opposed to express traffic) realistically takes at least 48 hours to arrive at the

consignee's door and often longer. Airline schedules and clearance of customs contribute to this. Typical service from Minnesota to Pacific Rim countries is four to five days to the destination airport.

International air freight traffic is expected to increase substantially in the future because of the natural growth of the world's economies, the increasing importance of time in the business world, and the emphasis on carrying less inventory with resulting smaller but more frequent shipments.

Air Freight Carriers

Effect of Deregulation in the United States

Reform of federal economic regulation of transportation in the United States that began in the late 1970's,⁸⁰ transformed the United States domestic airline industry. The elimination of domestic entry control and price regulation led to a number of new entrants in both the passenger and freight markets, expansion of pre-existing carriers, intense price competition, failure of a number of carriers, mergers among carriers, and a financially distressed industry in the early 1990's, part of the latter caused by the economic recession of the period.⁸¹ In early 1993,

⁸⁰Brought about by amendments to the Federal Aviation Act made in 1977 and enactment of the Airline Deregulation Act of 1978. International service by United States airlines and carriers of other countries is still regulated by the federal government through the United States Department of Transportation and, in some cases, by the President of the United States. Much of such regulation has to do with permission to serve international routes.

⁸¹See James Ott, "Massive Airline Losses Force Draconian Cuts," Aviation Week and Space Technology, January 11, 1993, p. 30.

three major carriers were in bankruptcy (America West, Continental, and Trans World) and several others in financial difficulty.

Many domestic carriers also serve international routes and some provide service to the Pacific region. The financial problems many of them had in the early 1990's, caused by conditions in the United States, had some impact on their ability to serve international routes. For example, if a carrier were financially stressed, it might sell its international routes to another carrier, or withdraw from international service to reduce its costs, or allow its international service to deteriorate.

In addition to United States carriers, there are air carriers of other countries that carry part of the United States' international trade, including that with Pacific area countries. These carriers were unaffected by domestic regulatory reform in the United States.

Combination Carriers

Air freight is carried by several kinds of airlines. Carriers that are primarily passenger carriers, such as Delta, United, and Japan Airlines,⁸² also carry freight in the cargo section of a passenger aircraft. This is referred to as "combination" service, because both passengers and freight are

⁸²Japan Airlines (JAL) is one of the largest air freight carriers in the world, in terms of the number of domestic and international ton-miles carried. About two-thirds is international. Information reported in CNS Focus, September 1991, p. 6.

carried in the same aircraft.⁸³ The domestic cargo capacity of United States combination carriers is generally underutilized. On the other hand, combination carriers have done much better in international service, having increased their cargo revenues substantially in the last ten years or so.⁸⁴

Some predominantly passenger airlines have operated air freighters or all-cargo aircraft, which are aircraft dedicated only to carrying freight. However, the use of all-cargo aircraft by United States passenger carriers has declined in recent years and, in 1993, only Northwest operated such aircraft. These were Boeing 747 aircraft that operated between the United States and Asia.

Most United States combination carriers treat air cargo as an ancillary service--it brings in about five percent of revenue --and flight schedules are made to best serve passengers (meaning daytime flights at congested times) and not cargo (where night time flights are appropriate).⁸⁵

⁸³There are several versions of combination passenger-cargo service. They are (1) palletized and/or containerized cargo and passengers carried on the main deck, (2) wide body passenger aircraft with pallets and/or containers carried in the "belly" compartment, and (3) narrow body aircraft with cargo carried in the lower deck baggage compartment.

⁸⁴Patrick Burnson, "Continued Economic Slowdown in Southern California Reflected in Latest Air Cargo White Paper," Pacific Shipper, January 4, 1993, p. 26.

⁸⁵For a discussion of this, see E.J. Muller, "Trends Bode Well for Air," Distribution, July 1992, pp. 34-35.

All-Cargo Carriers

A second kind of air freight carrier is one that carries only freight. These carriers may provide regularly scheduled service or a non-scheduled charter service where an entire aircraft may be chartered from them by a shipper or freight forwarder for one or more trips. This industry has been chaotic in the United States since the late 1970's, with a number of entries, exits, and mergers among carriers. The largest all-cargo carrier in the United States is Federal Express, which began as a carrier of small express shipments and became, through acquisition of Flying Tigers in 1987, a heavy freight carrier as well.

Air Express Companies

Finally, there are air express carriers or couriers that confine their carriage to small packages and envelopes, offering very fast service, including overnight delivery. Some carriers carry both air express and heavy air freight. They include Airborne Express, Burlington Air Express, Emery Worldwide, Federal Express, and United Parcel Service. These carriers provide pickup and delivery ground service as well as air carrier service and are called "integrated" carriers.

Going beyond just transportation, some air freight carriers have established warehouses in foreign countries as part of their attempt to offer a more complete logistics management service. In such situations, the carrier manages inventory for its customers, in addition to providing transportation, and shipments

and inventory are controlled by the carrier all the way to the final destination.⁸⁶

In 1991, the express and heavy freight revenue ton-miles carried (not including mail) by United States scheduled airlines totalled about 10.2 billion ton-miles, roughly 5.3 billion of which was international.⁸⁷

Kinds of Aircraft Used

The aircraft used to carry international air freight and express traffic usually are airplanes capable of covering long distances without refueling, especially on the long-distance Pacific routes. The premier aircraft are the various versions of the Boeing 747, whose wide body and large capacity are particularly amendable to carrying large quantities of air freight. Other aircraft used in the Pacific trades are the several versions of the Airbus Industrie's A-300, Boeing 707, 757, and 767, and McDonnell Douglas DC-8, DC-10 and MD 11.

Air freight often consists of relatively small shipments that have high value and are time sensitive. American Airlines reported that, in 1992, the average weight of its domestic small-packages and heavy freight was 220 pounds. International shipments averaged 699 pounds. When only the heavy freight was

⁸⁶"Emery Expands Foreign Warehousing," Traffic World, January 18, 1993, p. 36. Logistics contracting by air freight carriers is discussed in Andrew Tausz, "Integrators Go for Global Contracts," Distribution, October 1992, p. 38 and "DHL Eyes Logistics Markets with \$1.25 Billion Spending Plan," Traffic World, February 15, 1993, p. 32.

⁸⁷Air Transport Association of America, Air Transport 1992 (Washington, DC: Air Transport Association of America, 1992), p. 12.

counted (excluding small packages), the domestic average was 300 pounds; it was 900 pounds for international shipments.⁸⁸

Air freight shipments can be carried on pallets and loaded into an aircraft as such, containerized using containers (with or without pallets), or carried as individual pieces (cartons, crates, etc.). Air freight transport is usually accomplished without using intermodal containers because of the incompatibility of containers with different vehicles (aircraft and trucks or rail cars) used. Containers used in air freight service are often odd shaped, designed to fit the contours of the aircraft's fuselage. Thus, they usually must be unpacked before shipments can be transferred to another mode. However, it is possible to carry standard twenty-foot containers on large wide-body aircraft, such as the Boeing 747.

Ownership of Air Freight Carriers

United States Air Carriers

In the United States, all airlines are privately owned. In fact, the United States is the only major country in the world that has a completely privately owned system of airlines.⁸⁹ However, there is a long history of federal and local government involvement in the airline industry, including various kinds of promotional assistance in the form of cash subsidies and

⁸⁸Richard Malkin, "A Pragmatic View of Airfreight," Distribution, May 1992, p. 62.

⁸⁹Frederick J. Stephenson, op. cit., p. 436.

provision of airway and airport facilities. This means that the emphasis is on private enterprise, as in ocean water transportation, but it is not complete free enterprise.

In the deep airline recession of the early 1990's, foreign air carriers have shown an interest in purchasing part ownership of United States airlines, or increasing their existing ownership. For example, KLM Royal Dutch Airlines has acquired a twenty percent interest in Northwest Airlines and the two carriers have a "partnership" arrangement whereby they have merged operations and coordinated scheduling and marketing as if they were one airline; but the two companies are separate entities.⁹⁰

Foreign Air Carriers

Foreign air carriers serving the United States in the Pacific trade are, in some cases, owned by their national governments. Others are private companies, but usually subsidized by their governments. Still others are owned by a combination of government and private owners.

United States-Pacific Area Air Carriers

The top 25 United States cargo carriers are listed in Table 16, along with their total domestic and international cargo ton-miles carried. In the Pacific area freight market, the most important United States flag carriers are American, Continental,

⁹⁰"KLM, Northwest Officials Predict Closer Operations on Horizon," Aviation Week and Space Technology, September 14, 1992, p. 33.

Table 16
Leading United States Air Freight Carriers, 1991

<u>Carrier</u>	<u>Total Revenue Freight Ton- Miles Carried (in thousands)*</u>
Federal Express	3,622,660
Northwest Airlines	1,684,455
United Airlines	1,214,343
American Airlines	883,862
Delta Airlines	668,392
Continental Airlines	563,751
Pan American Airways	376,694
Trans World Airlines	368,940
United Parcel Service	209,634
USAir	136,665
Challenge Air Cargo	129,072
America West Airlines	72,117
Arrow Airlines	64,192
Air Transport International	49,069
Alaska Airlines	47,436
Zantop Airlines	32,617
Southwest Airlines	12,694
Midway Airlines	11,987
Northern Air	10,054
Markair	9,201
Amerijet	8,773
Aloha Airlines	8,056
Hawaiian Airlines	5,242
Midwest Express	3,994
Eastern Airlines	3,881

*Includes air express and heavy air freight, both domestic and international traffic. Based on ton = 2,000 pounds.

Source: Air Transport Association, Air Transport 1992 (Washington, DC: Air Transport Association, 1992), p. 13.

Delta, Federal Express, Northwest, and United. The two dominant carriers are Northwest and United.

There are many non-United States freight carriers in the Pacific market as well. Table 17 contains a list of combination and all-cargo carriers that serve the Pacific area from seven important United States airports⁹¹ along with their country of registration.

Pacific Area Traffic Carried

The Pacific area is one of the world's most important air freight regions. According to a Boeing Aircraft study, the United States-Orient part of the Pacific region air cargo traffic amounted to nine percent of the world's total in 1970, nineteen percent in 1990, and has been predicted to grow to 22 percent in 2005.⁹²

The kinds of commodities shipped by air from the United States to Pacific area countries are varied. Manufactured goods exported from Minnesota to the Pacific region reported in personal interviews with carriers and freight forwarders include audio headphones, auto parts, communications equipment, compact discs, computers, computer parts including cables and software, dental supplies, digital scanners, electronic components, film, fire detection equipment, floor maintenance equipment, golf

⁹¹The seven United States airports are located in Anchorage, Chicago (O'Hare), Denver, Los Angeles, Minneapolis-St. Paul, San Francisco, and Seattle-Tacoma.

⁹²"World Air Cargo Growth Spurs Need for Freighters," Aviation Week and Space Technology, June 8, 1992, p. 34.

Table 17
Air Cargo Carriers Serving Between the
United States* and Pacific Area Countries, 1993

Carrier and Country

Combination Carriers:#

Aeroflot-Russian Airlines, Russia
Air China, People's Republic of China
Air New Zealand, New Zealand
All Nippon Airways, Japan
American Airlines, United States
Asiana Airlines, South Korea
Cathay Pacific Airlines, Hong Kong
China Airlines, Taiwan
China Eastern Airlines, People's Republic of China
Continental Airlines, United States
Delta Airlines, United States
Garuder Indonesia, Indonesia
Japan Airlines, Japan
Korean Air, South Korea
Northwest Airlines, United States
Philippine Airlines, Philippines
Singapore Airlines, Singapore
United Airlines, United States
Thai Airways International, Thailand

All-Cargo Carriers:@

Federal Express, United States
Nippon Cargo Airlines, Japan

*From Anchorage, Chicago, Denver, Los Angeles, Minneapolis-St. Paul, San Francisco, and/or Seattle-Tacoma. Carriers listed either perform the first leg of a flight to the Pacific area or make the complete flight without connecting with another carrier.

#Includes air express and heavy freight.

@Includes heavy freight only.

Source: Official Airline Guides, Inc., OAG Desktop Flight Guide, Worldwide Edition (Oak Brook, IL: Official Airline Guides, Inc., March 1993) and Official Airline Guides, Inc., OAG Air Cargo Guide (Oak Brook, IL: Official Airline Guides, Inc., March 1-April 3, 1993).

equipment, high tech electronics, machinery parts, medical equipment, medical products, optical supplies, printed matter, soda dispensers, water purification systems, and windows.

Bilateral Agreements

Defined

Which air carriers serve where in international commerce is determined by bilateral treaties between the countries involved. Thus, in order for Northwest, for example, to add a new service point in Asia, it would be necessary for the United States Department of State to negotiate a new agreement or modify an existing agreement with the Asian country. Prior to the 1970's, the agreement would probably call for Northwest to serve the additional point or points and a carrier(s) from the other country would be given the right to serve a specified point(s) in the United States. The agreement would also specify the number of flights to and from the point(s) and restrictions on carrying domestic traffic. In addition, other restrictions, such as required intermediate stops, were commonplace. The right of government to veto fares and rates charged could also be included. In that period, the effect was to limit flight frequencies and the amount of capacity provided. The emphasis was on the passenger side of the business, not the freight side.

Liberalization

Since the late 1970's, United States-foreign country bilateral agreements have allowed for more freedom of entry and

operation. As a result, many new United States and foreign flag carriers have entered scheduled service. Numerous new United States interior points (such as Minneapolis-St. Paul and Denver) have been, opened providing direct air service to international markets, and more services have been offered between pre-existing United States and foreign airports. Expanded routes and fewer capacity limits developed during the period.⁹³ However, the situation is still far from one of open entry.

The United States has greatly liberalized its agreement with the Netherlands. Liberalization has also been proposed for other European countries under an "open skies" policy that would allow air carriers of the countries involved to serve at will to and from each other's countries and set prices without interference. It is probable that the same change will eventually take place in the Pacific region.⁹⁴

Cargo Carriers

At present, all-cargo flights have generally liberal arrangements around the world. However, this is not the case with combination flights, where freight is carried in passenger aircraft. Combination flights are subject to arrangements made mainly for passenger service, which are much more carefully

⁹³Frederick J. Stephenson, op.cit., p. 41.

⁹⁴James Ott, "More Skies to Open as U.S. Signs Pacts," Aviation Week and Space Technology, September 14, 1992, p. 32.

considered, and are likely to contain fairly restrictive provisions.⁹⁵

Pricing of Air Freight Service

Pricing of air freight service is similar to land transportation pricing. Rates on non-containerized freight may be quoted per unit of weight to carry a specific commodity between two specified points. Or the rate may be a freight all kinds (FAK) rate per unit of weight, regardless of the commodity(s) being carried between two specified points. On containerized freight, rates may be quoted per container with the rate depending on what is being carried and/or its weight. Some container rates are FAK rates per container, and may or may not depend on the weight involved.

Except where an integrated carrier is involved, rates quoted are airport-to-airport, meaning that ground transportation required to move goods to and from airports is not included in the price.

Rates are subject to fluctuation depending upon the capacity utilization of the carriers and the amount of competition. When excess capacity exists, carriers often reduce freight rates to attract business.

Air freight rates are considerably higher than rates charged by ocean carriers--the cost per ton-mile for air is many times

⁹⁵A brief argument in favor of liberalizing the restrictions on international aviation from the point of view of a Pacific carrier can be found in "Singapore Airlines Proposes Multilateral System for Aviation Liberalization," Pacific Shipper, August 10, 1992, p. 22.

the cost of water transportation. Air cargo rates from Minnesota to the Pacific region often amount to a dollar or more per pound. However, much of what is carried by air is not practically carried by water, and vice versa, so shippers often do not have a choice between the two modes.

Air freight carriers may belong to the International Air Transport Association (IATA) which attempts to control rates and fares of its members on a regional basis through its regional conferences that operate similarly to ocean shipping conferences. IATA also deals with baggage handling, through ticketing, liability issues, account settlement between third parties and carriers, and so on. Many carriers today do not belong to IATA or, even though members, disregard the rates and fares established by the organization.

Japan Airlines is traditionally the price leader on trans-Pacific rates.⁹⁶ Trans-Pacific rates reflect the balance of traffic eastbound to the United States versus westbound from the United States. In the mid 1980's, westbound air freight rates were lower than eastbound rates. In the late 1980's and early 1990's, however, United States exports to Asia increased substantially, while imports remained essentially flat, so that a more balanced situation existed in 1993 causing carriers to increase westbound rates to reflect this development.⁹⁷

⁹⁶Mark B. Solomon, "Economics, Capacity, Market History Drive Latest Round of Asian Rate Hikes," Traffic World, March 18, 1991, p. 20.

⁹⁷Ibid., p. 21.

Air Freight Carrier Capacity

Overcapacity in the 1990's

Domestic air freight in the United States has generally had an overcapacity problem since the effects of deregulation began to appear in the early 1980's. This was added to by the economic recession of the early 1990's. In international air freight, where bilateral treaties tend to have the effect of preventing overcapacity, the problem has not been as severe. The worldwide recession has affected that service, but not as much as in the United States domestic market. Nevertheless, the international industry has suffered from overcapacity for some time.⁹⁸

Bilateral Agreements

The bilateral treaty approach has the potential to restrict air service growth and thus cause an undercapacity problem for United States exporters if traffic should increase substantially. As noted earlier, restrictions in bilateral treaties are aimed primarily at passenger carriers and less at all-freight carriers. Therefore, they have a much more important effect on combination air freight service than on all-cargo service.

It is probably unlikely that the United States and other governments would allow serious undercapacity to occur, although their reaction to the need for more capacity would be slower than would be the case under complete free entry of new carriers or

⁹⁸Paul Page, "Global Alliances Key to Surviving More Competitive Aviation Market," Traffic World, December 16, 1991, p. 22.

expansion of existing carriers' service. The fact that the United States and other countries have shown interest in further liberalization of bilateral restrictions indicates that air freight capacity may be adequate in the future.

Traffic Balance

There is also the traffic balance problem. In the Pacific market, air freight traffic westbound from the United States generally has been less in volume than eastbound traffic to the United States. In recent years, however, as stated earlier, westbound traffic has increased substantially while eastbound traffic has stagnated, thus creating a more balanced situation. In terms of carrier efficiency, a balanced traffic pattern is desirable and encourages carriers to provide adequate capacity in both directions. However, it reduces the overcapacity problem westbound, which works to the detriment of westbound shippers.

Influence of the Passenger Market

To a great degree, air freight capacity is determined by the passenger market. This is because combination carriers add or subtract flights based on expected passenger volume, thereby also affecting the amount of air freight capacity offered to shippers. This is not true, of course, when carriers provide all-cargo flights. Consequently, whether or not combination carriers provide sufficient freight capacity in the future depends on what happens to passenger traffic. Assuming that projections of large increases in Pacific passenger traffic are correct, available

freight capacity of combination carriers should increase substantially over the next decade as carriers add capacity, when possible, to serve the larger passenger market.

Number of Carriers

The reduction that has already occurred in the number of United States combination carriers in freight service, caused by company failures and mergers, poses the eventual threat that, when economic conditions return to normal, the dilution of competition will work to the disadvantage of the exporter. There could be less total capacity available, less competition among carriers, and higher rates to the Pacific area.

The four largest United States air passenger carriers are American, United, Delta, and Northwest, all of whom are active in international air freight traffic, including the Pacific area. They had 63 percent of the United States carriers' total domestic and international passenger-mile traffic in 1991 and 44 percent of the total freight and express ton-miles.⁹⁹ If the freight traffic carried by Federal Express, an all-cargo carrier, also active in the Pacific, were added to the freight traffic of the four combination carriers, the five had about 79 percent of the freight market in 1991. Although the concentration is less in international freight, because of the existence of some important non-United States carriers, concentration of the market in the

⁹⁹Calculated from data in Air Transport Association, op. cit., pp. 12-13. See, on this subject, James Ott, "Consolidation of Airlines Threatens Future Competition," Aviation Week and Space Technology, September 16, 1991, p. 30.

hands of a small number of carriers could result in an international air freight capacity problem in the future.

Conclusion Regarding Capacity

Although bilateral agreements are likely to be further liberalized in the future, they will continue to tend to retard air freight capacity growth. Should a more balanced east-west and west-east traffic pattern emerge, it will reduce the amount of excess westbound capacity available to Minnesota exporters. Air carrier withdrawals, failures, and mergers could result in fewer carriers and less air freight service available to the Pacific region. These developments would have the effect of limiting future growth in the amount of capacity available to Minnesota exporters.

On the positive side, the expected growth in the Pacific area passenger market and the probable resulting addition of passenger service will add freight capacity provided by combination carriers.

On balance, it appears that there is some chance that a capacity problem could arise in the near future should the amount of traffic shipped from Minnesota to the Pacific area increase substantially.

