A COMPARATIVE ANALYSIS OF BARGESHIP SYSTEMS: WITH EMPHASIS ON THEIR IMPACTS ON UNITED STATES SEAPORTS AND INLAND PORTS

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ABSTRACT

A COMPARATIVE ANALYSIS OF BARGESHIP SYSTEMS:
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UNITED STATES SEAPORTS AND
INLAND PORTS

By

Kenneth M. Bertram

This dissertation's purpose was to increase the organized knowledge of bargeship systems in the United States. A comprehensive, organized compilation and presentation of all recent literature relating to these new systems was made. This information was then combined with analyses which compared bargeship systems to the other two major general cargo vessel systems, containerships and conventional ships, and determined bargeship system's to-date and anticipated impacts on the nation's seaports and inland ports.

The comparative bargeship system impacts studied were primarily those of U.S. major seaport general cargo volumes and investments, and the international cargo expectations of U.S. inland ports. Null hypotheses in each of these areas were tested, and many additional relevant analyses were made.

The primary data sources were separate sets of four questionnaires sent to the nation's seaports and inland ports. The latter population also included both the nation's minor general cargo seaports, which were classified as functional inland ports and defined as those ports located on seacoasts with volumes less than 1,000,000

current annual long-tons of general cargo, and inland terminal companies performing essentially as public ports. The methodology utilized combined accounting and statistical principles and techniques. Near-population data was acquired for the tests of seaport hypotheses, and approximately one-half of the inland port population responded.

A null seaport investment hypothesis was disproven, with required bargeship system implementation investments generally being found to be far less than those of containership systems. Specifically, this was the case for such investments on a direct absolute cost basis, direct plus indirect absolute costs basis, and direct cost basis relative to cargo volumes handled. The situation in which bargeship and containership system investments were roughly equivalent was on a direct plus indirect cost basis relative to cargo volumes handled.

A null seacoast relative utilization hypothesis was also disproven, and the Gulf Coast was shown to have both a far higher current and expected utilization of bargeship systems than the East and West Coasts. Gulf Coast bargeship system volume is at a level of approximately 19.8 percent of total general cargo volume representing about 3,500,000 long-tons per year, versus about 1,000,000 each on the East and West Coasts, which amounted to 2.2 and 3.8 percent of their respective general cargo volumes.

A null inland port hypothesis on expectations was also disproven because 19 inland ports, or a minimal 8.6 percent of the population of 221, were found to expect significant increases in their international cargo volumes because of bargeship systems. While these 19 disprove the hypothesis in general, research also found that 68 of 112 respondents did not expect any bargeship system traffic within three years, and the majority of these cited very high probabilities against such traffic. At the same time, 54 of 112 respondents either had bargeship system traffic (36) or expect it (18) within three to five years.

Much other important information was gathered through the questionnaires which was related to the above hypotheses. Regarding major seaports, it was found that the "average" U.S. port expecting bargeship systems by 1978 expected such traffic to comprise 16.3 percent of its general cargo traffic versus 8.1 percent in 1973. In a pattern similar to that shown in the seacoast utilization hypothesis test, the average Gulf Coast seaport expected the bargeship system share of its total general cargo traffic to increase to 22.7 percent by 1978, with 10.5 and 10.3 being the respective percentages on the East and West Coasts. Containership system shares were also expected to grow at the average port on all three coasts, exceeding even the conventional ship share on the East and West Coasts by 1978, and approximately equaling it for the United States as a whole.

The 36 inland ports with bargeship system traffic estimated 1973 bargeship system traffic at about 1,220,000 long-tons in 1973 versus 822,000 long-tons in 1972. In addition, this traffic was estimated at maximums of about 2,500,000 and 4,000,000 long-tons in 1978 and 1983, respectively. Comparisons were also made between to-date and expected inland port volumes of international cargo movements via bargeship barge and other international shipping systems. Bargeship barges were found to have considerably more volume and potential than waterborne container movements but less than international non-container movements. Bargeship system investments at inland ports were found to be generally included in those designed to increase overall traffic, rather than being specifically designed for these systems.

Analyses of the factors influencing bargeship systems by coastal region and at seaports and inland ports were also performed. The number of inland waterway miles of a coastal region was found to have a major influence on the amount of bargeship system traffic experienced by that region. For instance, the more heavily utilized Gulf Coast was found to have 14,383 miles versus 7,002 and 3,575 on the East and West Coasts, respectively. Similarly, the lack of entrenched, sophisticated containership systems on the Gulf Coast, when combined with its heavy flows of agricultural, non-containerizable commodities and the above-mentioned inland waterways, were found to encourage this traffic in this region, whereas opposite situations were found for the East and West Coasts.

Analyses of seaport and inland port opinions regarding factors encouraging and discouraging bargeship system traffic were also performed. These resulted in findings which, while not enabling absolute rankings, gave insights into how different factors were viewed by ports as a whole and by their coastal location and bargeship system traffic status.

Based on this research, the author recommends that United States foreign policy encourage and help to develop bargeship systems in the world's underdeveloped countries, particularly those with situations similar to that of the Gulf Coast. This recommendation is supported by the findings that bargeship systems require far lower direct port investment costs and a far smaller scale of implementation than containerships.

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In addition, I would like to thank all of the individuals at the nation's seaports, inland ports and terminal companies, and Chambers of Commerce who responded to this study's questionnaires. Their contributions were essential to the organized knowledge set forth herein.

Similarly, a special thanks goes to Mrs. Grace Rutherford for her professional typing efforts on this project. Her expert and timely performance, especially on the multitude of difficult tables herein, were invaluable to the successful completion of the study.

Finally, I would like to express my deep gratitude for the constant support and encouragement of my family and friends during this project. Being well loved by my parents and brother was one of my most important assets during this endeavor. Similarly, I consider myself quite fortunate to have been another major beneficiary of the matter-of-fact confidence of my brother's wife in the Bertram mold.

TABLE OF CONTENTS

LIST OF TABLES

Table		Page

Table | Page

Table		Page

LIST OF FIGURES

CHAPTER I

THE TOPIC

Introduction

The purpose of this research is to analyze and compare barge-carrying vessel systems versus containership and conventional ship systems, with primary emphasis on their impacts on United States seaports and inland ports. The analyses and comparisons herein are designed to show both the structural and financial differences between alternative distribution systems at individual seaports, as well as the effects which the economic and geographic characteristics of the different coasts can have on these systems. In addition, the most recently developed of these vessel types, bargeships, are analyzed regarding their effects on inland ports.

As is set forth in detail in the literature search chapter which follows, many claims have been made in recent years concerning the growing importance of bargeship distribution systems. These systems, while an extension of the containerization concept, nonetheless exhibit some major differences when compared with those of containerships, not to mention conventional ships. While many of these differences have received extensive treatment in the government studies mentioned in the second paragraph to follow and discussed in detail in the literature search's section on existing analyses of ship-based distribution systems, others have not, especially regarding the aspects contained in this dissertation's hypotheses.

This dissertation has been undertaken because of the continuing need for comparative and impact analyses generated by the continuing growth of the bargeship as a major shipping system after the studies which have been made concerning it. While estimates and expectations play a large part in this dissertation because of the newness of bargeship systems and the lack of data in many areas concerning them, as in the previous studies, the inevitability of the future impacts of this system motivated this dissertation's primary research into the extent and magnitude of these impacts for both seaports and inland ports. In addition, the basic absence of an extensive compilation of the literature concerning bargeship systems and their relationship to other shipping systems, seaports, inland ports, other inland transport modes, labor unions and government has motivated the gathering of this knowledge in this dissertation.

Further reasons for this research arise from the following facts: (1) bargeships have emerged as a major new form of ocean shipping, comprising over one-fifth of all ships currently under construction or conversion in the United States;[1] and (2) of all the government sponsored studies[2] in this area, none of them analyze:

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[1]"Modernization of U.S. Merchant Fleet Includes 49 Ships for Linear Trade," Container News, December, 1971, p. 15.

[2]Matson Research Corporation, The Impact of Containerization on U.S. Economy, Vols. I and II (San Francisco: U.S. Department of Commerce, September, 1970); Maritime Cargo Transportation Conference, Inland and Maritime Transportation of Unitized Cargo (Washington, D.C.:

(a) the individual respective capital investments required by coastal ports to accommodate each of the three vessel system types; (b) the up-to-date or anticipated effects of barge traffic (with or without containers) from barge-carrying vessels on inland ports; (c) the effects of the geographical, economic, and transportation characteristics of seaport hinterland areas on the three vessel system types; (d) the effects of bargeship barges on the other inland transport modes. The set of facts under two above represents research gaps in the knowledge of maritime competition and its supporting U.S. domestic distribution systems. This research is directed toward filling all but the last of these gaps, as is explained in the next paragraph.

These research gaps have arisen largely because of the impacts and anticipated impacts of bargeship systems. Seaports, for example, need no longer make massive investments in port facilities in order to participate in efficient containerized cargo movements when such cargo is carried via bargeships[1]--yet New Orleans is making a major investment to facilitate bargeship cargo movements through its port now,[2] though

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National Academy of Sciences, 1963); Planning Research Corporation, Transoceanic Cargo Study, Vols. I, II, and III (Los Angeles, Calif.: U.S. Department of Transportation, March, 1971); and United Nations, Unitization of Cargo (New York: United Nations, 1970); Southern Illinois University, A Study of River Ports and Terminals (Carbondale, Ill.: Southern Illinois University, June, 1968); and Manalytics, Inc., The Impact of Containerization on the United States Transportation System, Vols. I and II (San Francisco: U.S. Department of Commerce, February, 1972).

[1]Bohdan Nagorski, "Port Problems in Developing Countries," Dock and Harbour Authority, May, 1971, p. 11.

[2]"Gulf Ports Outlook--New Orleans," World Ports, May, 1972, p. 10.

such cargo has long since been moving through it.[1] The reasons behind these events, plus the well recognized fact that efficient standard container movements through seaports require massive port capital investments,[2] impelled the close investigation made herein. Similarly, the fact that because of bargeships, United States inland ports were for the first time considering themselves potential international ports[3] merited similar, careful analysis. In addition, it is generally recognized that the through movement of containers inland maximizes the efficiency of containerization by eliminating rehandling of container contents. Therefore, since inland waterway networks are required to accommodate the movement of bargeship barges (often called "floating containers")[4] inland, analyses of the flows of each general cargo vessel types through coastlines with (the U.S. Gulf Coast) and without (the U.S. East and West Coasts) such waterway networks, as well as other differing economic and transportation system characteristics were effected insofar as obtainable data allowed. Finally, since the effect of bargeship barges on other inland transport modes is a subject of sufficient complexity to constitute an entirely separate dissertation,

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[1]United Nations, Unitization of Cargo, op. cit., p. 13.

[2]"Coming Role in Barging in Marine Container Operations," Waterway Economics, April, 1969, in reprint of vols. II-IV, January, 1970, p. 62.

[3]"New Marine Systems Bring Containers to Inland Ports," Traffic Management, July, 1970, p. 63.

[4]Jerome L. Goldman, "How LASH Was Born--LASH Inventor Describes His System to ICHCA," ICHCA Journal, April, 1970, p. 9.

only limited, illustrative investigations of this area were made in this research, in order to indicate the relative significance of bargeship barges as an inland transport mode.

The basic methodologies utilized in this research were a literature search, questionnaires, direct correspondence and telephone calls, and statistical, comparative, summary tables and tests. The literature search was used to present a comprehensive, organized compilation of the secondary information relevant to the topic area. Questionnaires were used to analyze the United States seaport and inland port traffic and investment situations regarding bargeship and other alternative systems. Direct correspondence and telephone calls were used to refine and help interpret questionnaire results. Finally, statistical tables and tests were used to organize, analyze, and present questionnaire results.

Bargeships Described and Defined

As the newest and least known of the vessel types studied in this research, bargeships warrant early individual treatment with regard to describing their characteristics and defining them for the purposes of this study.

There are two different types of bargeships currently in operation or under construction, LASH and SEABEE. LASH is an abbreviation for lighter-aboard-ship. SEABEE is not an abbreviation. LASH ships are by far the most numerous of the two, comprising 24 of 27 bargeships currently in operation or under construction.[1] One major difference between LASH and SEABEE ships is the size barge they are designed to carry, the former's barges being 13' x 31' x 61' and holding approximately 370 long-tons of cargo each. The latter's are 17' x 35' x 97' and hold approximately 850 long-tons of cargo each. However, since LASH ships carry up to 89 barges, whereas SEABEES' ships carry 38 of the larger barges, their cargo-carrying capacities are roughly equivalent.

Both LASH and SEABEE ships may carry various combinations of barges and containers. Both have huge cranes for handling barges. LASH cranes are movable gantry-type and have a 510 long-ton (one loaded LASH barge) capacity, while the SEABEE cranes are elevator-type, located at the rear of the vessel, and have a 2,000 long-ton capacity, enabling them to lift two SEABEE barges or sets of eight forty-foot containers (on special container pallets) at one time.[2]

Additionally, both LASH and SEABEE ships can be equipped with gantry-type container cranes, enabling simultaneous handling of barges and containers. LASH and SEABEE ships differ in their stowage patterns. A vertical stowage configuration accommodates the LASH traveling gantry-type barge crane, with barges being stowed atop one another. SEABEE

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[1]Maritime Administration, Bargeship and Shipbarge Informational Data (New Orleans, La.: U.S. Department of Commerce, February, 1972), p. 7.

[2]U.S. Army Mobility Equipment Command, Comparative Analysis of the Multi-Mission Ships (MMS) and Multi-Purpose Ship (MPS) (Norfolk, Va.: U.S. Army Mobility Equipment Command, September, 1971), p. 36.

vessels, on the other hand, store cargoes horizontally below the main deck, utilizing a mechanically operated transporter wheel system to move the barges which the elevator-type crane has lifted to the desired height. Once a barge is in position, this conveyor-type system moves it longitudinally into its desired position on the appropriate one of the ship's three interior deck levels.[1]

In many ways, bargeships are similar to containerships. Like larger containerships, bargeships are between 800 and 900 feet long, can be completely loaded or discharged in about one day, carry tonnages between 25,000 and 32,000 long-tons, have operating speeds slightly in excess of twenty knots, and have "freight rates between ports generally the same as those filed by both containership and conventional ship operations."[2] Similarly, depending on their size, bargeships and containerships vary in cost between \$15 and \$30 million each.[3] Finally, for both larger bargeships and containerships, reduced time spent in port plus their faster steaming speeds results in each one of them equaling up to five conventional ships in yearly tonnage capabilities.

Because of their unique abilities to carry and handle barges as well as containers, bargeships are defined in this research as basically different from containerships. The definition is as follows:

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[1]Maritime Administration, "The Impact of Bargeship Systems on Traffic Management in Foreign Trade (unpublished slides presentation; New Orleans, La.: U.S. Department of Commerce, n.d.), pp. 18-21.

[2]*Ibid.*, p. 24.

[3]"Modernization of U.S. Merchant Fleet Includes 49 Ships for Linear Trade," *op. cit.*, p. 15.

Bargeships are those vessels capable of carrying both barges and containers, and are able to load or discharge barges not only at a pier but rather at any appropriate anchorage in a harbor area.

Other Definitions

In addition to bargeships, certain other terms utilized in the description of this research require complete understanding in order to prevent misinterpretations. This section is devoted, therefore, to the clarification of the following additional critical terms: conventional ships; break-bulk cargo; containerships; van containers; vessel systems; U.S. domestic distribution systems; distribution system components; distribution system sub-components; East, West and Gulf Coast seaports; inland ports; and inland transport modes.

In this study, conventional ships are those possessing only break-bulk cargo carrying capability. Break-bulk cargo includes individual packages, palletized or similarly unitized cargo, and vehicles which are lifted on and off the ship. Containerships are those which transport 20-foot or longer van containers. There are two sizes of these containerships--full-sized, which carry 300 or more van containers; and mini-ships, which carry under 300 van containers. Van containers are 8' x 8' x 20' or longer rectangular modules constructed of steel, aluminum or similar materials. All three vessel types are considered vessel systems which are combined with the inland distribution systems defined below.

Strictly U.S. domestic distribution systems are analyzed in this research. The terminology "distribution systems" has been used instead of "shipping systems" because these systems include not only the point-to-point transportation movement found in the latter, but also functions found in the study of physical distribution management such as storage and handling. The word "inland" is used interchangeably with "domestic" in referring to these distribution systems since both indicate the inland portion of international cargo movements, and the former has a more universal and less provincial connotation. Finally, only those U.S. domestic distribution systems beginning or ending with East, West and Gulf Coast ports are examined, as those are the distribution systems which support the ocean-going vessel types studied here.

These U.S. domestic distribution systems consist of a set of participating system components. Distribution system components are those organizations which are involved in the handling, storage, and transportation of goods as well as the administrative functions associated with the delivery of goods from the original producer to and through seaports for export, or through and from ports to the consignee in the case of imports. These components are grouped geographically and functionally in order to aid in understanding them and the larger systems of which they are a part. Sub-components are the parts of these components and are delineated and analyzed when their component is analyzed. It is emphasized here that in the analysis of these distribution systems and their components, port movement of goods either begins when the ocean-going vessel enters its first U.S. port-of-call, or ends when the vessel embarks on a direct course toward an overseas destination.

East, West and Gulf Coast seaports here include all ports along these seacoasts functionally capable of berthing full-sized conventional ships, containerships, and bargeships--and thus considered "major" in the dissertation hypotheses. Inland ports in this study are those ports either geographically located inland, or located on one of the above seacoasts but not presently functionally capable (due to insufficient facilities or relevant volume) of handling full-sized containerships or bargeships, and therefore performing the functions of an inland port. Regarding sufficient relevant volume, one million current annual long-tons _not_ consisting of predominately bulk-carrier (irrelevant to this study) cargoes, was set as the cut-off point. Inland locations included those on the Great Lakes, whose St. Lawrence Seaway cannot accommodate full-sized containerships and/or bargeships.

Inland surface transport modes include all the surface means of transportation utilized to deliver goods to or from the above ports. This includes barge, rail, and truck. Airlines are completely exempted from this study since they almost never compete or coordinate with barges due to the vastly different operating characteristics of the two modes, and analyzing the relationship between LASH barges and other modes is the reason for this definition.

Hypotheses

Hypothesis number one is that there is no difference in major seaport (component) investments required to implement bargeship versus containership and conventional ship domestic (inland) distribution systems under any conditions. Here the purpose, utilizing the null hypothesis technique, was to determine if different seaport investments are required for each of these vessel's inland distribution system, if certain investments are difficult to allocate to a particular system due to commonality of usage, if distinctions must be made between investments which are required to support a vessel's inland distribution system and those which merely facilitate such a system, and if differing investments may be required for the same vessel inland distribution system under different conditions.

Hypothesis number two is that bargeship systems have had no effect on the international traffic volume expectations of inland ports. Here the hope was to determine whether there have been significant positive changes in the international traffic volume expectations of many inland ports, whether many inland ports have already experienced either significant or at least initial encouraging volume changes which buttressed those expectations, and whether some of these ports (inland distribution system components) are making investments in facilities (inland distribution system sub-components) to support anticipated and/or real increased cargo movements. Also investigated were factors upon which the realization of such volume increases was contingent, including whether a given inland port's hinterland commodity and product needs and outputs were suitable for international movements via bargeship barge, whether reciprocal demand for international products was required from these ports, and whether there were or will be sufficient numbers of bargeship system barges available for serving expectant inland ports. Finally, determinations were made concerning the influence of "mini-containerships" at those select inland ports with sufficient waterway depth to accommodate them, as well as the influence of international containers shipped inland on conventional barges.

Hypothesis number three is that there is no difference between the U.S. East, West and Gulf Coasts regarding their relative utilization of the bargeship versus containership and conventional ship systems. The goal here was to determine whether the bargeship system share of major ports' total general cargo volumes varied by U.S. coastline. Also analyzed here were various geographic, commodity, flow, and transportation network characteristics of each coastline in order to attempt to gain insights into some of the probable causes of any utilization differences. Finally, future volume expectations were also secured and similarly compared.

Finally, it should be noted that after careful consideration by the author and the members of his dissertation committee, it was decided to limit the dissertation's hypotheses to the above three and not to hypothesize or enter into any involved investigations regarding the highly complex and controversial area of how bargeship barges may affect the other inland transport modes, namely rail and motor carriers. This latter area was considered to be of sufficient magnitude to constitute an entirely separate dissertation, and that to treat it as a part of this dissertation would therefore be inappropriate. Furthermore, it is recognized that the absence of the inland transport intra-modal competitive aspects of this area limits this study's contribution to public policy decisions to strictly a compilation and presentation of data, conclusions and recommendations regarding the positions of U.S. seaports and inland ports as they relate to the development of the international cargo vessel systems here studied. While investigation of the comparative effects of these vessel systems on inland transport modes is highly recommended here, it is beyond the scope of this research to do more than indicate in its literature search that some such effects do exist and warrant future investigation. It is emphasized, however, that the above statements do not imply that the often critical role of intermodal cooperation in the efficient development of distribution systems using various forms of containerization is ignored in this research. To the contrary, its asserted and proven importance is treated in depth wherever appropriate in the literature search.

Similarly, those readers interested in quantitative analysis of alternative methods and modal choices for transporting containers inland are referred to the Relevant Studies' Findings section of the Literature Search chapter. Included there are discussions of two extensive government sponsored studies into this area. The first was the one by Matson Research Corporation cited on page 3 and includes diagrammatic and cost analysis of such alternatives. The second was by Manalytics, Inc. and includes a model which "involves a computer program for evaluating the prime measures of any [container] transportation system: costs, man hours, and elapsed time."[1]

Implementing Tasks

Inherent in the foregoing hypotheses and related investigations were numerous implementing tasks. For the respective hypotheses these were discerned to be as follows:

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[1]Manalytics, Inc., The Impact of Containerization on the United States Transportation System, Vol. I (San Francisco: U.S. Department of Commerce, February, 1972), p. 24.

Hypothesis 1

A. Determine the recent (within 10 years) and planned investments required by major individual U.S. seaports directly required to implement bargeship, containership and conventional ships systems.

B. Determine, insofar as possible, the extent to which recent (within 10 years) containership and conventional ship investments are utilized regularly by bargeship systems.

C. Determine, insofar as possible, the extent to which bargeships utilize old, unmodified, already existing facilities which could not be considered directly or indirectly required for bargeship system implementation *per se*.

D. Compare the seaport investments required for implementation of bargeship, containership and conventional ship systems, performing the cost allocations and exclusions appropriate in tasks A, B, and C.

Hypothesis 2

A. Determine the experience and expectations of inland ports with respect to international cargoes moving through them via bargeship barges.

B. Determine the investments in facilities or other actions which have been made or are planned by these inland ports in order to facilitate such cargo movements.

C. Determine how the actual and expected international cargo movements through each inland port compare with the port opinions regarding factors influencing such traffic, the port's location with regard to rail, motor and barge services, hinterland supply and demand characteristics, and distance from a seaport.

D. Determine the importance of "mini-containerships" and international container movements via conventional barges at inland ports.

Hypothesis 3

A. Determine, insofar as possible and using estimates if necessary, the respective bargeship (in barges versus containers), containership, and conventional ship volumes of the U.S. East, West and Gulf Coasts. In this way, attempts were made to indicate the degree to which each of the three vessel types serve the three coasts, as well as indicate barge versus container usages.