Freight Forwarders and Local Trucking

International Air Freight Forwarders

Air freight service can be booked by the shipper directly with a carrier or through a freight forwarder. Air freight

forwarders are very important in international air transportation--most international air freight is controlled by them.¹⁰⁰ This stems from the fact that most air shipments are relatively small and consolidation by a forwarder is done to keep costs down and service quality up, and because many exporters, especially smaller companies, do not have the expertise to handle the complications of international transportation themselves. Freight forwarders can help both small and large exporters by handling the many different requirements needed to move goods properly and legally out of the United States.

International air freight forwarders provide services similar to those provided by international surface forwarders.¹⁰¹ They basically arrange air freight transportation for the shipper, consolidate small loads of different shippers, and perform the various ancillary services mentioned previously. To the shipper, a forwarder provides skills and expertise. To the carrier, the forwarder is a source of traffic and revenue.¹⁰²

Forwarders can also provide information about overseas markets regarding the types of transportation available, packaging needed, customs requirements in foreign countries, and

¹⁰⁰Because of Federal Express and other large integrated air freight carriers, freight forwarders now handle less than ten percent of domestic air cargo shipments (a dramatic change from the past), since these carriers deal directly with shippers.

¹⁰¹International air freight forwarders in some instances also serve as international surface freight forwarders.

¹⁰²Unlike international surface freight forwarders, international air freight forwarders are no longer subject to federal economic regulation in the United States.

other rules that apply. Forwarders often use a local independent agent in the foreign country to represent them rather than establishing their own offices. These agents can arrange for customs processing and local transportation.

Payment arrangements between freight forwarders and shippers and carriers vary--there is no standard or required method. The forwarder tries to collect more from the shipper for transportation than the forwarder pays to the carrier. This can be based on the difference between the smaller shipment rate collected from the shipper and the larger shipment rate paid to the carrier. Sometimes the forwarder is paid a commission by the carrier. The forwarder may also have separate charges for the various ancillary services provided. Forwarders sometimes guarantee to buy a certain amount of space from a carrier in a given period of time and receive a lower than normal rate in return.

There are many hundreds of international air freight forwarders in the United States. An air freight executive stated that more than 300 international forwarders work in the Chicago area alone.¹⁰³ Another source reported more than 300 international air freight forwarders being located in the Los Angeles area as well.¹⁰⁴ Most forwarders are small and have

¹⁰³Mark B. Solomon, "Small Air Freight Forwarders Seek to Fill Air Freight's Void," Traffic World, October 22, 1990, p. 30.

¹⁰⁴Patrick Burnson, "Cathay Pacific Announces Direct LAX to Hong Kong Freighter Service," Pacific Shipper, July 6, 1992, p. 30.

gross sales of less than \$1 million per year. Many air freight forwarders in the United States are owned by foreign companies.

Because the large integrated all-cargo carriers provide ground pickup and delivery service, they have somewhat less need for forwarders. However, combination carriers generally need forwarders to help generate traffic. In fact, many passenger airlines will not do business at all without a forwarder.¹⁰⁵ Some of these combination air carriers have entered into "partnerships" with larger air freight forwarders where electronic data interchange (EDI) systems are shared, space is committed to the freight forwarder by the carrier, and a long term relationship prevails.¹⁰⁶

It is easy to enter the freight forwarding business because a very small capital investment is required, minimal experience and formal training are needed, and entry control by government is nonexistent. Therefore, there is little possibility that a shortage of forwarder services would arise should export traffic to the Pacific area increase substantially in the foreseeable future.

Local Trucking Companies

In most cases, export shipments by air require ground transportation to the airport. With the exception of integrated

¹⁰⁵Mark B. Solomon, "Small Air Freight Forwarders Seek to Fill Air Freight's Void," op. cit., p. 31.

¹⁰⁶Jan Burke, "Airline-Forwarder Tensions may be Resolved by Partnerships," Traffic World, October 26, 1992, p. 44.

carriers, air carriers usually do not provide pickup and delivery services, and the freight rates they quote are airport-to-airport rates. However, pickup and delivery service is available from airlines at an extra charge, with the service being provided by a local independent trucking company.

When a shipper uses a forwarder, the forwarder will arrange for or provide the ground transportation and charge the shipper accordingly. When not using a forwarder, shippers can provide their own pickup service or make use of pickup service arranged for by the air carrier. Regardless of who arranges the service, there are thousands of local trucking companies that can be used for pickup and delivery service in the United States. Because of ease of entry and other economic characteristics of the business, there is ordinarily no capacity problem for the shipper; there is, instead, usually a problem of overcapacity. A contributing factor to the overcapacity problem is that no government control of entry into local trucking incidental to air transportation exists.¹⁰⁷

Overall Carrier and Third Party Capacity in the Air Transportation System

The above discussion of the carriers and third parties involved in international air transportation indicates: (1) there is an overcapacity problem currently in the international air transportation system, although not as severe as in the United

¹⁰⁷Local pickup and delivery of interstate air freight is exempt from federal economic regulation under the Motor Carrier Act of 1980.

States domestic system; (2) there is usually an imbalance in the Pacific area with more excess carrier capacity available westbound than eastbound; (3) total combination carrier freight capacity is determined to a great extent by growth trends in the passenger market and a huge growth in Pacific area passenger traffic is expected; (4) all-cargo service, on the other hand, must expand on its own merits because it does not have the passenger market to carry it along; (5) bilateral agreements have the potential to restrict the growth in air service and slow down the adaptation of service to a growing passenger and freight market; (6) airline failures and mergers should result in a smaller number of air freight carriers and greater concentration of traffic in the hands of a smaller number of carriers; (7) air freight forwarder capacity should continue to be sufficient; and (8) local trucking capacity should continue to be sufficient.

Although most of the items listed above indicate that there will be a favorable climate for expansion of air freight capacity in the Pacific area, especially in the service offered by combination carriers, items five and six could turn out to be serious impediments to such expansion. This means that there is a chance that a carrier capacity problem could arise in the near future should the amount of Minnesota export traffic increase substantially.

Airports

Ownership and Operation

Commercial airports in the United States are owned and operated by local governments, such as a city, county, or regional airport authority. Airlines are charged for the use of facilities and services provided by the airport in the form of landing fees, lease payments, and other kinds of charges.

The Airport Decision

The decision of an air carrier to serve a particular airport is based on traffic estimates, the amount and kind of air competition that exists there, the physical facilities available (including gates, baggage handling facilities, counter space, cargo handling facilities, and storage facilities), the fees charged, and so on. For combination carriers, the decisions are dominated by passenger considerations, not freight considerations.

Shippers and freight forwarders consider their proximity to the airport, the carriers serving the airport, and the ability of the airport to properly handle their freight.

However, exporters and freight forwarders ordinarily do not have a great deal of choice as to which United States airport to use. A shipper or forwarder will usually route traffic via the nearest commercial airport having service to the destination country, either directly or through connections at other

airports. In most cases, the exporter or forwarder attempts to minimize ground transportation costs.

Shippers and forwarders sometimes truck their shipments to more distant airports when nearby airports do not have the international services needed to reach a certain destination country or enough capacity to satisfy the shipper in terms of the number of flights, the frequency of flights, the appropriate size aircraft, etc.

Airports Available to Serve the Pacific Rim

The United States airports most likely to be used by Minnesota exporters to reach the Pacific Rim as origin or connecting airports are shown in Table 18, along with the domestic and international cargo tons enplaned and deplaned in 1991. Not shown is the country's top air freight airport which is John F. Kennedy in New York City, with 1,257 million tons handled in 1991.

Approximately seventy airports in the Pacific region are served collectively from the seven airports listed in Table 18, via direct flights or connecting flights, or both. The following discussion indicates that there is considerable airline service from the seven airports to points in Pacific area countries.

Minneapolis-St. Paul

Minneapolis-St. Paul International Airport is the most likely choice to originate export shipments from Minnesota. The airport is the major air terminal in the upper midwest area and

Table 18
 United States Airports Available to Minnesota
 Exporters to Reach Pacific Area Countries, 1993

<u>Airport</u>	<u>Cargo Tons Enplaned and Deplaned, 1991*</u>
Los Angeles International	1,141,196
Chicago O'Hare International	1,071,598
San Francisco International	606,008
Anchorage International	587,817
Seattle-Tacoma International	326,569
Denver Stapleton International	292,625
Minneapolis-St. Paul International	268,114

*Includes mail, express, and freight, both domestic and international traffic. Based on ton = 2,000 pounds.

Source: Air Transport Association of America, Air Transport 1992 (Washington, DC: Air Transport Association, 1992), p. 6.

draws passenger and freight traffic from a large area. However, the airport is not equally accessible to all exporters in the state; those located in greater Minnesota are less able to use the airport than are those located in or near the Twin Cities Metropolitan Area.

All air freight export shipments from Minnesota do not flow through Minneapolis-St. Paul airport. Some shipments are trucked to other airports for export, usually Chicago's O'Hare. In addition, O'Hare and other airports in Table 18 serve as connecting points for Minnesota exports to the Pacific area where aircraft and/or airlines are changed for the trip across the Pacific.

Minneapolis-St. Paul International Airport is served by nine major combination carriers and several all-cargo carriers, including Federal Express. The carriers are shown in Table 19. In addition to the carriers shown in Table 19, there are several regional combination carriers and several less-important all-cargo carriers serving the airport.

Most of the carriers, including those shown in Table 19, do not participate in Pacific area traffic. The main participants are Northwest, American, Continental, Delta, Federal Express, and United. There are also dozens of international air freight forwarders in the Minneapolis-St. Paul Metropolitan Area. They include, among others, Amerford International Corporation, Circle Air Freight International, Fritz Companies, Inc., Global

Table 19
Major Combination and All-Cargo Carriers Serving
Minneapolis-St. Paul International Airport, 1993

<u>Carrier</u>	<u>Cargo Tons Enplaned and Deplaned at MSP, 1991*</u>
Combination Carriers:	
America West Airlines	1,776
American Airlines	3,625
Continental Airlines	3,133
Delta Airlines	5,691
KLM Royal Dutch Airlines	2,913
Northwest Airlines	150,463
Trans World Airlines	1,695
United Airlines	5,479
USAir	2,089
All-Cargo Carriers:	
Airborne Express	7,796
Emery Worldwide	12,580
Federal Express	39,806
United Parcel Service	29,962
Zantop Airlines	4,726

*Includes mail, express, and freight, both domestic and international traffic. Based on ton = 2,000 pounds.

Source: Minneapolis-St. Paul Metropolitan Airports Commission.

Transportation Services, Inc., Intertrans, Corp., Kintetsu World Express, Norman G. Jensen, Inc., and Radix Group International.

Combination carrier direct flights¹⁰⁸ from Minneapolis-St. Paul International Airport to Pacific region countries are provided by Northwest to Japan (Tokyo), the People's Republic of China (Beijing), and Singapore. Connecting combination flights,¹⁰⁹ where the connection is made at another airport, are provided by combination carriers between Minneapolis-St. Paul and Australia, French Polynesia, Hong Kong, Indonesia, Japan, Malaysia, New Zealand, People's Republic of China, Philippines, Singapore, Socialist Republic of Viet Nam, South Korea, Taiwan, and Thailand. Combination connecting flights are originated at Minneapolis-St. Paul by five different carriers. They are American, Delta, KLM, Northwest, and United.¹¹⁰ Although there is service to a number of Pacific area countries, the capacity is somewhat limited because of the small cargo space in many of the narrow bodied aircraft used in combination flights. All-cargo flights and those combination flights using wide bodied aircraft provide much more capacity per flight.

¹⁰⁸A direct flight is one in which a change of flight number and/or change of carrier is not required between the origin point and the destination point.

¹⁰⁹A connecting flight is one in which there is a change in flight number and/or carrier between the origin and destination points.

¹¹⁰Airline flight data extracted from Official Airline Guides, Inc., OAG Desktop Flight Guide, Worldwide Edition (Oak Brook, IL: Official Airline Guides, Inc., March 1993).

There are direct all-cargo flights to only four destinations--Hong Kong, Japan, Taiwan, and Singapore. All-cargo connecting flights are available to those four countries plus Malaysia, South Korea, and Thailand.

The leading carrier serving the Pacific Rim from Minneapolis-St. Paul is Northwest. Presently, it has two regular direct all-cargo flights per week to Tokyo, one to Singapore, and one to Taiwan, all in wide bodied Boeing 747 aircraft.¹¹¹ Federal Express, the other major carrier, has a direct flight to Hong Kong. Northwest also has three regular connecting all-cargo flights to Tokyo with connections at Chicago, and connecting flights to Bangkok, Singapore, and Seoul via Tokyo. Federal Express has three regular connecting all-cargo flights to Tokyo with connection at Memphis.¹¹² Chicago has more overall service to the Pacific area than Minneapolis-St. Paul, including more Northwest flights (see below).

Chicago

Personal interviews among international air freight forwarders and air carriers indicated that a large share of air exports to the Pacific area from Minnesota are trucked to Chicago and then transferred to air transportation. This is due to the lack of sufficient air cargo service at Minneapolis-St. Paul

¹¹¹Northwest Airlines.

¹¹²Northwest Airlines and data extracted from Official Airline Guides, Inc., OAG Air Cargo Guide (Oak Brook, IL: Official Airline Guides, Inc., March 1-April 3, 1993).

and/or lower rates from Chicago. It is also done when a forwarder does not have enough traffic to make a single shipment or to fill a container; hence, small shipments are sent to Chicago for consolidation. For example, individual shipments may range between 100 and 600 pounds, whereas the forwarder may like to ship at least 1,000 pounds as a single shipment. One large forwarder said that eighty percent of its Pacific traffic is sent to Chicago.

A forwarder commented that movement by truck to Chicago does not cause a time or other kind of problem, stating that it takes eight hours to truck it there where it is immediately enplaned.

In addition to truck movement, some shipments are sent by air to Chicago for transfer to an international flight.

Chicago's O'Hare International has direct service by combination carriers to Australia, Hong Kong, Japan, New Zealand, Philippines, Singapore, and South Korea. It has connecting combination carrier flights to these same countries and also to French Polynesia, Indonesia, Malaysia, People's Republic of China, Russia, Socialist Republic of Viet Nam, Taiwan, Thailand, and Western Samoa.¹¹³ Five combination carriers have direct flights to Pacific area countries. They are American, Korean Air, Japan Airlines, Northwest, and United. Connecting service is originated at Chicago by nineteen combination carriers.¹¹⁴

¹¹³Extracted from Official Airline Guides, OAG Desktop Flight Guide, Worldwide Edition, op. cit.

¹¹⁴Ibid.

Chicago's all-cargo service to the Pacific region includes direct flights to Hong Kong, Japan, People's Republic of China, Singapore, South Korea, Taiwan, and Thailand. Connecting flights are provided to Hong Kong, Japan, Indonesia, Malaysia, Philippines, Singapore, South Korea, Taiwan, and Thailand.¹¹⁵ Airlines that provide direct all-cargo service to the Pacific region from Chicago are China Eastern, Federal Express, Japan Airlines, Nippon Cargo Airlines, and Northwest. Connecting all-cargo flights are originated in Chicago by Federal Express, Korean Air, and Nippon Cargo Airlines.¹¹⁶

Northwest's direct all-cargo flights to the Pacific from Chicago consist of seven flights per week, all of which go to Tokyo first. From there, two continue on to Taiwan, four to Hong Kong, and one to Singapore.¹¹⁷

Los Angeles

The busiest freight airport listed in Table 18 on page 103 is at Los Angeles. In 1990, the airport handled 1.3 million tons of cargo, 35 percent of which was international. Fifty-five percent of the exports went to Asia, Australia, and Oceania, while 75 percent of the imports came from that region. Two

¹¹⁵Extracted from Official Airline Guides, OAG Air Cargo Guide, op.cit.

¹¹⁶Ibid.

¹¹⁷Northwest Airlines.

million tons are forecast for the year 2000, fifty percent of which will be international, with an even larger Asian share.¹¹⁸

Therefore, of the seven airports shown in Table 18, Los Angeles is the most important in the Pacific area trade, with direct flights by combination carriers to over thirty Pacific region destinations. The destinations served by direct flights include those in Australia, Cook Islands, Fiji, French Polynesia, Guam, Hong Kong, Indonesia, Japan, Malaysia, New Zealand, Okinawa, People's Republic of China, Philippines, Saipan, Singapore, South Korea, Taiwan, and Thailand. Most of these places are also served by connecting combination flights from Los Angeles, as are other points, including American Samoa, Cambodia, New Caledonia, Papua New Guinea, Russia, Socialist Republic of Viet Nam, and Tonga Islands.¹¹⁹ A total of 21 combination carriers have direct flights from Los Angeles to Pacific area countries. A total of 31 combination carriers originate connecting flights from Los Angeles to the Pacific area.¹²⁰

Direct all-cargo service from Los Angeles is provided to a number of Pacific region locations, including those in Hong Kong, Japan, Malaysia, Singapore, South Korea, Taiwan, and Thailand. Connecting all-cargo service is available to Indonesia, Japan,

¹¹⁸Michael A. Dornheim, "LAX to Remain Prime Gateway Despite Growth of Other Airports," Aviation Week and Space Technology, January 6, 1992, p. 47.

¹¹⁹Extracted from Official Airline Guides, Inc., OAG Desktop Flight Guide, Worldwide Edition, op. cit.

¹²⁰Ibid.

Malaysia, Philippines, Singapore, South Korea, and Taiwan.¹²¹

Eight airlines provide direct all-cargo service. They are Cathay Pacific, China Airlines, Federal Express, Japan Airlines, Korean Air, Nippon Cargo Airlines, Northwest, and Singapore Airlines. Connecting all-cargo flights from Los Angeles to Pacific destinations are originated by three carriers: Federal Express, Korean Air, and Nippon Cargo Airlines.¹²²

San Francisco

San Francisco International Airport is the origin point for direct flights by combination carriers to seventeen different Pacific area destinations in addition to combination carrier connecting flights to these same places and thirty others in the Pacific. The destination points having direct combination service from San Francisco are located in Australia, Guam, Hong Kong, Japan, New Zealand, Okinawa, People's Republic of China, Philippines, Russia, Saipan, Singapore, South Korea, Taiwan, and Thailand. Most of these places are also served by connecting flights from San Francisco, as are the following: American Samoa, Cook Islands, French Polynesia, Indonesia, Malaysia, Papua New Guinea, Socialist Republic of Viet Nam, Tonga Islands, and

¹²¹Extracted from Official Airline Guides, Inc., OAG Air Cargo Guide, op. cit.

¹²²Ibid.

Western Samoa.¹²³ There are twelve combination carriers providing direct flights from San Francisco to Pacific destinations. The two dominant carriers are Continental and United. A total of twenty combination airlines originate connecting flights from San Francisco to the Pacific area.¹²⁴

Direct all-cargo service from San Francisco to the Pacific area is available to Hong Kong, Japan, Malaysia, People's Republic of China, Singapore, Taiwan, and Thailand. Connecting all-cargo service is available to Hong Kong, Japan, Malaysia, People's Republic of China, Philippines, Singapore, South Korea, Taiwan, and Thailand.¹²⁵ Airlines having direct all-cargo service are Air China, China Airlines, Federal Express, Japan Airlines, Nippon Cargo Airlines, and Northwest. Connecting service is originated by Federal Express, Korean Air, and Nippon Cargo Airlines.¹²⁶

Seattle-Tacoma

Northwest has direct combination flights from Seattle-Tacoma International Airport to Japan and South Korea, while American Airlines also has direct flights to Japan. Combination connecting flights are available to American Samoa, Australia, Cook Islands, French Polynesia, Hong Kong, Indonesia, Japan,

¹²³Extracted from Official Airline Guides, OAG Desktop Flight Guide, Worldwide Edition, op. cit.

¹²⁴Ibid.

¹²⁵Extracted from Official Airline Guides, OAG Air Cargo Guide, op. cit.

¹²⁶Ibid.

Malaysia, New Zealand, People's Republic of China, Philippines, Russia, Singapore, Socialist Republic of Viet Nam, Taiwan, Thailand, Tonga Islands, and Western Samoa. There are twelve carriers that originate connecting flights to the Pacific area.¹²⁷

Seattle-Tacoma International Airport has direct all-cargo flights to People's Republic of China, provided by China Eastern. Connecting all-cargo flights are provided by Federal Express to Hong Kong, Japan, Malaysia, Philippines, Singapore, South Korea, and Thailand.¹²⁸

Anchorage

Combination-carrier flights from Anchorage to Pacific area countries consist of direct flights to Hong Kong, People's Republic of China, and Taiwan. Four combination carriers serve the Pacific Rim with these direct flights. They are Aeroflot-Russian, Air China, China Airlines, and Delta.¹²⁹ There are no combination connecting flights from Anchorage to the Pacific region.

Anchorage is a very important all-cargo point. It has direct all-cargo flights to Hong Kong, Japan, Malaysia, Singapore, South Korea, Taiwan, and Thailand. Connecting all-

¹²⁷Extracted from Official Airline Guides, OAG Desktop Flight Guide, Worldwide Edition, op. cit.

¹²⁸Extracted from Official Airline Guides, OAG Air Cargo Guide, op. cit.

¹²⁹Extracted from Official Airline Guides, OAG Desk Top Flight Guides, Worldwide Edition, op. cit.

cargo flights are available to Australia, Hong Kong, Indonesia, Japan, Malaysia, People's Republic of China, Philippines, Singapore, South Korea, Taiwan, and Thailand.¹³⁰ Airlines providing direct all-cargo flights are Air France, Federal Express, Japan Airlines, and Northwest. Connecting flights are provided by Japan Airlines.¹³¹

Denver

Denver's Stapleton International Airport has combination direct flights by Continental to Australia and New Zealand. It has connecting flights to those two places and also to Hong Kong, Indonesia, Japan, Malaysia, People's Republic of China, Philippines, Russia, Singapore, Socialist Republic of Viet Nam, South Korea, Taiwan, and Thailand. The carriers originating these flights are American, Continental, Delta, United, and USAir.¹³²

There are no direct all-cargo flights from Denver to the Pacific area. However, Federal Express provides all-cargo connecting flights to Hong Kong, Japan, Malaysia, Singapore, South Korea, Taiwan, and Thailand.¹³³

¹³⁰Extracted from Official Airline Guides, OAG Air Cargo Guide, op. cit.

¹³¹Ibid.

¹³²Extracted from Official Airline Guides, OAG Desktop Flight Guide, Worldwide Edition, op. cit.

¹³³Official Airline Guides, OAG Air Cargo Guide, op. cit.

Summary of Airport Service

The data discussed in the preceding paragraphs are summarized in Table 20. Note that Minneapolis-St. Paul has less air freight capacity to reach Pacific countries in terms of the variables measured than several of the other airports studied. Its overall service appears to be similar in quantity to Seattle-Tacoma and Denver and superior to Anchorage. The latter has limited combination service but fairly extensive all-cargo service available to the shipper. Chicago's O'Hare has somewhat more freight capacity than Minneapolis-St. Paul while Los Angeles and San Francisco have considerably more air freight capacity to reach the Pacific area. Note that the data in Table 20 include the number of countries served and the number of carriers providing the service and not the number of flights scheduled. The latter could have some effect when comparing the several airports.

Airport Capacity

No new major commercial airports have been opened in the United States since 1974, although Denver's new airport is currently under construction. In some areas, attempts to secure authorization for new airport construction have been unsuccessful. These attempts have usually been driven by the need to serve a growing passenger market.¹³⁴ Instead of new

¹³⁴Pacific area countries are investing heavily in airport development in anticipation of large increases in passenger and freight traffic in the future. See "Asian Nations Anticipating Boom, Invest Heavily in New Airports," Aviation Week and Space Technology, November 11, 1991, p.

Table 20
Summary of Service to the Pacific Area
from Seven United States Airports*

	<u>MSP</u>	<u>ORD</u>	<u>LAX</u>	<u>SFO</u>	<u>SEA</u>	<u>ANC</u>	<u>DEN</u>
Combination direct [#] service-- number of countries	3	7	18	14	3	3	2
Combination connecting [@] service--number of countries	14	16	25	23	18	0	14
All-cargo direct service-- number of countries	4	7	7	7	1	7	0
All-cargo connecting service-- number of countries	7	9	7	9	7	11	7
Combination direct service-- number of carriers	1	5	21	12	2	4	1
Combination connecting service--number of carriers ^{&}	5	19	31	20	12	0	5
All-cargo direct service-- number of carriers	2	5	8	6	1	4	0
All-cargo connecting service-- number of carriers	2	3	3	3	1	1	1

*Minneapolis-St. Paul, Chicago O'Hare, Los Angeles, San Francisco, Seattle, Anchorage, and Denver, respectively.

[#]A direct flight is one in which a change in flight number and/or change of carrier is not required between the origin and destination points.

[@]A connecting flight is one in which there is a change in flight number and/or carrier between the origin and destination points.

[&]Carriers that originate the first part of a flight connecting elsewhere with another carrier or with another flight of the same carrier.

Source: Extracted and calculated from data in Official Airline Guides, Inc., OAG Desktop Flight Guide, Worldwide Edition (Oak Brook, IL: Official Airline Guides, Inc., March 1993) and Official Airline Guides, Inc., OAG Air Cargo Guide (Oak Brook, IL: Official Airline Guides, Inc., March 1-April 3, 1993).

airports, major airport operators have engaged in considerable expansion and modification.¹³⁵ Expansions or modifications, rather than opening new airports, resulted from numerous difficulties in building a new facility. These include environmental opposition, aircraft noise, the extremely high construction costs, and airline industry opposition.

The lack of new airport construction and the inability of expansion to keep up with traffic growth has resulted in congestion problems at some airports; thus, it is entirely possible that serious airport capacity problems will occur in the United States in the future. An advantage all-freight carriers have is that they can operate at airports during off-peak times, thereby avoiding congestion. Combination carriers do not have this opportunity. On the other hand, if hard choices must be made regarding which carriers are permitted to use congested airports, passenger carriers will probably be given preference, thus keeping all-cargo airlines out while allowing combination carriers to continue operating at those sites. Eventually, freight-only airports could be developed as a solution.

A problem with keeping airport capacity at levels sufficient to meet carrier needs is that, because major airports in the United States are publicly owned, their finances are subject to

¹³⁵Development plans of Pacific Coast airports are discussed in Richard G. O'Lone, "Pacific Coast Airports Seek Niche as Staging Point to Asia," Aviation Week and Space Technology, January 6, 1992, p. 44.

the uncertainties of public financing and interference by local and state governments.¹³⁶

Los Angeles provides an example of possible future capacity problems. According to a report of the Southern California Association of Governments, without creation of substantial new airport capacity in the area, the Los Angeles airport will eventually have a shortage of space to accommodate new cargo facilities; the association estimated that existing and currently planned cargo capacity should be sufficient to accommodate forecast air cargo volumes to the year 2000 but not beyond. Inadequate highway access to the airport was also cited as a future problem.¹³⁷

In Pacific area countries, there is the potential problem of airports being unable to accommodate the fast increasing passenger and freight traffic. A study funded by the International Air Transport Association reported that the Pacific region's international scheduled airline passenger traffic, which is now one quarter of the world's total, will double by the year 2010, raising concern that the area's airports

¹³⁶The city of Los Angeles is currently considering diverting revenues from the international airport to the city government to help it meet financial obligations, similar to the Los Angeles ocean port situation described earlier. See Paul Page, "Air Carriers Fighting Los Angeles on Referendum Raiding Airport Fees," Traffic World, November 2, 1992, p. 30.

¹³⁷Patrick Burnson, "Continued Economic Slowdown in Southern California Reflected In Latest Air Cargo White Paper," op. cit., p. 26 and "SCAG Analysts Warn that Restrictions on Future Air Cargo Could Mean Loss of Trade," Pacific Shipper, January 11, 1993, p. 26.

and navigation systems will be unprepared to cope. Much of the growth will be intra-Asian traffic.¹³⁸

The conclusion to be drawn from this review is that there is a potential danger of inadequate airport capacity that would act to curb the growth of international air freight transportation involving the Pacific region in the future. The problem in the United States is most likely to occur at Los Angeles, the most important airport in Pacific trade. Should capacity be reached there or at other United States airports, however, freight traffic could be accommodated elsewhere, but with some expected delays in expansion of facilities at the substitute airports. Eventually, large regional all-cargo airports or combination airports in various parts of the country may be the ultimate solution to the airport capacity problem.

Barriers to International Air Freight Transportation

In addition to capacity problems, there are other current and potential hindrances to the growth of international air freight transportation.

Bilateral Agreements

An important barrier to international air freight transportation is the bilateral treaty system of determining which carriers can serve which routes. There is little doubt that, if there were complete free entry into the international

¹³⁸Michael Mecham, "Doubling of Asia's Growth will Strain Area's Facilities," Aviation Week and Space Technology, June 1, 1992, p. 20.

air carrier industry, there would be more total service available to the shipper in the form of a larger number of carriers and/or more service offered by presently authorized carriers.

Airport Charges

Another barrier is similar to that in ocean transportation--the fees charged international carriers to use an airport. The motivation sometimes is the desire to protect the interests of the country's home carrier(s). These take the form of landing fees assessed against each landing aircraft and other fees charged to use various airport facilities, including baggage handling facilities, gates, cargo space, etc. When these fees and charges are excessively high or where they are higher for foreign carriers than for domestic carriers, they become barriers.

Taxes on aviation fuel purchased at airports represent another barrier to international transportation when they are excessive or discriminatory against foreign carriers, i.e., higher for foreign carriers than for domestic carriers.

Airport Congestion

Another barrier is the congestion problem at some major airports, discussed earlier. This slows down air freight movement in the air and on the ground and dilutes its main advantage--speed. Of the United States airports likely to be used to export from Minnesota to the Pacific area, Chicago O'Hare and Los Angeles are the most likely to have this problem.

Use of Airport Facilities

A related issue is the control of takeoff and landing slots at airports. When the number of slots is limited and the airport operator assigns slots in a preferential way benefitting that country's carrier(s), this works to the detriment of the foreign carriers and is a barrier to their participation in international air commerce.¹³⁹

Discriminatory allocation of airport facilities can also occur. For example, the new terminal at Narita airport in Japan was assigned to Japanese carriers, while the old terminal which waits to be remodeled was assigned to foreign carriers.¹⁴⁰ However, overall United States carriers have about as many slots at Narita as do Japanese carriers.¹⁴¹

Aircraft Noise

There is also the very important aircraft noise problem which has resulted in noise regulation of various kinds at most major United States airports. Such noise regulation is particularly hard on all-cargo carriers because they frequently operate older and more noisy aircraft and at night when the noise problem is especially annoying to airport neighbors. To date

¹³⁹See "U.S., Japanese Officials Meet to Head Off Latest Cargo Crisis," Traffic World, October 8, 1990, p. 40 and "JAL Capitalizes on Travel Boom, Control of Scarce Airport Slots," Aviation Week and Space Technology, May 13, 1991, p. 42.

¹⁴⁰Paul Proctor, "Japan's Airlines Anticipate Decade of Strong Growth," Aviation Week and Space Technology, May 13, 1991, p. 37.

¹⁴¹Paul Proctor, "Oriental Airlines Post Profits of \$2.2 Billion," Aviation Week and Space Technology, November 2, 1992, p. 32.

these regulations have not had a significant impact on the movement of air freight. Federal legislation enacted in 1990¹⁴² has the purpose of curbing local noise regulation development in exchange for a federal phase-out program for stage II (more noisy) aircraft. The phase-out program is not severe enough to cause serious problems for air freight carriers.¹⁴³

Other Barriers

Other barriers include delays in approving plans for expansion of a foreign carrier's facilities at an airport, requiring foreign carriers to use a specific ground handling services company, and discriminatory noise regulation against foreign carriers.

The barriers to international air commerce described above have had a moderate negative effect to date but have not caused a serious problem for United States-Pacific area trade. As time passes, the barriers that do exist, with the exception of airport congestion, will probably be reduced as countries become more accepting of trade with others and more aware of the benefits of international trade.

¹⁴²Airport Noise and Capacity Act.

¹⁴³The aircraft noise problem is discussed in Donald V. Harper, "Regulation of Aircraft Noise at Major Airports: Past, Present, and Future," Transportation Law Journal, No. 1, 1988 and Donald V. Harper, "The Continuing Dilemma of Aircraft Noise," Transportation Journal, Winter 1988.

Overall Capacity of the Air Transportation System

As was discussed earlier, although there are several positive aspects of the carrier side of air transportation indicating that there would be adequate capacity to carry additional export traffic from Minnesota to the Pacific area, continued use of bilateral agreements and greater concentration in the airline industry could result in near term carrier capacity problems should the amount of Minnesota export traffic increase substantially. As to airports, the airport congestion problem in the United States, the lack of new airport construction, and the difficulty in expanding existing airports pose threats to continued growth in air freight traffic to the Pacific area, i.e., there is some danger that airport capacity inadequacy could inhibit the expansion of Minnesota exports to the Pacific area.

Consequently, of the modes of transportation under consideration, air transportation appears to be the one that might present a capacity problem if Minnesota exports to the Pacific area should grow substantially in the next few years.

The Use of Air Transportation by Minnesota Exporters to Pacific Area Countries

Use of Air Transportation

It was noted earlier that 32 of the Minnesota exporters included in the mail study used both water and air transportation while fourteen used only air transportation. Therefore, a total

of 46 of the 53 firms that answered the question used air transportation (see Table 9 on page 63).

Products Exported

Data collected by the United States Department of Commerce for twelve Pacific Rim countries indicate that the commodities shipped to those countries from Minneapolis-St. Paul International Airport are considerably diverse in terms of their physical characteristics and value per unit of weight. Most commodities, though, are of medium to high value and are manufactured goods. Examples of manufactured goods are aircraft parts, bed and table linen, builders carpentry and joinery, calculating machines, cinematographic cameras, coats, computers and peripherals, cosmetics, diodes and transistors, electro-medical apparatuses, footwear, furniture, glass products, hand tools, iron and steel sheets, lenses and prisms, machine tools, orthopaedic appliances, pharmaceutical goods, printed circuits, rotary pumps, sewing machines, stranded wire and cables, television receivers, textile fabrics, travel goods including suitcases, tulle lace, turbo propellers, typewriters, uncut diamonds, welding machines, and works of art.¹⁴⁴

Origin Points in Minnesota

As indicated in the discussion of water transportation, most Minnesota exporters to the Pacific area in the mail study were

¹⁴⁴United States Department of Commerce data for 1987 from David Braslau Associates, Minneapolis, Minnesota.

located in or near the Twin Cities Metropolitan Area. Because 46 of the 53 exporters whose modal choice was identified used air transportation, this location pattern can be assumed to apply to them. This conclusion was supported by freight forwarders and carriers interviewed who stated that exporters using air transportation were located mainly in the Twin Cities area.

Destination Countries

The Department of Commerce data concerning exports to twelve Pacific Rim countries from Minneapolis-St. Paul International Airport indicate that these exports were predominantly to Japan and South Korea, with fairly large amounts to Hong Kong, Taiwan, and Australia, as measured by the value of the goods transported. To what extent the goods may have subsequently been sent to other countries is not known. According to that data, out of a total of about \$97 million exported to the twelve countries, Japan accounted for almost \$50 million in annual shipments from the Twin Cities airport, while South Korea accounted for about \$37 million.¹⁴⁵ The other ten countries studied were Australia, Hong Kong, Indonesia, Malaysia, New Zealand, People's Republic of China, Philippines, Singapore, Taiwan, and Thailand.

The Minnesota exporters in the mail study that used air transportation reported the most important Pacific Rim countries shipped to by air. Table 12 on page 69 indicates that, for the 33 firms that answered the question, Japan, Taiwan, Australia, South

¹⁴⁵Ibid.

Korea, and Singapore were the countries most often named. As noted previously, the pattern for air transportation is similar to that for exports moved by water. In personal interviews conducted among freight forwarders, Japan was usually cited as the most important destination of air freight shipments in terms of volume. However, a number of other countries were named as well.

Airports Used

As shown in Table 21, the airports most frequently used by the Minnesota exporters included in the mail study to ship goods to the Pacific region were Minneapolis-St. Paul and Chicago's O'Hare. Although there was some use of Los Angeles, the other airports studied were not often used by the respondents. The relatively frequent use of Chicago's O'Hare is because a fair amount of freight is trucked to Chicago from Minnesota for connection with international flights there and because some freight moves by domestic air from Minneapolis-St. Paul to Chicago for international connections, as discussed above. Other airports are used because a flight originating at Minneapolis-St. Paul or Chicago connects with another flight at that airport or because a flight makes a stop there before proceeding overseas.

Table 21 also shows the average overall perception that the Minnesota exporters in the mail study had of the service provided at the airports included in the study. All airports received at least an average rating and some ratings were relatively high. Minneapolis-St. Paul received a relatively high rating. However,

Table 21
 Airports Used by Respondents to Export to the Pacific Region
 and Average Respondent Rating* of Airports

<u>Airport</u>	<u>Number of Exporters</u>	<u>Rating</u>
Anchorage	2	4.50 (2) [#]
Chicago O'Hare	15	3.79 (14)
Los Angeles	8	3.88 (8)
Minneapolis-St. Paul	30	4.10 (29)
San Francisco	1	3.00 (1)
Seattle-Tacoma	3	3.33 (3)
Other [@]	1	5.00 (1)
Don't know	6	
Number responding	39	

*All ratings are on a scale of 1 to 5, where 1 = poor, 2 = fair, 3 = average, 4 = good, 5 = excellent.

[#]The number in parenthesis is the number of exporters providing a rating.

[@]Airports not included in study.

only a small number of exporters were familiar enough with Anchorage, San Francisco, and Seattle-Tacoma to enable them to have a perception about their service.

Carriers and freight forwarders interviewed in the study expressed general satisfaction with the facilities available and services provided at the airports studied, with the exception of Los Angeles. Several commented that, because of congestion there, delays had occurred. Overall, it can be concluded that the exporters in the study were satisfied with the service received at the airports studied.

Size and Frequency of Shipments

The size of shipment by air to the Pacific Rim varied among the 55 Minnesota exporters in the mail study from less than five pounds to 3,300 pounds. Both air express and heavy freight are included in this count. Most heavy freight shipments were in the range of 200 to 600 pounds.

The frequency of shipments by air to the Pacific Rim varied from one per year to over 1,300 per year. The frequency of shipment was much greater than for water transportation, partly because the count included air express as well as heavy freight shipments. Overall, however, it appeared that the frequency was moderate, especially when one considers the small amount of weight involved in the typical shipment.

Perceptions About Air Transportation Service

The Minnesota exporters included in the mail study were asked to indicate their perceptions of the service provided by the several modes of transportation to the Pacific Rim with which they had some familiarity. The results are given Table 15 above.

The results indicate that air transportation was viewed positively regarding most of the items in the table, with average ratings well-above the average of 3.0. The lowest rating was given for cost (3.00), reflecting the high cost of air transportation when compared with water carriers, while after-sale service was also rated relatively low (3.21). The overall perception average rating given to air transportation was 3.75, second only to motor trucking's 3.86, and slightly above that given to water transportation (3.62). Freight forwarders interviewed in the study also expressed satisfaction with the service received from air carriers.

RAILROAD TRANSPORTATION

Importance of Railroad Transportation in Overseas International Trade

Railroads historically have been critical to the overseas foreign trade of the country, bringing goods to ocean ports for export and hauling imported goods from the ports to manufacturers, distributors, and others in the United States. Since World War II, as other modes of transportation have eroded the railroads' market and as their own intermodal railroad-truck

(IRT) service (see discussion below) has grown, straight railroad¹⁴⁶ participation in the country's overseas international trade in manufactured goods has declined. The economic and service characteristics of railroads are such that, unlike in the past, they no longer carry most of the nation's manufactured goods in domestic or international commerce.

Kinds of Carriers and Equipment

Railroads have always served as common carriers, meaning they had certain obligations to serve the public generally but were not allowed by government regulation to enter into long-term agreements with individual shippers as contract carriers. However, since 1980, because of federal legislation,¹⁴⁷ they have been allowed to serve as contract carriers as well as common carriers. By the early 1990's, a large part of their traffic was carried under contract.

There are about 370 line-haul railroad companies in the industry today.¹⁴⁸ However, the industry is dominated by the fourteen class I railroads, those having \$96.1 million or more in annual revenue during 1991. Those carriers accounted for 91

¹⁴⁶Conventional railroad service, not IRT service.

¹⁴⁷Staggers Rail Act of 1980.

¹⁴⁸Interstate Commerce Commission, 1991 Annual Report (Washington, DC: U.S. Government Printing Office, 1992), p. 116.

percent of railroad freight revenue in that year.¹⁴⁹ The fourteen class I railroad are listed in Table 22.

Ownership

America's freight railroads are all privately owned and operated; the United States is the only country in the world that does not have at least part of its freight railroad system owned by the national government. Although there was considerable government promotion and subsidy of railroads in the past, no major programs of that kind exist today.

After over one hundred years of economic regulation by government, railroads were substantially deregulated in the 1970's and 1980's and little remains of the federal regulatory structure that once existed.¹⁵⁰ For the most part, present day regulation has little effect on shippers.

Traffic Carried

Railroads are the country's largest freight carrier in terms of ton-miles carried; in 1991, railroads carried 37 percent of the domestic intercity ton-miles moved by all modes in the United States. This share has been fairly stable since the late 1970's, after a long period of decline.¹⁵¹

¹⁴⁹Association of American Railroads, Railroad Facts, 1992 edition (Washington, DC: Association of American Railroads, 1992), p. 3.

¹⁵⁰The statutes were the Railroad Revitalization and Regulatory Reform Act of 1976 and the Staggers Rail Act of 1980.