B. Determine the geographic characteristics of the three coastlines, especially in terms of extent of inland waterway networks. Also obtain relevant data on the percentage of each's economy which is non-agricultural versus agricultural, which ports have international traffic in manufactured goods versus raw materials versus agricultural commodities, and the number of serving bargelines for each port and seacoast.

C. Determine port opinions regarding factors influencing bargeship traffic through their location.

D. Compare results found in A B and C above.

Implications

The major implications of testing the first hypothesis were expected to lie in a better knowledge and understanding of the three vessel systems as they currently relate to major U.S. seaports, as well as in an indication of what will probably occur when underdeveloped areas are increasingly opened up to modern ocean shipping systems. For instance, it was anticipated that bargeship systems might be proven more suitable for seaports in underdeveloped areas, because of lower investments required by these ports for these systems than containership systems.

Regarding the second hypothesis, the main implication of its test was expected to be greater knowledge and understanding of the current situation and future expectations of inland ports regarding international cargo flows via bargeship barges through them. For example, it was expected to be proven that there are small but growing amounts of such cargoes currently flowing through these ports as a whole, and that some of them are experiencing far more activity in this area than others due to various locational, economic, and product characteristics. In addition, by studying the effects of bargeship systems on U.S. inland ports, some knowledge of the probable effects of these vessels on inland ports in currently underdeveloped areas served in the future was expected to be obtained.

Testing the third hypothesis was intended to increase the knowledge of the state of the current and anticipated situations regarding the relative utilization of bargeship systems by major

U.S. ports according to seacoast, as well as how such utilizations compare with the geography, agricultural versus industrial economic orientations, and transportation networks of these coastal regions. Assuming at least some meaningful estimates of major seaport volumes by vessel system could be achieved, such comparisons were expected to shed light on how the latter characteristics appear, using logical inferences, to affect the suitability of a coastal area for this study's three vessel systems.

It should be noted here, however, that while the above hypotheses and their implications are important to this study, they are only part of its overall contribution. The organized, comprehensive compilation of knowledge in the Literature Search chapter is also important. Similarly, much other useful information was sought in the study's questionnaires which was related to, but not part of, the hypotheses tests. All of these information sources were expected to enable an integrated, multi-faceted analysis of the comparative impact of bargeship systems on the nation's seaports and inland ports.

Finally, the opinions of U.S. seaports and inland ports sought by the questionnaires with respect to the factors which encourage and discourage bargeship traffic at their location, were expected to yield further insights regarding which factors are thought to affect the bargeship traffic suitability of a location or area.

CHAPTER II

LITERATURE SEARCH

Introduction

This chapter is composed of two parts: (1) a description of the procedures used and sources consulted during conduct of the dissertation's literature search, and (2) a summary of the information gathered during this secondary research concerning the alternative distribution systems, their components, and relevant exogenous forces.

The first part is self-explanatory. Regarding the latter, initial emphasis is placed on giving the reader an overview of the historical, current, and projected situations of barge-carrying vessel and containership systems, with secondary attention given conventional ship systems for comparative purposes only. Next is a discussion of the domestic components of these distribution systems which receive primary emphasis in this dissertation, namely U.S. seaports and inland ports. Finally, the inland transport mode components, the labor and legislative situations influencing the distribution systems, and the relevant findings of existing studies are discussed.

Sources

Relevant material was gathered in this literature search through the use of reference sources and direct correspondence with organizations involved with the topic area. Reference sources included Dorothy V. Ramm's Containerization bibliography from 1965 through 1970, the Guide to Business Periodicals from 1969 through the current date, Northwestern University's Current Literature in Traffic and Transportation from 1971 through the current date, and the Maritime Research Information Service's MRIS Bulletin from January 1971 through June 1973. Organizations contacted for their available information included most seaports and inland ports serving the U.S. East and Gulf Coasts, the U.S. Department of Transportation, Federal Maritime Commission, Federal Maritime Administration, Interstate Commerce Commission, Association of American Railroads, American Trucking Associations, Inc., and the American Waterway Operators, Inc.

Unfortunately, though contact was made with the two most experienced LASH vessel operators to date, neither could be of substantial assistance due to the confidentiality of information required by competitive considerations.

Finally, recent editions (1969 to present) of scholarly publications such as Dissertation Abstracts, Harvard Business Review, and Journal of Marketing were also covered, in order to insure the originality of the subject area. Though two dissertations were discovered in the abstracts which analyzed subjects relevant to this research,[1] nothing was found which threatened its originality.

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[1]William F. Schoell, III, "Causes and Effects of the Recent Growth in Barge Transportation: With Emphasis on the Period 1953-1964" (University of Arkansas, 1969), in Dissertation Abstractions International, Sect. A, Vol. 30, No. 7, January 1970, pp. 2699A-2700A; and

All researched material was recorded, retained, and categorized according to sub-topic area of interest for the reader of this dissertation. The following sections of this chapter treat each sub-topic area in depth.

Vessel Systems

Barge-Carrying Vessels

Barge-carrying ships, as containerships before them, were developed in response to inefficiencies in the operations of conventional ship systems. The creator of the LASH system, Jerome L. Goldman, describes the reasons for his invention as follows:

> . . . the origin of LASH goes back 18 years. . . . I became strongly convinced the conventional cargo liner design required major improvements in the area of cargo handling costs and port turnaround time.[1]

The ship which Mr. Goldman designed in response to this need combines the elements of barging and standard container operations, i.e., it is capable of carrying both. On certain ships, containers may only be carried in barges, on others a separate container handling and storage facility is designed into the ship's superstructure. LASH ships operating off the U.S. East and West Coasts have a container crane and a 500 short-ton capacity elevator-type crane which lifts and lowers from and to the water the system's 370 long-ton capacity barges (long tons

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Vernon C. Sequin, An Investigation of the Factors Inhibiting Growth of Containerization in Domestic Surface Freight Shipments, Michigan State University, 1971.

[1]Jerome L. Goldman, "How LASH Was Born--LASH Inventor Describes His System to ICHCA," ICHCA Journal, April 1970, p. 4.

and short tons have a very slight weight difference). Many LASH ships which operate off the U.S. Gulf Coast have just the barge crane, a fact which will receive greater emphasis in analysis of the suitability of these coasts for bargeship operations. The barge crane is capable of loading and discharging one barge every fifteen minutes from any location within the port area, not necessarily at a pier. The system's barges may be loaded or discharged using conventional gear except when their cargo includes containers or other very large items, at terminals located either within or near the seaport area, or at inland river port locations after being towed there either singly or several at a time in integrated tows.

Several statements have been made about the advantages of the LASH system, with the following being clearest, albeit incomplete:

1. The LASH system will leap-frog port congestion by leaving her inbound barges to wait for unloading opportunity, proceed immediately on her voyage with loaded outbound barges, and thereby spend more productive time at sea. Her cargoes are delivered sooner.

2. LASH will eliminate the necessity for exporters or importers making large capital expenditures for new warehouse and dock facilities.

3. The LASH system can service small river and canal ports which are now inaccessible to ocean-going vessels. A saving in inland transportation costs results.

4. The LASH system will mean a substantial reduction in the number of times cargo must be handled. The result is less claims, and, in turn, lower insurance premiums.

5. The LASH system will make possible a steady, regular flow of goods to the market place, thereby enabling substantial reductions in inventory. This, obviously, means working capital freed up for other purposes and lower interest charges.

6. The LASH system will speed up delivery of cargo by eliminating delays enroute. The number of ports of call of the ocean-going vessel will be reduced to a minimum and so will port time--barges will be placed in the water promptly on arrival at each, port, and distributed to loading or discharging docks without delay. All receivers should, therefore, receive their cargo at about the same time rather than the receiver at the first port, whose cargo is on top, get delivery first, while the receiver at the last port with his cargo on the bottom getting delivery perhaps two or three weeks or more later.

7. The LASH system will offer a thru [sic] Bill of Lading, reducing paper work, and facilitating clearance and entrance of cargo.[1]

Additionally, the following advantages have been claimed for LASH: reduction in fleet investment costs; almost the complete elimination of bad weather port delays; reductions in pilferage and overstow problems; straight-time stevedoring of lighters, which only remain in port instead of the ship, reducing overtime.[2]

While union and other problems (to be covered later in detail) have prevented complete realization of all of these advantages, the viability of the LASH concept and LASH operations have been quite strongly reaffirmed, both in the statements of its operators and customers thus far, and in the extent of the financial investments made in it by both ports and new operators.

Central Gulf Lines, the first LASH operator, negotiated a 10-year contract with the International Paper Company in 1968, in which

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[1]Niels W. Johnson, "LASH System-Revolutionary New Seaborne Transportation," Zosen, May 1969, Uraga Heavy Industries, Ltd., New York, p. 23.

[2]"LASH System Gets Underway," Containerization International, January 1968, p. 19.

the latter agreed to use "eastbound LASH voyages for 250,000 tons of wood pulp and linerboard annually from its Southern plants to customers in the United Kingdom and western Europe."[1] Not only were these operations, which began in October 1969, hailed as highly successful by International Paper personnel on both the American[2] and European[3] sides of the Atlantic after approximately nine months' operations, but these claims are supported by near-capacity shipments on the all-important westbound return movements,[4] without which even the ten-year contract would be unprofitable, and favorable statements by European exporters using this service.[5]

Furthermore, when Central Gulf's two sister ships showed an increase in their 1971 LASH volumes (700,000 tons to Rotterdam--Europort alone),[6] it raised its number of LASH ships on order from one to three, all of which are due for delivery and service in 1974,[7] increasing its fleet size to five. Evidence of the firm's ability to generate

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[1]"New Marine Systems Bring Containers to Inland Ports," Traffic Management, July 1970, p. 64.

[2]Ibid.

[3]J. Fletcher Morris, "Why LASH Makes Economic Sense," ICHCA Journal, August 1970, p. 6.

[4]"New Marine Systems Bring Containers to Inland Ports," p. 64.

[5]"Acadia Forest--A 10 Million Dollar Guinea Pig," Containerization International, July 1970, reprint.

[6]Frans Posthuma, "Rotterdam--Europort--Versatility Increases Efficiency," Defense Transportation Journal, May-June 1972, p. 52.

[7]"Central Gulf Orders Two More LASH Ships With New Orleans Avondale Shipyards," New Orleans Port Record, May 1972, p. 34.

additional traffic to support the new vessels exists for such cargo items as peanuts,[1] cotton,[2] and steel coils.[3]

Central Gulf has not been alone among operators in its acceptance and implementation of the LASH. According to correspondence received from John V. Borkowski, Vice President of LASH Systems, Inc., the following have also taken place over the last five years toward increasing the amount of LASH vessels in the international maritime industry:

1. In late 1967, but for 1971 and 1972 deliveries (as compared to Central Gulf's 1969 and 1970 deliveries), Prudential-Grace Lines and Pacific Far East Lines contracted for five (5) and six (6) ships, respectively.
2. In August 1970, Combi-Lines ordered two (2) ships for delivery in mid-1972.
3. In August 1971, Delta Steamship Company and Waterman Steamship Company each ordered three (3) ships for delivery in late 1972 and early 1973.

The preceding firms have also ordered substantial numbers of LASH barges to support these vessels. Cost and quantity information on these barges, along with that of the LASH ships, is shown in Table 1.

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[1]"Peanuts Aren't Peanuts," New Orleans Port Record, March 1972, p. 32.

[2]Stanley Mantrop, "U.S. Cotton Industry Gets Boost," Journal of Commerce, March 25, 1971, p. 7.

[3]"Philip Bros. Ships Products Overseas in LASH Vessels," Traffic Management, March 1970, p. 17.

TABLE 1

APPROXIMATE BARGE-CARRYING VESSEL INVESTMENTS TO DATE

Company	LASH Ships		LASH Barges		SEABEE Ships		SEABEE Barges	
	Number	Cost ($000)	Number	Cost ($000)	Number	Cost ($000)	Number	Cost ($000)
Central Gulf Steamship	5	101,750	1,050	31,250				
Combi Lines	2	26,500	400 200	13,200 8,000				
Prudential-Grace Lines	5	106,500	400	13,200				
Pacific Far East Line	6	127,800	500	17,500				
Delta Steamship	3	84,900		N/A				
Waterman Steamship	3	84,900		N/A				
Lykes Lines					3	100,000	246	27,000
Totals	24	532,350	2,555	83,150	3	100,000	246	27,000

Sources: Letter from John V. Borkowski, Vice-President, LASH Systems, Inc., New Orleans, La., April 6, 1972; "Central Gulf Orders Two More LASH Ships with New Orleans Avondale Shipyards," New Orleans Port Record, May, 1972, p. 34; "Bigger Barge Units Coming," Journal of Commerce, January 28, 1971, p. 6; and "Lyke Bros. Awards $27 Million Barge Contract," Journal of Commerce, April 5, 1971, p. 28.

Also in this table are listed similar data for Lykes Lines' three new SEABEE ships which were launched during 1972,[1] and their barges. The SEABEE system, as noted in Chapter I, is also a barge-carrying vessel system, except that its ships carry approximately half the number of barges as LASH ships, and the barges are twice the size of LASH barges. Since there are only three SEABEE ships in operation or on order as compared to twenty-four LASH ships, the latter will receive the main emphasis. A glance at the totals in Table 1 indicates approximately $740 million has been committed by these firms, with barge orders for recently contracted LASH ships still forthcoming. LASH inventor Jerome Goldman predicts a minimum of twenty additional orders for LASH vessels on both sides of the Atlantic.[2]

Prudential-Grace and Pacific Far East LASH ships have both been operating for over two years, from the U.S. East Coast to the Mediterranean and the U.S. West Coast to the Far East, respectively. Combi Lines began its LASH service between the U.S. Gulf and South Atlantic Coasts and England and Northern Europe in April 1972. Delta Steamship Company began its LASH service between the U.S. Gulf Coast and the Caribbean and the East Coast of South America in 1972, and Waterman Steamship Company will begin operations between the U.S. East and Gulf Coasts and the Red Sea, Persian Gulf, and Indian Ocean Ports in 1973-74.

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[1]"Lykes Cargo Vessel En Route to Europe on Maiden Voyage," Journal of Commerce, October 2, 1972, p. 10.

[2]Maritime Administration, Billion Dollar Boom on the Rivers, p. 2.

Lykes Lines began its SEABEE service between the U.S. Gulf Coast and England and Continental Europe in June 1972.

The commitments of Combi Lines, Delta and Waterman are particularly strong endorsements of the viability and profitability of the LASH concept. For it is certain that they studied the operations of Central Gulf and Prudential-Grace, which were already operating on trade routes at least similar, and in some cases identical to those of Combi, Delta, and Waterman. Indeed, an industry observer pointed out following Combi's LASH commitment that:

> Unlike Central Gulf, which relies on a concrete contract with International Paper for one-way transport, Holland American part of Combi Lines has virtually nothing but its traditional liner customers--and a firm belief that LASH will prove to be the best transport on its European-Gulf trade.[1]

Similarly, it was pointed out prior to Delta's LASH commitment that it was:

> holding in abeyance its plans for three new full containerships while studying possibilities for combination barge and container vessels. "Some of the ports we serve are not ready for containerization on a large scale," said J. W. Clark, Delta's President.[2]

The above statement provides a lead-in to what is one of the essential points of analysis in this research--the relative efficiencies of bargeship versus containership systems. As pointed out in the statement, the bargeship has become a major investment alternative to containerships for American shipping lines. Also evident in the statement

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[1]"An Important Convert to LASH," Distribution Worldwide, February 1971, p. 19.

[2]"New Marine Systems Bring Containers to Inland Ports," p. 65.

is the importance of port "readiness" for the alternative systems, which will be discussed later in the Ports section.

While a detailed presentation of the comparisons made thus far of bargeship versus containership versus conventional ship distribution systems will be made in the final section of this chapter, some initial comparisons are presented here of the former two in order to establish an understanding of their basic similarities as well as fundamental differences.

Perhaps most important for the reader of this research is to avoid:

> the tendency of some authorities to regard barge ships and containerships as mutually exclusive categories. . . . The barge ship system can be regarded as the ultimate of this unitization trend for its barges are integral containers--or units--large enough to accept practically all freight in either loose or packaged increments. A fair statement is that barge ships are containerships of the most non-restrictive type. They provide the means by which virtually all cargo can be utilized.[1]

Of course, herein also lies one of the fundamental differences between bargeships and containerships, the number of types of cargo they can carry. Suffice it to say at this point that the larger barges can carry everything containers can, and many larger and/or low-value bulk items that containers cannot, but that barges can be at a disadvantage on smaller, low-volume items which cannot be consolidated with other items into a full bargeload.

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[1]"Four Ways LASH Adds to Quality of Transportation," Container News, September 1970, p. 96.

Not only is LASH an extension of the container concept, but as its creator points out:

> The LASH ship is also a containership up to any degree required by a trade route. The international movement of containers is here to stay, although the degree of market penetration at which it will ultimately stabilize will depend upon, for each trade route, economic and physical considerations.[1]

This potential for straight containerization has been sought more by Prudential-Grace and Pacific Far East Lines on their U.S. East and West Coast routes, respectively, using their ships initially designed and planned to handle 61 barges and 350 twenty-foot containers[2] and 49 barges and 334 twenty-foot containers,[3] respectively. This is no doubt due in large part to the following reasons set forth by Central Gulf, the major Gulf Coast operator:

> We do not pretend that it [LASH] is the answer to all ocean transportation problems; there are certainly trade routes for which we would never recommend it. For example, where sophisticated rail and road networks are available at both ends of the line, over-the-road containers linked up with container ships is a much more sensible and efficient mode of transportation.[4]

For while the Mediterranean[5] and Far East[6] both boast considerable number of ports along a limited coastline for dropping off and

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[1]Goldman, p. 9.

[2]"New Marine Systems Bring Containers to Inland Ports," p. 65.

[3]"LASH Comes to the Pacific," Distribution Worldwide, September 1971, p. 50.

[4]Johnson, p. 23.

[5]"New Marine Systems Bring Containers to Inland Ports," p. 65.

[6]"New Hope for Asian Ports," Asian Industry, June 1971, p. 41.

picking up LASH barges, as well as substantial inland waterway networks to service, neither the U.S. East or West Coast has the U.S. Gulf Coast assets of:

> . . . 19 ports on a coastline of just 1000 miles in length . . . and the navigation waterways leading to the Gulf which total nearly 12,000 miles with their numerous seaports and inland ports, as well as waterside manufacturing plant sites.[1]

Finally, merging of the bargeship and containership concepts takes place due to the capability of LASH barges to carry up to seven (7) twenty-nine-foot containers each.[2]

Let us now examine the development of containership systems.

Containerships

An 18' x 8' x 8' container was first moved via a conventional ship as early as 1906, and containership services began in the United States domestic trades about ten years earlier than international containership services. A predecessor company of Sea-Land Service, Inc., Matson Line, and Sea-Land each had trial container services operating between various U.S. coastal points by 1960.[3] It is considered likely that these successful container services were one of the major factors which prompted:

> a rather sudden and revolutionary growth of containerization . . . in the international ocean trades in 1966 with

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[1]"Four Ways LASH Adds to Quality of Transportation," p. 96.

[2]"Answers to Shippers Questions About LASH" (mimeograph), Prudential-Grace Lines, undated, p. 3.

[3]United Nations, Unitization of Cargo, New York, 1970, p. 12.

> specialized vessels and specialized facilities for container handling both in ports and inland.[1]

A further analysis drawn from the above information is:

> Thus, containers have evolved from their initial function as a means of packaging to being a means of inter-modal transportation which eliminates inter-modal handling of cargo carried. In this sense, a container functions in various ways: it becomes a part of the ship's hold or of the shed or warehouse; it also becomes an essential part of a truck or a railway wagon. Thus, a container can penetrate through all phases of transport with the cargo intact.[2]

While no one can now deny that containers have evolved in their desired function, this investigation has found that this desired function has been far from totally achieved in too many instances, and that on the North Atlantic trade routes particularly, this failure has been one of the major causes which has led to severe difficulty for many international ocean shipping lines.

These difficulties reached crisis stage for some operators in mid-1971 when:

> in the scramble for the available cargo, ship lines declared an all-out rate war. Then with their books running a tide of red ink, the seven main operators on the North Atlantic averted disaster by getting together in nothing less than an old-fashioned cartel to pool revenues.[3]

While this agreement has stabilized the situation somewhat, the basic problem of over-capacity (a problem which new competition from barge-ships will no doubt aggravate) that plagues containerships operators

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[1] Ibid.

[2] Ibid.

[3] "Cooling the Rate War on the North Atlantic," Business Week, April 29, 1972, p. 48.

still remains. This problem and the very results it has produced, were warned against as noted in a study sponsored by the U.S. Department of Commerce back in 1970:

> The problem facing U.S. carriers is not only competition from foreign carriers; it is the over-tonnage that might reduce ship utilization below profitable levels. . . . By 1974, under present plans . . . on the major East Coast to Europe trade routes, even if all of the containerizable cargo actually moved in containers, fleet utilization would be only about 40 per cent in the heavy direction (less per round trip).[1]

Furthermore, a recently published study for the U.S. Department of Commerce pinpoints "overcapacity in both ships and terminals"[2] as a major problem area, as well as forecasting that by 1975 the U.S. share of containerization traffic will drop from 50 percent to 40 percent.

The euphoria in the maritime industry over the undeniable efficiency of the container, which led to well over a billion dollars being invested by operators in containership systems in the late 1960's,[3] laid much of the groundwork for the overcapacity problems, and continuing investments[4] and the failure of containers to achieve their desired function, as mentioned earlier, have compounded it.

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[1]Matson Research Corporation, The Impact of Containerization on the U.S. Economy: Volume II (San Francisco, Calif.: Maritime Administration, U.S. Department of Commerce, 1970), pp. 4, 11.

[2]"Containerization Study Completed," Journal of Commerce, July 10, 1972, p. 26.

[3]Harold B. Meyers, "The Maritime Industry's Expensive New Box," Fortune, November 1967, p. 151.

[4]"Modernization of U.S. Merchant Fleet Includes 49 Ships for Liner Trade," Container News, December 1971, p. 15.

The function which a container must perform in order to increase efficiency in the distribution channel is to enable unhampered intermodal through movement of itself, the whole container, as far as possible between consignee and consignor, thereby eliminating delays caused by rehandlings of the cargo inside, lack of equipment and/or required services, and liability and documentation problems. Progress in the area of achieving efficient intermodal inland movement of containers has been painfully slow, however.

A good overview of the situation was given in the analogy by J. D. Robins, Director of Traffic for Catapillar Tractor Company, at a meeting of shippers at the Containerization Institute: "Intermodality is something everybody seems to be for--like motherhood--but few want to get pregnant."[1] Moreover, industry observers do not find such attitudes "surprising, since development of container systems depends so much on agreement among entities of varying operations and interests."[2]

One interest in particular has been a major obstacle in the implementation of container systems--unions. This would seem quite natural, however, since a major government study back in 1963 found that "an increase in container utilization causes a decrease in the earnings of the longshore workforce, the shipper's warehousemen, and the inland carriers personnel."[3] A more detailed description of labor's

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[1]"Making the System Work Better," Distribution Worldwide, May 1972, p. 43.

[2]Gus Welty, "TOFC/COFC Hits Its Stride Again," Railway Age, May 29, 1972, p. 29.

[3]Maritime Cargo Transportation Conference, Inland and Marine Transportation of Unitized Cargo (Washington, D.C.: National Academy of Sciences, 1963, p. 53.

influence on not only containership systems, but also bargeship systems, will be presented in a later section of this chapter entitled External Factors.

Other areas where conflicts of interest between container system participants are almost inevitable, and indeed have occurred, are determining who shall be liable for damage incurred during an intermodal shipment,[1] who shall supply (and where) and pay for chassis to carry containers,[2] and who should bear the costs of such weaknesses of containerization as the movement of empty containers back to port (international container movements are heavily imbalanced in the import direction) when two-way cargo movements are not achieved.[3]

In addition to these conflict of interest problems, some major difficulties have resulted from the fact that while containers are highly efficient items aboard ships, they are not as easily integrated into inland rail and motor operations. Here again, a recent government-sponsored study pinpoints one major aspect of the problem:

> Only a few railroads have embraced the concept of handling containers on flatcars or framecars. Until the carriers generally commit themselves to a special container system, it is unlikely that the full advantages of containerization will be realized by the inland shippers. In any mixed system, capital costs at terminals are higher and the interface between rail and truck is more complex than with an all-container operation. In other words, a good

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[1]"Making the System Work Better," p. 43.

[2]"Shippers Decry Lack of Chassis," Container News, May 1972, p. 77.

[3]Robert Roberts, "Recession Puts Dip in Flatback Growth," Modern Railroads, November 1971, p. 46.

> deal of management innovation and capital expenditure is needed to realize the benefits of low-cost, all-container rail operation.
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> Unfortunately, the capability of the railroad industry to invest in new general or special service equipment is in jeopardy.[1]

Railroads, moreover, are also reluctant to set up rates which account for container savings for fear of placing their revenue base in jeopardy.[2]

These obstacles are compounded, not only regarding railroads but also truckers, because of the fact that "land carriers are more justifiably concerned with the more-than-90 percent of their business that is domestic."[3] While truckers generally transport more containers than railroads, especially those shipments which originate or terminate within a 400-mile radius of the port area, for which trucking has efficiency advantages over railroads,[4] they prefer to move cargo via their more efficient semi-trailer vans.[5] Their reasoning is explained thusly:

> Marine containers fall short of the most efficient standards for inter-city road equipment. Marine containers on chassis have a higher tare weight and lower cubic capacity than the most efficiently designed semi-trailers of corresponding outside dimensions. Optimum

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[1]Matson Research Corporation, p. 12.

[2]Ibid., Vol. I, p. 57.

[3]Joseph S. Coyle, "Pandora's Boxes," Traffic Management, October 1968, p. 41.

[4]Matson Research Corporation, The Impact of Containerization on the U.S. Economy: Volume I (San Francisco, Calif.: U.S. Department of Commerce, 1970), p. 63.

[5]U.S. Steel Corporation, Containerization--A Maturing Intermodal Concept (Pittsburgh: U.S. Steel Corporation, August 1969), p. 15.

> container payload capacities for vessel loading are sometimes illegally high for highway trucking.[1]

While these reasons only apply to intermediate and long haul movements, not local and short haul movements, they create difficulty in the very geographical areas which containership operators must add to local port area movements for profitable ship usage.

Both railroad and trucking involvement in intermodal systems will be treated more extensively in their sub-sections of the Inland Transport Mode Section. Barges were not discussed here due to the fact that barge movement of containers is small although growing, and limited primarily by shipper location and preference for speed.

Finally, the legal problems regarding trucking mentioned above only scratch the surface of those which inhibit intermodalism. The basic obstacle, according to one European, is U.S. government regulation itself:

> In the U.S., of course, you have your FMC, ICC, and CAB. In Europe there are no equivalent regulatory agencies. At the present time what is the regulatory function in the U.S. is in Europe, as a practical matter, being carried out by private consultative groups, working together rather than working separately. The payoff, many authorities feel, is that in Europe we simplify and speed up rather than complicate and slow down the passage of international cargo.[2]

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[1]Regular Common Carrier Conference of American Trucking Associations, Containerization in International and Domestic Commerce (Washington, D.C.: American Trucking Associations, Inc., 1970), p. 3.

[2]Jacques J. LeBlanc, Containerization Today--Seven Danger Signals (mimeograph), Statement at Houston Intermodal Transport Seminar, Houston, Texas, May 18, 1972, p. 6.

While much effort and progress has been made by U.S. regulatory agencies toward simplifying and modifying legal requirements in order to facilitate international container movements, it must be admitted that the recent jurisdictional dispute between the Interstate Commerce Commission (ICC) and Federal Maritime Commission (FMC) over the filing of joint international tariffs,[1] for example, lends credence to European criticisms.

In fact, U.S. officials themselves have complained of having to work with obsolete laws, regulations, and agreements, which have hindered LASH as well as overall containerization.[2] And they have done their utmost, although not always successfully, to promote the development of containerization, and LASH, as has been evidenced in FMC approval of cooperative working agreements between both containership and barge-ship operators, FMC submission to Congress of a bill designed to establish special rates for through-shipments in U.S. foreign commerce, attempted resolution of a major FMC-ICC jurisdictional issue, and attempted passage of the Surface Transportation Act, all of which will be discussed in detail later in the government sub-section of the External Factors section.

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[1]U.S. Interstate Commerce Commission, 337 ICC 625, Ex Parte No. 261--In the Matter of Tariffs Containing Joint Rates and Through Routes for the Transportation of Property Between Points in the United States and Points in Foreign Countries, ICC Reports, Vol. 337 (Washington, D.C.: Government Printing Office, September 30, 1970), p. 647.

[2]"LASH and SEABEE Systems Handicapped by Archaic Shipping Laws," Traffic Management, May 1971, p. 25.

Furthermore, the Research Results Chapter will later show how in spite of their obstacles, containers are nevertheless moving in growing numbers through U.S. East, West and Gulf Coast ports. This is no doubt because many of the items on the following list of impressive potential advantages of containerization are being realized, at least partially:

1. a more direct, possibly even door-to-door, freight service can be offered;
2. paperwork can be reduced;
3. time required for customs inspection can be reduced;
4. handling is reduced;
5. turnaround time can be reduced resulting in a greater utilization of expensive freight vehicles;
6. breakage and pilferage losses can be minimized;
7. export packaging can be substantially reduced;
8. insurance rates can be lowered;
9. lower freight rates can be established;
10. transfer from mode to mode is much easier;
11. lower inventories can be maintained resulting in savings on interest charges;
12. storage and warehousing costs can be reduced.[1]

Generally, those advantages being realized are those not dependent on intermodalism. For example, two government-sponsored studies, one in 1963 for the Naval Office of Research[2] and one in 1971 for the

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[1]Douglas Schweitzer, Containerization (Saskatoon, Canada: University of Saskatchewan, 1969), p. 64.

[2]Maritime CArgo Transportation Conference, pp. 36, 62, 65.

Department of Transportation,[1] found that containerization has made great strides in reducing packaging costs, time in port, and cargo handling costs. Similarly, other studies have found significant reductions in loss, damage,[2] and theft[3] through the use of containers. Finally, house-to-house movements of containers are a reality for some firms such as Celanese Corporation, which in 1971 shipped over 2,500 forty-foot containers that way.[4] When house-to-house container movements are consistently achieved, then the benefits of lower inventories, cargo insurance rates, reduced paperwork, and lower freight rates are more easily attainable. Of course, such movements imply intermodal shipments.

Thus, when greater progress is made in achieving intermodalism, the yet unrealized benefits of containerization, which depend on the existence of efficient intermodalism for their own existence, should emerge and aid containership operators in generating much needed cargo. One hopeful sign in this area is that much progress has been made in Europe by intermodalism. For example, four of twenty-five ports surveyed by Container News in an issue featuring European ports recently

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[1]Planning Research Corporation, Transoceanic Cargo Study: Volume II (Washington, D.C.: U.S. Department of Transportation, March 1971), pp. IX 15, IX 49, IX 62, IX 63.

[2]"Only 55 Incidents in Carriage of 330,693 Vans," Container News, January 1970, p. 10.

[3]"Container Theft at Port of NY Drops Dramatically in 1971," Defense Transportation Journal, May-June 1972, p. 6.

[4]"Shippers Decry Lack of Chassis," p. 77.

claimed less than 50 per cent through movement of containers.[1] However, no such figures were forthcoming in the next issue featuring North American ports. U.S. progress in intermodalism will be especially crucial in the near future because of the 1970 Merchant Marine Act which commits the United States to a ten-year construction program of 300 ships.[2] Among these ships currently under construction, two-thirds are containerships (competing LASH ships being about one-third of the containership total),[3] and by 1975 these ships will be part of a world containership fleet of over 700 which will more than double the 1970 fleet, carrying over one million containers, which will more than triple the 1970 total.[4]

This uncertain future for containership operators on the U.S. East and Gulf Coasts will no doubt heighten their competition with bargeship operators. Strong competition is already being experienced on the Gulf Coast, where both barge and container traffic has risen sharply in recent years, and where long-awaited containership facilities are being built along with those for bargeships, at New Orleans, Houston, and Galveston.[5] Such competition is also expected to grow on the East

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[1]"Container Bet Pays Off," Container News, June 1972, p. 8.

[2]"FMC Proposes Law on Single Factor Rates," Container News, July 1972, p. 50.

[3]"Modernization of U.S. Fleet Includes 49 Ships for Liner Trade," p. 16.

[4]"Over One Million Containers By 1975," Container News, February 1970, p. 20.

[5]Stanley Mantrop, "Sea Barge Versus Containership Controversy in Gulf Still Strong," Journal of Commerce, October 4, 1971, p. 194.

and West Coasts, where bargeship services, as mentioned in the preceding sub-section, have been and will continue increasing. The important variables which will play a major role in this competition will be set forth in the Relevant Studies' Findings section to follow.

Let us now analyze conventional ship systems, which despite their diminishing role in world trade, still transport a major segment of that trade.

Conventional Ship Systems

Perhaps the most characteristic news item found regarding conventional ships is that none of them are among the 78 currently being built in the United States.[1] This is not surprising for in virtually every major U.S. port, larger and larger percentages of the total general cargo (formally the exclusive domain of conventional ships) moved are moving via containerships and bargeships.

The Port of Hampton Roads, Virginia, provides a characteristic example, with its percentage of general cargo moving via container increasing from 12.5 percent to 22.0 percent to 34.7 percent to 44.3 percent in the years from 1968 through 1971, with a maximum percentage containerized of 61 percent projected by 1981.[2] For the United States as a whole, total general cargo is estimated to grow at a rate of 4.5

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[1]"Modernization of U.S. Merchant Fleet Includes 49 Ships for Liner Trade," p. 16.

[2]Virginia Port Authority, Economic Forecast of General Cargo to Be Handled by Public Port Facilities in the Port of Hampton Roads (Norfolk, Va.: Virginia Port Authority, April 1972), pp. 12, 49.

percent to 5.5 percent per year through 1981.[1] While conventional ships are expected to retain a significant portion of this total general cargo traffic in most large ports, this portion is almost universally expected to erode.

Given the results of the government-sponsored studies which were cited in the preceding section, plus the more detailed comparisons which will follow in the Relevant Studies' Findings section, the above expectations can be considered virtual certainties.

Thus it is quite probable that conventional ship operators are merely doing the best they can with existing equipment, while refraining from investments in new ships except in special situations apart from general trends. Furthermore, it is likely that conventional ships will fare best in smaller ports which cannot afford extensive containership facilities and are not profitable service areas of bargeships or their towed barges.

The next section will present the relevant information gathered on the U.S. ports with which this study is concerned.

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[1] Ibid., p. 39.

Ports

Seaports

Seaports played a major role in the development of new containership and bargeship systems long before they began their adjustment to these new systems. It was a combination of the inefficiency of the unloading methods (i.e., individual piece by piece) required by the structural design of conventional ships, plus the high port costs (mainly rising labor rates, especially in the late 1950's) to which ocean shipping lines responded by developing containership and bargeship systems.[1]

These new systems in turn have had a major impact upon the world's seaports, and this discussion is directed toward analyzing this impact as experienced by ports on the U.S. East, West, and Gulf Coasts, and later their respective inland ports. Three major forms of this impact on seaports have been found in this research: (1) their changing role; (2) their new facilities and services, and (3) their recent and planned major investments. The first two forms are discussed here, while the third is treated later during the analysis of seaport questionnaire results.

An industry observer recently noted that whenever containers move house-to-house or small shipments are consolidated into containers at inland points, "many of the functions . . . which are associated with

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[1]"Coming Role of Barging in Marine Container Operations," p. 62.

the port as a terminal are either thinned out or disappear altogether."[1] While some major container ports still indicate that 30 percent of their containerized cargo is loaded into containers at the port,[2] thus implying storage, sorting, handling and often palletizing of individual break-bulk packages at the port, the majority of containers flow through ports with their contents untouched. Moreover, many of these containers move directly from or to the truck-chassis or rail cars that bring them to or from the port, while most of the rest at most require limited storage and handling services by a container marshalling yard. A similar situation also exists for LASH barges, which often are loaded or discharged at inland ports and are merely floated to or from the bargeship without seaport service, other than possible berthing for a short waiting period.

Observers therefore see the role of seaports inevitably changing toward that of a "transit station in an entire system of (intermodal) carriage,"[3] for the containership and bargeship portions of their cargo. And indeed, predictions of elimination of the transit warehouse and transit shed on the pier and the provision in its place of open space for marshalling containers for interchange between the ship and inland transport[4] have already become a reality.

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[1] H. A. Mann, "The Port as a Unit in Intermodal Transportation," Dock and Harbour Authority, March 1972, p. 456.

[2] Virginia Port Authority, p. 26.

[3] Mann, p. 456.

[4] R. P. Holubowicz, "Port Arrangements Between the Ship and Road and Rail Transport," ICHCA Journal, April 1967, p. 15.

Significantly, however, more than just "open space," which alone can be quite expensive in high valued port areas, is required for seaports to perform their new responsibilities in the rapid through-movement of cargo through ports. Additionally, considerable investments have been made and planned by ports in the past five years in order to meet these responsibilities.[1] These investments, while receiving extensive treatment in numerous articles throughout various trade publications in recent years,[2] are nevertheless not treated until the discussions of the seaport questionnaire's findings in the Research Results chapter. This is because the questionnaire provided more complete information than many of the articles.

Analysis of the types of new facilities and services provided by port investments is now in order. For containerships, new facilities consist mainly of new berths for the ships themselves, cranes and smaller handling equipment for handling their containers (shoreside or floating derricks), container freight stations for "stuffing" of containers, and acres of container marshalling areas at pierside or nearby.

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[1]Matson Research Corporation, pp. 29-33.

[2]"Review of North American Ports," Container News, July 1972, pp. 12-34; "World Container Ports," Container News, December 1971, pp. 18-20; "South Atlantic Ports Outlook," World Ports, March 1972, pp. 12-21; "Gulf Coast Ports Outlook," World Ports, May 1972, pp. 10-25; James M. Dixon, "The Ports of North America," Distribution Worldwide, March 1970, pp. 33-35; "The Maritime Industry's Expensive New Box," Fortune, November 1967, pp. 151, 154+; "U.S. Pacific Northwest Ports: World Traders," Traffic World, September 20, 1971, pp. 30-33; "Virginia Seaport Reaches for East Coast Container Title," Traffic World, September 14, 1970, pp. 45-46; "Terminal Facilities at United States and Canadian Ports," Traffic World, September 18, 1972, p. 78; and "Battle of the Boxes" and "Expansion in California," Traffic World, September 9, 1967, pp. 58-62 and pp. 65-66.

While the new containership berths are not unlike those of conventional ships in terms of length and depth, they differ with respect to the support facilities for these berths. One significant difference lies in the one or more massive container cranes which containership berths require at pierside, usually costing a million dollars and up. It is noted, moreover, that a recent government-sponsored study selected container "lift capacity" as the "best general index of the ability of a container port to handle demand--with pure container cranes of special interes in view of the projected excess of lift capacity."[1] The reader is referred to Tables 14 and 15 in the Relevant Studies' Findings section of this chapter for further information, albeit incomplete, on that study's analysis of the current lift capacities and projected container berths and container cranes for 1975 by U.S. seacoast.

Moreover, the smaller container handling equipment items usually includes items costing over a hundred-thousand dollars apiece. Another major difference is that unlike conventional terminals, which have a pier shed and warehouses for sheltering goods prior and subsequent to shipboard loading or unloading, containership terminals utilize smaller covered container freight stations for stuffing and unstuffing individual containers, and large, paved, uncovered container marshalling areas.[2]

The services provided by container terminals vary with the individual shipment. When fully loaded containers come into a port,

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[1]Manalytics, Inc., The Impact of Containerization on the U.S. Transportation System, Vol. II, San Francisco, 1972, p. 6.

[2]Matson Research Corporation, pp. 29-33.

they are either moved to the container marshalling area for later movement aboard ship, or in well-timed cases loaded directly onto the ship from their respective motor or rail carrier. The latter carrier, of course, indicates rail facilities aboard the pier, but these facilities are also in conventional terminals. What is different are the special container cranes and straddle carriers designed to load containers directly aboard railcars, which were not required investments of ports for loading break-bulk cargo from railcars, which was done by a combination of ship's gear and smaller pierside equipment such as forklifts.[1] When trucks and railcars cannot bring containers directly to shipside, they are moved there from their respective carrier or the marshalling yard via large container handling equipment which are basically high-capacity forklifts.

When break-bulk cargo moves into a container terminal for overseas movement via container, it is "stuffed" into containers at a covered container freight station using standard forklifts. From there, loaded containers are moved to the marshalling area on the ship. This latter movement is conducted by the high capacity forklifts mentioned above, or similar equipment.

The reverse of all of the above activities take place when containerized cargo is moving from the ship inland. Port charges are assessed for virtually all of the above equipment usage and services.[2]

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[1]American Association of Port Authorities, Port Practices, Rules and Terminal Rates: 1970 Annual Report of Committee VII (Washington, D.C.: American Association of Port Authorities, 1971).

[2]"LASH Comes to the Pacific," Distribution Worldwide, September 1971, p. 49.

Bargeships, on the other hand, require little, if any, specialized seaport facilities. This has been a benefit often stressed by bargeship advocates[1] recognized by government officials[2] and borne out by the facts that New Orleans has been handling considerable amounts of LASH cargoes for years without the facilities currently under construction there,[3] and that ports such as Baltimore and Norfolk[4] have handled lesser amounts of such cargo without even planning specialized bargeship facilities. Such operations have been made possible because bargeships do not need special berths with specialized equipment to load and discharge their barges from the mother vessel, and because once separate from the mother vessel, these barges may be loaded or unloaded using conventional mobile cranes which often are already part of cargo handling equipment inventories. The flexible nature of barge cargo unloading operations has been especially evident in Los Angeles where during periods of peak volume, they have been diverted to other than their usual berths in the harbor area for cargo unloading.[5] Furthermore, direct service to ports such as Norfolk has already been augmented,

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[1]"New Marine Systems Bring Containers to Inland Ports," p. 61.

[2]Maritime Administration, "Billion Dollar Boom on the Rivers," unpublished slide presentation, New Orleans, U.S. Department of Commerce, p. 7.

[3]"Review of North American Ports," Container News, July 1972, p. 14.

[4]Bob Frink, "Dockman Leary of LASH Ships," Newport News Times Herald, January 4, 1972, reprint.

[5]"LASH Operations at Los Angeles," World Ports, March 1972, p. 22.

again without port facilities investments, by indirect service to other nearby seaports such as Baltimore and Philadelphia with barges from the mother ship being towed from Norfolk, the mother ship's port-of-call.[1]

Barges do require some harbor space for "fleeting" or floating into position, but this can often be accomplished in nearby bay[2] or other unused harbor areas,[3] thus eliminating the need for port investments in space which otherwise might be used for other harbor activities. Some backland area is needed to support heavy bargeship volumes,[4] but its advocates claim such requirements are less than those required for containership operations.[5] In general, backland areas for bargeships consist of covered storage for barge cargo and marshalling areas when containers are also carried by bargeships. The questionnaire sent to seaports had a question designed to indicate to what extent cargoes are or are expected to bypass each seaport's cargo handling facilities and move directly to or from inland destinations or origins. The results of the question, which are discussed later in the Research Results chapter give an indication of where reductions in backland areas are made possible by bargeship systems.

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[1]Frink, op. cit.

[2]"New, Modern Port Complex Construction to Start Soon," Port of Houston Magazine, August, 1970, p. 285.

[3]"LASH Operations at Los Angeles," p. 23.

[4]"LASH Comes to the Pacific," p. 49.

[5]"LASH--Containerization . . . Without Dumping the Hogshead or Present Handling Systems," Tobacco International, June 25, 1971, reprint.

As will also be discussed in the Research Results chapter in terms of responses to specific questions, the seaport investments in bargeship facilities which have been made or planned thus far have been facilitating in nature rather than required. The mother vessel berths in these investments can really accommodate any of the three type ships, and the only equipment really unique to bargeship operations are the barge freight stations, which are generally covered wharf areas, being housed under canopies in some cases[1] and in "floating" buildings in other cases.[2] The more sophisticated of these barge freight stations include five-ton stacker type cranes used for working barges. These cranes come with auxiliary hooks for handling unpalletized and irregular objects, and each is capable of handling about 350 five-ton pallets per 16-hour day, thus providing customized, high-speed barge cargo loading operations.[3]

Many ports handling bargeships and/or their barges have no need for such sophisticated equipment, and indeed merely work bargeship barges using conventional equipment and straight-time labor. This is especially true in cases where there may be one bargeship in port every two weeks or so, which does not actually berth but rather just receives

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[1]Stanley Mantrop, "U.S. Cotton Industry Gets Boost," Journal of Commerce, March 25, 1972, p. 7.

[2]"LASH Terminal a World First," World Ports, June, 1972, p. 16.

[3]"LASH Operations at Los Angeles," p. 23.

and drops off barges, which are either pre-loaded with cargo or discharged later.[1]

In addition to the barge cargo loading services provided by the equipment above, seaports also have push-tugboat service available for the movement of barges.[2] These ports assess charges for the dockage and transit (mere through movement, with no working of cargo) of barges, in addition to the usual charges for the mother vessel.[3]

Conventional ship facilities and equipment at seaports are basically unchanged, except for the development of things such as greater capacity forklifts and mobile cranes, and improved warehouses and transit sheds. Bargeship and containership systems have already generated new usages of many of these items, however,largely due to the systems' increases in volume.[4]

Additionally, a recent survey of major shippers around the United States has found that 70 percent of them consider conventional break-bulk facilities "good," with 12 percent and 18 percent judging them "excellent" and "poor," respectively. The same shippers also rated containership facilities, with 42 percent responding "excellent,"

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[1]Marc Felice, "Barcelona is LASH-Happy," Container News, April 1971, reprint.

[2]"LASH Comes to the Pacific," p. 50.

[3]Port of Houston Authority, Tariff Number 8--Rates, Rules and Regulations (Houston: Port of Houston Authority, July 19, 1972), pp. 40-41.