¹⁵¹Association of American Railroads, Railroad Facts, 1992 edition, op. cit., p. 32 and Eno Transportation, Transportation in America, 1992 edition (Waldorf, MD: Eno Transportation, Inc., 1991), p. 10.

Table 22
Revenue of Class I Railroads,* 1991

<u>Carrier</u>	<u>Revenue (in millions)</u>
Atchison, Topeka and Santa Fe Railway Company	\$2,153.2
Burlington Northern Railroad Company	4,558.7
Chicago and North Western Transportation Company	803.0
Consolidated Rail Corporation	3,136.5
CSX Transportation	4,436.4
Denver and Rio Grande Western Railroad Company	321.7
Florida East Coast Railway Company	138.2
Grand Trunk Western	270.4
Illinois Central Railroad Company	549.7
Kansas City Southern Corporation	322.3
Norfolk Southern Corporation	3,654.0
Soo Line Railroad Company	589.3
Southern Pacific Transportation Company	2,348.6
Union Pacific Railroad Company	4,663.0

*Carriers with annual revenue of at least \$96.1 million in 1991 dollars.

Source: Association of American Railroads, Railroad Facts, 1992 edition
(Washington, DC: Association of American Railroads, 1992), pp. 64-77.

Since the 1920's, railroads have been forced by their competitors to shift from carrying a wide range of commodities, including many manufactured products, to carrying a more narrow range of commodities, with far less participation in the transportation of manufactured goods. The traffic carried by railroads in straight rail service consists primarily of bulk commodities moving in large quantities, and are of medium to low value per unit of weight. In 1991, for example, of the 1.4 billion tons of freight carried by the country's class I railroads, coal accounted for about 41 percent, farm products for approximately ten percent, and chemicals and allied products for roughly nine percent. These were the top three commodity groups carried. With the exception of food and kindred products, which accounted for six percent, the other major commodity groups did not include manufactured goods.¹⁵² Some examples of manufactured goods shipped by rail were automobiles, automobile parts, beer, cement, lumber and wood products, paper, processed food products, and steel. In Minnesota, the railroads have been very important to some manufacturers, particularly in the food processing and paper industries.

A study of Minnesota's manufacturers conducted in 1991 found that, of 33 users of IRT, the share of all their outbound tonnage shipped by straight rail was only about five percent; for 87 non-

¹⁵²Calculated from Association of American Railroads, Railroad Facts, Ibid., p. 29.

users of IRT, it was only one-half of one percent.¹⁵³ Motor trucking dominated the outbound intercity transportation used by both groups. The study also indicated that the perception of quality and rates that Minnesota manufacturers had of straight railroad freight service was lower than their perception of quality and rates associated with IRT and motor trucking service.¹⁵⁴

Railroads have important disadvantages when competing for manufactured goods traffic. In order for a shipper to use straight railroad service, it is necessary for shippers to provide large individual shipments that make full carload service practical, since today's railroads do not offer less-than-carload rail service. It is also necessary to be satisfied with relatively slow service in most cases, when compared with motor truck service. The rates charged may be higher or lower than truck rates, depending on the individual situation. Service is more infrequent and loss and damage probably higher than when using truck service.

However, as will be discussed later, railroads remain active in carrying manufactured goods through the use of IRT service.

Pricing of Railroad Service

Railroad rates for single shipments are of various kinds, but are basically rates per unit of weight (e.g. per 100 pounds

¹⁵³Donald V. Harper and Philip T. Evers, An Analysis of Intermodal Railroad-Truck Facilities and Services in Minnesota, op. cit., p. 102.

¹⁵⁴Ibid., pp. 117-128.

or per ton) with various kinds of discounts and incentives for large shipments. Contract rates are negotiated with shippers and apply over the duration of long-term contracts which spell out what is to be carried, where and when it is to be carried, what the carrier is to be paid, and penalties for non-performance by the parties.

Westbound Railroads

Minnesota has about 4,500 miles of railroad line within its borders. This represents a large reduction in mileage from previous years and has created a situation where many smaller locations in the state have no direct railroad service, thus making straight rail service inaccessible to them.

The Minnesota railroads involved in exports sent by straight rail to a west coast port include the BN, the largest railroad in both the state and the country, with a total line mileage of 23,500. It enables Minnesota shippers to have one-carrier access to the ports of Seattle, Tacoma, and Portland. Other western railroads that serve Pacific coast ports are reached by Minnesota shippers through an interchange of traffic originated by the BN, the Chicago and North Western (CNW), or the Soo Line, the other two major railroads located in Minnesota. The CNW has limited mileage in the state but does provide access to Chicago and other points, including Omaha and Kansas City, where interchange takes place with the UP, the ATSF, or the SP for westbound carriage. The Soo Line, part of the CP (Canadian Pacific) Rail System, offers the same opportunities for interchange with other carriers

at Chicago and Kansas City. It provides access to the CP for carriage to the port at Vancouver, British Columbia.

Western railroads, other than the BN, that serve west coast ports are the ATSF (Chicago to Los Angeles, Long Beach, San Francisco, and Oakland), the SP (Chicago to Los Angeles, Long Beach, San Francisco, Oakland, and Portland), and the UP (Omaha or Kansas City to Los Angeles, Long Beach, San Francisco, Oakland, Portland, Seattle, and Tacoma).

Westbound Railroad Traffic

Conventional rail equipment is used to carry a number of agricultural products, plus other bulk commodities such as scrap iron and steel, animal feeds, and waste paper, for export to the Pacific Rim. There is only a limited amount of straight rail transportation of manufactured goods to west coast ports for export--most rail manufactured goods export traffic is IRT containerized freight. A large international freight forwarder interviewed in the study stated that straight rail is seldom used for export traffic to the Pacific region and estimated that fifty percent is by IRT, 35 percent by air, and fifteen percent by truck in tonnage carried.

Railroad Capacity

Balance of Traffic

The prevailing balance of straight railroad traffic, both domestic and international, is that traffic leaving the state is greater in amount than traffic entering the state. However,

because of the adverse international balance of trade, exports to the Pacific region from Minnesota are less in volume than imports from that area. The result is that, as far as Pacific area traffic is concerned, there is an excess capacity situation existing for exports. However, this capacity is probably at least partially used by domestic traffic moving out of the state.

Overall Capacity

As to overall railroad capacity in the western United States, there has been and continues to be a general overcapacity situation, principally in the roadbed or "way" and less so in the terminals they operate. This situation is not likely to change in the near future. The nature of railroads is such that carriers could handle considerably more traffic than they do now and, even if congestion should occur, small adjustments, such as adding some passing or yard tracks, could easily increase capacity.

Vehicle capacity is another matter. Freight car shortages are rather frequent, caused by a lack of new car investment by carriers, poor car utilization, and poor car distribution. Car shortages represent a shortage of vehicle capacity at times but do not negate the assumption that railroads generally have unused capacity.¹⁵⁵

However, as indicated earlier, only a small number of carriers--the fourteen class I railroads--have most of the

¹⁵⁵Donald V. Harper, Transportation in America, 2nd edition (Englewood Cliffs, NJ: Prentice-Hall, Inc., 1982), p. 223.

business and, in most cases, especially in the west, an individual railroad has no direct parallel rail competitor. This presents a possible future danger that carrier failure or severe reduction in a carrier's route mileage for financial or other reason, could reduce the amount of rail capacity available. Also, there is the monopoly issue--the lack of competition among railroads can lead to excessively high rates and generally unfair treatment of shippers.

Third Parties

Freight Forwarders

The international and domestic freight forwarders referred to above in the discussion of water transportation are also available to assist shippers when arranging straight railroad transportation. Shippers' agents, intermediaries that are used in connection with IRT service, are discussed below.

Capacity of Freight Forwarders

Because of the minimal investment required and lack of other significant barriers to entry, there is little likelihood that international and domestic surface freight forwarders would be unable to handle future growth in export traffic to the Pacific Rim.

Perceptions About Railroad Service

As noted previously, Minnesota exporters that participated in the mail study were asked to indicate their perceptions of the

service provided by the modes of transportation available to the Pacific Rim with which they had some familiarity. The results are given in Table 15 on page 76.

The table indicates that railroad transportation was perceived less positively than the other four modes considered, with below-average ratings for availability at the destination point(s), availability of equipment, reliability of service, cost, communication, and after-sale service. The average overall perception rating given to railroads (2.89) was the lowest of the five modes in the table.

MOTOR TRUCK TRANSPORTATION

Importance of Motor Truck Transportation in Overseas International Trade

After 1920, motor truck transportation developed into a very important part of the domestic transportation system in the United States. It also became a vital part of international transportation, first as a pickup and delivery service for railroads, and later providing ground transportation for airlines and the pickup and delivery link for intermodal railroad-truck (IRT) service. Motor trucking is also important as a provider of transportation service between exporters/importers and ocean ports. This means that motor trucking is involved to some extent in most United States international trade, either as a pickup and delivery carrier or as an intercity carrier to and from ocean ports. Because of its pervasiveness, it is impossible to measure

the role or the contribution of motor trucking to the international commerce of the country.

In this section, motor trucking's role as an intercity carrier is discussed. Its role as a pickup and delivery carrier in air transportation (pp. 98-99) and IRT (p. 174) are briefly dealt with elsewhere.

Kinds of Carriers

In intercity or over-the-road trucking, there are several different kinds of carriers. For-hire motor truck service consists of common carriers who serve the general public and contract carriers who enter into long-term agreements with individual shippers to perform motor truck service. Today, many for-hire carriers are both common and contract; about three-quarters of the interstate trucking companies regulated by the Interstate Commerce Commission hold contract carrier authority.¹⁵⁶ Private motor truckers are those business firms, such as manufacturers, wholesalers, etc., who operate their own trucks. All of these forms of motor trucking provide intercity service as part of international trade.

For-hire carriers can be further categorized by size of shipments carried. Truckload carriers carry individual shipments that amount to a full truckload. Less-than-truckload (LTL) carriers carry smaller less-than-truckload shipments, usually combining shipments of several shippers into truckload

¹⁵⁶Interstate Commerce Commission, op. cit., p. 47.

quantities. Of 1991 intercity trucking revenues, the truckload segment accounted for about \$44 billion; the LTL segment accounted for about \$16 billion.¹⁵⁷ Some of the more well known truckload and LTL carriers are shown in Tables 23 and 24, respectively.

Many of the carriers shown in Tables 23 and 24 do not operate in Minnesota. Some that do serve the state include Schneider, Ryder, Ranger, Yellow Freight, CF Motor Freight, Roadway Express, and ABF Freight System. However, there are many other smaller carriers, especially truckload carriers, that operate in Minnesota, some of which operate between Minnesota and west coast ocean ports. Defining exactly which interstate motor trucking companies operate over a particularly route in the 1990's is difficult because, unlike in past periods of meaningful federal economic regulation, carriers are relatively free to operate where they wish and to enter and leave markets at will. Furthermore, there are no available detailed records identifying individual carriers and their operating routes.

For-hire motor trucking companies are generally small in size and large in number. The small size and large number of carriers stem largely from the fact that capital and other requirements necessary to enter the industry are limited. Note that, although several companies have annual revenue of over \$1 billion, the largest carriers shown in Tables 23 and 24 are

¹⁵⁷Alex. Brown and Sons cited in Thomas A. Foster, "Truckload Returns to Stability," Distribution, July 1992, p. 20.

Table 23
 Revenues of Largest For-Hire Interstate
 Truckload Trucking Companies,* 1991

<u>Carrier</u>	<u>Revenue (in millions)</u>
Schneider National	\$908.0
J.B. Hunt Transportation	732.6
Ryder Distribution	370.2
Werner Enterprises	322.8
MNX	288.7
Burlington Motor Carriers	249.5
Ranger Transportation	248.5
CRST International	216.4
Builders Transport	212.4
Swift	190.7
Signal Delivery Service	171.5
Independent Freightways	158.7

*General commodity carriers.

Source: Interstate Commerce Commission and individual carriers, reported in Thomas A. Foster, "Truckload Returns to Stability," Distribution, July 1992, p. 22.

Table 24
 Revenues of Largest For-Hire Interstate
 Less-Than-Truckload Trucking Companies, 1991

<u>Carrier</u>	<u>Revenue (in millions)</u>
National Carriers:	
Yellow Freight	\$2,323.3
CF Motor Freight	2,045.3
Roadway Express	2,041.3
Overnite Transportation	799.8
ABF Freight System	783.0
Carolina Freight Carriers	583.6
Interregional Carriers:	
Conway Transportation	534.5
Preston Trucking	414.1
Central Transport	302.1
Watkins Motor Lines	269.1
NW Transport	258.8
Churchill Truck Line	165.0

Source: Interstate Commerce Commission data reported in Thomas A. Foster,
 "Rough Going for LTL Carriers," Distribution, July 1992, p. 12.

relatively small compared to manufacturing firms. Further evidence of small size, and large numbers, is found in data provided by the Interstate Commerce Commission (ICC). In 1991, the ICC reported that a total of 46,389 interstate for-hire motor trucking companies were under its jurisdiction; however, only 2,011 of them were class I or class II carriers (those having annual operating revenue of at least \$1.3 million in 1990 dollars). The remainder, mostly truckload carriers, were smaller than this.¹⁵⁸ The 46,389 carriers regulated by the ICC were only part of the total trucking population in the country. Some interstate carriers are exempt from ICC regulation; in addition, there are thousands of intrastate motor trucking companies not included in the ICC statistics.

Ownership

As with other modes of transportation in the United States, for-hire motor trucking companies are privately owned--there is no government ownership. However, there is a fairly strong tie to government in that governments at all levels provide roads and streets that trucking companies use, with carriers paying user taxes in return.

There is also a fairly long history of government economic regulation of motor trucking at the federal and state levels. This regulation was substantially reformed in the late 1970's and

¹⁵⁸Interstate Commerce Commission, op. cit., p. 116.

early 1980's by legislation¹⁵⁹ and numerous ICC decisions so that it now has only a limited effect on carriers and shippers. Nonetheless, most states have retained intrastate economic regulation with some liberalization in several states.

Traffic Carried

When measured in intercity ton-miles carried, motor trucking in all its forms, private and for-hire, accounted for 26.3 percent of the ton-miles carried in 1991, making it the second largest mode.¹⁶⁰ This proportion of total traffic has been fairly stable since the late 1970's.¹⁶¹

Although intercity trucking is capable of carrying and does carry a wide variety of goods, its traffic consists mainly of higher-value goods, and trucking dominates the domestic movement of manufactured products. Trucking has taken most of the higher-value traffic away from railroads.

In a study of Minnesota manufacturers conducted in 1991, it was found that, for 33 users of IRT, an average of 54 percent of their outbound tonnage was moved by truckload carriers and 31 percent was moved by LTL carriers. The 87 non-users of IRT reported using truckload carriers for an average of 36 percent of their outbound tonnage and LTL carriers for 51 percent. The

¹⁵⁹See Motor Carrier Act of 1980.

¹⁶⁰If measured as a share of the value of goods carried or the tons carried in intercity commerce, rather than ton-miles, the motor truck proportion is much higher than 26.3 percent.

¹⁶¹Eno Transportation, op. cit., p. 10. and Association of American Railroads, Railroad Facts, op. cit., p. 32 and 1980 edition, p. 36.

perception that both groups of respondents had of motor trucking generally was very positive and much higher than their perception of railroad service.¹⁶²

The advantages that motor trucking has in carrying manufactured goods are that it is relatively fast (particularly on short hauls), it can carry small shipments as well as large ones, vehicles can be loaded and unloaded quickly, it moves in single units so that frequency of service is very good, it offers door-to-door domestic service (regardless of shipment size), its loss and damage record is better than that of railroads, and it can go just about anywhere. Truck rates may be higher or lower than competing modes of transportation, depending on the situation.

A disadvantage of trucking is that, because most of its costs are variable, it historically has had difficulty in competing for long-haul traffic as its costs increase with distance. Its speed advantage also decreases as the length of haul increases. It is usually assumed that railroads have the advantage over truck service on hauls of approximately 600 miles or more. However, federal regulatory reform in the late 1970's and early 1980's drastically changed the truckload industry. By making entry into the industry more open, reform resulted in an excessive number of truckload carriers. This led to depressed truckload rates and improved service. Many of the survivors of

¹⁶²Donald V. Harper and Philip T. Evers, An Analysis of Intermodal Railroad-Truck Facilities and Services in Minnesota, *op. cit.*, pp 102 and 118.

this chaotic period have become very efficient, providing high quality service at relatively low rates, and very difficult to compete against, including on hauls of over 600 miles. They often have non-union drivers or owner-operators¹⁶³ which contributes to their success in controlling costs. They also use high-capacity trailers, in order to gain the maximum productivity per driver, and fuel efficient tractors. In addition, they concentrate on high traffic density lanes with balanced traffic flows. The larger carriers have vehicle, fuel, and tire purchase arrangements that provide them with low purchase prices.

As to LTL carriers, regulatory reform led to considerable geographic expansion by existing carriers, the adding of new commodities to carry, and the entry of some new companies. The result was overcapacity and price cutting, the failure of many carriers, and mergers among some survivors. The improved efficiency of LTL carriers encouraged by stiff competition, and the exit of railroads from less-than-carload service, has meant that LTL carriers currently perform well on longer hauls.

A recent development among larger LTL motor trucking companies is their incursion into international trade beyond United States ports. The original incentive was to somehow participate in the trade with unified Europe, but the trend has begun to appear in the Pacific area as well. Nearly all major

¹⁶³ Owner-operators or "independent truckers" are persons who own one or more vehicles but do not carry traffic in their own names. Instead, they hire themselves and their vehicles out to a for-hire trucking company and carry under that company's name.

LTL carriers are now actively involved in overseas transportation. They have established or purchased NVOCC's or set them up as subsidiaries and some have agreements with joint-venture partners in foreign countries to handle matters overseas. This enables the carriers to control transportation to the foreign port of entry and sometimes to the ultimate consignee in the foreign country.¹⁶⁴ Under these arrangements, when LTL shipments arrive at a west coast port, the trailer containing the mixed load is unloaded and the contents reloaded (stuffed) into a container(s) for the ocean voyage. The carrier's own NVOCC provides this service or hires someone else to do it, and the NVOCC arranges the ocean transportation. An example is Roadway's entrance into Pacific Rim service in 1992; it now offers direct weekly service to Japan, Korea, Taiwan, Hong Kong, and six other countries and fortnightly service to two others. The company has established an agency network in Asia and customers are given a range of customer services in each Pacific area location, including bonded warehousing and delivery.¹⁶⁵

On the other hand, long-haul trucking, both LTL and truckload, to the west coast has been adversely affected by the development of double-stack IRT service to west coast ports (see pages 162-164). In some cases, long-haul truckload carriers have entered into partnerships with intermodal railroads whereby

¹⁶⁴Walter Weart, "Major LTL Carriers Extend Reach as Off-Shore Alliances Grow," Traffic World, October 26, 1992, p. 31.

¹⁶⁵"Roadway Introduces Trans-Pacific Service," Pacific Shipper, June 1, 1992, p. 24.

the railroad provides the long-haul service for the trucking company's traffic (see pages 159-160).

Finally, intercity motor trucking is sometimes used in connection with air transportation to the Pacific region. As noted above (see pages 107-108), a large share of Minnesota's exports are trucked to Chicago to connect with air transportation there. In addition, some freight forwarders and air carriers consolidate shipments into truckloads and send them to west coast airports for carriage to the Pacific Rim.

Pricing Motor Trucking Service

Motor truck rates for single shipments are quoted on a per unit of weight basis, usually 100 pounds, with various kinds of discounts and incentives for larger shipments. Rates often reflect the commodity carried but not always (meaning that only the weight is considered). In addition, some truckload rates disregard weight as well--the rates are quoted per trailer or per mile, regardless of what is inside. Contract rates are negotiated with shippers and apply for the duration of the contract.

The pricing structure in for-hire interstate trucking has been chaotic since the late 1970's because federal regulatory reform brought about an excess capacity and highly competitive situation. This led to considerable rate cutting and new variations in how rates are quoted along with many trucking company failures and numerous mergers.

Westbound Motor Truck Traffic

The kinds of traffic carried by truckload and LTL carriers to west coast ports for export to the Pacific area are varied and include most items exported there, as listed in the discussion of ocean transportation above. Traffic is normally carried in conventional truck trailers and, upon arrival at the port, the contents must be unloaded and then stuffed into a container(s) for the ocean voyage.

When an LTL carrier is involved, Pacific region shipments are consolidated at a midwest consolidation point or terminal. Then a full trailer is sent to a west coast port. For example, CF Motor Freight consolidates Minnesota shipments at its terminal in Blaine and sends the trailers to the ports of Seattle or Long Beach in double or triple 28-foot trailers. Pacific area traffic ordinarily amounts to a small part of an LTL carrier's total tonnage. One carrier reported it to be five percent. Shipments are often arranged for by international freight forwarders. The shippers involved are usually located in the Twin Cities Metropolitan Area.