[4]Stanley Mantrop, "Sea Barge Versus Containership Controversy in Gulf Still Strong," Journal of Commerce, October 4, 1971, p. 19A.

56 percent "good," and 2 percent "poor." The shippers were not asked to rate bargeship facilities.[1]

Inland Ports

The most comprehensive study of United States river ports and terminals found by this author was conducted in June 1968 and concluded that the vast majority of river ports are basically unorganized. This was found to have led to problems in the development of traffic potential, with very few facilitating services being available to carriers and patrons who usually dealt directly with one another. The study also cited impending problems which were expected to be compounded by this situation, in particular the determination and development of appropriate facilities for anticipated increases in container movements through these ports, as well as the determination of the optimal role of government in such endeavors.[2]

This study also developed a classification system for use in the analysis of these ports, which is incorporated into the dissertation's questionnaire as one of the bases for comparing the inland ports studied. This classification system is as follows:

Regional Port

1. At least 10 terminals or terminal activities, including at least one for public use, all located within a waterfront area identified with an urban area defined as a Standard Metropolitan Statistical Area (SMSA) by the U.S. Census Bureau;

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[1]"Regearing the Ports," Traffic Management, July 1972, p. 37.

[2]Southern Illinois University, A Study of River Ports and Terminals (Carbondale, Ill.: Southern Illinois University, 1968), pp. 33-34.

2. Served by at least five Class I railroads;

3. Served by at least five U.S. and/or interstate highways.

Sub-Regional Port

1. At least three terminals or terminal activities, located within a limited waterfront distance;

2. Place identity, by reason of association with an adjacent or nearby town or city;

3. Served by a railroad and at least one major highway, U.S. or interstate.

Non-Port Terminals

Land-water transfer facilities (terminals) located at waterside in rural areas or at locations having place identity but not otherwise classifiable as a regional or sub-regional port.[1]

This 1968 study also found that most river ports up to that time had "developed as loose agglomerations of private facilities, without local public aid or hindrance, and without benefit of port-relevant organization or systemization." Similarly, the situation was found to be "not much different where port authorities do exist. . . . Only a few act as promoters of traffic for their ports . . . [and] keep fairly good files on port-traffic information. . . ." The study did cite, however, an apparently growing movement toward the creation of port authorities and public and private teamwork in waterway affairs, which should enable "optimum benefit from the opportunities becoming visible."[2]

Domestic containerization and the "imminent construction of the first sea-going barge carrier ships" had been cited as the greatest

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[1] Ibid., p. 17.

[2] Ibid., pp. 15-16.

technological contributions to the above mentioned opportunities in the beginning of the study,[1] and much trade literature published since then cites facts which indicate the importance of these distribution systems to the development of inland ports.

This literature will be discussed in greater detail as it describes individual inland ports in the next few pages. A characteristic situation which has materialized, however, is evident along the Arkansas River system where following early LASH barge movements, "port authorities are enthusiastically awaiting mini-ships, container barges,[2] SEABEES and more LASH barges,"[3] and are entertaining "ambitions of becoming world ports."[4]

More specifically, several articles have been written in distribution-oriented magazines during the past few years which describe such selected bargeship barge movements as cotton from Greenville, Mississippi,[5] peanuts (Oklahoma's third largest cash crop) from Tulsa's Port of Catoosa to Rotterdam;[6] steel from Antwerp to Muskogee, Oklahoma;[7]

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[1]Ibid., p. 1.

[2]Janet Bosworth, "Waterway to the World," Distribution Worldwide, May 1971, p. 29.

[3]"New Marine Systems Bring Containers to Inland Ports," p. 63.

[4]"Review of the North American Ports," p. 34.

[5]Ibid.

[6]"Peanuts Aren't Peanuts," New Orleans Port Record, March 1972, p. 32.

[7]Bosworth, "Waterway to the World," p. 29.

rice from Little Rock;[1] soybeans from Pine Bluff;[2] tobacco from Richmond to various European cities;[3] and wood products from various U.S. inland ports to various European points.[4]

While these articles do indeed indicate an involvement of U.S. inland ports in such movements, perhaps more important in these articles and others are the descriptions of investments in and development of bargeship barge and mini (container)-ship, as well as other facilities being undertaken by these ports.

Taking one of the Mississippi River's more publicized major tributaries as an example, over $30 million has been committed to developing ports and industrial parks on the McClellan-Kerr Arkansas River Navigation system in Pine Bluff, Little Rock, Russellville-Dardanell, Clarksville, Van Buren, and Fort Smith in Arkansas, and Muskogee and Tulsa-Catoosa in Oklahoma. These investments are being made in order to take advantage of not only the new bargeship and mini (container)-ship systems, but also the recent completion of the $1.2 billion Arkansas waterway system by the U.S. Army Corps of Engineers, which will facilitate the development of these shipping systems. The ports are investing in intermodal transfer facilities, industrial parks, warehouses, transit-storage buildings, wharves, bulk cargo terminals, and materials handling equipment to include, in the case of the Port

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[1]*Ibid.*, p. 42.

[2]*Ibid.*, p. 32.

[3]"LASH-Containerization . . . Without Dumping the Hogshead on Product Handling Systems," reprint.

[4]"New Marine Systems Bring Containers to Inland Ports," pp. 64-65.

of Catoosa, a 200-ton capacity container crane, designed to accommodate mini-ships, LASH and SEABEE barges, and standard bargeloads of containers.[1] These investments are additionally motivated by the estimate that

> . . . there are at least 65 minerals in the Arkansas basin that in the past could not be developed because of high transportation costs. The new river system and the low cost mode of transport it provides has made mining of some of these minerals practical.[2]

Similarly, at two inland ports, Little Rock and Kansas City, the development of export traffic is being encouraged by the granting of foreign trade zones[3] and the establishment of customs centers to enable goods to travel all the way inland on a single bill of lading, instead of requiring inspection at the coastline.[4]

Finally, the "industrial parks" which have been or are being developed along this and other waterways deserve detailed attention since they represent an extension of the port facilities described above. For example, Presidents Island, which is owned by Memphis and the Shelby County Port Commission has 960 acres, is served by river, rail, and truck, and is at least 83 percent occupied. Presidents Island is a port of call for both mini-ships and bargeship barges.[5] Similar

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[1]Bosworth, "Waterway to the World," pp. 32-36.

[2]Braxton B. Carr, "Americans Newest Distribution Opportunities," Handling and Shipping, March 1972, p. 89.

[3]"Kansas City Receives A Foreign-Trade Zone," Wall Street Journal, March 28, 1973; and "Two Free Trade Zones Opened in Kansas City," Container News, June 1973, p. 42.

[4]Bosworth, "Waterway to the World," p. 35.

[5]Dower, "Southeast-Hub," p. 49.

parks are also being developed at Pine Bluff, Little Rock, Fort Smith, and Tulsa-Catoosa.[1]

The Arkansas River inland system, moreover, is not unique in its handling of bargeship barges and containers, and enthusiastic port development for the future. Similar events are taking place on the West Coast at Stockton and Sacramento,[2] further south on the Mississippi at Natchez,[3] on the Warrior River in Alabama at Birmingham.[4] One of the major purposes of this dissertation's inland port questionnaire, therefore, was to obtain specific dollar and time information wherever possible on such investments.

Thus the trade literature indicates that not only are inland ports entertaining thoughts of becoming world ports, but many of them are preparing for and encouraging such an eventuality with facilitating investments. Furthermore, examples have been given indicating that such investments have resulted in cost savings including thirteen cents per bushel of wheat shipped from Muskogee to New Orleans,[5] six to nine cents per bushel of soybeans shipped from Pine Bluff to New Orleans,[6] and $1,000 per bargeload of cotton moving overseas from Greenville through

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[1]Bosworth, "Waterway to the World," pp. 32, 35, 36.

[2]"Review of North American Ports," p. 2.

[3]William A. Adams, "Speech to Natchez Rotary Club," Natchez, Mississippi, August 16, 1972. (Mimeographed.)

[4]Dower, "Southeast-Hub," p. 31.

[5]Bosworth, "Waterway to the World," p. 32.

[6]*Ibid.*, p. 35.

New Orleans.[1] Similarly, the fact that bargeship operators are heavily promoting their "standing offer" of cost analysis services for potential inland customers who may benefit by shipping overseas via bargeships,[2] would seem to indicate that inland ports are likely to experience at least some increases in such traffic. Moreover, it would appear that such increases will cause further increases since bargeship operators are likely to increase the availability of their barges inland once volume justifies it.[3] For many small shipments not justifying inland barge movements by themselves could then be consolidated with larger shipments.

Finally, the reader is referred to the Research Results chapter for the relevant findings regarding the above inferences and other inland port matters.

Inland Transport Modes

Barges

In the past 20 years, inland barge traffic has had a resurgence which ended more than a century of decline. This turnaround in the barge share of United States domestic commerce has resulted in a rise from less than 5 percent in 1950 to 9 percent in 1965,[4] to 15 percent

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[1] Mantrop, "Cotton Industry," p. 7.

[2] "New Prudential-Grace Offices in Chicago Seen as Major Shipper Service Improvement," Journal of Commerce, September 19, 1972, p. 24.

[3] Mantrop, "Sea Barge Versus Containership Controversy in Gulf Still Strong," p. 19A.

[4] Southern Illinois University, p. 3.

in 1970.[1] It is projected, moreover, that the demand for barge transportation will almost double by 1990[2] and increase by from 350 to 500 percent in the next 50 years.[3]

The reasons behind this resurgence were determined in a 1969 dissertation by William F. Schoell III at the University of Arkansas. In testing his major hypothesis, Dr. Schoell determined that the growth was due to purposive action by barge operators rather than largely uncontrollable factors such as the number of miles of navigable waterways and the existing business situation. More specifically, he showed that the barge traffic growth was caused by the following:

1. Increased exploitation of technological innovation in the design, construction and operation of barges and towboats.

2. Marketing innovation primarily oriented around increased awareness of the desirability of tailoring the service to the peculiar needs of present and potential shippers.

3. Enhancement of the cost and qualitative aspects of barge transportation; i.e., speed damage considerations, flexibility, versatility, scheduling operations, etc., and

4. Intensified effort to exploit the advantages of barge transportation by barge operators and shippers.[4]

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[1]The American Waterway Operators, United for Action (Washington, D.C.: The American Waterway Operators, Inc., May 1972), p. 3.

[2]The American Waterway Operators, "DOT Issues Comprehensive Report on Current Transportation Services and Future Needs," Weekly Letter, August 5, 1972, p. 1.

[3]The American Waterway Operators, United for Action, p. 3.

[4]William F. Schoell III, "Causes and Effects of the Recent Growth in Barge Transportation: With Emphasis on the Period 1953-1964" (University of Arkansas, 1969), in Dissertation Abstracts International, Sect. A, Vol. 30, No. 7, January 1970, p. 2700A.

It is noted here that each of these reasons is applicable to bargeship barges. Regarding the first reason, these barges as conventional barges, are designed so as to enable their assembly into integrated tows[1] at similar speeds[2] and utilizing the same important "horse and wagon" principle of a powered unit being able to push or pull more freight than it can carry.[3] Similarly, the extended discussions of the extensive applications of bargeship barges in previous sections have already illustrated embodiments of the latter three reasons cited above.[4]

These are not the only elements of favorable situations being faced by bargeship barges and their larger counterparts, however. While it is true that the number of navigable miles does not cause increases in barge traffic, improvements of and increases in the available inland waterways of the United States make possible such increases by efficient, aggressive operators. These operators are thus benefactors of what has been referred to in a recent U.S. military publication as a 100-year old partnership between the U.S. Congress and the U.S. Army Corps of Engineers with the purpose of building and operating inland navigation channels for the "interests of the people in general."[5] This partnership has resulted in authorized capital expenditures of over $7 billion

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[1]"Lighters to Broaden Intermodal System," Journal of Commerce, January 29, 1971, p. 6A.

[2]Planning Research Corporation, p. X-44.

[3]J. White, "Towage of LASH Barges in a River Operation," ICHCA Journal, April 1970, p. 23.

[4]See p. 50, pp. 54-58, supra.

[5]Michael R. Scott, "Inland Waterways Face a Bright Future," Translog, December 1971-January 1972, p. 21.

(excluding the non-federal New York State Barge Canal), most of which have been spent,[1] as well as annual yearly operating and maintenance expenditures of over $67 million, the latter of which the Chief of Engineers, U.S. Army, says, "may be considered as fixed, at least for any of the ordinary purposes for which a division of costs into the fixed and variable components is needed."[2] The reasoning behind this judgment is that locks must be fully manned 24 hours a day regardless of the number and size of vehicle transits, maintenance of grounds and equipment are similarly unavoidable, and required channel dredging and bank stabilization are governed by weather and stream flow conditions and are totally unresponsive to traffic variations.[3] It should be noted here, however, that there is some chance that not only will this partnership come to an end, but in addition there is a possibility that waterway user charges will be imposed on barge operators. This would be the case if the recommendations of a November 1972 report by the presidentially appointed National Waterway Commission are enacted into law by Congress. Stiff opposition to such measures by legislators whose states would be adversely affected is anticipated, however.[4]

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[1]The American Waterway Operators, Big Load Afloat (Washington, D.C.: The American Waterway Operators, Inc., 1965), pp. 71-97; and The American Waterway Operators, "Groundbreaking for Tennessee-Tombigbee Waterway Scheduled for December 12 at Gainesville, Alabama," Weekly Letter, November 4, 1972, p. 4.

[2]"Waterway User Charges and Marginal Cost Pricing," Waterway Economics, October 1967, in reprint of Vols. II-IV, January 1970, p. 2.

[3]Ibid.

[4]Walter B. Wright, "The National Water Commission Report: Why Shippers Should Support It," Transportation and Distribution Management, March 1973, pp. 44-48.

The inland waterway network which has resulted from and is supported by these expenditures is described in terms of depth and mileages in Table 2, which was tabulated by The American Waterway Operators, Inc. (AWO), utilizing data published by the U.S. Army Corps of Engineers. It should be noted that most conventional barges have a loaded draft (immersion into water) of six feet or more, and bargeship barges have a loaded draft of approximately eight and one-half feet.

Several other waterways are being developed besides the completed Arkansas River Navigation System discussed in the previous section. These include the Tennessee-Tombigbee Waterway which is under construction and will connect Alabama's river system and the Port of Mobile with the Tennessee, Ohio and Mississippi Rivers, and similar construction underway to canalize and extend the Mobile River to Montgomery, Alabama and the Chattahoochee River to Columbus, Georgia. Additional studies are also being conducted regarding extending the latter two rivers to Gadsden, Alabama, and Atlanta, Georgia, respectively. Similarly, the Cross-Florida Barge Canal which will connect the Atlantic Intercoastal waterway with the Gulf of Mexico, is under construction, as well as various redevelopment, modernization, widening and deepening projects on the Ohio, Illinois and Missouri Rivers.[1]

A significant aspect of these investments is that they all involve waterways connected directly or indirectly to the Gulf of Mexico. As can be seen in Table 2, this coastline and its Mississippi River

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[1]Charles W. Howe et al., Inland Waterway Transportation: Studies in Public and Private Management and Investment Decisions, Resources for the Future, Washington, D.C., 1969, pp. 14-15.

TABLE 2

NAVIGABLE LENGTHS AND DEPTHS OF UNITED STATES WATERWAY ROUTES

Group	Lengths in Miles of Waterways[a]					
	Under 6 Ft.	6 to 9 Ft.	9 to 12 Ft.	12 to 14 Ft.	14 Ft. & Over	Total
Atlantic Coast Waterways (exclusive of Atlantic Intracoastal Waterway from Norfolk, Virginia to Key West, Florida) but including New York State Barge Canal System	1,426 *1,487*	1,241 *1,445*	584 *589*	938 *965*	1,581 *1,544*	5,768 *6,030*
Atlantic Intracoastal Waterway from Norfolk, Virginia to Key West, Florida	--- ---	65 *160*	65 *65*	1,104 *1,104*	--- ---	1,234 *1,329*
Gulf Coast Waterways (exclusive of Gulf Intracoastal Waterway from St. Marks River, Florida to Mexican border	2,055 *2,174*	647 *812*	1,133 *2,095*	79 *269*	378 *388*	4,292 *5,738*
Gulf Intracoastal Waterway from St. Marks River, Florida to Mexican border (including Port Allen-Morgan City alternate route)	--- ---	--- ---	--- ---	1,137 *1,180*	--- ---	1,137 *1,180*
Mississippi River System	2,020 *4,365*	969 *1,457*	4,957 *5,062*	740 *755*	268 *268*	8,954 *11,907*
Pacific Coast Waterways	730 *733*	498 *515*	237 *237*	26 *27*	2,084 *792*	3,575 *2,304*
Great Lakes	45 *100*	89 *148*	--- *14*	8 *8*	348 *369*	490 *639*
All other Waterways (exclusive of Alaska)	76 *76*	7 *7*	--- ---	1 *1*	7 *7*	91 *91*

Source: The American Waterway Operators, Inc., "Commercially Navigable Waterways of the United States," compiled from information supplied by U.S. Army Corps of Engineers, Washington, D.C., 1970, table accompanying map.

[a]The mileages shown in this table in regular type represent the lengths of all navigable channels of the United States including those improved by the Federal Government, other agencies, and those which have not been improved but are usalbe for commercial navigation. The mileages shown in this table *in italics type represent the lengths authorized improvement of the Congress of the United States in legislation known as Rivers and Harbors Acts.*

System already enjoy better than two-to-one advantage over the East Coast in navigable miles and about a four-to-one advantage over the Pacific Coast. The favorable waterway resource position of the Gulf Coast is therefore increasing as its natural assets are futher exploited with man-made improvements. Though there have been some projects on the East Coast such as the famed New York State Barge Canal and the C & D canal connecting the Chesapeake Bay and Delaware River,[1] and on the West Coast in the form of a 24-mile deepwater channel between San Francisco and Sacramento,[2] these coastlines do not have as many natural waterways to build on as the Gulf.

While government investment has provided an extensive foundation upon which to develop barge traffic, in the form of an inland waterway network openly lauded by both Eastern[3] and Western[4] Europe, they are not the only indirect impetus to such growth. Another lies in the non-federal investment projects at inland waterway oriented locations which the federal investments in many cases made feasible. In yearly data collected by the AWO they estimate that in the period from 1952 through 1971 a total of 8,411 such investments were made, summing to $139 billion.[5] Study of the yearly reports upon which these totals are based

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[1]The American Waterway Operators, Inc., Big Load Afloat, p. 91.

[2]"Review of North American Ports," p. 24.

[3]Vlastimil Pechousek, "Containers and Their Transport By Water," Doprova (Transportation), 8 Kes, 1968, p. 12.

[4]Charles F. Klapper, "Inland Waterways: Canals Can Help Port Environment," Docks and Harbour Authority, Vol. LII, No. 614, December 1971, p. 337.

[5]United for Action, p. 3.

indicated that these investments have been made by manufacturing firms in the form of plant construction and expansions, as well as docking facilities; by rail and motor carriers in the form of intermodal transfer facilities; and by inland ports in the form of terminal facilities similar to those discussed in the previous section.

Much of the impetus for the aforementioned government and private investments, however, lies in the economics of barge transportation they are facilitating. As was stated in the same U.S. military publication cited earlier in this section:

> the availability of low cost water transportation to carry bulk commodities to feed U.S. manufacturing processes for industry and defense, the capability to transport fertilizers and chemicals to farm lands, to move tremendous quantities of energy-producing fuels and to move agricultural and forestry products, has brought about the dispersal of industry throughout the heartland of the nation which otherwise would not have occurred. Without efficient internal water transportation, without barge transportation, the United States, like most other nations in the world, would have concentrated its manufacturing and distribution centers on its seacoasts. This distribution of industrial production centers and marketing centers throughout the country continues to have a significant influence on the Nation's overall economy and defense capability.[1]

The following quote, from a recent publication of the AWO, indicates the degree of barge economies:

> Barge service costs the shipper on the average of 3 mills per ton mile, with the range being 1-3/4 mills for some commodities to 7 mills for others. . . . Only pipelines can offer comparable rates. Rail service costs the shipper an average of 15 mills per ton-mile. Truck service averages 6¢ per ton-mile. Air freight service is about 20¢ per ton-mile.[2]

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[1]Scott, pp. 20-21.

[2]United for Action, p. 3.

These economies have been cited as holding down the rates of the other inland transport modes and enhancing the productive and marketing capabilities of "St. Louis, Pittsburgh, Minneapolis-St. Paul, and most recently such areas as Little Rock and Tulsa."[1] Indeed, in the case of the McClellan-Kerr Arkansas navigation system, it was pointed out that during its construction

> . . . both truck and rail rates on grain to Gulf Coast ports have been decreased--even during otherwise inflationary years and even in anticipation of the waterway's completion. Railroads have moved to develop better equipment such as larger cars. In some places, to effect economies of scale and in anticipation of truck-barge combinations, sections of truck have been abandoned. Similarly, the costs of steel prices have been favorably affected because of the waterway's effects on the iron and steel industry's multi-basing point pricing system.[2]

Besides indicating the considerable competitive position of barges where navigable waterways exist, the above quote provides the reasoning behind intensive regional support of such projects. In Oklahoma, for instance, where area rail rate cuts have saved the region's wheat farmers $12 million in two years, the state has launched a major program to attract international trade on the McClellan-Kerr waterway.[3] The overall region's support of the new waterway has been so great, moreover, that in its first year of operation 3,100 barges handled 3.4 million tons of cargo, an amount which would have filled 68,000

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[1]Scott, p. 21.

[2]J. Edwin Becht, "A Distribution Service That Is Both Obvious and Subtle," Handling and Shipping, March 1972, p. 93.

[3]"Oklahoma Plans Major Program to Attract International Trade," Journal of Commerce, June 3, 1971, p. 26.

rail cars,[1] which gives another indication of the competitive ability of barges. Nor is this situation unique. The Tennessee Valley Authority estimates that users of the Tennessee River Waterway saved an estimated $63.1 million in 1971, $615 million overall since 1933, and $304 million in the last seven years alone on the $288 project.[2]

So the economies of barges have won them state, as well as federal and local government and private supporters. All of this support, plus the considerable investments of the barge industry in itself, including $281.8 million in equipment under construction in 1971,[3] seems to reinforce the predictions of continued barge traffic growth. The capabilities of barges to handle large shipment volumes and outsized cargo,[4] plus their extreme flexibility in scheduling and service within their roadway restraint[5] should also contribute to this growth. While it is likely that conventional barges will take the major share of future domestic traffic, bargeship barges should get much of the international traffic. This is because of their capability for being transported internationally by the mother ship without multiple handlings of barge contents, which quite importantly include not only traditional bulk cargo, but also such items as motorcycles, shoes, handicraft, handbags, perfumes, wines, olive oil, machinery tools,

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[1]Bosworth, "Waterway to the World," p. 32.

[2]"Water Transport Briefs," Traffic World, June 12, 1972, p. 31.

[3]Scott, "Inland Waterways Face a Bright Future," p. 20.

[4]The American Waterway Operations, Big Load Afloat, p. 27.

[5]Southern Illinois University, p. 30.

and lamps, and which may or may not be containerized.[1] These characteristics point up why these barges were chosen by bargeship designers to compete with containers, i.e., they can carry profitably containerizable items, marginally containerizable items, and non-containerizable items.[2] Bargeship owners believe, moreover, that their barges can compete even for customers not located on waterways because barge economies make combination barge-rail or barge-truck movements to seaports cheaper than straight rail or truck moves to these ports.[3] And numerous such combination movements have already occurred.[4] One final characteristic which should aid LASH barges, in particular, in future competition for traffic is that not only are they in one standard size, unlike containers,[5] but the Federal Maritime Commission has recently approved a proposed agreement to form an equipment pool including these barges, and to share facilitating services and costs thereof between four firms operating LASH ships on the Gulf Coast.[6]

Both conventional and bargeship barges are likely to fare well in the future in the area of container movements. The tendency of many

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[1]Felice, reprint.

[2]Goldman, p. 9.

[3]"LASH Questions Answered," Shipbuilding and Shipping Record, June 5, 1970, pp. 31-32.

[4]Stanley Mantrop, "Intermodal Units Spreading in the Valley," Journal of Commerce, January 28, 1971, p. 5.

[5]E. F. Johnson, "LASH in Operation," ICHCA Journal, April 1970, p. 18.

[6]Federal Maritime Commission, Cooperative Working Agreement: Agreement No. 9980, Washington, D.C., July 3, 1972, p. 2.

executives to overlook the barge role in the carriage of containers, also noted in this literature search, was cited in 1969 in an AWO publication article.[1] The article, to the contrary, suggests that the role of barging in container handling is likely to increase because of barge capabilities to serve in shallower waterways than the feeder ships which often connect major seaports with others nearby, and the ability of barges to easily handle containers. It also points out that the original impetus of containerization was mainly cost savings and that speed has been overemphasized due to equipment shortages which required maximum utilization.[2] Aluminum industry container data and projections indicate that this problem is being reduced considerably.[3] Finally, the AWO article cites the considerable cost advantages of barges which often offset their slower transit times, especially in the case of international shipments to which they may only add one or two days to a 14-day shipment.[4] In the case of bargeship barges, moreover, we have seen in the port section that barge cost savings can include not only the aforementioned line-haul ones, but also savings in port costs when barges bypass seaports and are loaded or discharged inland.

The Interstate Commerce Commission (ICC) data shown in Table 3 indicates that barge traffic in containers has grown since the

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[1]"Coming Role of Barging in Marine Container Operations," p. 57.

[2]Ibid., pp. 58-63.

[3]Kaiser Aluminum and Chemical Corporation, Containerization--An Outlook to 1977, Oakland, California, 1968, p. 13.

[4]"Coming Role of Barging in Marine Container Operations," p. 61.

TABLE 3

NUMBER OF TOTAL PIGGYBACK UNITS AND CONTAINERS MOVED
BY ALL MODES, YEARS 1964-71
(thousands)

Year	Total Trailers/Containers Reported	Total Containers	Index	Total Participation (%)
RAILROADS				
1964	1,216.8	116.3	100.0	10
1965	1,432.4	132.3	113.7	9
1966	1,686.2	146.9	126.3	9
1967	1,726.2	140.2	120.5	8
1968	1,915.2	154.6	132.9	8
1969	2,036.8	121.5	104.4	6
1970	1,898.2	60.5	52.0	3
1971	1,842.7	69.2	59.4	4
MOTOR CARRIERS				
1964	311.0	49.2	100.0	16
1965	327.2	50.9	103.6	16
1966	346.0	61.2	124.4	18
1967	288.3	53.4	108.4	19
1968	308.0	63.2	128.5	21
1969	280.9	44.6	90.8	16
1970	226.0	45.1	91.7	20
1971	263.8	41.0	83.4	16
WATER AND MARITIME CARRIERS				
1964	76.7	67.2	100.0	88
1965	70.2	59.9	89.0	85
1966	80.5	67.1	99.8	83
1967	58.4	49.1	73.0	84
1968	50.9	40.5	60.3	80
1969	69.8	57.4	85.4	82
1970	82.8	68.6	101.9	83
1971	80.0	69.9	103.9	87

Source: "Transport Economics," Bureau of Economics, Interstate Commerce Commission, June-July, 1972, p. 19.

aforementioned article, but that the eight-year pattern fluctuates too much to indicate a definite trend. Similarly, the marginal success of Mechling Barge Lines container operations despite 30 percent lower than rail freight rates, mainly because of slower transit times,[1] suggests cautious expectations in this area. The ICC data does indicate, however, that while rail and truck total piggyback movements of trailers and containers are both higher than barge total piggyback movements, barge total container movements are now greater than both, that the eight-year pattern for barge total container movements is the best of the three, and that the percentage of containers in barge piggyback movements versus the other two modes is and has consistently been far greater, with railroads in particular showing a definite downward trend.

This data, plus that presented earlier in this section, indicates the vital part played by both conventional and bargeship barges in U.S. distribution systems. Both of these, moreover, are seeking maximum participation in future traffic through emphasis on examples of the effective utilization of conventional barges for "overnight or same day distribution service"[3] and bargeship barges for "point to point service."[3]

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[1]"Common Carrier Capabilities (I) Rail and Water Carriers," Transportation and Distribution Management, March 1972, p. 26.

[2]F. A. Mechling, "Overnight or Same Day Distribution Service Prompts Many Shippers to 'Think Barge,'" Traffic World, June 26, 1972, p. 42.

[3]Carlo J. Salzano, "Prudential-Grace to Sell 'Point-to-Point' Service with Five Barge-Carriers," Traffic World, May 8, 1972, p. 21.

Regarding service, probably the most important negative characteristic of barges which will be balanced against cost savings by prospective new customers of both barge types in the future will be their transit times. Table 4 combines data from two government related sources to indicate both sample transit times between New Orleans and various inland ports, and how such times are affected by whether the barge is moving down river to New Orleans or up river to an inland port. Where the sources' figures did not match up, which happened in the case of the longer distances and transit times, probably because of different assumptions, both are given as a range. The reasons for the differences cannot be given here because while the Planning Research Corporation cited distance tables and average rates of speed as the basis of its estimates,[1] the Maritime Administration does not describe its methods of computations.

In comparison to Table 4, the Illinois Central Railroad offers piggyback service to New Orleans from Memphis in 10 hours, Chicago in 27 hours, and St. Louis in 26 hours, mainly in order to compete with truck transit times.[2] A shipper thus must choose between saving the up to $1,000 per bargeload that has been saved by the cotton industry on bargeship exports from Memphis and St. Louis through New Orleans,[3] and the two and one-half day and three and one-half day time savings

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[1]Planning Research Corporation, pp. X-44, 45, 46.

[2]Nancy Ford, "Marketing Approach Booms Illinois Central Piggyback," Modern Railroads, February 1970, p. 36.

[3]Mantrop, "Cotton Industry," p. 7.

TABLE 4

ESTIMATED BARGE TRANSIT TIMES BETWEEN SELECTED
U.S. PORTS AND NEW ORLEANS

Port	Transit Times in Days	
	Import	Export
Baton Rouge	1	--
Mobile	2	--
Natchez	2	--
Vicksburg	3	--
Greenville	4	--
Panama City	4	--
Houston	5	--
Galveston	5	--
Memphis	5-5.4	3.1
Little Rock	6	--
Cairo	7	--
Ft. Smith	9	--
Pt. Birmingham	9	--
St. Louis	9-8.79	4.37
Muskogee	9.5	--
Catoosa	10	--
Nashville	10	--
Louisville	11	--
Owensboro	11	--
Cincinnati	12-10.79	6.79
Peoria	12-9.5	6.0
Decatur	13	--
Chicago	15-11.33	8.9
Knoxville	15	--
Rock Island	15	--
Minneapolis/St. Paul	20-13.5	7.92
Pittsburgh	20-14.08	8.75
Omaha	16	9.0
Kansas City	11.87	6.0
Chattanooga	11.3	7.1

Sources: Planning Research Corporation, Transoceanic Cargo Study, Vol. II (Los Angeles, Calif.: U.S. Department of Transportation, March, 1971), pp. X-44, 45; and Maritime Administration, Bargeship and Shipbarge Informational Data (New Orleans, La.: U.S. Department of Commerce, February, 1972), p. 63.

available via rail from these cities. As was seen in the bargeship section, the choice in this case is increasingly the former[1] in the choice between cost and time savings. This is not always the case as was shown in the Mechling container example, however, and a more detailed look at the rail alternative and its competitive position and characteristics now follows.

Railroads

Railroads are and will continue to be the inland transport mode with the most intercity freight traffic in the United States. Since 1939 when they held a 63.1 percent share of this traffic, however, their share has steadily decreased with the exception of the World War II period.[2] The U.S. Department of Transportation's (DOT) "1972 National Transportation Report," moreover, indicates that this share, which stood at 35.9 percent in 1970, will decrease to 33 percent in 1980 and 31.3 percent in 1990, though it will still remain the largest modal share. Despite this share decrease, however, total rail freight traffic is expected to increase from 740 billion ton-miles in 1970 to 1,223 billion ton-miles in 1990, necessitating a DOT projected $32.9 billion in investments for capital improvements in order to maintain current service levels, with $41.6 billion being needed to sharply improve current service standards.[3]

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[1] Ibid.

[2] Frank Mossman and Newton Morton, Logistics of Distribution Systems (Boston: Allyn and Bacon, Inc., 1965), p. 154.

[3] "Railroads in 1980: A DOT Projection," Railway Age, August 28, 1972, p. 54.

This expected absolute, though not percentage growth in traffic, has already generated considerable activity by individual railroads intending to garner their share of the mode's share. This activity has been in the form of investment in and development of strictly rail services designed to maximize rail's inherent advantages, especially long range speed, as well as increasing rail's participation in and ability to participate in intermodal agreements. As shall be discussed at the end of this section, such agreements will hopefully enable railroads, trucks and barges to cooperate and maximize, as well as share the wealth of the increasing United States demand for inland freight transportation.

This activity has been taking place despite DOT worries that railroads lack the resources for overall future required capital investments without government help,[1] and a government-sponsored study's similar fears in the containerization area in particular.[2] Comparisons with the Canadian response to containerization, moreover, have prompted some U.S. government officials (A. E. Gibson, Assistant Secretary of Commerce for Maritime Affairs) to chastize U.S. railroads for failing "to fully seize the opportunities inherent in containerization"[3] for reasons which will be discussed in the next paragraph. One railroad executive has conceded, moreover, that criticisms of the rail response to containerization being "spotty and uncoordinated" are "justified in

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[1]Ibid.

[2]Matson Research Corporation, The Impact of Containerization on the U.S. Economy: Volume II (San Francisco, Calif.: U.S. Department of Commerce, 1970), p. 12.

[3]Gerald D. Archdeacon, "The Container Boom: Is It A Bust?" Modern Railroads, November 1971, p. 52.

part."[1] The DOT report, however, cites some governmental policies which seem to favor the other inland transport modes and place railroads in an unfavorable relative position.[2]

The particular policies cited in the DOT study are the basic tendency to publicly finance the routeways of air, highway and water modes, while railroads and pipelines build and maintain their own, and in particular, the far larger and more frequent recent federal expenditures for the highway mode than rail, with rail passenger service getting the only government support. The report also mentioned how only railroads and pipelines must pay state and local property taxes on their routeways. Additionally, it states that a large portion of trucking and water freight transport are unregulated, while almost all rail transport is regulated, and uniquely so. Finally, after pointing out that truck and water transport profitability has consistently paralleled that of manufacturing industries over the years while rail profits have been consistently below this range, it concludes that: "the current financial problems of certain segments of the railroad industry are in part a reflection of these [above] differences."[3] While the regulatory environment is acknowledged by Assistant Secretary of Commerce Gibson in his criticism of railroads' lack of response to containerization,

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[1]D. H. Tierney, "Promotion of Container and LASH/SEABEE Traffic Railroads Responsibility," statement at Houston Intermodal Transport Seminar, Houston, Texas, May 18, 1972. (Mimeographed.)

[2]"Railroads in 1980," p. 54.

[3]*Ibid.*

he also points out that much of it is due to "an apparent reluctance to upset the present rate structure. . . ."[1]

This research has found considerable support for the essence of the statements of both of the above government sources. For example, rail operating income has shown a very erratic, basically decreasing trend for the past 40 years, and has never during this period exceeded $904 million, while annual capital expenditures have consistently remained around the $1 billion figure. This has resulted in a steady decline in the working capital available for such investments, with the situation reaching drastic proportions in the eastern segment since the late 1960's.[2] This takes on particular impact because of the fact that containerization, the area of the majority of recent criticisms of railroad shortcomings,[3] began its major development during this period, thus requiring substantial investments for maximum realization of its potential.

One factor compounding this problem in the area of railroad containerization, is that of rate structures mentioned earlier. The difficulty here has been that railroads have "too often" lost traffic which was first diverted to trailer-on-flatcar (TOFC)-type piggyback movements and then "picked-away" by motor carriers. This has left

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[1]Archdeacon, p. 52.

[2]Association of American Railroads, Yearbook of Railroads Facts: 1972 Edition (Washington, D.C.: Association of American Railroads, 1972), pp. 20, 21, 56.

[3]Archdeacon, p. 52.

railroads with a net loss in revenues,[1] and railroad executives on the whole have therefore tended to view both TOFC and its container-on-flatcar (COFC)-type piggyback counterpart as threats to boxcar traffic.[2] This has generally caused railroads to charge rates on piggyback (TOFC/COFC) traffic higher than boxcar rates but lower than trucking rates, in order to maximize revenues per carload of such traffic rather than volume, the latter of which would be more facilitative to the development of containerization. Figures provided by the Economics and Finance Department of the Association of American Railroads (AAR), for instance, indicate that the average revenue in 1969 per COFC/TOFC carload was $531 versus $382 per carload excluding piggyback.[3] Some downward adjustments in these rate structures have been made since then, however, perhaps most significantly in a change in which Eastern railroads recently discarded as outmoded a rule designed to protect boxcar traffic and thereby effectively lowered piggyback plans II-1/2 and III (the most utilized) by 6 percent.[4]

Additionally, in the rate-making for containers area, it should be pointed out that railroads perhaps justifiably criticize both steamship operators and government regulatory agencies for lack of

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[1]"Flatback Gains Stature at Penn Central, Reading and Central New Jersey," Modern Railroads, April 1972, p. 49.

[2]Ibid., p. 47.

[3]Association of American Railroads, Revenue Pen Piggyback Carload vs. Average All Other Cars--1969, Washington, D.C., undated. (Mimeographed.)

[4]Robert Roberts, "Recession Puts Dip in Flatback Growth," Modern Railroads, November 1971, p. 45.

cooperation and facilitation, respectively. In the former case, a government-sponsored study has shown that the ratio of containers which must be returned empty from their original destination substantially increases the costs of such hauls,[1] and railroads indicate that empty return-ratios are far higher for COFC traffic than domestic traffic as a whole.[2]

Since steamship lines have thus far refused to pay for the inland movements of empty containers, railroads have complained of losing their "shirts" on such traffic,[3] causing some industry observers to suggest that some traffic is now moving via bargeship barges (and trucks, which will be discussed in the next section) because of railroad "reluctance" to handle international containers.[4] Regarding government regulatory agencies, suffice it to say at this point pending a more detailed treatment in the governmental influences section later, that railroads have been dismayed over ICC-FMC jurisdictional squabbles which have generally prevented filings of "through" (joint rail-water, international inland origin to inland detination) rates in this country,[5]

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[1]Matson Research Corporation, The Impact of Containerization on the U.S. Economy: Volume I (San Francisco, Calif.: Matson Research Corporation, 1970), pp. 43-45.

[2]Tierney, p. 2.

[3]Archdeacon, p. 52.

[4]"New Marine Systems Bring Containers to Inland Points," p. 63.

[5]Archdeacon, p. 52.

which railroads and truckers,[1] as well as ICC[2] and FMC[3] officials all agree is essential to the development of international, intermodal movement of containers. While certain exceptions do exist in this area, such as a few recent "land-bridge" rates,[4] and while legislative proposals have been made to attempt to remedy it,[5] the lack of through rates still generally deters the development of international container traffic in general, and more importantly for railroads, the achievement of "balanced moves" of such containers which would eliminate the excessive backhaul costs railroads suffer in moving empty containers.[6]

One area in which railroads have been able to side-step the empty return problem and charge rates which may prove conducive to the development of international container movements, is in the new "land-bridge" service recently worked out between the Santa Fe, Penn Central and Southern Pacific railroads and Sea Land and Sea Train containership lines. The railroads are currently charging rates equivalent to lower all-water rates on shipments across the United States from the Far East

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[1]Interstate Commerce Commission, 337 ICC 625, September 30, 1970, ExParte 261, In the Matter of Tariffs Containing Joint Rates and Through Routes for the Transportation of Property Between Points in the United States and Points in Foreign Countries, ICC Reports, Vol. 337, June 1970-January 1971 (Washington, D.C.: Government Printing Office 1971), p. 643.

[2]Ibid., p. 627.

[3]"Bentley of FMC Seeks Support of Intermodal Bill, Assails D of J Provision," Traffic World, September 25, 1972, p. 63.

[4]Robert Roberts, "The Intermodal Future--New Growth in Flatback," Modern Railroads, April 1972, p. 45.

[5]"Bentley of FMC Seeks Support of Intermodal Bill, Assails D of J Provision," p. 63.

[6]Matson Research Corporation, pp. 43-45.

to Europe and vice-versa. The shipments enter the rail networks for unit (all-container) train movements at West and East or Gulf Coast ports for movements to their opposites. This arrangement differs from all previous attempts at such movements, which have failed, in that the railroads have for the first time agreed to the all-water rates and the resultant slim profit margin in the hopes that consistent and good volume moves will combine with the lack of empty container movements to enable adequate railroad profits.[1] Increasing commitments of railcars and added services have also been added by these and other railroads in an effort to develop such traffic.[2] Finally, the chances for success of the operation should also be enhanced by the fact that these unit trains contain none of the high center-of-gravity cars (conventional or piggyback trailer) which destroy the lower center-of-gravity, lower wind resistance, lower motive power requirement and higher speed capability advantages of unmixed rail container movements.[3]

It should be noted, however, that the "land-bridge" system, like the vast majority of rail movements of containers, is one of the long-hauls. This is because railroad COFC movement is uneconomical for distances of less than 200 miles and only marginally economical for

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[1]Roberts, "Intermodal Future," p. 45.

[2]"Railroads Go All Out To Tie Up With Ports," Container News, April 1973, pp. 18, 36; and "Railroads Meet Demands With Unit Trains and Mini-Bridges," Container News, May 1973, pp. 14, 20.

[3]Matson Research Corporation, p. 55.

distances up to 300 miles.[1] This is likely to restrict railroad participation in the international container movements and has led the manager of intermodal services of Central New Jersey Railroad to base his 1972 potential international rail container traffic estimates on moves of 400 or more miles inland, which constitute only 20 percent of the port of New York's total container traffic, for instance.[2] The situation regarding railroad international container participation is nothing new, however, as trucks have similarly lower cost characteristics for short distance break-bulk cargo movements. Trucks therefore carry the majority of non-containerized, general cargo moving international with some estimates ranging by U.S. port from 50 to 60 percent at New Orleans[3] to 82 percent at New York.[4] A more detailed comparison of these modes' port capabilities appears in the Relevant Studies Findings section of this chapter in the discussion of the government-sponsored study by Manalytics, Inc.[5] For both railroads and trucks, however, international cargo movements constitute only about 10 percent

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[1]A. T. Kearney & Company, Inc., An Economic Evaluation of Container Size Standards, pp. 1-6, as cited by Regular Common Carrier Conference of American Trucking Association, Containerization in International and Domestic Commerce, Washington, D.C., 1970, p. 3.

[2]"Flatback Gains Stature at Penn Central, Reading and Central New Jersey," p. 49.

[3]R. Stanley Chapman, "Container Revolution Coming to Gulf, Southern Shipper-Trucker Council Told," Traffic World, June 7, 1969, p. 37.

[4]F. G. Freund, "The Coordination of Cargo Movement Between Road Carriers and Ocean-Going Vessels," ICHCA Journal, May 1965, p. 24.

[5]See pp. 149-151, supra.

of their total business, a situation which has tended to cause both to concentrate more on their domestic business.[1]

Nevertheless, however, Vernon C. Seguin contends in his 1971 doctoral dissertation at Michigan State University that containerized unit trains are feared by truckers as a threat to their long-haul traffic.[2] This author concurs that increased international container movements to destinations for inland would likely go to railroads, but disagrees that such activities will undermine truckers' traditional long-haul traffic. For unit trains are also to some extent feared by railroads as a threat to their traditional revenue structures,[3] and most containers travel a relatively short distance overland to and from ports.[4] Finally, unit trains in any large amounts at seaports appear to be an unwieldy proposition given current port congestion which is considered a major problem by U.S. shippers,[5] and the maximum rail share of 20 percent of U.S. international container movements projected by a government-sponsored study.[6]

Railroads have, however, been the more active of the two modes in seeking and investing in container traffic potentials;

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[1]Joseph S. Coyle, "Pandora's Boxes," Traffic Management, October 1968, p. 41.

[2]Vernon C. Seguin, "An Investigation of the Factors Inhibiting Growth of Containerization in Surface Freight Shipments," Michigan State University, 1971, p. 75.

[3]Matson Research Corporation, p. 57.

[4]Ibid.

[5]"Regearing the Ports," Traffic Management, July 1972, p. 37.

[6]Matson Research Corporation, p. 125.

mainly because truckers, except in lucrative, short-distance, heavy port traffic areas, find containers less compatible with their movement system characteristics than the railroads,[1] for reasons which will be discussed in the next sub-section. The immediately following paragraphs, therefore, will describe some of the recent railroad policy changes and investments made in order to improve rail traffic potentials in the TOFC/COFC area.

Though Penn Central, which handles about 20 percent of TOFC/COFC traffic, is still leading the way, smaller and even bankrupt lines are making major efforts to garner such traffic,[2] as well as the other major lines.[3] These events should change the existing situation in which a very small percentage (8.5 percent in 1971) of rail intermodal transfer points are mechanized,[4] with these handling over half of such volume.[5] Replacing it is a situation in which many rail carriers are reevaluating their TOFC/COFC facilities, closing them where there is insufficient traffic potential and investing in mechanization where such potential does exist.[6]

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[1]Regular Common Carrier Conference of American Trucking Association, Containerization in International and Domestic Commerce, Washington, D.C., 1970, p. 3.

[2]"Flatback Gains Stature at Penn Central, Reading and Central New Jersey," pp. 47-49.

[3]"Common Carrier Capabilities (1): Rail and Water Carriers--Railroads: Continuing the Move to Marketing," Transportation and Distribution Management, March 1972, pp. 21-24.

[4]Roberts, "Recession Puts Dip," p. 46.

[5]John H. Marino, "Intermodal Services Hold Key to Intercity Freight Markets," Container News, June 1972, p. 18.

[6]Roberts, "Recession Puts Dip," p. 45.