Truckload carriers are fairly heavily involved in moving goods to the west coast for export. There are dozens of them that are or have been in this trade directly competing with the IRT service of railroads.

Two of the state's larger international surface freight forwarders estimated that about fifteen percent of total Pacific Rim outbound traffic from Minnesota moves by truck to the west

coast.

There is no accurate count of what or how much motor truck traffic moves through the several west coast ports. However, nearly all manufactured goods exported to the Pacific Rim from Minnesota could be carried to the west coast by truck.

Motor Truck Capacity

Balance of Traffic

In general, more truck traffic moves out of the state than into the state. However, exports to the Pacific Rim from Minnesota are less in volume than imports, precisely the opposite. Thus, as far as international traffic is concerned, there is an excess capacity situation existing for exports; however, the excess is probably used by the relatively heavy flow of other traffic out of the state. Indeed, there is a general pattern of truck rates that are lower inbound to Minnesota than outbound from Minnesota, reflecting the overall imbalance in volume of traffic available to be carried.

Overall Truck Capacity

As to overall motor truck capacity, the motor trucking industry suffers from chronic overcapacity as a result of low capital and other requirements to enter and federal regulatory reform which ended meaningful control over entry into the industry. This is especially true of truckload carriers. The statistics cited above regarding the number of carriers

authorized by the ICC is evidence of this. This situation is general throughout the country, including the western United States, and is not likely to change in the near future.

A negative element in the future growth of the intercity trucking industry is the driver shortage problem that has been present for several years. This is caused by the declining number of people in their twenties who are normally the new hires in the industry, drug testing rules that cause some persons to stay away from the industry, driver licensing law changes that have made some drivers ineligible to drive, long absences from home and health problems caused by over-the-road driving, and the generally unglamorous, and sometimes negative, image of the trucking industry. However, the industry is working hard to solve this problem and will probably be able to avoid capacity curtailment because of it. One solution that some truckers have used is to employ IRT service for the long haul, as noted above.

It appears, then, there is little danger that, should Minnesota's exports to the Pacific region increase substantially in the next few years, there will be a shortage of motor truck capacity to carry goods to west coast ports or distant airports. This is especially true of truckload carriers, whose entry costs are quite low. A plentiful supply of LTL carriers should also be available, although to a lesser extent. Failures of carriers and mergers among survivors, and the higher costs of entry and expansion in LTL trucking, have had the effect of concentrating LTL freight in a smaller number of larger carriers since the late

1970's. Thus, the three largest LTL carriers, Yellow, CF Motor Freight, and Roadway, had 37 percent of the LTL market in 1991.¹⁶⁶ However, the quantity of service offered by the industry is abundantly sufficient for today's needs and, should there be a significant increase in export traffic, existing carriers could easily expand, and new carriers could enter the business, to carry that traffic.¹⁶⁷

Third Parties

Freight Forwarders and Truck Brokers

The international and domestic surface freight forwarders referred to in the discussion of water transportation on pages 40-43 are also available to assist shippers when arranging motor truck transportation.

Truck brokers serve as intermediaries between for-hire trucking companies and shippers, arranging truck transportation that may be strictly domestic or part of an international move. Unlike forwarders, they do not consolidate or handle freight or have liability for it. They also do not quote their own rates; they merely bring truckers and shippers together. Interstate truck brokers are licensed by the Interstate Commerce Commission

¹⁶⁶Thomas A. Foster, "Rough Going for LTL Carriers," Distribution, July 1992, p. 46.

¹⁶⁷The highway system connecting Minnesota with west coast ports was not part of this study. However, with the exception of the congested areas in some port cities, especially Los Angeles, western highways are probably adequate for some time to come to accommodate an increase in Minnesota exports.

and must show evidence of insurance in the amount of \$10,000 to cover claims against them, but there is no direct effort to control the number of brokers or their business practices. Brokers are usually paid a percentage of the transportation rate paid by the shipper to the carrier. In 1991, there were more than 7,000 brokers holding ICC licenses.¹⁶⁸

Domestic freight forwarders and brokers can be involved in overseas international shipments that move by water. However, as noted above in the discussion of water transportation, that would require the exporter or another intermediary (international freight forwarder or NVOCC) to arrange the ocean transportation part of the trip, and perform or arrange for ancillary services, such as documentation.

Because there is no regulation of domestic surface freight forwarders and minimal regulation of truck brokers, it has become very difficult to identify them as either one or the other due to the overlapping in services performed by them and since some companies operate as both.¹⁶⁹

Capacity of Third Parties

Because of the minimal investment required and lack of other significant barriers to entry, there is little likelihood that international and domestic surface freight forwarders or truck

¹⁶⁸Interstate Commerce Commission, op.cit., p. 47.

¹⁶⁹John D. Schulz, "Broker-Forwarder Difference Obsolete in Modern Transport Marketplace," Traffic World, March 23, 1992, p. 19 and E.J. Muller, "Forwarders Vs. Brokers," Distribution, June 1992, p. 38.

brokers would be unable to handle future growth in export traffic to the Pacific area.

Perceptions About Motor Truck Service

Minnesota exporters to the Pacific region participating in the mail study were asked to give their perceptions of the service provided by the several modes of transportation available to them to ship to the Pacific Rim. As indicated previously, the results are given in Table 15 on page 76.

The table shows that motor truck transportation was positively perceived by the respondents, with above-average ratings on all items and with several over 4.00. The highest ratings were given to availability at origin point(s), availability of equipment, suitability for shipment size(s), adequacy of capacity, frequency of service, pickup times, and transit time, reflecting some of the traditional advantages that motor truck service has over its competitors. Motor trucking received a rating of 3.60 on cost, the highest of the five modes included in the table. Motor trucking received the highest average overall perception rating (3.86) of the five modes.

INTERMODAL RAILROAD-TRUCK TRANSPORTATION

Intermodal Railroad-Truck Service Defined

Intermodal freight transportation occurs when a shipment is moved over the lines of carriers of two or more modes of transportation. Intermodal railroad-truck (IRT) service means that a motor truck(s) provides the short-haul pickup and/or

delivery service (drayage) part of the trip and a railroad(s) provides the long-haul or "line-haul" part. The equipment involved includes truck trailers or containers, which are carried on railroad cars. IRT combines the door-to-door convenience of trucks with the high volume, long-haul economies of railroads.¹⁷⁰

In international IRT export service, a trucker picks up the loaded trailer or container (usually a container) and carries it to the railroad's terminal. After placing the container onto a railroad car, the railroad then carries it to the destination rail terminal near or at an ocean port. Then, the shipment is either transferred to a trucker for final delivery to the dock or stored and delivered to the dock later. Occasionally, the rail car is delivered to a dockside position alongside the ocean going vessel. Sometimes the railroad will interchange with another railroad, i.e., when the destination port is not on its own lines, it will transfer the container to the line(s) of one or more other railroads for carriage to the destination port area.

Advantages of Intermodal Railroad-Truck Service

The potential advantages of IRT for the shipper are that transit time may be reduced when compared with that offered by other modes and rates paid may be less. When containerized, IRT provides the usual advantages of containerization regarding less

¹⁷⁰The history of IRT is discussed in several publications, including David R. McKenzie, Mark C. North, and Daniel S. Smith, *op. cit.*, and Gerhardt Muller, *Intermodal Freight Transportation*, 2nd. edition. (Westport, CT: Eno Foundation for Transportation, 1989), Chapter 2 and p. 83.

time and labor cost in transferring between modes, less loss and damage, and less expensive product packaging.

Disadvantages of Intermodal Railroad-Truck Service

Transit Time

Slow door-to-door transit time is one of the primary disadvantages of IRT. This is caused by several factors. One is that IRT must deal with the two-mode problem and the difficulty of making the connection between modes in a reasonable amount of time. In regard to this, local drayage companies are frequently criticized for not picking up containers promptly when they are available, thus contributing to the transit time problem.

The need to assemble and disassemble trains and infrequent train scheduling also affect transit time and can contribute to the slow service problem. In addition, the two-mode system often means that a shipment moves "out of line," meaning that it does not make a direct move from the door of the shipper to the port but, instead, must go indirectly because it must pass through railroad terminals at each end. Also, railroad service sometimes involves more circuitous routing when compared with the Interstate Highway System.

Finally, sometimes more than one railroad is involved when the originating railroad interchanges with one or more other railroads, and this adds to the total transit time. The problems of interchanging between railroads are illustrated by the fact that, in some congested large cities, trailers and containers are

sometimes unloaded from rail cars and hauled by truck tractors to the yard of the connecting railroad, in order to avoid the delays in moving the units entirely by rail through the area.

The transit time disadvantage is most clearly found in the case of short hauls of less than 600 miles or so.

Double-stack service, discussed below, has to a great degree overcome these traditional difficulties IRT has had by providing better control of the operation from the shipper's door to the port, thereby reducing yard delays, indirect routing, and interchanges between railroads. Double-stack trains also run at a higher speed and with greater frequency and on schedules that mesh with the sailing dates of ocean vessels.

Loss and Damage

Another service difficulty is associated with damage to freight. Because of the extra handling involved in transferring between road and rail, the impact occurring when cars are switched (coupled), and the slack action in train operation,¹⁷¹ early IRT service had a poor damage record. Although damage has been reduced significantly in recent years, the damage issue remains a handicap.¹⁷²

¹⁷¹Slack action occurs when a train stretches or "runs out" (accelerates or ascends a grade) or contracts or "runs in" (decelerates or descends a grade).

¹⁷²Loss and damage in IRT is discussed in David R. McKenzie, Mark C. North, and Daniel S. Smith, op. cit., pp. 258-262.

Importance of Intermodal Railroad-Truck Service in Overseas International Trade

As noted above, IRT service is both an international and domestic form of transportation. Its growth in international transportation is the result of the container revolution in ocean transportation. As stated earlier, containerization has become the dominant method of moving general cargo in international water commerce and ninety percent of today's liner trade is carried by container. A natural result of this was that containerized IRT became very important in the import and export trade of the United States.

A growing form of IRT service takes place when an LTL trucking company receives LTL shipments from several shippers, combines them into a containerload, moves the container to a rail terminal, and ships the container to an ocean port by rail, i.e., the trucking company acts as a shipper in these situations. The use of IRT by LTL truckers has grown so that it was five percent of their total vehicle miles in 1991.¹⁷³ The reasons for doing this include their own insufficient long-haul carrying capacity and the desire for lower costs.

In recent years, some truckload carriers have also begun to ship their trailers and containers via IRT under "partnership" arrangements because of the truck driver shortage, the need to

¹⁷³American Trucking Associations data cited in Standard and Poor's, "Railroads and Trucking, Includes Coal Basic Analysis," Industry Surveys, (New York: Standard and Poor's Corporation, February 14, 1991), Volume 2, p. R3.

increase utilization of trailers and containers, lower costs, and other reasons.¹⁷⁴

This kind of IRT movement for LTL and truckload trucking companies has increased as IRT service has improved, including the introduction of double-stack service (see below).

Kinds of Carriers

Railroads

IRT has become an important source of revenue for United States railroads. In 1989, domestic and international IRT generated about \$4.6 billion, or about fifteen percent of total railroad revenues, making it the second most important revenue source. The major railroads in IRT are the BN, Conrail, CSX, Norfolk Southern, ATSF, SP, and UP. Of the rail carriers, the BN generated the largest number of loads in 1989, amounting to almost sixteen percent of the trailers and containers loaded by

¹⁷⁴See Trailer Train Company, Intermodal Market Survey, December 1989, pp. 26-27. For discussions of the well-publicized arrangement between J.B. Hunt Transport Company and the ATSF railroad, see "Santa Fe, J.B. Hunt Joint Venture Targets Coast-Midwest Intermodal Trade," Traffic World, December 18, 1989, p. 7; "Santa Fe Plays It Both Ways," Containerization Intermodal, May 1991, pp. 45-46; "Quantum's Pace Quickens," Railway Age, May 1991, p. 43; and Ira Rosenfeld, "J.B. Hunt-Santa Fe Honeymoon Has Other Carriers Thinking Marriage," Traffic World, June 3, 1991, p. 9. Hunt has also entered into a similar agreement with the BN. See Ira Rosenfeld, "J.B. Hunt Finds Northwest Passage Aboard Burlington Northern Trains," Traffic World, July 1, 1991, p. 100 and David Sparkman, "Hunt to Begin 2nd Rail Venture; BN is Partner," Transport Topics, July 1, 1991, p. 1. Other examples of truckload carrier participation in IRT are Schneider National's arrangement with the SP railroad, Anderson Trucking's (of St. Cloud, Minnesota) with ATSF, and Con-Way Intermodal's with five railroads. See David L. Sparkman, "Intermodal Game Has New Rules," Transport Topics, October 26, 1992, p. 1; Association of American Railroads, Rail News Update, November 25, 1992, p. 2; and "Con-Way Intermodal Introduces Con-Quest," Pacific Shipper, June 22, 1992, p. 24.

the railroads.¹⁷⁵ In 1991, the BN, UP, Conrail, ATSF, and SP each carried about one million trailers and trailer size containers in their IRT service.¹⁷⁶ The BN is the dominant intermodal rail carrier serving Minnesota shippers and receivers.

Intermodal Operators

In addition to railroads, "intermodal operators" affiliated with ocean carriers are very important in IRT. These are organizations that have long-term agreements with United States railroads for the latter to carry IRT containers, mainly for international trade purposes. To date, a company affiliated with American President Lines has been the most far reaching and successful intermodal operator. Others include OOCL, Mitsui O.S.K. Lines, Hanjin Shipping Company, K Line, NYK Line, Maersk, and Evergreen. These organizations schedule IRT double-stack trains and exercise different degrees of control over their operations. They also vary in the provision of related intermodal services.¹⁷⁷

Drayage Companies

Drayage companies are local trucking companies that provide the pickup and delivery service associated with IRT. They are independent companies called upon by railroads or shippers'

¹⁷⁵Standard and Poor's, October 25, 1990, op. cit., p. R20.

¹⁷⁶Jay Gordon, "Intermodal Wins New Converts," Distribution, July 1992, p. 44.

¹⁷⁷David R. McKenzie, Mark C. North, and Daniel S. Smith, op. cit., pp. 54-55.

agents (see pages 176-177) to perform service when needed. Usually a highly competitive business, local drayage often suffers from depressed rates and high turnover rates.

Double-Stack Service

One of the more dramatic changes in IRT has been the development of "double-stack" service on some railroads. Double-stack allows two layers of containers to be carried on rail cars. It requires a different kind of rail car, new kinds of containers (that can be stacked and locked together), and different handling equipment. Hence a considerable investment is needed.¹⁷⁸

Double-stack accounts for about two-thirds of all railroad container movements.¹⁷⁹ Double-stack cars amounted to about 25 percent of total IRT capacity in 1990.¹⁸⁰

The cars are a series of platforms that are "welled"--they are lower than the floor of a conventional rail car. They are often articulated in the sense that each pair of stacked containers rests on a platform of its own that is separated from the next platform. A common version is where five articulated platforms serve as one "car" in a train, each platform sharing

¹⁷⁸The history of double-stack is discussed in U.S. Department of Transportation, Double-Stack Container Systems: Implications for U.S. Railroads and Ports (Springfield, VA: National Technical Information Service, June 1990), pp. 1-13. This study by the Federal Railroad Administration and Maritime Administration assessed the potential for domestic double-stack container transportation and the implications of expanded double-stack systems for railroads, ports, and ocean carriers.

¹⁷⁹Standard and Poor's, October 25, 1990, op. cit., p. R21.

¹⁸⁰U.S. Department of Transportation, Double-Stack Container Systems, op. cit., Executive Summary, p. i-a.

wheels with the next platform. "Stand alone" welled platform cars that do not share wheels with other cars are also used for double-stack service. Double-stack is available on most main line routes serving larger cities.

Double-stack has been used for containers only (not for trailers) and mainly in international trade. However, there has been rapid growth of domestic double-stack service in recent years.¹⁸¹

Double-stack has several important advantages over conventional container movements. The reduced train length required to move a given number of containers means that overall capital costs per ton carried are reduced. Train crew cost per carried ton is substantially less. Because double-stack cars are articulated sets, there are fewer sets of wheels, fewer couplers, and fewer air brake hoses involved, resulting in a large reduction in weight moved. This reduces the energy cost per ton of freight carried. Less loss and damage occurs because articulated double-stack cars with five platform have fewer couplers than conventional trains, thus substantially reducing slack action, a frequent cause of damage to freight.¹⁸²

A disadvantage of double-stack is its high terminal costs--expensive equipment is required to handle the containers. Other

¹⁸¹David R. McKenzie, Mark C. North, and Daniel S. Smith, op. cit., p. 31.

¹⁸²Double-stack is described in David R. McKenzie, Mark C. North, and Daniel S. Smith, Ibid., pp. 28-31 and p. 217. See also, Gerhardt Muller, op. cit., pp. 79-81.

disadvantages include: the need for a large volume of freight because of the large capacity of a double-stack train and the high terminal costs that must be covered;¹⁸³ the fact that it is feasible for the customer mainly only on longer hauls in terms of the rates charged (straight trucking often underprices double-stack on shorter hauls);¹⁸⁴ and the fact that double-stack requires higher overhead clearances (as high as 20 feet, 6 inches, depending on the size of the equipment used) than conventional IRT needs.

Ownership

As noted earlier, American railroads are owned by private companies--there is no government ownership of intercity line-haul freight railroads. The same is true of the local drayage companies that provide pickup and delivery service for IRT railroads.

The reform of federal economic regulation of railroads and motor trucking companies that took place in the late 1970's and early 1980's eventually resulted in substantial reduction in economic regulation of IRT service.¹⁸⁵

¹⁸³The practicality of using double-stack for points that do not meet the normal criteria for double-stack because of their location and the volume of traffic is reviewed in H. Barry Spraggins, "Assessing the Feasibility of Double-Stack Rail Service in Smaller Locations--A Model to Study Double-Stack Potential," Proceedings of the Transportation Research Forum, 1990.

¹⁸⁴A study commissioned by the Federal Railroad Administration and the Maritime Administration concluded that double-stack can be fully competitive with motor trucks in dense traffic corridors of 725 miles or more. See U.S. Department of Transportation, Double-Stack Container Systems, op.cit., p. 183.

¹⁸⁵For a discussion of regulatory reform of IRT service, see Gerhardt Muller, op. cit., pp. 26-29.

Traffic Carried

Between 1980 and 1990, the number of trailers and trailer size containers loaded by United States railroads in domestic and international service increased from 3.0 million units to 6.2 million units, or 106.7 percent.¹⁸⁶ In 1992, the number was about 6.3 million units.¹⁸⁷ The growth in IRT traffic can be partly attributed to regulatory reform. IRT also benefitted from increased international trade, most of which was containerized, equipment developments, including the advent of double-stack, highway fuel and truck tax increases, and the energy crises of the 1970's and subsequent sensitivity to energy consumption. More aggressive marketing by railroads and ocean carriers and shippers' agents also contributed. Part of the increase was caused by the surge in Pacific Rim imports.¹⁸⁸ In addition, there has been a growing acceptance of IRT by shippers.¹⁸⁹

Despite the rapid growth since 1980, IRT still accounts for a very small share of the total intercity freight traffic in the United States, probably about five percent.

¹⁸⁶Calculated from Association of American Railroads data.

¹⁸⁷Association of American Railroads, Rail News Update, December 16, 1992, p. 1.

¹⁸⁸Nat Welch, "The Future Decade," Georgia Anchor Age, Second Quarter 1991, p. 16. See also David R. McKenzie, Mark C. North, and Daniel S. Smith, op. cit., pp. 55-57.

¹⁸⁹See Kathy Keeney, "Intermodal Market Growing but Underpromoted," Pacific Shipper, February 8, 1993, p. 8; Jay Gordon, op. cit., p. 44; and David P. Bearth, "Outlook: Never Been Better," Transport Topics, April 27, 1992, p. 6.

Because IRT export traffic is transferred to ocean vessels for the trip to the Pacific region, the kinds of commodities carried in IRT service for export to that area are the same as those carried by water, discussed above.

Pricing Intermodal Railroad-Truck Service

A mix of freight all kinds (FAK) rates and commodity rates, where the rates are based in part on what is being carried, are used by IRT railroads, quoted on a per-container or per-mile basis. For international movements, the rate charged the exporter may include only the IRT portion of the trip, i.e., to the west coast ocean port. However, the rate could include the entire transaction from pickup at the shipper's door to the port in the Pacific Rim or even to the door of the consignee in the foreign country. The entire-trip approach is most likely to take place when a steamship line is making the sale to the shipper.

Export rates to the Pacific coast are lower than the corresponding rates for imports eastbound to Minnesota because of the traffic imbalance and the need to move containers west. As stated earlier, the cost of moving a forty-foot container from Minnesota to a west coast port ranges from \$1,200 to \$3,000, depending on the specific destination and what product is in the container. Overall cost from Minnesota to a Pacific area port can be as high as \$4,000 or more.

Intermodal Railroad-Truck Facilities in Minnesota

In Minnesota, IRT service is provided by the BN and the Soo Line. The CNW formerly provided IRT service but no longer does so, although it has substantial IRT service elsewhere in its system. The route systems of the BN and Soo Line are shown in Figures 1 and 2, respectively.

Burlington Northern

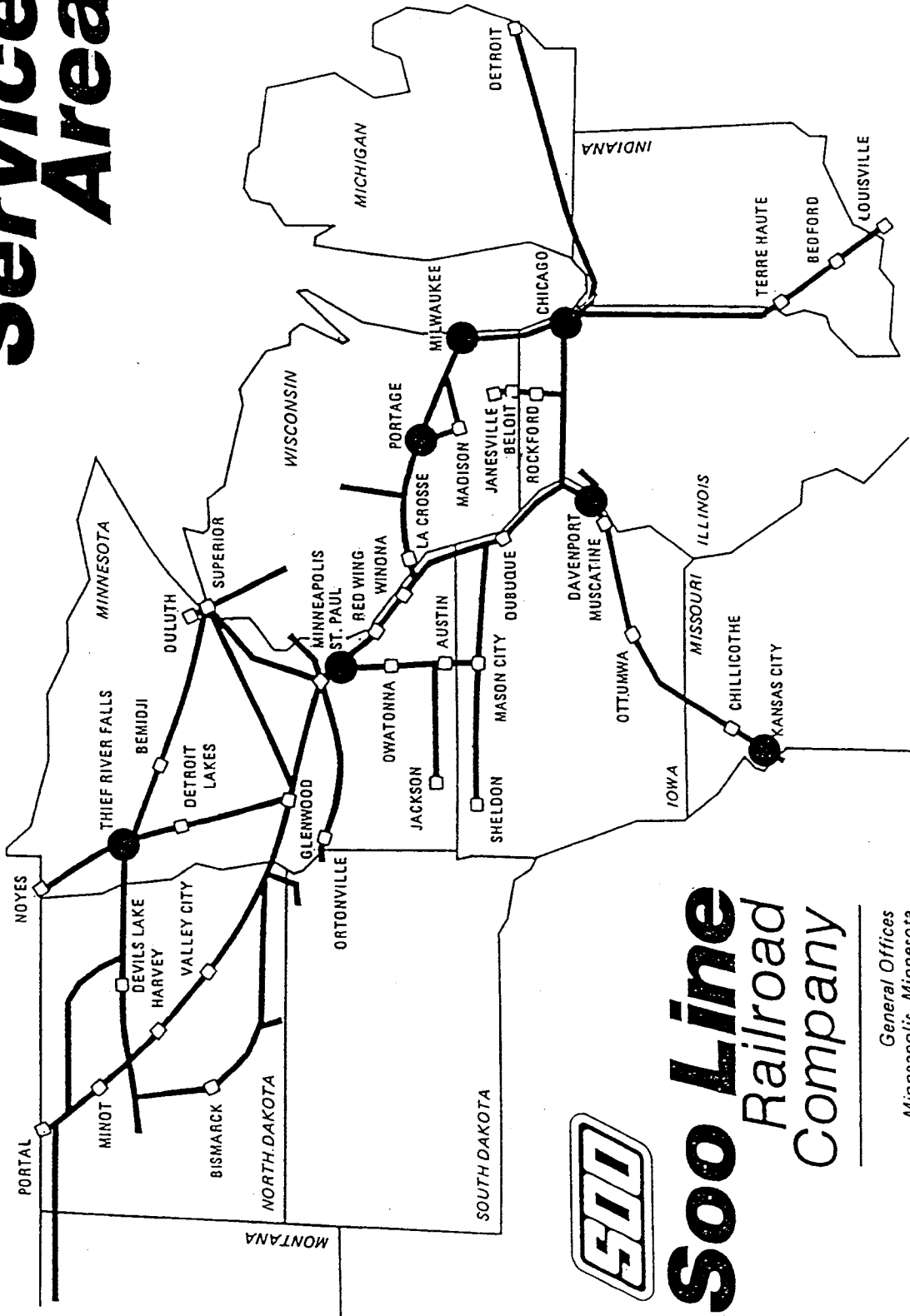
One of the nation's largest IRT railroads, the BN carried about one million trailers and trailer-size containers on its total system in 1991,¹⁹⁰ providing nationwide domestic and international IRT service. The company serves the 100 largest transportation corridors from its 26 hub centers, either directly or via interchange agreements with other railroads.

BN Minnesota service includes conventional domestic trailer-on-flatcar (TOFC) and container-on-flatcar (COFC) service and both domestic and international double-stack container service. Most BN international traffic is routed through Seattle, Tacoma, and Portland, served directly by the BN. Much of its international double-stack traffic moves through the ports of Portland, Seattle, and Los Angeles, the latter through an agreement with the ATSF railroad. Trains containing double-stack loads from Chicago and from the west coast stop at the BN's Midway yard in St. Paul, picking up and delivering both domestic and international double-stack loads.

¹⁹⁰Jay Gordon, op. cit., p. 44.

Figure 2
The Soo Line System Map

Service Area



Soo Line
Railroad
Company

General Offices
Minneapolis, Minnesota

● INTERMODAL TERMINALS

Soo Line

Although the Soo Line serves a relatively small geographic area, it interchanges IRT traffic with other railroads to provide service to the west coast. Interchanges take place at Chicago and Kansas City. In 1991, the Soo Line carried almost 209,000 trailers and trailer-size containers on its system.¹⁹¹ About two-thirds of the Soo Line's IRT traffic to and from Minnesota is international.

The company does not provide double-stack service to Minnesota customers, although the Soo Line has double-stack service between Chicago and Kansas City, where it interchanges traffic with the SP railroad which directly serves the ports of Los Angeles, Long Beach, San Francisco, Oakland, and Portland.

American President Distribution Services

American President Distribution Services (APDS) is a division of American President Companies (APC) and is responsible for selling APC IRT service. American President Lines (APL), an ocean carrier, is also a subsidiary of APC. APC and APDS do not operate any railroads. Instead, they contract with United States railroads to provide the rail part of their service. They are an example of an ocean carrier participating in IRT directly and are referred to as an "intermodal operator" in the industry.

APC and APDS offer double-stack service in Minnesota but usually do not use Minnesota IRT hubs. Instead, the traffic is

¹⁹¹Ibid.

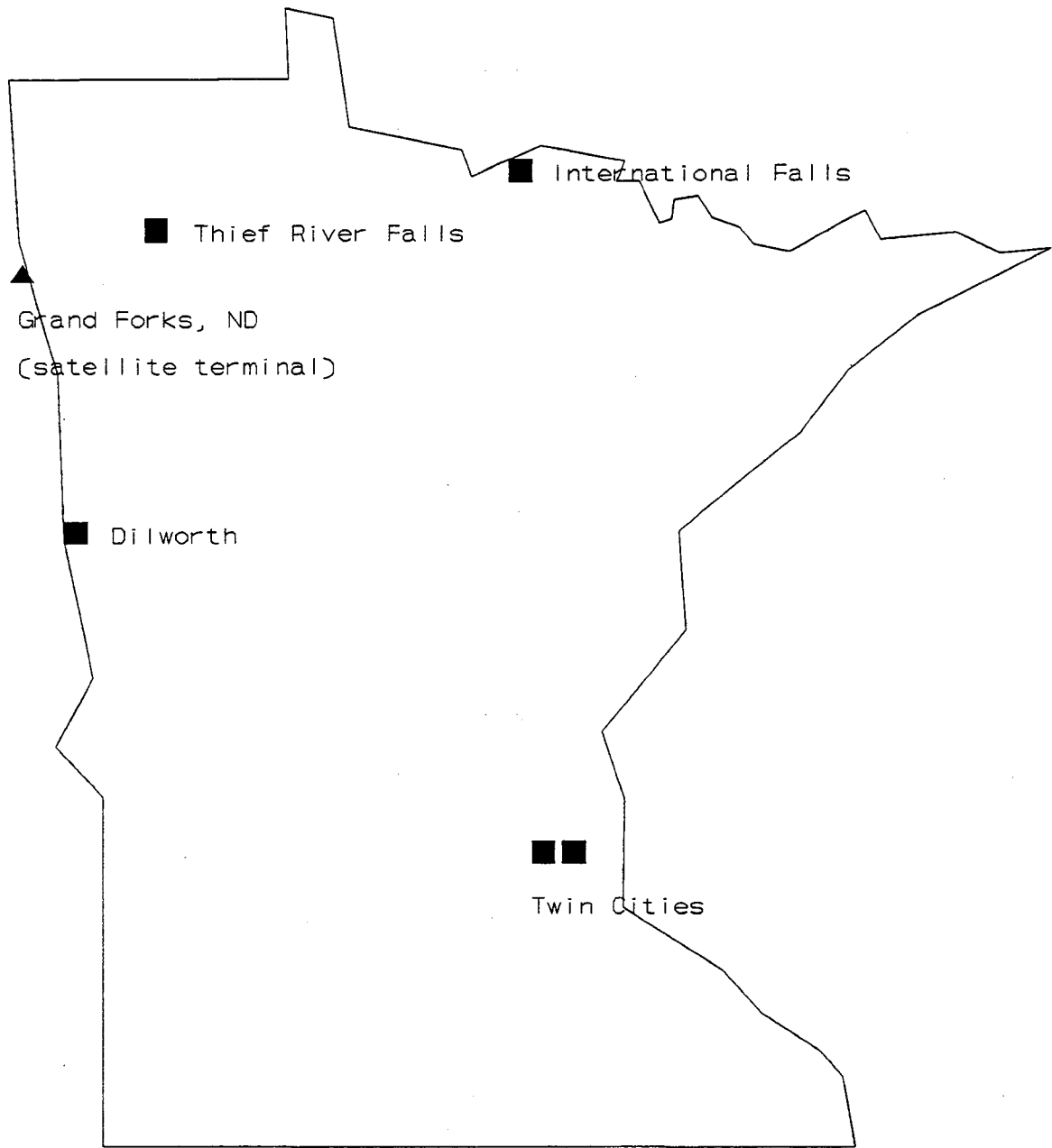
trucked to or from Chicago by another APC subsidiary, American President Trucking (APT). At Chicago, the containers are placed on or removed from rail cars. Both domestic and international shipments are moved this way. Occasionally, APDS uses the Soo Line for the Minnesota-Chicago segment.

Intermodal Railroad-Truck Terminals in Minnesota

There are six IRT terminals available to Minnesota manufacturers. Their locations are shown in Figure 3.

The largest and most important IRT terminal in Minnesota in terms of traffic volume is the BN's Midway terminal in St. Paul. It is one of 26 major IRT hubs on the BN system. The BN also operates an IRT terminal at Dilworth, Minnesota, on the border near Fargo, North Dakota. The two BN terminals generally serve two different geographic areas in the state, with some blurring of the dividing line. In addition, an IRT terminal opened in 1990 at International Falls primarily to serve paper mills there. It is owned by a paper company and operated by its own railroad subsidiary. Intermodal traffic is moved from the yard by the Duluth, Winnipeg, and Western Railroad (owned by the Canadian National Railroad) to Superior, Wisconsin where it is transferred to the BN. Finally, there is a BN "satellite" terminal at Grand Forks, North Dakota, on the Minnesota border, which is serviced by highway from the Dilworth terminal. This means that it has no direct IRT service but trailers and containers are moved by the BN to and from Grand Forks by highway from and to the Dilworth yard near Fargo.

Figure 3
Location of Intermodal Terminals
In or Near Minnesota



The Soo Line has seven IRT terminals in the United States. The main Soo Line IRT terminal or hub in Minnesota is the Shoreham yard located in northeast Minneapolis where a new IRT facility was opened in 1990. Another Soo Line IRT terminal facility, primarily for agricultural products, is located at Thief River Falls in northwestern Minnesota, where bags of Red River Valley seasonal agricultural commodities¹⁹² are loaded into containers for export to other countries.

Access to Intermodal Railroad-Truck Service in Minnesota

IRT service is nominally available everywhere in the state of Minnesota but not in practice. This is because of the cost and time involved in drayage to and from the limited number of intermodal terminals and the problem of out-of-line hauls to and from some parts of the state.

As to the cost and time of drayage, the opinions of experienced IRT executives vary as to what is the practical service area from a hub, ranging up to 250 miles, with about 100 miles being the most likely limit.

The out-of-line problem is another barrier to access. Areas in Minnesota that would involve an impractical out-of-line haul when using a Twin Cities IRT hub to reach the west coast would most likely include the western, southwestern and northwestern parts of the state. For example, a shipper in Marshall, in southwestern Minnesota, may find it difficult to effectively use

¹⁹²Including edible beans, seeds (sunflower, flax, millet, rye), wheat, lentils, soybeans, peas, and popcorn.

IRT service for shipments to a west coast port because of the need to move a container northeast to the Twin Cities and then west to the coast. The time and cost required to move a container to a Twin Cities IRT terminal would be added to the three days or more that it takes to move the container from the Twin Cities to a west coast port.

Drayage Services

Local pickup and delivery for IRT service is provided by for-hire trucking companies selected by the BN and Soo Line from a previously approved list. For both railroads, shippers' agents are not heavily involved in international traffic so the railroads deal directly with the drayage companies.

In addition to using its affiliated company, APT, APDS uses local for-hire trucking companies to perform local pickup and delivery service for IRT movements. Local drayage companies provide about seventy percent of its drayage service; the rest is provided by APT.

There is a sufficient supply of drayage carriers available throughout the areas in Minnesota where IRT is a practical alternative for shippers and receivers.

Minnesota Traffic Volume

The total number of loaded IRT units moved to or from Minnesota intermodal terminals per year is about 195,000 trailers and containers. About 36.0 percent of this is made up of

international traffic. A good deal of the IRT international traffic is exported to the Pacific area through west coast ports.

The BN accounts for a large part of the IRT traffic originated or terminated in Minnesota, amounting to about 140,000 trailers and containers per year. BN's IRT traffic to or from Minnesota is about 75 percent domestic and 25 percent international, much of it traffic to or from the Pacific region.

The Soo Line IRT traffic to or from its two Minnesota intermodal terminals amounts to about 47,000 units per year. About 69 percent of the Soo Line's IRT traffic is international, much of it eastbound through Canada. The Soo Line estimates its Pacific area traffic from Minnesota amounted to between 5,200 and 7,800 forty-foot containers per year.

APDS moves about 7,500 trailers and containers per year to or from Minnesota, most of which is domestic traffic.

Kinds of Traffic Carried

The traffic moved by IRT to the Pacific Coast mirrors what is carried by water from those ports to the Pacific region. It consists of a wide assortment of manufactured goods.

In the opinion of some IRT executives, IRT is not suitable for "time-sensitive" freight, defined as freight requiring fast service. This is because of the time disadvantage that IRT has, at least over shorter hauls, when competing with trucking. However, "time-sensitive" is also sometimes taken to mean that the freight must arrive consistently on-time, even though it is not necessary that the transit time be short. Given that

international IRT traffic is transported by slow-moving water carriers to the foreign country, rail transit time to the port is less important than arriving at the port in time for a particular sailing and doing so consistently. This latter kind of time-sensitive traffic can be carried successfully by IRT. The fact that most IRT trains are scheduled to leave at specific set times with cutoff times for accepting freight for them is an indication that there is an attempt made to regularize and be consistent regarding delivery time.

Shippers' Agents

As noted previously, shippers' agents are intermediaries who sell IRT service to shippers on behalf of railroad companies. The agents have become "retailers" of IRT service, while the railroads are the "wholesalers." In effect, the railroad sells the service to the agent who, in turn, sells it to the shipper. Contracts between the railroad and the agent are often involved.¹⁹³

Currently, there are about 150 shippers' agents in the United States (less than in the past--there were between 500 and 600 in 1985). Most of these are small regional or local companies with annual revenues of less than \$20 million. The agents that are based in Minnesota vary in size ranging up to about 10,000 loads per year and \$30 million per year in annual

¹⁹³Shippers' agents are not really "agents of the shipper." Instead, they are intermediaries between rail carrier and shipper.

domestic and international sales. Some of them are truck brokers in addition to their agent work.

Most shippers' agent business is domestic, although they are sometimes involved in international trade as well. In 1989, it was reported that agents accounted for thirty percent of the domestic and international IRT market served by railroads, fifty percent was accounted for by steamship lines and affiliated intermodal operators, only sixteen percent of the business came directly from shippers, and four percent came from LTL motor trucking companies.¹⁹⁴ Although the BN and Soo Line use shippers' agents to sell their domestic IRT service, they generally do not use them to sell their international service. However, agents sometimes do get involved, primarily when the exporter wishes to use an agent. The Soo Line estimated it at five percent of its Pacific traffic.

Capacity

Balance of Traffic

The balance of overall domestic and international IRT traffic to and from Minnesota is such that more traffic moves out of the state than in, leaving more unused capacity on the inbound side than on the outbound side. The outbound traffic is about 56 percent of the total number of IRT loads moved per year; inbound traffic is about 44 percent. However, in IRT international service, the volume of exports from Minnesota to Asia is less

¹⁹⁴Trailer Train, op. cit., pp. 4 and 14.

than the volume of imports from Asia. This means that, when exporting to the Pacific region from Minnesota, there is plenty of international IRT capacity available to carry traffic and the ship lines and railroads are eager to get the containers back to the Pacific region for use in future movement to the United States. This can favorably affect outbound rates, i.e., they can be lower than inbound rates.

Overall Capacity

As noted earlier, the United States railroad system could carry much more traffic than it does--its roadbed and track network is generally underutilized. It was also noted that local trucking is usually an easy entry activity with excessive capacity. In both cases, it is difficult to perceive that an increase in Minnesota exports would result in a capacity shortage of any significance. This assumes that the rail carriers would be willing and able to invest in the required loading and unloading equipment and rail cars and that someone, perhaps railroads and/or ship lines, would be willing and able to invest in a suitable number of containers. This, in turn, would depend on how their managements perceive the profitability of increased IRT traffic.

The Use of Intermodal Railroad-Truck Service by Minnesota Exporters to the Pacific Region

Number of Firms

Of the 153 manufacturers responding to a mail survey conducted in 1991, 43 (28.1 percent) reported that they used IRT service for either inbound domestic shipments, inbound international shipments, outbound domestic shipments, outbound international shipments, or some combination of the four.¹⁹⁵ Generalizing this result to all Minnesota manufacturers:¹⁹⁶ at a 95 percent confidence level, the true percentage of Minnesota manufacturers using IRT was somewhere between 21.0 percent and 35.3 percent; at an even higher confidence level (99 percent), the range was from 18.7 percent to 37.5 percent. The implication is that the percentage of Minnesota manufacturing firms using IRT was most likely between one-fifth and one-third of all Minnesota manufacturing firms.

Of the 41 IRT users responding in the 1991 study (two of the 43 users did not indicate their specific uses of IRT service), twenty used IRT for inbound international shipments and 28 for outbound international shipments.¹⁹⁷ These results indicated

¹⁹⁵Donald V. Harper and Philip T. Evers, An Analysis of Intermodal Railroad-Truck Facilities and Services in Minnesota, op. cit., pp. 78-79 and 103-104.

¹⁹⁶Generalization of this result requires use of the binomial confidence interval.

¹⁹⁷Donald V. Harper and Philip T. Evers, An Analysis of Intermodal Railroad-Truck Facilities and Services in Minnesota, op. cit., pp. 103-104.

that international IRT was used by a large number of Minnesota manufacturers.

Products Exported

The products shipped by Minnesota exporters in the study reported on here via IRT for export to the Pacific region are similar to those carried by ocean carrier. In domestic IRT service, although a wide variety of different commodities of various values are carried, the commodities tend to be of relatively low value per size unit. In international service, the commodities tend to be of higher value than in domestic service, probably because of the lack of a feasible alternative to ocean transportation (air transportation costs are too high in many cases).

Origin Points in Minnesota

In the 1991 study, referred to above, users of IRT tended to be located relatively close to IRT terminals. Indeed, the regions in Minnesota with the greatest number of users were all relatively close to IRT terminals, while regions removed from the terminals had few, if any, users. In terms of actual distances, of the twenty non-Twin Cities Metropolitan Area users, six (30.0 percent) were located more than 100 miles from an IRT terminal. Only one user (5.0 percent) was located more than 132 miles from a terminal.¹⁹⁸

¹⁹⁸Ibid., pp. 84-88.

Why Intermodal Railroad-Truck Service is Used

In the 1991 study, domestic and international IRT users were asked to indicate their reasons for using IRT service, naming as many reasons as applied. The most frequently named reason was cost; however, availability and suitability of the service were important reasons as well.¹⁹⁹ Thirty-one named cost, fourteen named availability at origin point(s), thirteen cited availability of equipment, thirteen indicated suitability for shipment size(s), twelve named availability at destination point(s), eleven designated request by a supplier and/or customer, and ten named suitability for the commodity(s) to be carried. Other reasons were given for using IRT but are not discussed here.