At least two major railroads, the Southern Pacific[1] and Norfolk and Western[2] have recently adopted and stated policies to this effect, while the Penn Central's recent adding of a Detroit TOFC/COFC terminal, doubling the capacity of its Kearney, New Jersey TOFC/COFC terminal, and modernizing the mechanized container handling equipment in its other five major TOFC/COFC terminals,[3] while planning to attempt to abandon 3,922 miles of low traffic potential trackage (20 percent of its total system),[4] infers such a policy. Such actions have come after a decline in both the number of mechanized and unmechanized ramps between early 1970 and late 1971, indicating that such "pruning" has been taking place for some time. In early 1970, in North America for instance, there were 1,586 total TOFC/COFC ramps, 150 of which had the ability to side-load and/or crane-(top-lift) load containers onto railcars.[5] In late 1971, in North America there were 1,389 total ramps, with 115 of these having side-loading and/or crane loading capabilities.[6]

Yet despite the decline in both types of ramps available during this period, flatback traffic during 1972 exceeded that of 1970 and 1971

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[1]"Common Carrier Capabilities (1): Rail and Water Carriers--Railroads: Continuing the Move to Marketing," p. 21.

[2]Robert Roberts, "Interface: Domestic Containerization Inevitable," Modern Railroads, June 1972, p. 31.

[3]"Flatback Gains Stature at Penn Central, Reading and Central New Jersey," pp. 47-48.

[4]Frank E. Shaffer, "Streamlined PC--Basic 11,000 Mile System," Modern Railroads, August 1972, p. 40.

[5]Matson Research Corporation, pp. 125-127.

[6]Roberts, "Recession Puts Dip," p. 46.

and was only slightly below that of 1969's record total,[1] lending credence to railroad industry observers comments that railroads have used that recessionary period's traffic decline to improve rail flatback capabilities.[2]

Such comments are further reinforced by recent railroad managerial elevations of intermodal services functions. At least two railroads, Penn Central[3] and Illinois Central,[4] now have vice-presidents in charge of intermodal services, and in the former case the individual is in charge of a permanently established division of the company. Other railroads, while not going quite this far, have established international sales[5] or intermodal services[6] departments managed by general managers or similar executives. These delineations and assignments of high-level responsibilities for such functions should also foster further rail traffic growth in these areas.

Perhaps the best indicators of international container movement potentials for railroads, however, have been the recent actions taken by two smaller railroads in deep financial difficulties. One of these, the

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[1]"Industry Briefs," Transportation and Distribution Management, September 1972, p. 10.

[2]Roberts, "Recession Puts Dip," p. 45.

[3]"Flatback Gains Stature at Penn Central, Reading and Central New Jersey," p. 47.

[4]"New Intermodal Services Bring Containers to Inland Points," p. 64.

[5]B. J. Carlin, "Santa Fe Stands Ready to Serve," statement at Houston Intermodal Seminar, Houston, Texas, May 18, 1972, title page. (Mimeographed.)

[6]"Flatback Gains Stature at Penn Central, Reading and Central New Jersey," p. 48.

Reading, decided to build a new TOFC/COFC facility in Philadelphia before its decision to file for corporate reorganization, and despite bankruptcy has gone "all out" to build the 25,000 trailers per year capacity terminal, and expects to double 1971's 1,000 volume in 1972. In addition, the Reading is working on new rates designed to facilitate such traffic. Finally, it should also be noted that the Reading has seven other flatback ramps, none of them approaching the Philadelphia terminal's volume.[1]

Similarly, the Central New Jersey railroad, bankrupt since 1967 and verging on total collapse in 1970 due to continued erosion of its financial position, has made a major investment in a new TOFC/COFC terminal at Port Newark in the Port of New York--New Jersey container terminal, hoping to capitalize on the Port of New York's estimated 120,000 containers-by-rail potential through the port.[2] This example and the one preceding it indicate the extent of railroad potential faith in participation in international container movements. The Reading example, moreover, tends to indicate that rail potential TOFC/COFC movements are highly dependent on the location of a terminal, as well as its facilities, thus supporting the reasoning behind the "pruning" of such terminals discussed above. Not shown by these examples or found anywhere else in this literature search is the extent of railroad or any other market research into the yet untapped volume potentials of inland rail terminal locations. Such market research could give a clear

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[1]Ibid., pp. 47-48.

[2]Ibid., pp. 48-49.

indication of whether or not the intermodal role of these locations is being viewed too passively.

There has been research, however, on the restrictive factors inherent in rail intermodal terminals. The recent Manalytics study for the Department of Commerce found that the requirement that such terminals handle domestic trailers as well as international containers to be one restrictive factor because it uses up much of such terminals' capacity, particularly when combined with such physical limitations as the capacity of the transfer system, the size of the storage area for trailers or containers, and the amount of track work area.[1]

Regarding the construction of such terminal facilities, the same government study has been publicized in a major rail industry publication, which analyzes the relative efficiency of various types of mechanized flatback terminal facilities for handling various volume levels of containers.[2] Such information should enable optimally developed terminals once true volume potentials for inland terminals are determined. These determinations, though complex and beyond the scope of this research, seem highly desirable to this author.

A final noteworthy comment recently made in a major rail industry publication indicates that the publication has begun its new comment page called "Interface" in order to inform its readers of key developments in the other forms of transportation. The magazine is providing

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[1]Manalytics, Inc., The Impact of Containerization on the United States Transportation System: Volume II, p. 100.

[2]Robert Reebie and Associates, "An Evaluation of Alternative Rail Container Handling Systems," as quoted in Gerald D. Archdeacon, p. 54.

such information in order to facilitate the "inevitable" increase in cooperation between the inland transport modes, to the benefit of all these modes, which has been lacking in the past.[1] This action indicates an appreciation of the Department of Transportation projections of future traffic demands. The magazine's conviction that future traffic demands will be more than sufficient to inevitably provoke "intelligent intermodal cooperation," and its encouragement of such cooperation[2] bode well to a healthy competition and cooperation between the modes, to the benefit of not only themselves, but also shippers, ports, and bargeship and containership systems. Individual railroad executive perceptions of where their self-interests lie will heavily affect such developments, however. Moreover, such perceptions will have a strong influence on the extent of movement railroads make from their current situation with flat-back accounting for 5 percent of rail traffic[3] toward one railroad executive's prediction of a 20 to 40 percent flatback share of total rail traffic.[4]

The next section discusses recent activities and capabilities of trucklines, the other major inland transport alternative for bargeship, containership and conventional ship systems.

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[1]Roberts, "Interface: Domestic Containerization Inevitable," p. 31.

[2]Ibid.

[3]Marino, p. 16.

[4]"Containerization's Problems and Progress," Traffic Management, December 1970, p. 56.

Trucks

Probably the most striking thing about the literature on trucking in relation to its position as a competitor of, and/or partner with, railroads and barges in the movement of containerized (bargeship or containership) international cargo, is the lack thereof. A survey of a yearly bibliography entitled Containerization published by Dorothy V. Ramm at Northwestern University indicated that both marine and rail literature in this area regularly amounts to double or more that of truck literature. Similarly, while the former two regularly have subsections under the "Containerization" section in Northwestern University's monthly bibliography entitled Current Literature in Traffic and Transportation, there is usually none for motor carriers. Finally, the American Trucking Association, in its publication American Trucking--Trends 1970-71, does not even mention containerization.

This might be considered surprising in view of the fact that truckers share of domestic freight traffic has been steadily growing since 1939 when they carried 9.8 percent of such traffic.[1] By 1970 that share had risen to 16.9 percent and the DOT expects this rise to continue through 1990, increasing to 19.4 percent.[2] It should be noted, moreover, that this share would be even larger if the addition of Hawaii and Alaska as states did not cause deep-sea domestic traffic to them to be included in the latter, DOT figures. Strictly inland domestic ICC data published by the American Trucking Association for instance, shows

[1]Mossman and Morton, p. 154.

[2]"Railroads in 1980: A DOT Projection," p. 54.

the 1970 share at over 21 percent.[1] The limited amount of trucking containerization literature published provides sample reasons, however, for containerization's limited popularity with truckers, and therefore the dearth of such literature.

This limited popularity has been cited by containerization studies of firms in both the aluminum[2] and steel[3] industries, as well as by railroad executives,[4] transportation industry observers,[5] and most recently in correspondence from the American Trucking Association.[6] Tables 5 and 6 illustrate a combination of three reasons instrumental in limiting such popularity. Table 5 compares the respective tare (cargo container) weights and cubic capacities of traditional highway trailer vans and marine containers, while Table 6 illustrates how a potentially economical movement of two 20-foot containers is prohibited by federal highway weight limitations.

These tables indicate how marine containers possess less than optimum weights and capacities, although four major modifications in

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[1]American Trucking Associates, Inc., American Trucking--Trends 1970-1971 (Washington, D.C.: American Trucking Associations, Inc., undated), p. 7.

[2]Kaiser Aluminum and Chemical Corporation, p. 29.

[3]United States Steel Corporation, pp. 15-16.

[4]"New Marine Systems Bring Containers to Inland Ports," Traffic Management, July 1970, p. 64.

[5]Ibid., p. 63.

[6]Letter from Richard A. Staley, Assistant Director, American Trucking Associations, Inc., September 15, 1972.

TABLE 5

REPRESENTATIVE TARE WEIGHTS AND CUBIC CAPACITIES MARINE CONTAINERS FOR HIGHWAY TRUCKING COMPARED WITH CONVENTIONAL TRUCKING EQUIPMENT

	Conventional 40' Semitrailer	40' Container	Two 20' Containers
(1) Tare Weight	(pounds)	(pounds)	(pounds)
Tractor	15,000	15,000	15,000
Trailer	10,125	..	..
Container(s)	..	5,630	7,260
Chassis	..	7,000	7,000
Total tare weight	25,125	27,630	29,260
Container increment	..	2,505	4,135
(2) Cubic Capacity	(cu. ft.)	(cu. ft.)	(cu. ft.)
Trailer or container(s)	2,390	2,258	2,220
Container decrement	..	132	170

Sources: Herman D. Tabak, Cargo Containers, Their Stowage, Handling and Movement (Cambridge, Md.: Cornell Maritime Press, 1970), p. 121; and Regular Common Carrier Conference of American Trucking Association, Inc., Containerization in International and Domestic Commerce (Washington, D.C., 1970), p. 4.

TABLE 6

LEGAL OVERLOAD EXPERIENCED BY TWO MAXIMALLY LOADED 20-FOOT CONTAINERS

	Pounds	Pounds
Maximum load in two 20-foot containers:		
2 containers @ 20 long-tons each		89,600
Allowance for broken stowage @ 15%		13,440
Practicable maximum two-container load		76,160
Add tare weight of highway vehicles:		
Tractor	15,000	
Chassis	7,000	
Containers (2)	7,260	29,260
Gross combination weight		105,420
Maximum federal allowable gross cargo weight		73,280
Overload		32,140

Source: Herman D. Tabak, Cargo Containers: Their Stowage, Handling and Movement (Cambridge, Md.: Cornell University Press, 1970), p. 122; and Regular Common Carrier Conference of American Trucking Associations, Inc., Containerization in International and Domestic Commerce (Washington, D.C., 1970), p. 4.

the scope of the tables' applicability have been noted. These include the following:

1. The disadvantages of marine containers in highway carriage apply principally to intermediate and long hauls. They affect, principally, line-haul costs. Therefore, they are of little or only moderate concern with respect to local and short-haul movements.

2. The overall economies of containerization from inland shipper to overseas consignee, involving savings in packaging, loss and damage, insurance, waterfront handling, and marine carriage, in their totality, vastly outweigh such diseconomies as occur in the overland segment of the movement.

3. For through container service, any higher cost for highway movement is somewhat offset by load lightness in the absence of export packaging. When cargo is packaged at an inland point for export by conventional methods, the cost of overland transfer to the waterfront includes hauling the extra weight and bulk of the packaging. Containerization commonly eliminates export packaging. Thus, the extra tare weight and limited cubic capacity of the container is something of a trade-off as against the overland freight saving on export packaging.

4. Finally, the design of containers is subject to continuous improvement. The differentially higher tare weight of the container-on-chassis unit will probably be reduced by progress in light-weight construction, notably through improved application of light weight materials such as aluminum. This becomes particularly promising as progress continues in product improvements of such materials and in design innovation. In short, the movement of marine containers on the highways imparts a higher importance than previously to lightweight design and construction, and faster progress in this direction may be expected.

In addition to lighter-weight materials, other design improvements may reduce weight. Notable among these is the availability of containers which do not require support of a chassis, such as 20-foot containers which may be directly coupled together.[1]

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[1]Herman D. Tabak, <u>Cargo Containers: Their Stowage, Handling and Movement</u> (Cambridge, Md.: Cornell Maritime Press, 1970), p. 120.

The first modification when combined with the fact that most U.S. international cargo originates within 300 miles of ports,[1] explains why the area in which truckers have heavily participated in international container movements has been for short hauls near port areas.[2] And there has for years, in fact, been a policy of "selective solicitation" of only that cargo destined for local area hauls by port area truckers.[3] At the same time, however, it should be pointed out that long hauls are the more profitable part of the trucking business.[4] This has been due largely to the heavy competition for this short haul business between common carriers, contract operators, and owner operated truckers, which has produced low rates on this traffic. This competition is expected to remain keen, moreover, and the rates are expected to remain low.[5]

The second modification, while true, makes no difference to the

> many long-haul truckers [who] see no advantage in introducing a new unit which creates an equipment imbalance and a higher line haul cost. For this reason, they prefer to re-handle freight in the port area and use their conventional equipment for the inland move.[6]

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[1]A. T. Kearney and Company, Inc., An Economic Evaluation of Container Size Standards, pp. 1-6, as cited in Regular Common Carrier Conference of American Trucking Associations, Inc., p. 3.

[2]Letter from Richard A. Staley.

[3]Matson Research Corporation, p. 131.

[4]Kaiser Aluminum and Chemical Corporation, p. 29.

[5]Matson Research Corporation, Containerization Impact: Volume II, p. 10.

[6]Ibid.

Thus the extent of a carrier's participation in container traffic depends on how containers fit into his equipment balance.[1] The equipment imbalances referred to above are geographic ones, caused by the fact that containers on chassis which move imports inland create a need for moving these high-cost containers back to the seaport under load if possible, which takes traffic away from conventional movements in this direction.[2] Moreover, truckers point out that the leasing costs for marine containers are higher than the ownership costs for their conventional trailer vans.[3]

No disputative information has been found regarding the third modification. The fourth modification, however, is somewhat in conflict with information from a Kaiser Aluminum Corporation publication on containerization. The Kaiser study states that an average 20-foot container constructed of aluminum and steel weigh 3,550 pounds,[4] making the total weight for two 7,100 pounds, only 160 pounds less than the like-figure in Table 6, and reducing the differential between conventional trailer and containers and chassis combinations only slightly from 4,135 pounds to 3,975 pounds. Furthermore, for the larger 40-foot containers, the steel content is often increased for added strength.[5] Similarly, it is unlikely that the need for strong, heavy steel posts

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[1]Ibid.

[2]Regular Common Carrier Conference of American Trucking Association, p. 4.

[3]Matson Research Corporation, Containerization Impact: Volume I, p. 59.

[4]Kaiser Aluminum and Chemical Corporation, p. 48.

[5]Ibid.

required in marine containers to enable them to be stacked six-high in containership holds, a feature not required in standard highway trailers, is going to be eliminated.[1]

Another factor considered important in inhibiting trucker acceptance and promotion of containerization are proposed changes in federal and state highway size and weight regulations, which may render current containers obsolete.[2] Thus truckers, who unlike railroads, have been consistently profitable over the last 25 years[3] and require some $34.6 billion in capital investments for the 1971-80 period,[4] are not expected to invest heavily in containerization.[5] Neither are they expected to make extensive operational adjustments in order to facilitate long-haul container movements. Rather, although one trucker states that he is making a study of how he can best handle shiplines' 20-foot containers over-the-road in conformity with state and federal regulations, he states that there is "quite a bit of work to be done in this area."[6] Further, a large trucker's international men located at seaports are trained to "determine if it is feasible and in the best

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[1]Ibid., p. 29.

[2]United States Steel Corporation, pp. 15-16.

[3]American Trucking Associations, Inc., Trends, p. 17.

[4]"DOT Issues Comprehensive Report on Current Transportation Services and Future Needs," p. 2.

[5]Matson Research Corporation, p. 129.

[6]F. A. French,"ETMF Freight System Containerization Facilitation Plans," statement at Houston Intermodal Transport Seminar, Houston, Texas, May 18, 1972, title page. (Mimeographed.)

interest to the importers to transport the sea container to the inland destination."[1] These examples illustrate the more general comment made by the American Trucking Association that:

> motor carrier operations will be determined by highway capabilities and motor carrier requirements. These factors will, in turn, govern the size of motor carrier equipment. The acceptance of [marine] containers by the carriers will depend on how well the containers fit the motor carrier equipment, rather than the reverse.[2]

Trucker interest and response to bargeship cargoes has been discussed little in the literature thus far, although claims are being made that it will benefit truckers both at seaports (without inland waterways)[3] and at inland ports.[4] This is indeed likely to be true as one major difference between bargeship barges and containers is that the former are not expected to be moved via trucking equipment, just their cargoes (except, of course, when containers may be part of the cargo). Instances of direct interchange between bargeship barges and conventional truck-trailers have been cited,[5] as well as an increase in cooperation

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[1]Jim Morrissey, "Re: Intermodal Transportation," statement at Houston Intermodal Transport Seminar, Houston, Texas, May 18, 1972, p. 2. (Mimeographed.)

[2]American Trucking Associations, Inc., Containers-Land, Air and Sea, monograph (Washington, D.C.: American Trucking Associations, Inc., undated), p. 11.

[3]"The LASH Era and What It Means to Western Truck Operators," Go: Transport Times of the West, February, 1972, p. 42.

[4]Bosworth, "Waterway to the World," p. 43.

[5]Stanley Mantrop, "Intermodal Units Spreading in the Valley," Journal of Commerce, January 28, 1971, p. 5.

between the two.[1] Furthermore, at the Port of San Francisco, for instance, a highly ordered procedure has been developed for interchanging cargoes between bargeship barges and conventional truck-trailers.[2]

When inland waterways are present at a seaport, however, bargeship barges can and have taken cargo away from truckers.[3] Similarly, even at seaports where waterways are quite limited, an ocean shipping line has developed a way to partially by-pass expensive trucks by using bargeship barges for intraport movements, thus saving its shippers money.[4] Nevertheless, the potential exists for effective coordination between the two at bargeship barge inland destinations which are other than waterside-located consignees or consignors, as well as at most East and West Coast seaports which do not have extensive inland waterway connections. Moreover, the removal in most cases of a requirement for truckers to move containers in such coordinations usually renders these modes more compatible.

Any coordinations involving trucks, however, whether with conventional ship, containership or bargeship cargoes, will suffer if seaports have not improved their accessibility to trucks, a fact cited as a major problem area by one maritime observer. Pointing out that most seaports were built before trucking reached its current level of importance, he cited two to four-hour delays at many ports, at a cost

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[1]Bosworth, "Waterway to the World," p. 43.

[2]"The LASH Era and What It Means to Western Truckers," p. 42.

[3]Bower, "Southeast-Hub," p. 49.

[4]"Answers to Shippers' Questions About LASH," Prudential Grace Lines, undated, pp. 1, 4.

(in 1965) of eight cents per minute, resulting from poor truck access routes.[1] A July 1972 survey of United States shippers, moreover, indicates that congestion in port areas ranks second only to labor difficulties in current port problems. One shipper, in fact, stated that "the congestion and resulting delays on some East Coast piers is impossible to live with."[2] Furthermore, a recent government-sponsored study indicated that the capacity of access roads into and out of port areas is the main restriction of motorized container traffic. This capacity was stated to be dependent on two major factors, the number of such roads and the distance of the port from major highways.[3]

Efficient intermodal coordination remains critical to bargeship, as well as containership systems, however, and the fact remains that railroads and truckers are naturally inclined to pay more attention to the about 90 percent domestic portions of their business.[4] It is therefore encouraging that ports are increasingly recognizing their stake in such coordination,[5] and that for example, an Intermodal Seminar was sponsored by the Port of Houston on May 16-18, 1972. Such meetings can do much to spur the intermodal cooperation discussed at the end of the previous sub-section.

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[1]F. G. Freund, "Coordination of Cargo Movement Between Rail Carriers and Ocean-Going Vessels," ICHCA Journal, May 1965, p. 22.

[2]"Regearing the Ports," p. 37.

[3]Manalytics, Inc., p. 98.

[4]Coyle, p. 41.

[5]Mann, p. 458.

Before proceeding to the labor and government material in the next section, it is noted that a more extensive, although less up-to-date discussion of the relationship of the rail and motor transport modes to containerization can be found in Vernon C. Seguin's doctoral dissertation written at Michigan State University in 1971, entitled "An Investigation of the Factors Inhibiting Growth of Containerization in Domestic Surface Freight Shipments." It is also noted that because of this research's different timing, sources, and goals, the degree of overlap between these analyses and his is small. Finally, Dr. Seguin's dissertation also includes extensive discussions of the effects of labor and government on such freight movements, and his conclusions regarding these effects which are more relevant to this research's goal, will be presented and analyzed in the light of later developments in the next section.

External Factors

Labor

Vernon Seguin's dissertation, discussed at the end of the previous section, provides an excellent review of the effects both labor and government have had on the development and implementation of containerization up until early 1971. Both this and the following subsection, therefore, will begin with a brief summation of his findings.

Seguin relied heavily on a study by Merrill J. Roberts for the United States Department of Commerce in his analysis of the effects of rail and trucking unions on acceptance and implementation of containerization. The following quote summarizes Roberts' conclusions:

> The Teamster's Union, as a national organization, has interposed only insignificant obstacles to the trucking industry's coordination efforts. The lack of opposition appears to stem from a combination of economic constraints, union impotence, and union leadership decisions.
>
> The policies, attitudes, and behavior of the railroad unions have not impeded containerization and coordination. The reasons for this are similar to those governing the teamsters behavior, plus the fact that railroad employees have largely benefited from these changes.
>
> Government policy on labor relations within the trucking and railroad industries has had no substantial productivity or cost implications that might affect coordination adversely.[1]

Seguin then elaborated on these observations, pointing out that some difficulties have arisen concerning whether railroad workers or Teamsters would load and unload piggyback trailers, that some trucking labor contracts set limits on the numbers of layoffs which could occur as a result of containerization, and that these same contracts established royalty payments per container handled to be paid to the union. Similarly, he pointed out that the "make-work" rules which have plagued railroad operations in general also had some adverse effects on railroad piggybacking (TOFC/COFC). On the other hand, he observed that the protections against layoffs proved to be unnecessary because of additional loading and unloading tasks required by containerization, and concluded that no significant obstacles to the growth of containerization have been caused by these unions.[2]

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[1]Merrill J. Roberts, Intermodal Freight Transportation Coordination: Problems and Potential (Pittsburgh: University of Pittsburgh, 1966), pp. 266-267, as quoted in Vernon C. Seguin, pp. 108-109.

[2]Seguin, pp. 109-111.

Similarly, this current research has shown no major obstacles posed by these unions to the movement of either standard containers (including TOFC piggyback operations) or bargeship barges. On the other hand, this research, as Seguin's, has found that longshoremen's unions have greatly inhibited both the growth of standard van containerization and the acceptance and growth of bargeship systems, both before and after Seguin's research.

The following observation by Seguin, for example, applies to negotiations both before and after his research, regarding both van container movements and bargeship barge movements.