Lane Comparisons With Motor Trucking

In the 1991 study of Minnesota's IRT facilities and services, a comparison of IRT rates and transit times versus truckload motor truck service on 24 domestic traffic lanes²⁰⁰ revealed that IRT was at a disadvantage transit-time-wise on every lane examined, both inbound and outbound and both long-haul and short-haul. IRT did better with rates, having the lowest

¹⁹⁹Ibid., pp. 115-117.

²⁰⁰A traffic lane connects an origin point with a destination point, such as Duluth, Minnesota with Dallas, Texas.

rate in some situations.²⁰¹ The study analyzed only trailerload moves by IRT. Containers were not included.

These results are applicable to the domestic leg of an international IRT-ocean trip, and indicate the disadvantage that IRT can have. As noted above, however, the study examined only trailerload moves by IRT, not containers. The use of containers, particularly when double-stack is used, can overcome some or all of the transit time problem and, because of efficiencies, the rate problem as well. Double-stack already has shown that it can compete effectively on both transit time and rates in many situations.

Perceptions About Intermodal Railroad-Truck Service

In the 1991 study, overall, users tended to rate IRT service as slightly above average. Moreover, no user rated IRT service as poor. Users rated IRT service higher overall than railroad service but lower than motor truck service. No IRT users rated railroad service as excellent nor did any rate motor truck service poor or fair. In general then, IRT service tended to be perceived by IRT users as somewhere in between the good service that motor carriers provide and the fair service that railroads provide.²⁰²

Minnesota exporters that participated in the mail study reported on here indicated their perceptions of the service

²⁰¹Donald V. Harper and Philip T. Evers, An Analysis of Intermodal Railroad-Truck Facilities and Services in Minnesota, op. cit., pp. 131-143.

²⁰²Ibid., pp. 117-122.

provided by the several modes of transportation available to them for Pacific area traffic. As indicated previously, the results are given in Table 15 on page 76.

The table shows that IRT service was perceived less positively than water, air, and motor truck transportation, but better than straight rail transportation, a result similar to that in the 1991 study. Its average overall perception rating of 3.00 was only slightly higher than straight rail and considerably lower than the other three modes. However, most of its ratings on individual items were fairly positive, with only one of them (communication) below the average of 3.00. IRT received a rating of 3.00 on the important cost factor.

PART 5 CONCLUSIONS

IMPORTANCE OF THE PACIFIC REGION TO MINNESOTA MANUFACTURERS

The purpose of the study discussed in this report was to identify the transportation facilities and services available to Minnesota exporters to Pacific region countries. This included the modes of transportation as well as individual carriers, third parties, and ocean ports and airports available to Minnesota exporters. An attempt was made to determine the number of carriers involved, the amount of service available, transit times, rates charged, the quality of the service provided, the accessibility to the system by Minnesota shippers, and the capacity of the system in general terms. Also included was the ability of the system to adapt to increases in Minnesota exports. For the most part, these objectives were achieved in the study.

The Minnesota-Pacific area transportation system includes international water and air transportation and domestic railroad, motor truck, and intermodal railroad-truck (IRT) transportation. These alternatives involve third parties, mainly freight forwarders, as well as carriers.

INTERNATIONAL WATER TRANSPORTATION

Ocean Carriers

International water transportation, employing mainly the containerized method of handling goods, dominates overseas international transportation in terms of weight carried and is

very important in Minnesota's trade with Pacific area countries. The number of ocean carriers available to serve the Pacific area and the total amount of service available is adequate, and there are no capacity shortage problems. In fact, there is a general overcapacity situation in the ocean carrier industry. Indeed, the balance of ocean-carrier traffic is such that Minnesota shippers generally benefit from an overcapacity situation westbound to the Pacific area, regardless of the capacity situation overall in the industry.

Although, as westbound shipments increase, the imbalance of traffic favoring Minnesota exporters will be lessened, the capacity of the ocean carrier system is such that it appears to be able to handle any substantial increases in exports from Minnesota to the Pacific area. Because west coast ports are easily accessible from Minnesota, there are no accessibility difficulties for Minnesota exporters in reaching Pacific destinations.

Minnesota exporters included in the mail study had a positive perception of water transportation service, with the average ratings on most items asked well above the average of 3.00, and an average overall perception rating of 3.62, thus indicating that the quality of ocean carrier service is satisfactory. Water transportation received a relatively high rating on the cost factor. Freight forwarders interviewed in the study also indicated satisfaction with the service provided by the ocean carrier industry.

International Surface Freight Forwarders

International surface freight forwarders are extremely important in moving Minnesota's waterborne traffic to the Pacific area. There are numerous forwarders available and the supply of service is satisfactory.

The economic characteristics of international surface freight forwarders are such that there is little chance that there could be a shortage of supply of their services in the foreseeable future, even if there is a substantial increase in the exports of manufactured goods from Minnesota to the Pacific region. In addition, there are no accessibility problems associated with international surface freight forwarders.

The perception Minnesota exporters included in the mail study had of the service of freight forwarders in general, not only those involved in arranging water transportation, was very positive.

West Coast Ports

West coast ports in the United States are a key element in waterborne exports of goods from Minnesota to Pacific area countries. The seven ports studied have adequate capacity. They are served by most of the important Pacific region ship lines and provide access to numerous ports in the Pacific area.

Although there are financial and environmental difficulties in port development and expansion, all of the west coast ports studied have such programs under way, including the addition of more on-dock facilities for transfer of rail-borne containers.

It appears that Minnesota exporters will have adequate ocean port capacity through which to reach the Pacific area in the future, even if there is a significant increase in Minnesota exports. Moreover, west coast ports are fully accessible from Minnesota via rail and motor truck service.

Minnesota exporters included in the mail study had a positive perception of the service of the seven ports studied, indicating that there was general satisfaction. Carriers and freight forwarders interviewed in the study also had a positive reaction to the quality of service provided at west coast ports.

Overall Water Transportation Capacity

In terms of overall water transportation capacity, it can be concluded that it is probable that there will be sufficient water carrier and port capacity to handle additional Minnesota exports to the Pacific area in the foreseeable future.

INTERNATIONAL AIR TRANSPORTATION

Air Carriers

Air transportation is involved in only a small part of the total overseas international trade of the United States, when measured in terms of weight carried, but it accounts for about one-third of the traffic carried when measured in terms of the value of the goods carried.

Although there is only a small number of all-cargo carriers serving the United States-Pacific area, there are many combination carriers, and the total amount of service available

to serve the Pacific from Minnesota is substantial. There are currently no capacity problems. In fact, although not as serious as the overcapacity problem in United States domestic air transportation, both passengers and freight, a general overcapacity situation exists in the international segment of air transportation. Also, because the balance of traffic in the Pacific is such that more air freight moves eastbound than westbound, Minnesota exporters enjoy the benefits of excess capacity on westbound flights.

Although the capacity of the air freight carrier system is currently adequate to handle the traffic available, bilateral agreements among countries are a potential threat to adequate future capacity. The trend toward greater liberalization of such agreements could help to maintain adequate capacity. A better balance between eastbound and westbound traffic, which can occur if United States exports continue to grow, could work to the disadvantage of Minnesota exporters because of less excess capacity westbound. A smaller number of air freight carriers in the future can also serve to restrict the growth of capacity available. On the other hand, the expected large growth in passenger traffic in the area and the probable resulting addition of passenger service will also add freight capacity provided by combination carriers (assuming bilateral agreements do not interfere).

On balance, it appears there is a chance that capacity problems will arise in the near future should the amount of

traffic shipped from Minnesota to the Pacific region increase substantially.

With regard to airport accessibility to Minnesota exporters, airports providing access to the Pacific region are easily reached, although there is a difficulty for exporters in locations some distance from the Twin Cities in being able to incur the cost and time involved in moving their shipments to Minneapolis-St. Paul International Airport. Another problem is that some Minnesota exporters find it necessary to use airports other than Minneapolis-St. Paul International Airport as the origin airport in order to get the service desired.

Minnesota exporters included in the mail study had a positive perception of air transportation service to the Pacific region regarding most of the items asked about, with average ratings well above average. The lowest rating (3.00) was given to cost, reflecting the relatively high cost of air transportation. It can be concluded that shippers were satisfied with the quality of air transportation service provided. Freight forwarders interviewed in the study also indicated satisfaction with the service received from air carriers.

International Air Freight Forwarders

International air freight forwarders play a very important role in moving Minnesota's manufactured exports to Pacific destinations. There are numerous forwarders available in Minnesota and the supply of service is satisfactory.

As is the case with international surface forwarders, the economic characteristics of international air freight forwarders are such that there is little chance that a shortage of supply could result in the foreseeable future should the quantity of exports moving from Minnesota to the Pacific area by air increase substantially. There are no accessibility problems regarding freight forwarders.

As noted earlier, Minnesota exporters included in the mail study believed that the service provided by freight forwarders in general, not only those involved in international air transportation, was very good.

Local Trucking Companies

Whether used by a shipper or by an air freight forwarder for local pickup service, local trucking service is abundant in supply in Minnesota.

Because of the ease of entry and other economic characteristics of the business, there is ordinarily no capacity problem for the shipper, and there is not likely to be a capacity problem even if Minnesota exports to the Pacific area increase significantly in the next few years. There are no accessibility problems associated with local trucking service.

Airports

Exporters and freight forwarders ordinarily do not have a great deal of choice as to which United States airport to use when exporting to the Pacific area. A shipper or forwarder will

usually route traffic via the nearest commercial airport having service to the destination country, either directly or through connections at other airports. In most cases, the exporter or forwarder attempts to minimize ground transportation costs.

The airports studied that are available to Minnesota exporters for Pacific area shipments are collectively served by all of the important air carriers serving the Pacific region and provide access to many destination points within that region. However, Minneapolis-St. Paul International Airport provides less service to the Pacific region than some of the other airports studied. This partially explains why a fair amount of traffic is trucked to Chicago's O'Hare field to connect with international flights there.

Because of the financial and environmental difficulties involved in building new airports in the United States and the inability of expansion of existing airports to keep up with traffic growth, capacity problems have developed at some airports. Among those airports studied, Los Angeles presents the most serious current congestion problem. There is also a growing congestion problem at airports in some Pacific area countries. Therefore, there is the danger of inadequate airport capacity acting to curb the growth of Minnesota's international air freight transportation involving the Pacific region in the future. Various solutions to the congestion problem have been proposed, including the establishment of large regional airports

around the United States, but no national plan is presently in place.

The airports studied are accessible to Minnesota exporters via long- or short-haul motor trucking or connecting air service. However, for typical export shipments from Minnesota, those areas in Minnesota that are distant from the Twin Cities must incur extra time and money costs to reach the Minneapolis-St. Paul airport, which can serve as a barrier to exporting by air. In some cases, the high value of the products being shipped can make the extra cost problem a minor one.

Minnesota exporters included in the study had a generally positive perception of the service provided at most of the seven airports studied. Minneapolis-St. Paul, in particular, received a very high average overall perception rating of 4.10. Carriers and freight forwarders interviewed in the study also expressed general satisfaction with the facilities available and the services provided at the airports studied, with the exception of Los Angeles.

Overall Air Transportation Capacity

In terms of overall international air transport capacity, because of the possible problems associated with bilateral agreements among countries, a more balanced traffic flow in the Pacific trades, a smaller number air freight carriers, and the possible problem of inadequate airport capacity, it can be concluded that, among the modes studied, air transportation appears to be the one that might present a capacity problem if

Minnesota exports to the Pacific area should have a substantial growth in the next few years.

RAILROAD TRANSPORTATION

Rail Carriers

Straight railroad service has declined considerably in the country's international trade in manufactured goods since World War II. Thus, there is only a limited amount of straight rail transportation of manufactured goods from Minnesota to the west coast for export; most manufactured goods export traffic carried by rail is IRT containerized freight.

The amount of straight railroad service available to Minnesota exporters to the Pacific area is adequate in terms of the number of carriers and frequency of service.

As to overall railroad capacity in the western United States, there has been and continues to be a general overcapacity situation, principally in the roadbed or "way" and less so in the terminals. Vehicle capacity is another matter and car shortages do occur, but this does not negate the assumption that railroads generally have unused capacity. A different kind of capacity issue is the declining number of railroads in the country and the resulting danger that this could eventually lead to a reduction in the amount of capacity and service available to the shipping public as well as to reduced competition among railroad companies.

At the present time and for the foreseeable future, the capacity of the railroad system should be sufficient to handle substantial increases in exports from Minnesota to the Pacific area.

An accessibility problem exists in some smaller locations in the state that have lost rail service. However, west coast ports are accessible to Minnesota exporters by railroad via the several western railroads that serve directly from Minnesota or by interchange with Minnesota carriers.

Minnesota exporters included in the mail study viewed the railroad industry less positively than the other four modes studied, with below-average ratings for several of the items asked, including cost. The average overall perception rating given to railroads (2.89) was the lowest of the five modes studied.

International Surface Freight Forwarders

International surface freight forwarders participate in arranging straight rail service to west coast ports. As noted previously, there are many forwarders available for exporters to use and the supply of forwarder services should be plentiful, even if exports to the Pacific area increase significantly. In addition, there are no accessibility problems associated with freight forwarders.

Overall Railroad Transportation Capacity

As to overall straight railroad capacity, there is no reason to expect any kind of capacity difficulty in the event that Minnesota exports of manufactured goods increase greatly in the next three to five years, despite a possible problem caused by a reduction in the number of carriers.

MOTOR TRUCK TRANSPORTATION

Motor Truck Carriers

Intercity motor trucking is involved in much of the export international trade of the United States as a carrier to ocean ports. Sometimes intercity trucking is also used to connect exporters with distant airports for connection with air transportation there, such as Minnesota exporters using O'Hare Field in Chicago.

There is considerable intercity motor trucking service available to the shipping public in Minnesota, including LTL and truckload service. The motor trucking industry, in Minnesota and elsewhere, suffers from chronic overcapacity, especially truckload carriers. This situation is not likely to change in the near future. There is little danger that, should Minnesota's exports to the Pacific area increase substantially, there will be a shortage of motor truck capacity to carry the goods to west coast ports or to distant airports.

In general, motor trucking service is the most accessible service among the modes of transportation because it is not

spatially bound to a way such as a track or waterway. This holds true within Minnesota as well.

Minnesota exporters included in the mail study expressed considerable satisfaction with motor trucking service, with above-average ratings on all items asked about and with several over 4.00. Additionally, it had the highest rating on the cost factor of the modes studied. Motor trucking received the highest average overall perception rating (3.86) of the five modes.

International Surface Freight Forwarders

The comments above regarding international surface freight forwarders also apply to those involved with motor truck service and to domestic freight forwarders involved with trucking companies in international trade.

Truck Brokers

Domestic truck brokers are occasionally involved in overseas international shipments moving by water. Because of their economic characteristics, there is little likelihood that truck brokers would be unable to handle future growth in Minnesota export traffic to the Pacific area. Moreover, they are easily accessible to Minnesota exporters.

Overall Motor Truck Transportation Capacity

Should a substantial increase in Minnesota exports to the Pacific region occur, the capacity of the intercity motor trucking system should be able to successfully handle the increase.

INTERMODAL RAILROAD-MOTOR TRUCK (IRT) TRANSPORTATION

Rail Carriers

IRT service has become important in the international trade of the United States, both inbound to the country and outbound to other countries via ocean ports. Despite its success, IRT still accounts for only a small part of the intercity freight traffic in the United States and of total railroad revenue. This, combined with the general overcapacity condition of railroads, indicates that there is plenty of room for expansion of the service. In addition, IRT eastbound traffic from the west coast is greater than IRT westbound traffic to the coast so there is generally a surplus capacity situation westbound, which works to the advantage of Minnesota exporters to the Pacific area.

Therefore, it is difficult to perceive that an increase in Minnesota exports to the Pacific area would result in a capacity shortage of any significance, if at all. This assumes, of course, that rail carriers are willing and able to invest in the required loading and unloading equipment and rail cars and that someone is willing and able to invest in a suitable number of containers.

IRT service is nominally available to all locations in the state, but not in practice. This is because of the cost and time involved in drayage to and from the limited number of intermodal terminals in the area and the problem of out-of-line hauls to and from some parts of the state. Users of IRT service tend to be located relatively close to IRT terminals.

Minnesota exporters participating in the study perceived IRT service less positively than water, air, and motor truck transportation service, but better than straight rail. The cost factor was rated fairly low, at 3.00.

Shippers' Agents

Shippers' agents sometimes become involved in international IRT service. Agents are plentiful in Minnesota, and there should be an ample supply of their services if Minnesota exports via IRT increased significantly in the future. Further, there are no accessibility problems regarding shippers' agents.

Local Trucking Companies

For the reasons given earlier when discussing other modes of transportation, there should be sufficient local trucking company service available to provide the necessary local drayage should a substantial increase in the amount of exports from Minnesota to the Pacific area occur. There are no accessibility problems associated with local trucking.

Overall IRT Capacity

It may be concluded that the IRT system in the United States should be able to handle increases in exports from Minnesota to the Pacific area.

SUMMARY OF CONCLUSIONS

The basic conclusions to be drawn from this study can be summarized as follows: (1) the transportation service from

Minnesota to the Pacific area is sufficient in quantity in all modes, although some problems arise because of the lack of enough air freight service at Minneapolis-St. Paul; (2) the transportation service available is satisfactory in quality in all modes; (3) the transportation service is satisfactory in terms of cost for water and motor truck service and less satisfactory in terms of the cost of air freight, straight rail, and IRT transportation; (4) the transportation service is generally accessible to Minnesota exporters--the problem areas are air service for exporters distant from the Twin Cities, IRT service for exporters located far from IRT terminals, and straight rail service in locations not having track; and (5) the transportation system for the most part should be able to handle a major increase in the quantity of exports to the Pacific region from Minnesota; the possible exception is air freight transportation in terms of both carrier capacity and airport capacity.

REFERENCES

- Air Transport Association of America. Air Transport 1992.
Washington, DC: Air Transport Association of America, 1992.
- "Asian Nations Anticipating Boom, Invest Heavily in New
Airports." Aviation Week and Space Technology, November 11,
1991.
- Association of American Railroads. Rail News Update, November
25, 1992.
- . Rail News Update, December 16, 1992.
- . Railroad Facts. 1992 edition. Washington, DC:
Association of American Railroads, 1992.
- Beargie, Tony. "APL/Sea-Land: 'Keep the Heat On'." American
Shipper, October 1992.
- . "Japan Refutes U.S./EC Charges." American Shipper,
June 1991.
- . "Japanese Concede on Harbor Fee." American Shipper,
July 1991.
- . "Koreans Agree to Concessions." American Shipper,
September 1992.
- Bearth, David P. "Outlook: Never Been Better." Transport
Topics, April 27, 1992.
- Bonney, Joseph. "Like Columbus Discovering America." American
Shipper, May 1991.
- Brady, Caroline. "Another Setback for Los Angeles in Its Massive
'2020' Port Project." Traffic World, August 24, 1992.
- . "California Ports Face Budget Woes as State
Government Ends Its Own." Traffic World, September 7, 1992.
- . "City of Los Angeles Takes \$44 Million from Port as
Industry Officials Howl." Traffic World, February 8, 1993.
- . "Port Expansions at LA, Long Beach Delayed in Snag
with State Regulators." Traffic World, January 21, 1991.
- Brennan, Terry. "Dockside Rail Flourishes in West; Eastern Ports
Find Cost Hard to Justify." Traffic World, January 25,
1993.

Burke, Jan. "Airline-Forwarder Tensions may be Resolved by Partnerships." Traffic World, October 26, 1992.

Burnson, Patrick. "California Port Authorities Continuously Eye Options in Dealing with State Tax Plans." Pacific Shipper, November 9, 1992.

----- . "Cathay Pacific Announces Direct LAX to Hong Kong Freight Service." Pacific Shipper, July 6, 1992.

----- . "Continued Economic Slowdown in Southern California Reflected in Latest Air Cargo White Paper." Pacific Shipper, January 4, 1993.

----- . "Port of San Francisco Loses Significant Portion of Top Maritime Client's Business." Pacific Shipper, August 17, 1992.

Canna, Elizabeth. "APL, OOCL to Share Ships in the Pacific." American Shipper, September 1991.

----- . "Hyundai to Share Ships in Europe-Asia Trade with Sea-Land." American Shipper, July 1992.

----- . "'K' Line, MOL in Transpacific Space Charter." American Shipper, May 1991.

----- . "MOL, 'K' Line Set Service Details." American Shipper, June 1991.

----- . "The Maersk/Sea-Land Deal." American Shipper, May 1991.

CNS Focus, September 1991.

"Con-Way Intermodal Introduces Con-Quest." Pacific Shipper, June 22, 1992.

"DHL Eyes Logistics Markets with \$1.25 Billion Spending Plan" Traffic World, February 15, 1993.

Directory of United States Exporters, 1992. Phillipsburg, NJ: The Journal of Commerce, 1992.

Dornheim, Michael A. "LAX to Remain Prime Gateway Despite Growth of Other Airports." Aviation Week and Space Technology, January 6, 1992.

"Emery Expands Foreign Warehousing." Traffic World, January 18, 1993.

Eno Transportation. Transportation in America. 1992 edition.
Waldorf, MD: Eno Transportation, Inc., 1991.

"FMC Seeks New Data from Four Ocean Lines on Taiwan Trucking
Curb." Traffic World, January 4, 1993.

Foster, Thomas A. "Rough Going for LTL Carriers." Distribution,
July 1992.

----- . "Truckload Returns to Stability." Distribution,
July 1992.

Gordon, Jay. "Intermodal Wins New Converts." Distribution, July
1992.

Gottshall, Ronald G. "Firm but Fair." Traffic World, May 25,
1992.

Harper, Donald V. "Regulation of Aircraft Noise at Major
Airports: Past, Present, and Future." Transportation Law
Journal, No. 1, 1988.

----- . "The Continuing Dilemma of Aircraft Noise."
Transportation Journal, Winter 1988.

----- . Transportation in America. 2nd. edition. Englewood
Cliffs, NJ: Prentice-Hall, Inc., 1982.

Harper, Donald V., and Philip T. Evers. An Analysis of
Intermodal Railroad-Truck Facilities and Services in
Minnesota. Minneapolis: Center For Transportation Studies,
University of Minnesota, 1991.

----- . "Competitive Issues in Intermodal Railroad-Truck
Service." Transportation Journal, Spring 1993.

Horn, Shari. "Tough Standards Included in Oil Pollution Act of
1990 Challenging Tanker Operations." Pacific Shipper,
August 17, 1992.

Horowitz, Rose A. "Ocean Carriers Expect Import Drops to Drive
Price War, Space Sharing." Traffic World, December 31,
1990.

----- . "Ocean Carriers Intermodal Subsidiaries Give Them
Important Competitive Edge." Traffic World, May 27, 1991.

Interstate Commerce Commission. 1991 Annual Report. Washington,
DC: U.S. Government Printing Office, 1992.

"Intra-Asia: Biggest Market of All." American Shipper, July
1992.

"JAL Capitalizes on Travel Boom, Control of Scarce Airport Slots." Aviation Week and Space Technology, May 13, 1991.

James, Robert P. "Environment Plays Growing Role in National Ports' Agendas." Traffic World, September 23, 1993.

-----". "Evergreen's Move Stings Seattle as Export Boom Passes by the Port." Traffic World, February 17, 1992.

-----". "Former Ocean Shipping Lines Sailing Unchartered Free-Market Waters." Traffic World, January 20, 1992.

-----". "Hyundai Shipping Unit Faces Hurdles on Marketing and Political Fronts." Traffic World, April 27, 1992.

-----". "Major Shift in Maritime Economics Induces Most Carriers to Raise Rates." Traffic World, April 8, 1991.

-----". "Oakland Port Commissioners Cut Staff, Refocus Business After Gimpel's Firing." Traffic World, April 22, 1991.

-----". "Oil Pollution Law Seen as Onerous to Shipowners and Port Authorities." Traffic World, September 28, 1992.

-----". "Port of Seattle to Add 339 Acres as Part of 20-Year Expansion Plan." Traffic World, May 13, 1991.

-----". "Proposal to Modify Tariff Filing Raises Ire of Carriers, Some Shippers." Traffic World, July 20, 1992.

-----". "S.F. Port to Alter Two Tunnels for Double-Stacks." Traffic World, April 29, 1991.

-----". "San Francisco Port Loses Twice: Voters Restrict Hotels, Veto Funding." Traffic World, November 19, 1990.

-----". "Sanction Threats Against Chinese Lines Seen as Leverage in Reform Efforts." Traffic World, July 8, 1991.

-----". "Shippers Complaining of New Rate Hikes as Asia-Trade Space Crunch Deepens." Traffic World, June 10, 1992.

-----". "Shippers Warn of Long-Term Effects of Liner Vessel-Sharing Deals." Traffic World, June 1, 1992.

-----". "Tacoma Launches \$450 Million Plan to Triple Port Capacity by 2010." Traffic World, January 21, 1991.

-----". "The Container Revolution Swept Away All Companies Slow to Accept Its Terms." Traffic World, May 27, 1991.

- Journal of Commerce. Journal of Commerce PIERS Port Import/Export Reporting Service, various issues.
- Keeney, Kathy, "Intermodal Market Growing but Underpromoted." Pacific Shipper, February 8, 1993.
- "KLM, Northwest Officials Predict Closer Operations on Horizon." Aviation Week and Space Technology, September 14, 1992.
- Knee, Richard. "APL to Expand Seattle Terminal." American Shipper, January 1993.
- . "NYK Gets Ocean Terminal at Oakland." American Shipper, January 1992.
- . "Outbound-Pacific Stabilization Pact." American Shipper, May 1991.
- . "Seattle's Search for Space." American Shipper, January 1992.
- . "TWRA Plans More Commodity Rate Hikes Sept. 1." American Shipper, September 1991.
- . "TWRA Plans Rate Hikes This Month." American Shipper, January 1993.
- "Los Angeles Still Tops Port Ratings; Long Beach Leapfrogs into No. 2 Spot." Traffic World, April 1, 1991.
- Malkin, Richard. "A Pragmatic View of Airfreight." Distribution, May 1992.
- McKenzie, David R., Mark C. North, and Daniel S. Smith. Intermodal Transportation--The Whole Story. Omaha, NE: Simmons-Boardman Books, Inc., 1989.
- McMahon, Erik S. "An Agency's Annual Analysis." Pacific Shipper, June 11, 1992.
- . "Hyundai Launches Giant Ships, Describes Ambitious Vision of Role in Trans-Pacific." Pacific Shipper, September 7, 1992.
- Mecham, Michael. "Doubling of Asia's Growth will Strain Area's Facilities." Aviation Week and Space Technology, June 1, 1992.
- Muller, E. J. "Forwarders Vs. Brokers." Distribution, June 1992.

- . "Ocean Carriers Are Holding Their Own."
Distribution, July 1992.
- . "Ocean Shipping Gets Rational." Distribution, July 1991.
- . "Ports: Development is Stuck in the Mud."
Distribution, July 1992.
- . "Trends Bode Well for Air." Distribution, July 1992.
- Muller, Gerhardt. Intermodal Freight Transportation. 2nd. edition. Westport, CT: Eno Foundation for Transportation, 1989.
- "New U.S. Russian Maritime Pact Opens New Ports, Bolsters Trade."
Traffic World, May 18, 1992.
- "Oakland Lays Out Building Program." American Shipper, September 1991.
- "Ocean Carriers Rush to Establish Presence in Growing Trade Lane to China." Traffic World, March 15, 1993.
- Official Airline Guides, Inc. OAG Air Cargo Guide. Oak Brook, IL: Official Airline Guides, Inc., March 1-April 3, 1993.
- . OAG Desktop Flight Guide. Worldwide edition. Oak Brook, IL: Official Airline Guides, Inc., March 1993.
- O'Lone, Richard G. "Pacific Coast Airports Seek Niche as Staging Point to Asia." Aviation Week and Space Technology, January 6, 1992.
- Ott, James. "Consolidation of Airlines Threatens Future Competition." Aviation Week and Space Technology, September 16, 1991.
- . "Massive Airline Losses Force Draconian Cuts."
Aviation Week and Space Technology, January 11, 1993.
- . "More Skies to Open as U.S. Signs Pacts." Aviation Week and Space Technology, September 14, 1992.
- Pacific Shipper, ship line schedules, various issues.
- Page, Paul. "Air Carriers Fighting Los Angeles on Referendum Raiding Airport Fees." Traffic World, November 2, 1992.
- . "Global Alliances Key to Surviving More Competitive Aviation Market." Traffic World, December 16, 1991.

- "Port of San Francisco's Pier 80 Container Terminal Improvements Ahead of Schedule." Traffic World, December 14, 1992.
- Proctor, Paul. "Japan's Airlines Anticipate Decade of Strong Growth." Aviation Week and Space Technology, May 13, 1991.
- ". "Oriental Airlines Post Profits of \$2.2 Billion." Aviation Week and Space Technology, November 2, 1992.
- "Public Ports to Spend \$5.4 Billion for Upgrades Over Next Five Years." Traffic World, December 21, 1992.
- "Quantum's Pace Quickens." Railway Age, May 1991.
- "Roadway Introduces Trans-Pacific Service." Pacific Shipper, June 1, 1992.
- Rosenfeld, Ira. "J.B. Hunt Finds Northwest Passage Aboard Burlington Northern Trains." Traffic World, July 1, 1991.
- ". "J.B. Hunt-Santa Fe Honeymoon Has Other Carriers Thinking Marriage." Traffic World, June 3, 1991.
- Sampson, Roy J., Martin T. Farris, and David L. Schrock. Domestic Transportation: Practice, Theory, and Policy. 6th edition. Boston: Houghton Mifflin Company, 1990.
- "Santa Fe, J.B. Hunt Joint Venture Targets Coast-Midwest Intermodal Trade." Traffic World, December 18, 1989.
- "Santa Fe Plays It Both Ways." Containerization Intermodal, May 1991.
- "SCAG Analysts Warn that Restrictions on Future Air Cargo Could Mean Loss of Trade." Pacific Shipper, January 11, 1993.
- Schulz, John D. "Broker-Forwarder Difference Obsolete in Modern Transport Marketplace." Traffic World, March 23, 1992.
- Shaw, Jim. "Development Focus on Container Logistics." Cargonews Asia, May 27, 1991.
- "Singapore Airlines Proposes Multilateral System for Aviation Liberalization." Pacific Shipper, August 10, 1992.
- Solomon, Mark B. "Economics, Capacity, Market History Drive Latest Round of Asian Rate Hikes." Traffic World, March 18, 1991.
- ". "Small Air Freight Forwarders Seek to Fill Air Freight's Void." Traffic World, October 22, 1990.

- Sparkman, David. "Hunt to Begin 2nd Rail Venture; BN is Partner." Transport Topics, July 1, 1991.
- ". "Intermodal Game Has New Rules." Transport Topics, October 26, 1992.
- Spraggins, H. Barry. "Assessing the Feasibility of Double-Stack Rail Service in Smaller Locations--A Model to Study Double-Stack Potential." Proceedings of the Transportation Research Forum, 1990.
- Standard and Poor's. "Railroads and Trucking, Includes Coal Basic Analysis." Industry Surveys. New York: Standard and Poor's Corporation, Vol. 2, October 25, 1990 and February 14, 1991.
- Stephenson, Frederick J. Transportation USA. Reading, MA: Addison-Wesley Publishing Company, 1987.
- Tausz, Andrew. "Integrators Go for Global Contracts." Distribution, October 1992.
- "Trade Analysts and Authors Agree: No End in Sight for Pacific Rim Boom." Pacific Shipper, December 7, 1992.
- Trailer Train Company. Intermodal Market Survey, December 1989.
- Traffic World, October 26, 1992.
- Tyworth, John E., Joseph L. Cavinato, and C. John Langley, Jr. Traffic Management: Planning, Operations, and Control. Prospect Heights, IL: Waveland Press, Inc., 1991.
- U.S. Bureau of the Census. Statistical Abstract of the United States: 1992. 112th edition. Washington, DC: U.S. Government Printing Office, 1992.
- U.S. Department of Transportation. Double-Stack Container Systems: Implications for U.S. Railroads and Ports. Springfield, VA: National Technical Information Service, June 1990.
- U.S. Department of Transportation, Maritime Administration. U.S. Merchant Marine Data Fleet.
- "U.S., Japanese Officials Meet to Head Off Latest Cargo Crisis." Traffic World, October 8, 1990.
- Voorhees, Mark. "\$227 Rate Jumped to \$270." American Shipper, January 1993.

Weart, Walter. "Major LTL Carriers Extend Reach as Off-Shore Alliances Grow." Traffic World, October 26, 1992.

Welch, Nat. "The Future Decade." Georgia Anchor Age, Second Quarter 1991.

Wood, Donald F., and James C. Johnson. Contemporary Transportation, 3rd. edition. New York: Macmillan Publishing Company, 1989.

"World Air Cargo Growth Spurs Need for Freighters." Aviation Week and Space Technology, June 8, 1992.

APPENDIX A

MAIL STUDY QUESTIONNAIRE

University of Minnesota
Carlson School of Management
Pacific Rim Questionnaire

July 29, 1992
Confidential

IN THIS QUESTIONNAIRE, THE TERM "PACIFIC RIM" INCLUDES THE FOLLOWING COUNTRIES: AUSTRALIA, CHINA, HONG KONG, INDONESIA, JAPAN, MALAYSIA, NEW ZEALAND, PAPUA NEW GUINEA, PHILIPPINES, RUSSIA (PACIFIC IMPORTS ONLY), SINGAPORE, SOUTH KOREA, TAIWAN, AND THAILAND.

PLEASE FILL IN YOUR ANSWER OR INDICATE YOUR ANSWER WITH A CHECK OR CIRCLE.

1. Company name: _____

2. Name and title of person completing questionnaire:

Name: _____

Title: _____

3. Site(s) of your company's Minnesota manufacturing and/or processing facility(s) that you are familiar with:

PLEASE ANSWER THE REMAINING QUESTIONS ONLY FOR THE FACILITY(S) NAMED IN QUESTION 3.

4. Total annual sales revenue of the facility(s):

\$ 0 - 499,999 _____ \$ 1 million - 9,999,999 _____ \$25 million - 49,999,999 _____ \$100 million and over _____
\$500,000 - 999,999 _____ \$10 million - 24,999,999 _____ \$50 million - 99,999,999 _____

5. Total number of employees at the facility(s):

Under 50 _____ 75 - 99 _____ 250 - 499 _____ 1000 - 1999 _____
50 - 74 _____ 100 - 249 _____ 500 - 999 _____ 2000 and over _____

6. Principal products manufactured at the facility(s):

7. Does the facility(s) export to countries in the Pacific Rim? Yes _____ No _____ Don't know _____

IF YOU ANSWERED **NO** OR **DON'T KNOW** TO QUESTION 7, PLEASE STOP HERE AND RETURN THE QUESTIONNAIRE IN THE ENCLOSED ENVELOPE. THANK YOU FOR YOUR COOPERATION.

IF YOU ANSWERED **YES** TO QUESTION 7, PLEASE CONTINUE.

8. Total annual sales volume of products shipped to the Pacific Rim:

\$ 0 - 249,999 _____	\$ 750,000 - 999,999 _____	\$20 million - 29,999,999 _____	\$40 million - 49,999,999 _____
\$250,000 - 499,999 _____	\$ 1 million - 9,999,999 _____	\$30 million - 39,999,999 _____	\$ 50 million and over _____
\$500,000 - 749,999 _____	\$10 million - 19,999,999 _____		

9. Do you expect an increase in exports to the Pacific Rim in the next three years? Yes _____ No _____ Don't know _____
If yes, by how much?

0 - 9% _____	30 - 39% _____	60 - 69% _____	90 - 99% _____
10 - 19% _____	40 - 49% _____	70 - 79% _____	100% and over _____
20 - 29% _____	50 - 59% _____	80 - 89% _____	Don't know _____

Comments:

10. Annual transportation costs to ship to the Pacific Rim (include both company operated and for-hire transportation):

\$ 0 - 24,999 _____	\$100,000 - 249,999 _____	\$ 1 million - 4,999,999 _____	\$20 million - 49,999,999 _____
\$25,000 - 49,999 _____	\$250,000 - 499,999 _____	\$ 5 million - 9,999,999 _____	\$ 50 million and over _____
\$50,000 - 99,999 _____	\$500,000 - 999,999 _____	\$10 million - 19,999,999 _____	

11. What criteria are considered when selecting the mode(s) of transportation (both domestic and international) used to export to the Pacific Rim (check only those that are considered)?

Availability at origin point(s) _____	Pickup times _____
Availability at destination point(s) _____	Transit times _____
Availability at equipment _____	Cost _____
Suitability for commodity(s) to be carried _____	Amount of loss and damage _____
Suitability for shipment size(s) _____	Processing of loss and damage claims _____
Adequacy of capacity _____	Communication (tracing, notification) _____
Reliability of service _____	After-sale service _____
Frequency of service _____	Other (please explain) _____

Comments:

14. What size of containers does your facility usually use to ship to the Pacific Rim (check all that apply)?

10 foot	_____	48 foot	_____
20 foot	_____	Other (please explain)	_____
30 foot	_____	Containers not used	_____
40 foot	_____	Don't know	_____
45 foot	_____		

Comments:

15. Please indicate the United States port(s) your company uses to export to the Pacific Rim and your perception of the service provided at the port(s) used (1=poor, 2=fair, 3=average, 4=good, 5=excellent) (answer for all that apply)?

Long Beach, CA	_____	1 2 3 4 5	Seattle, WA	_____	1 2 3 4 5
Los Angeles, CA	_____	1 2 3 4 5	Tacoma, WA	_____	1 2 3 4 5
New Orleans, LA	_____	1 2 3 4 5	Other (please explain)	_____	1 2 3 4 5
Oakland, CA	_____	1 2 3 4 5	Don't know	_____	
Portland, OR	_____	1 2 3 4 5			
San Francisco, CA	_____	1 2 3 4 5			

Comments:

16. What mode(s) of domestic transportation is used to reach the United States port(s) (answer for all that apply)?

Truck to port	_____	% of total water volume	_____	Domestic carrier(s) used	_____
Rail to port	_____	% of total water volume	_____	Domestic carrier(s) used	_____
Intermodal rail-truck to port	_____	% of total water volume	_____	Domestic carrier(s) used	_____
Other (please explain)	_____	% of total water volume	_____	Domestic carrier(s) used	_____

Comments:

19. Indicate the United States airport(s) your company uses to export to the Pacific Rim and your perception of the service provided at the airport(s) used (1=poor, 2=fair, 3=average, 4=good, 5=excellent) (answer for all that apply)?

Anchorage, AK	_____	1 2 3 4 5
Chicago, IL	_____	1 2 3 4 5
Los Angeles, CA	_____	1 2 3 4 5
Minneapolis/St. Paul, MN	_____	1 2 3 4 5
San Francisco, CA	_____	1 2 3 4 5
Seattle/Tacoma, WA	_____	1 2 3 4 5
Other (please explain)	_____	1 2 3 4 5
Don't know	_____	

Comments:

20. What mode(s) of domestic transportation is used to reach the United States airport(s) (answer for all that apply)?

Truck to airport	_____	% of total air volume	_____	Domestic carrier(s) used	_____
Rail to airport	_____	% of total air volume	_____	Domestic carrier(s) used	_____
Intermodal rail-truck to airport	_____	% of total air volume	_____	Domestic carrier(s) used	_____
Other (please explain)	_____	% of total air volume	_____	Domestic carrier(s) used	_____

Comments:

21. What international airline(s) is used to export to the Pacific Rim?

Comments:

22. What is your perception of the water, air, motor truck, railroad, and intermodal rail-truck transportation service to the Pacific Rim? Please answer only for those modes and items with which you are familiar. Circle the appropriate number (1=poor, 2=fair, 3=average, 4=good, 5=excellent).

	Water	Air	Motor Truck	Railroad	Intermodal Rail-Truck
Availability at origin point(s)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Availability at destination point(s)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Availability of equipment	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Suitability for commodity(s) to be carried	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Suitability for shipment size(s)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Adequacy of capacity	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Reliability of service	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Frequency of service	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Pickup times	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Transit time	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Cost	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Amount of loss and damage	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Processing of loss and damage claims	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Communication (tracing, notification)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
After-sale service	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Other (please explain)	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Overall perception	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Not acquainted with the service (check)	_____	_____	_____	_____	_____

Comments:

23. When arranging for transportation service to the Pacific Rim, with whom do you usually deal (check all that apply)?

Carrier _____ Freight forwarder _____ Shipper's agent _____ Don't know _____
Freight broker _____ NVOCC _____ Other (please explain) _____

Comments:

24. How do you rate the services of the agency(s) listed below that you deal with (answer for all that apply)? Circle the appropriate number (1=poor, 2=fair, 3=average, 4=good, 5=excellent).

Carrier	1 2 3 4 5	Don't know _____
Freight broker	1 2 3 4 5	Don't know _____
Freight forwarder	1 2 3 4 5	Don't know _____
NVOCC	1 2 3 4 5	Don't know _____
Shipper's agent	1 2 3 4 5	Don't know _____
Other (please explain)	1 2 3 4 5	

Comments:

Do you have any other comments about transportation to the Pacific Rim?

Thank you for your cooperation.

If you would like to receive a summary of the results of this study, check here _____.