> Union negotiations involving dock labor handling import and export trade have also been influenced by two basic considerations; namely, (1) a desire to participate in the economic benefits derived from increased productivity generated through containerization; and (2) protection of workers displaced as a result of the increased productivity.[1]

This has been true for both the International Longshoremen's and Warehousemen's Union (ILWU) on the United States West Coast and the International Longshoremen's Association (ILA) on the East and Gulf Coasts.

As pointed out by Seguin, both these unions have pursued similar goals via differing paths. Prior to his dissertation, for instance, both had won protections against adverse effects of containerization, including job and income guarantees such as maintaining or only slightly modifying traditional work gang sizes despite lower workloads and minimum weekly work-hours agreements. Both unions have similarly won the right to stuff or strip containers which on the West Coast are not

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[1] Ibid., pp. 111-112.

manufacturers' loads and on the East and Gulf Coasts are not under a single bill of lading and are destined or originate from within a 50-mile radius of the relevant port.[1] Seguin also observes that these

> dockside labor agreements have added to the cost of marine transfers of containers and any slowing of growth in this sector will reflect in reductions in domestic movements of import-export traffic.[2]

Additional details concerning the preceding material, of course, can be found in Seguin's dissertation.

Since Seguin's research, moreover, the ILA in late 1971 struck for and got, besides the usual wage increases, a requirement for two 18-man gangs to work each bargeship, with each gang working only one barge at a time, and only the ILA permitted to work such cargo. Although it did not get the right to strip and load all containers arriving at East and Gulf Coast docks from anywhere, the contract also calls for a $1 per ton royalty to be paid for containers worked by non-ILA labor within a 50-mile radius of each port. Moreover, the ILWU, after the longest dock strike in West Coast history in 1971, won in addition to its wage increases an identical $1 royalty per ton of container cargo handled by non-ILWU workers within a 50-mile radius of each port, with the proceeds going toward financing a guaranteed work-week clause.[3] Both of these agreements have raised further

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[1] Ibid., pp. 113-114.

[2] "All But Two Port Ratify Three Year Pact Including 32.5% Raise for ILA Workers," Traffic World, March 13, 1972, p. 7.

[3] "West Coast Ports Tie-Up Ends as Nixon Signs Back-To-Work Legislation in Peking, China," Traffic World, February 29, 1972, p. 49.

disputes, however, and these will be discussed in the discussion of court cases at the end of the government sub-section to follow.

Bargeship systems, judging from some union leader statements, are even more feared than containers as a threat to dock union job and income security. Seguin's reference to ILA President Thomas W. Gleason's singling out of LASH as a particularly threatening form of containerization back in April of 1970[1] has been reinforced in 1972 by a Virginia ILA official (unnamed) who was quoted as saying of LASH ships:

> We're not in love with that type ship. We wish they would go out of business. Containers were bad enough, but these LASH ships are worse.[2]

These fears have led to ILA-shipper agreements protective of union jobs in a manner similar to the containership agreements, with 10 or more man (depending on the commodity) work gangs required for the loading of the barges and 36 required aboard the mother ship.[3] Similar agreements have been made on the West coast.[4]

In addition to these agreements, another has been made which provides a $1 per bale royalty to the ILA for LASH bargeloads of cotton loaded at St. Louis, Memphis, and Greenville (Mississippi) for export,[5] thus providing some reimbursement to the union for shipments which

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[1]Seguin, pp. 114-115.

[2]Bob Frink, "Dockmen Leary of LASH Ships," Newport News Times-Herald, January 4, 1972, p. 42.

[3]Maritime Administration, "Billion Dollar Boom on the Rivers," p. 4.

[4]"Subsidy Board Sinks Oversized Crews," Business Week, January 2, 1971, p. 15.

[5]Mantrop, "Cotton Industry," p.

bypass seaport barge dock workers. Similarly, the current ILA overall Gulf contract calls for a $2 per ton royalty on all non-bulk commodities loaded aboard LASH barges by other than ILA workers.[1] Finally, it should be pointed out that while LASH, as containerization was before it,[2] has been favorably accepted by unions in Europe,[3] it has had labor problems in its attempts to service South America. Specifically, Delta Steamship Lines has been forced by three South American governments, Argentina, Brazil and Uraguay, who have been pressured in turn by their unions, to agree that any barges traveling in their waters will be manned by nationals of their country. This, moreover, is one of many restrictions South American unions are seeking to place on both container and barge traffic.[4]

Both the container and barge provisions in all of the abovementioned agreements have led to considerable concern by not only American ocean-shipping managements, but also their European counterparts who serve American ports, as well as American truckers, port authorities and American and European shippers of goods. The President of one European container line, for instance, voiced a complaint undoubtably shared by American shiplines when he pointed out that a container loaded by 8 to 10 men in Antwerp must be loaded by an 18-man

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[1]Maritime Administration, "Billion Dollar Boom on River," p. 4.

[2]Jacques J. LeBlanc, "Containerization Today--Seven Danger Signals," talk given at Houston Intermodal Transport Seminar, Houston, Texas, May 16, 1972, p. 6. (Mimeographed.)

[3]Felice, pp. 1, 2.

[4]"LASH for South America," Container News, September 1970, p. 70.

gang in Norfolk.[1] Similarly, Spiros Skouras, President of United States-based Prudential-Grace Lines, recently pointed out that the "LASH ship system encountered initial labor reactions which to date have precluded such ships from reaching their inherent productivity potential." While noting hopeful signs of changing labor attitudes which may enable improvements in the profitability of LASH ships, Skouras also states that the "full potential of the system can only be achieved after the affected workforce has fully assessed its impact, particularly its long-range implications."[2]

While East Coast trucking firms' complaints that the ILA's 50-mile rule would drive many firms out of business have not proven true, its complaints of union inadequacies in reloading containers after stripping them have been partially admitted to by the ILA. Further, New York area truckers in particular point to decreases in their port's share and tonnages of North Atlantic oceanborne trade, while Baltimore's and Norfolk's tonnages have increased.[3]

On a larger scale, United States government offices and port authorities have complained of increasing diversions of container traffic to Canada (and elsewhere) because of U.S. high labor costs,[4]

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[1]LeBlanc, p. 6.

[2]Carlo J. Salzano, "Prudential-Grace to Sell 'Point-to-Point' Service With Five Barge Carriers," Traffic World, May 8, 1972, p. 21.

[3]Ken Taylor, "Dangerous Days for Containerization," Fleet Owner, July 1971, pp. 47, 48, 147.

[4]"U.S. Found Losing Benefit of Container, Barge Ship; Labor Legislation Cited," Traffic World, October 26, 1970, pp. 77-78.

and these complaints are supported somewhat by the figures in Tables 7 and 8 gathered by a member of a marine-oriented management consulting firm. On the other hand, this consultant points out that such diversions are not new, and that various inland transport system, shipline, and government policies have also contributed to Canada's net increase in cargo through diversions, while Canadian port low-volume characteristics have held down its net gains.[1]

Regarding shippers, a recent survey of American shippers indicated that they ranked "labor including interruption of services" as their number one port problem,[2] while a European writer has cited American port labor problems as the "worst of all troubles" of European shippers utilizing containers.[3]

It of course should be remembered that while conventional ship systems have not been involved in these containerization disputes, they have suffered along with their system's competitors during waterfront strikes.

Although one "trucking expert" claims that the ILA's 50-mile rule is clearly in variance with United States national transportation policy,[4] the federal government had generally kept out of management-labor problems in this area except for such actions as presidential

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[1]George M. Jones, "U.S.-Canada Cargo Diversion: A Century Old Phenomenon," Container News, September 1972, pp. 48-54.

[2]"Regearing the Ports," p. 37.

[3]Norman Douglas, "How Shippers Are Living With Containerization," Shipping and Shipbuilding Register-Marine Design International, February 27, 1970, p. 12.

[4]Taylor, pp. 49-50.

TABLE 7

"GAINS" AND "LOSSES" BY DIVERSION OF LINER AND LINER-TYPE CARGOES IN 1970

	Apparent Traffic Lost to Diversion (000 ST)	"Loss" as a % of Total Traffic (%)	Apparent Traffic Gained by Diversion (000 ST)	"Gain" as a % of Total Traffic (%)	Net of "Loss" and "Gain" (000 ST)	Net as a % of Total Traffic (%)
<u>INBOUND</u>:						
United States						
North Atlantic	150	1	80	1	-70	-1
Pacific Northwest	25	2	35	3	+10	+1
Canada						
Atlantic	80	2	150	4	+70	+2
Pacific	35	3	25	2	-10	-1
<u>OUTBOUND</u>:						
United States						
North Atlantic	321	3	267	3	-54	-1
Pacific Northwest	48	2	17	1	-31	-1
Canada						
Atlantic	267	3	321	1	+54	+2
Pacific	17	2	48	6	+31	+4

Source: George M. Jones, "U.S.-Canada Cargo Division: A Century Old Phenomenon," <u>Container News</u>, September, 1972, p. 48.

TABLE 8

COMPARATIVE LABOR COSTS FOR CONTAINER HANDLING--1971

Port	Gang Size	Base Hourly Rate ($)	Labor Overhead (%)	Total Labor Cost Per Gang Hour ($)
New York	19*	4.60	63**	143
Montreal	8.5***	4.60	26	49
Halifax	8	4.40	36.5	48
Saint John	10****	4.40	36	60

Source: George M. Jones, "U.S.-Canada Cargo Diversion: A Century Old Phenomenon," <u>Container News</u>, September 1972, p. 48.

*Includes one checker or clerk.

**Includes guaranteed annual income.

***One walking boss, with a base rate of $4.80, for each 2 container gangs.

****Includes one foreman with a base rate of $4.72.

calls for both sides to maximize negotiation settlement efforts,[1] selected arbitration and invoking the Taft-Hartley when the national interest has been threatened.[2] The last ILWU strike, however, because of its length and effect on the national interest, prompted both a Congressionally passed and presidentially signed bill to end it though settlement was achieved just before signing,[3] as well as providing added impetus to the presidentially-sponsored "Crippling Strikes Prevention Act,"[4] which is discussed in detail in the government sub-section which follows.

Government

In the area of governmental regulation, although not the government subsidies which have been so important in the recent building of bargeships and containerships, Seguin also has a good summation of important developments up to 1971. His discussion covers the history of the regulation of piggyback traffic, multi-modal ownership limitations, the functional purposes of the recently established Department of Transportation (DOT), the problems resulting from the "overlapping authority and gaps in coverage" of Interstate Commerce Commission (ICC), Federal Maritime Commission (FMC), and Civil Aeronautics Board (CAB),

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[1]"ILA and Port Negotiators Deadlocked at Expiration of Pact, 'T-H' Considered," Traffic World, October 4, 1971, p. 14.

[2]"Dock Strike Picture Cloudy at Many Deep-Sea Ports; Some Gulf Harbors Open," Traffic World, October 18, 1971, p. 78.

[3]"West Coast Ports Tieup Ends as Nixon Signs Back-to-Work Legislation in Peking, China," p. 49.

[4]"Nixon Renews Plea for New Authority Over Transportation Labor Disputes," Traffic World, February 7, 1972, p. 23.

and the legislative attempts to rectify regulatory problems prior to his dissertation.[1]

Since Seguin has covered the history of piggyback regulation and no recent developments in this which are relevant to this research have been found, it is not discussed here. Similarly, only the major recent development in the multi-modal ownership area is discussed here, in the discussion of relevant court and regulatory agency decisions. The other three areas mentioned above are closely intertwined, however, and since important developments have taken place regarding each since Seguin's research, some of his findings are presented here as an introduction to the discussion of later developments.

Regarding the DOT, Seguin points out that it

> was created in recognition of the need for a coordinating, planning agency.. . . [given] responsibility for promoting development of the transport system and appears to be a step in the right direction.[2]

Having no authority over modal regulatory agencies, however, it has pursued these goals in the area of containerization mainly through studies made or sponsored by its Office of Facilitation,[3] and Office of Systems Analysis and Information Systems[4] and through legislative proposals. Seguin mentioned one of the latter entitled the Trade Simplification Act of 1968, as not having been passed before the

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[1]Seguin, pp. 117-129.

[2]<u>Ibid</u>., p. 124.

[3]<u>Ibid</u>., p. 118.

[4]Planning Research Corporation, Vols. I-III.

completion of his research.[1] Designed to improve coordination of regulation of intermodal transfers, it has since been set aside by Congress.[2]

Regarding generalized inland transport mode support, the DOT threw its support behind the Surface Transportation Act of 1972, which was sponsored like that of 1971, by the major rail, barge, and trucking common carrier associations when it became clear that its own proposed transportation reform bills had no chance of passage. Officials in Washington claimed this action would enable the DOT to reintroduce its own proposals to modernize transportation regulation and assist transport modes in the 1973 Congress.[3] The Surface Transportation Act also deals with assistance to common carriers, particularly railroads, in the form of government loans and guarantees on commercial loads ($3 billion for railroads,[4] $5 billion overall), forbidding of discriminatory tax practices by state and local governments with respect to common carriers,[5] and improved procedures for railroad track abandonments.[6] All of the above legislation died with the adjourning of the

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[1]Seguin, p. 121.

[2]Archdeacon, p. 52.

[3]Alex Bilanow, "Strong Push on Surface Transport Bill Slated," Journal of Commerce, September 18, 1972, pp. 1, 22.

[4]Ibid.

[5]The American Waterway Operators, "Senate Committee Orders New Draft of Surface Transportation Act Prepared for Early September Consideration," Weekly Letter, August 19, 1972, p. 1.

[6]Bilanow, pp. 1, 22.

92nd Congress,[1] but the Surface Transport Act has been reintroduced to the House Interstate and Foreign Commerce Committee for consideration in 1973.[2]

Finally, as discussed in the inland transport mode sections,[3] the DOT's 1972 Transportation Report has created an awareness of future transportation needs, and expected modal shares and investment requirements.

Overall, however, the problem of "fragmented regulation" cited by Seguin[4] still remains, despite the DOT. This fragmentation has resulted in the "overlapping authority and gaps in coverage" mentioned in the first paragraph of this sub-section. The following comment by a DOT official, R. J. Barger, provides a good analysis of the problem:

> All things considered, a regulatory scheme that evolved in a period when transportation modes were readily classifiable into air, rail, marine or motor may simply not be in tune with the technology of the last third of the 20th century.[5]

This, as was shown back in the first section of this literature search, has been recognized and appreciated within regulatory agencies.[6]

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[1]The American Waterway Operators, "Surface Transportation Bills Die With Congressional Adjournment," Weekly Letter, October 21, 1972, p. 2.

[2]The American Waterway Operators, "Surface Transportation Act Reintroduced: Retains Rate Filing Provision," Weekly Letter, March 10, 1973, p. 1.

[3]See p. 74, *supra*.

[4]Seguin, p. 124.

[5]R. F. Stoessel, "Transport in the 70's: Revolution Ahead," reprint from Business Management, November 1969, as cited in Seguin, pp. 123, 124.

[6]See p. 37, *supra*.

Nevertheless, perhaps even more damaging to the development of coordinated regulation than the lack of success of the proposals for merging the CAB, FMC and ICC mentioned by Seguin,[1] has been the regulatory agencies' continued lack of ability to agree not only with each other, but also within their own agency. For example, Seguin cited how back in 1970 one point of disagreement was settled by the ICC and FMC regarding a unilateral intermodal joint through rate rules issued by the former.[2] This research, however, has found that another point of disagreement on the same rules has resulted in both FMC petitions being filed and oral arguments being heard, so that the ICC finally decided in June 1972 that no general tariff rules in this area should be promulgated, although the 1970 rules' proceedings are acceptable but not required.[3] Further, even this decision was dissented by two ICC commissioners and its Chairman who citing ICC attempts toward implementing joint international rates carrying back to April 1969,[4] concluded that,

> . . . the auspicious start with its glowing promise of simplified, easily understood regulations has now given way to indecision, doubts, and ambiguous standards. And this in the face of repeated assurances to interested

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[1]Seguin, pp. 122, 123.

[2]*Ibid*., p. 121.

[3]U.S. Interstate Commerce Commission, *341 ICC246, August 11, 1972, ExParte No. 261, Special Permission No. 70-275, In the Matter of Tariffs Containing Joint Rates and Through Rates for the Transportation of Property Between Points in the United States and Points in Foreign Countries*, ICC Reports, Vol. 341, reprint (Washington, D.C.: Government Printing Office, 1972), p. 246.

[4]*Ibid*., p. 249.

> parties that the Commission would establish workable procedures to facilitate the movement of joint international traffic.[1]

Moreover, the dissenters further point out in a footnote to the second sentence of the above quote, that because the Commission had explicitly stated in 1969 that it would not defer promulgating rules at that time under what it construed to be its authority, Congress decided to postpone action on the Trade Simplification Act[2] discussed earlier in this section. Finally, the dissenters asserted that the majority's decision would "create confusion in place of orderly procedures now followed," warned that the decision may damage the ICC's purposes in this area, and stated that the decision "appears to come full circle with a return to the starting point."[3]

Such examples serve to underline the following previously quoted[4] recent statement made by a European shipline executive:

> In the U.S., of course, you have your FMC, ICC and CAB. In Europe there are no equivalent regulatory agencies. At the present time what is the regulatory function in the U.S. is in Europe, as a practical matter, being carried out by consultative groups, working together rather than government agencies working separately. The payoff, many authorities feel, is that in Europe we simplify and speed up rather than complicate and slow down the passage of international cargo.[5]

On the other hand, the federal government and its agencies do desire to facilitate the development of international containerization

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[1] _Ibid_., p. 254.

[2] _Ibid_.

[3] _Ibid_., p. 255.

[4] See p. 36, _supra_.

[5] LeBlanc, p. 6.

(including bargeships) and have taken numerous actions in its behalf. One of the most important and far-reaching of these actions has been passage of the 1970 Merchant Marine Act, which in 1971 was providing $390.7 million of the $841.9 million being spent on the construction of new containerships and bargeships under construction in U.S. shipyards.[1] Regarding bargeship operators, additional financial help has been provided them through an 87 1/2 percent load guarantee on the financing of their barges, which has prompted standard inland barge operators to seek and have passed legislation which raises their loan guarantees from 75 percent to the same 87 1/2 percent.[2]

Additionally, despite their shortcomings, regulatory agencies have taken many successful actions to promote containerization, and have proposed corrective legislation. The ICC and FMC, for example, both agreed (the former doing so over numerous filed protests) to authorize the "landbridge" plans of Sea Land Service and Seatrain Lines discussed in the inland transport mode section earlier,[3] although the operators were required to file their tariffs at both agencies.[4] Similarly, the regulatory agencies have made a public jurisdictional agreement regarding the movements of bargeships and their barges engaged

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[1]"Modernization of U.S. Merchant Fleet Includes 49 Ships for Liner Trade," Container News, December 1971, p. 16.

[2]The American Waterway Operators, "Title XI Finance Guarantee Bill with AWO Amendment Signed Into Law By President Nixon," Weekly Letter, October 28, 1972, p. 1.

[3]See pp. 80-81, supra.

[4]"International 'Landbridge' Plans of Sea-Land, Seatrain Authorized by ICC, FMC," Traffic World, January 24, 1972, p. 40.

in international trade. It was agreed that the FMC should be the filing agency for bargeship's "entire port-to-port service" even though some of such service may be performed by carriers subject to ICC jurisdiction. Regarding the barges, the ICC jurisdiction is limited to "that portion of transportation between United States ports which precedes or follows transshipment at an intermediate port." Further, the agreement states that the transfer of cargoes between a carrier's barges shall not be considered transshipment.[1]

The FMC, moreover, has proposed[2] a bill which would enable it to approve for the first time,

> . . . agreements entered into between parties subject to the FMC and those subject to the ICC. . . . The parties to approved agreements . . . would be insulated from from prosecution for anti-trust violations as to the approved activities.[3]

As might be expected, however, the latter provision has been diluted by a provision included in response to the concern of the Department of Justice which would

> . . . prohibit the commission [FMC] from approving an agreement to establish a through intermodal rate or route that has been arrived at with the participation of (1) a carrier not physically participating in the particular intermodal movement, (2) a steamship conference, or (3) a rate bureau.[4]

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[1]U.S. Interstate Commerce Commission, Joint Jurisdictional Statement Issued by ICC, FMC on "LASH" Operations, ICC Release No. 132-72 (Washington, D.C.: U.S. Interstate Commerce Commission, May 12, 1972), pp. 1-2.

[2]"FMC Proposes Law on Single Factor Rates," Container News, July 1972, p. 52.

[3]"Bentley, of FMC, Seeks Support for Intermodal Bill, Assails D of J Provision," Traffic World, September 25, 1972, p. 63.

[4]Ibid.

This provision has in turn been attacked by the Chairman of the FMC as defeating the purpose of the bill and if included and passed gravely endangering the steamship conference system and basic stability in foreign commerce.[1] Further, while no ICC complaints have been received as yet on the bill, the State Department and CAB have also raised objections, though these have been dismissed as minor by the FMC chairman.[2]

Additionally, the FMC has approved separate but similar cooperative agreements between both containership and bargeship operators, in which both equipment and operating costs may be shared and exchanged.[3] Such agreements have been approved over Justice Department and conventional shipline objections,[4] enable open voluntary participation, and require that the FMC be notified of inter-company arrangements either prior to or promptly after them, depending on where the arrangement falls under FMC specifications.[5] Further, the FMC has allowed a revenue pooling agreement between seven North Atlantic containership operators to stay in effect since fall 1971 when its members filed for its

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[1]Ibid.

[2]Robert F. Morison, "Intermodal Role Urged for the FMC," Journal of Commerce, September 19, 1972, p. 24.

[3]"More LASH Developments," Containerization International, March 1972, p. 57; and Federal Maritime Commission, Cooperative Working Agreement No. 9980 (Washington, D.C.: Federal Maritime Commission, July 3, 1972), pp. 1-3.

[4]"Carriers to Exchange Cost Information," Container News, January 1971, p. 36.

[5]Federal Maritime Commission, pp. 133.

approval with the FMC.[1] The approval hearings were still in session in September 1972, and stand a far greater chance of an affirmative decision now that the containership operators have agreed to satisfy a basic objection of shippers, trade association, commerce and industry organizations, labor leaders, ports, cities and states by permitting pool members to call at and provide sailings from any U.S. port.[2]

Further help may possibly be provided not only shiplines, but also the inland transport modes, by the Nixon Administration's proposed "Crippling Strikes Prevention Act." This bill, originally proposed in 1970, may have greater support in the future after the dock strikes discussed in the previous sub-section, although it was not passed by the 92nd Congress in 1972 despite Presidential pleas. For as was seen in the last sub-section,[3] Congress recently took action in this area and by doing so provoked a negotiated end of the strike on the West Coast before signing of the legislation. In addition, support for the administration's bill has been given by the Transportation Association of America,[4] while the United Transportation Consumers group supports such legislation in general[5] and another bill similar to the administration's has also

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[1]"Cooling the Rate War on the North Atlantic," Business Week, April 29, 1972, p. 48; also see p. 31 , supra.

[2]"North Atlantic Pool Lines to Call at Any U.S. Port," Container News, September 1972, p. 36.

[3]See p. 111, supra.

[4]"TAA Favors Legislation," Traffic World, February 7, 1972, p. 25.

[5]"Transport Consumer Group Urges Campaign to Enact Labor Reform Legislation," Traffic World, April 24, 1972, p. 26.

made some headway in Congress.[1] The administration's proposed bill would subject all transportation industries to the national emergency provisions of the Taft-Hartley Act and grant presidential powers for extending the latter act's 80-day "cooling-off" period by as long as 30 days, establishing a board empowered to direct continuation of "essential operations" of the industry for a period up to 180 days, and establishing procedures compulsory arbitration by a neutral board of the final offers of each negotiating side. The bill would also establish a commission to conduct a two-year study of labor relations in industries particularly vulnerable to national emergency disputes and amend the railway labor act to conform labor relations in that industry with those prevalent in other industries, including encouragement of voluntary settlement of grievances through changes in the existing grievance procedures.[2]

Another governmental effort at facilitating intermodal transport through aiding the inland barge (including bargeship barges) industry in its attempts to establish low rail-water rates for shippers, has been undertaken by the Maritime Administration (MA) of the U.S. Department of Commerce. The MA, because of railroad refusals to offer the same rates for combined water-rail shipments that they do for all-rail shipments, has determined that such rates are "an unfair competitive practice, unjustly discriminatory and detrimental to sound economic

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[1]"Congress Eyes Simmering Labor Disputes; Docks Reopened in Philadelphia," Traffic World, April 3, 1972, p. 11.

[2]"Nixon Renews Plea for New Authority Over Labor Disputes," p. 23.

conditions in the transportation industry." The MA further stated that it will endeavor to be alert to any violations of the above principles.[1] The MA has also made recommendations in the area of seaports, namely that federal funds for additional seaport construction be refused because existing facilities are adequate for expected volumes until 1985, and that there be established regional port authorities to enable specialization and improvement by individual ports in an area rather than duplication.[2]

Customs procedures have also been adjusted somewhat to facilitate both containership and bargeship cargo movements, and active cooperation from Customs Officials has been noted by a bargeship operator.[3] The main adjustments that have been made are single inspection points at some seaport container terminals for containers,[4] and the waiving of existing regulations at seaports and the checking of bargeship barges at inland points.[5] Further adjustments are called for by both containership[6] and bargeship[7] operators, however, mainly in the

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[1]Stanley Chapman, "Maritime Administration Says Railroads Have 'Obligation' to Offer Water-Rail Rates," Traffic World, April 3, 1972, p. 28.

[2]"Regearing the Ports," p. 33.

[3]E. F. Johnson, "LASH in Operation," ICHCA Journal, April 1970, p. 20.

[4]Houston Custom House Brokers Association, "Containers--What You Are Ordering and What to Expect," statement at Houston Intermodal Transport Seminar, Houston, Texas, May 16-18, 1972, pp. 3, 4. (Mimeographed.)

[5]Johnson, p. 20.

[6]LeBlanc, p. 6.

[7]Johnson, p. 20.

form of the destination nations accepting the origin nation's evaluation and descriptions of goods.[1]

One area in which the government has been remiss, however, is in the area of revising federal truck weight and dimension regulations. While these regulations were established to protect highways in 1956, both a Congressional study completed in 1964 and a revised size and weight code prepared by the American Association of State Highway Officials recommended federal legislative revisions that would facilitate economical container movements. Moreover, since then even though both Europe and several states (on non-Interstate highways) have approved such higher limits, Congress has still not done so on a national basis.[2]

Finally, federal courts and regulatory agencies have made various decisions in recent years which have been directly or indirectly relevant to containerization and intermodal systems. The ones which seem to have the most potential impact are in relation to the 1972 ILWU settlement discussed earlier in the labor sub-section,[3] where a federal district court in May 1972 enjoined the $1 per ton royalty payment on non-ILWA stuffed containers, and the ILWU and management negotiators agreed two weeks later to replace the royalty provision with the old 1970 agreement which stated that any containers within 50 miles of ports not stuffed by shippers must be stuffed by the ILWU. This action was

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[1]Ibid.

[2]Letter from Richard A. Staley, Assistant Director, The American Trucking Association, Inc., December 12, 1972.

[3]See pp. 104-105, supra.

also enjoined by the court in mid-June 1972, however, and since then an administrative law judge of the National Labor Relations Board (NLRB) has also taken action. Ruling that the agreement attempted to capture work for longshoremen that they had not previously performed, Judge James T. Rasbury barred both the 1970 agreement and the 1972 royalty agreement as being in the same spirit as the former, determining both to be "unenforceable and void" for the above reasons.[1] His decision blocks enforcement of the agreements unless it is reversed on appeals. It is reported that his decision prevents the driving out of business of several California motor carriers who were threatened by it.[2] His decision and the federal courts have been severely criticized, on the other hand, by both the ILWU and management participants in the agreements, as "aggressive" and unwarranted "intervention" which has left the labor peace "up in the air" for 10 months.[3]

A dispute has also arisen regarding the East Coast ILA contract, in which Prudential-Grace Lines, a bargeship operator, plans to sue both the New York Shipping Association and the Council of North Atlantic Shipping Associations for a combined total of over $100 million. Prudential-Grace charges that the containership and conventional ship operators in the associations who are "hostile" toward bargeship operators, have negotiated a contract which discriminates against the latter.

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[1]Alfred B. Veerhoff, "Motor Carriers Keep Right to Pack Containers," <u>Transport Topics</u>, November 13, 1972, pp. 1, 38.

[2]<u>Ibid</u>.

[3]"West Coast Dock Labor Peace Upset," <u>Journal of Commerce</u>, November 17, 1972, pp. 1, 17.

Specific complaints are the contract's restricting of LASH operations to ILA-worker ports, thus prohibiting Teamster-worked Richmond and other points along the Hudson River and East Coast canals and inland waterways from engaging in such operations. Further, the contract's use of two 18-man ILA work gangs on LASH ships, while only one 18-man gang is used on containerships, and its allowance of containerships but not barge-ships payment of royalties in lieu of use of ILA labor at plant sites are also held to be discriminatory. The president of the sued associations responded to these charges by stating that Prudential-Grace is free to negotiate its own contract with the ILA.[1]

Another court case which deals directly with containerization is one in which a U.S. court judge ruled that a terminal operator and containership operators' liability for the loss of $29,000 worth of goods through theft in the Port of New York were limited to $500 as a single package under the Carriage of Goods By Sea Act. The decision conflicts with another in which a leather manufacturer was awarded $49,500 in its suit against a containership operator, and was made on the basis of terminology differences on the bill of lading in the two cases, as well as the fact that in the former case the container was supplied by a freight forwarder while in the latter case it was supplied by the shipline. These differences have been termed insignificant by a New York lawyer-author who specializes in the maritime field and who severely criticized the decision as leaving the "law of containerization

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[1]"LASH Operator Hits ILA Pact, Plans Court Suit; Dickman, of NYSA, Responds," Traffic World, March 13, 1972, p. 70.

in severe disarray" as well as opening the door to new cases tried on the basis of similar "alleged differences."[1]

Finally, two other decisions relevant to this research have been made recently which involve railroads. In the first of these the ICC approved Southern Railway's application to purchase a barge line.[2] While the railroad claims this arrangement will benefit shippers and improve intermodalism,[3] bargelines and motor carriers consider it an improper step toward common ownership of other forms of transportation by railroads, which could lead to the railroads acquiring more than their fair share of the total traffic.[4] Moreover, The American Waterway Operators have filed an appeal against the decision,[5] while another railroad is using the Southern Railway decision as the basis for a supplemental pleadings in its efforts to purchase three barge lines and a mud company.[6]

The second court decision relevant to railroads was the setting aside by a federal court of the new ICC guidelines which would allow railroads to abandon track handling less than 34 carloads per year.

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[1]Seymour Simon, "U.S. Court Rules: Container Is One Package," Container News, September, 1972, pp. 10, 68-72.

[2]"ICC Lets Railroad Take Over Barge Line," Transport Topics, October 30, 1972, p. 1.

[3]"A Railroad That May Run a Barge Business," Business Week, November 18, 1972, pp. 87-88.

[4]"ICC Lets Railroad Take Over Barge Line," pp. 1, 27.

[5]"Barge Line Operation of Southern Rail Hit," Journal of Commerce, November 27, 1972, p. 9.

[6]The American Waterway Operators, "ICC Approval of Southern Railway's Control of Barge Line Cited by Katy Industries in Its Acquisition Bid," Weekly Letter, November 11, 1972, pp. 2-3.

The decision has caused reversion back to the old requirement that a railroad prove that track should be abandoned, "often a more difficult and time consuming procedure."[1] This action reinforces that taken earlier by the same court which held up actions based on the new ICC rules with a court order obtained by the state of Pennsylvania and labor organizations.[2]

Thus it can be seen in this and the previous sub-sections that the influences of the external factors of labor and government have been, still are, and no doubt will continue to be important factors in determining the course of the development of generalized surface transport systems, and containerization systems in particular, whether they be containership or bargeship based. The immediately following Relevant Studies' Findings section will discuss the relevant research studies that have been made concerning containership, bargeship and conventional ship systems or their components.

Relevant Studies' Findings

Introduction

The majority of relevant study findings have already been mentioned in the previous sections of this literature search. Some findings, however, because they pertain to more than one of the previous sections at one time or are international in scope rather than domestic,

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[1] "New ICC Rail Abandonment Rules Are Set Aside," Journal of Commerce, November 17, 1972, p. 1.

[2] Frank E. Shaffer, "Streamlined PC-Basic 11,000-Mile System," Modern Railroads, August 1972, p. 41.

have not yet been mentioned though they are nevertheless meaningful to this research.

It is the primary purpose of this section, therefore, to set forth such findings. Since, however, some studies' assumptions, approaches and findings have been found to differ in the same area, such differences will also be noted here.

Discussion

Two major studies have been found which compared bargeship systems with those of containerships and conventional ships. One of these was done for the United Nations (UN) in 1970 by the United Nations Conference on Trade and Development and entitled Unitization of Cargo. The other was done by the Planning Research Corporation for the U.S. Department of Transportation (DOT) in 1971 and entitled Transoceanic Cargo Study.

The former's approach was primarily a verbal and accounting-type analysis, while the latter's was directed toward setting up computerized, mathematical simulations. Both were international in scope, the former's analysis being on the basis of developing versus developed nations, the latter's computing dollar values and labor and port costs by trade area (coastline) or country. These international emphases render the studies useful to this research, but not duplicative, since neither treats individual U.S. seaports specifically.

Of the two, however, it appears that despite the computerization of the DOT study, the UN study is more useful toward gaining an understanding of the differences between the systems, particularly in the area of port costs. For example, the DOT study uses the following equations to constitute port costs for all three vessel systems--bargeship, containership and conventional ship, in its model:[1]

<u>Entry and Exit Costs</u>:

$PE = k_i\ e^L\ G^{.585}$ $\qquad$ $i = 1,2,3,4,5$

PE = \$ cost to enter and exit the port

L = labor ratio in the trade area

e = 2.718 (not in original text, received by letter from firm)

k (constant) values are listed in separate table by trade area.

<u>Daily Costs</u>:

$P_c = 17\ k_i\ L^{.5}\ G^{.67}$ $\qquad$ $i = 1,2,3,4,5$

P_c = \$ cost for each day vessel is in port

L = as above

G = as above

k values = as above

The value "17" in the latter equation, which was not further treated, may contain some of the more detailed items discussed in the next paragraph, and the model also contains cost equations for break-bulk,[2]

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[1]Planning Research Corporation, p. IX-28.

[2]*Ibid.*, pp. IX-19-IX-24.

barge[1] and container[2] cargo handling, but these equations are also constructed on the basis of charges rather than delineations of system components, and while they may enable rapid computer simulations of alternative system costs do little to enhance reader understanding of the structural and port investment cost difference between the systems.

On the other hand, the UN study breaks port costs down into separate labor, capital, and cost of ship's time at berth for each vessel system. Tables 9, 10, and 11 thoroughly delineate in detail, moreover, not only the physical sub-components of the above components, but also quantify them both in terms of generalized man-hours and/or dollars for developing and developed countries. Though these breakdowns are shown only in the study's appendices and not discussed in detail in its text, they provided a useful sound analytical base for this research's efforts toward gathering and interpreting data from individual U.S. seaports.

Regarding the port costs shown in these tables, while the United Nations study does not discuss specific cases, it should be noted in Table 11 that the only unique capital cost for working the bargeship parent vessel or its barges is one for tugboat services, which most U.S. seaports certainly had prior to bargeships, thus requiring little or no new investments in this area. Similarly, the study also points out in the text that bargeship systems are the most versatile of the three, not requiring specialized facilities but rather capable of using

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[1] Ibid., pp. IX-24-IX-27.

[2] Ibid., pp. IX-15-IX-18.

TABLE 9

ASSUMPTIONS AND PORT COST PER TON CALCULATIONS--BREAK-BULK BERTHS

PART I. Definitions of symbols and list of assumptions

Definition	Symbol	Typical Break-Bulk Berth in Developing Country	Typical Break-Bulk Berth in Developed Country
Total number of dock-workers employed in transferring cargo from ship to road or rail transport or vice versa (per ship gang per shift)	d	30	26
Total number of staff employed (per day per berth)	x	60	20
Average wage of a dock-worker ($ per shift)	l	5.0	25.0
Average salary of staff ($ per annum)	s	1,500	7,500
Berth throughput (tons per annum)	t	120,000	120,000
Average productivity (tons per gang/shift)	p	80	120
Length of berth (meters)	y	160	160
Capital cost of quay construction ($ per meter)	c_q	8,000	8,000
Amortization period for quay construction cost (years)	n_q	40	40
Maintenance cost of quay as fraction of capital cost ($ per annum)	m_q	0.025	0.025
Area of berth (sq. meters)	z	19,000	19,000
Capital cost of surfacing the berth area ($ per sq. meter)	c_z	10	10
Amortization period for surfacing cost (years)	n_z	40	40
Maintenance cost of surfaced berth area as fraction of capital cost ($ per annum)	m_z	0.025	0.025
Floor area of shed (sq. meters)	a	10,000	10,000
Capital cost of shed ($ per sq. meter)	c_s	40	40
Amortization period for shed (years)	n_s	30	30
Maintenance cost of shed as fraction of capital cost ($ per annum)	m_s	0.05	0.05
Number of shore cranes (per berth)	p_{sc}	4	4
Capital cost of shore cranes ($ per piece)	c_{sc}	100,000	100,000
Amortization period for shore cranes (years)	n_{sc}	25	25
Maintenance cost of shore cranes as fraction of capital cost ($ per annum)	m_{sc}	0.075	0.075
Capital cost of other equipment ($ per berth)	c_{oe}	150,000	200,000
Amortization period for other equipment (years)	n_{oe}	8	8
Maintenance cost of other equipment as fraction of capital cost ($ per annum)	m_{oe}	0.125	0.125
Interest rate	i	0.08	0.08
Berth occupancy be vessels as percentage of working time	u	83	67
Daily cost of average vessel visiting the berth ($) (based upon a vessel of 4,000 dwt for Piraeus and a vessel of 8,000 dwt for the remainder)	v	2,000	2,000

TABLE 9--Continued

PART II. Formulae for cost per ton calculations

A. Labor and staff costs	$= \frac{d.l}{p} + \frac{x.s}{t}$	
B. Capital equipment costs	$= (1) + (2) + (3) + (4) + (5)$	
(1) Berth cost	$= \frac{y.c_q(m_q+f_q)}{t}$	in which $f_q = \frac{i(1+i)n_q}{(1+i)n_q - 1}$
(2) Surfacing cost	$= \frac{z.c_z(m_z+f_z)}{t}$	in which $f_z = \frac{i(1+i)n_z}{(1+i)n_z - 1}$
(3) Shed cost	$= \frac{a.c_s(m_s+f_s)}{t}$	in which $f_s = \frac{i(1+i)n_s}{(1+i)n_s - 1}$
(4) Shore crane cost	$= \frac{p_{sc}.c_{sc}(m_{sc}+f_{sc})}{t}$	in which $f_{sc} = \frac{i(1+i)n_s}{(1+i)n_{sc} - 1}$
(5) Other equipment cost	$= \frac{c_{oe}(m_{oe}+f_{oe})}{t}$	in which $f_{oe} = \frac{i(1+i)n_{oe}}{(1+i)n_{oe} - 1}$
C. Cost of ships' time at berth	$= \frac{v.365.u}{t}$	

PART III. Cost per ton calculations ($ per ton)	Typical Break-Bulk Berth in Developing Country	Typical Break-Bulk Berth in Developed Country
Labor and staff costs	2.63	6.66
Capital equipment costs	2.73	2.85
Cost of ships' time at berth	5.05	4.08
Total port cost per ton	10.41	13.60

Source: United Nations, *Unitization of Cargo*, New York, 1970, pp. 129-130.

TABLE 10

ASSUMPTIONS AND PORT COSTS PER TON CALCULATIONS--BARGESHIPS

SECTION ONE: Discharging and Loading the Parent Vessel

PART I. Definitions of symbols and list of assumptions

Definition	Symbol	Developing Country	Developed Country
Number of dock-workers employed (per shift per berth)	d	14	12
Number of staff employed (per day per berth)	x	18	6
Average wage of a dock-worker ($ per shift)	l	5.0	25.0
Average salary of staff ($ per annum)	s	1,500	7,500
Rate of discharging and loading barges (barges per shift) . . .	r	15	15
Average weight of cargo in barge (tons)	j	250	250
Number of barges handled per year	h	960	960
		(40 per visit; 24 visits per annum)	
Number of tugboats employed	g	3	3
Cost of tugboats ($/hour)	c_g	50	50
Daily cost of average vessel visiting the berth (4) (based upon a vessel of 43,000 dwt)	v	7,200	7,200
Daily cost of a barge ($)	k	16	16
Number of days a barge spends in port	b	15	15

PART II. Formulae for cost per ton calculations

(A) Labor and staff costs $= \frac{d.l}{4.j} + \frac{x.s}{h.j}$

(B) Capital equipment costs $= \frac{g.c_g}{2.j}$

(C) Cost of ships' time at berth $= \frac{v}{2.4.j} + \frac{k.b}{2.j}$

PART III. Cost per ton calculations ($ per ton)

	Developing Country	Developed Country
Labor and staff costs	0.13	0.27
Capital equipment costs	0.30	0.30
Cost of ships' time at berth	1.44	1.44
Total cost per ton for ship operation	1.87	2.01

SECTION TWO: Discharging and Loading the Barges

PART I. Definitions of symbols and list of assumptions

Definition	Symbol	Developing Country	Developed Country
Total number of dock-workers employed in transferring cargo from barge to road or rail transport or vice versa (per gang per shift)	d	23	20
Average productivity (tons per gang-shift)	p	100	150

Except for the manning and the achieved productivity, the discharging and loading of the barges completely fits in a regular break-bulk berth operation. Therefore the assumptions made for the break-bulk berths remain valid.

TABLE 10--Continued

PART II. Formulae for cost per ton calculations

(A) Labor and staff costs $= \frac{d.l}{p}$

Staff cost $= \frac{x.s}{t}$

(B) Capital equipment costs = (see break-bulk berth)

(C) Cost of barges at berth $= \frac{k}{2.p}$ (but this is already included in Section One, II(C), in the cost of ships' time at berth as part of the time that barges spend in port).

PART III. Cost per ton calculations ($ per ton)

	Developing Country	Developed Country
Labor and staff costs	1.90	4.58
Capital equipment costs	2.73	2.86
Cost of barges' time in port	(included in cost of ships' time at berth--see section one, II(C))	
Total cost per ton for break-bulk operations . . .	4.63	7.44

SECTION THREE: Cost per Ton Calculation for the Handling of the Parent Vessel and for the Break-Bulk Operation of the Barges ($ per ton)

	All Barges Door-to-Door		All Barges Quay-to-Quay	
	Developing Country	Developed Country	Developing Country	Developed Country
Labor and staff costs	0.13	0.27	2.03	4.85
Capital equipment costs	0.30	0.30	3.03	3.16
Cost of ships' and barges' time in port . . .	1.44	1.44	1.44	1.44
Total cost per ton for the handling of the parent vessel and for the break-bulk operation of the barges	1.87	2.01	6.50	9.45

Source: United Nations, Unitization of Cargo, New York, 1970, pp. 138-140.

TABLE 11

ASSUMPTIONS AND PORT COST PER TON CALCULATIONS--LIFT-ON/LIFT-OFF CONTAINER BERTH

PART I. Definitions of symbols and list of assumptions

Definition	Symbol	Values for Developing Country 1-Gantry-Crane Berth	Values for Developing Country 2-Gantry-Crane Berth	Values for Developed Country 1-Gantry-Crane Berth	Values for Developed Country 2-Gantry-Crane Berth
Number of dock-workers employed (per shift per berth)	d	17	32	15	28
Number of staff employed (per day per berth)	x	75	123	25	41
Average wage of a dock-worker ($ per annum)	w	1,500	1,500	7,500	7,500
Average salary of staff ($ per annum)	s	1,500	1,500	7,500	7,500
Berth throughput (tons per annum)	t	480,000	960,000	480,000	960,000
Length of berth (meters)	y	250	250	250	250
Capital cost of quay construction ($ per meter)	c_q	8,000	8,000	8,000	8,000
Amortization period for quay construction cost (years)	n_q	40	40	40	40
Maintenance cost of surfaced berth area as fraction of capital cost ($ per annum)	m_q	0.025	0.025	0.025	0.025
Area of berth (sq. meters)	z	50,000	100,000	50,000	100,000
Capital cost of quay construction ($ per sq. meter)	c_z	10	10	10	10
Amortization period for surfacing cost (years)	n_z	40	40	40	40
Maintenance cost of surfaced berth area as fraction of capital cost ($ per annum)	m_z	0.025	0.025	0.025	0.025
Number of gantry cranes (per berth)	p_{gc}	1	2	1	2
Capital cost of gantry cranes ($ per piece)	c_{gc}	1,000,000	1,000,000	1,000,000	1,000,000
Amortization period for gantry cranes (years)	n_{gc}	15	15	15	15
Maintenance cost of gantry cranes as fraction of capital cost ($ per annum)	m_{gc}	0.10	0.10	0.10	0.10
Number of straddle carriers (per berth)	p_{str}	3	6	3	6
Capital cost of straddle carriers ($ per piece)	c_{str}	100,000	100,000	100,000	100,000
Amortization period for straddle carriers (years)	n_{str}	6	6	6	6
Maintenance cost of straddle carriers as fraction of capital cost ($ per annum)	m_{str}	0.20	0.20	0.20	0.20
Number of trailers (per berth)	p_{tl}	18	36	18	36
Capital cost of trailers ($ per piece)	c_{tl}	3,000	3,000	3,000	3,000
Amortization period for trailers (years)	n_{tl}	8	8	8	8
Maintenance cost of trailers as fraction of capital cost ($ per annum)	m_{tl}	0.125	0.125	0.125	0.125

TABLE 11--Continued

Definition	Symbol	Values for Developing Country: 1-Gantry-Crane Berth	Values for Developing Country: 2-Gantry-Crane Berth	Values for Developed Country: 1-Gantry-Crane Berth	Values for Developed Country: 2-Gantry-Crane Berth
Number of tractors (per berth)	p_{tr}	3	6	3	6
Capital cost of tractors ($ per piece)	c_{tr}	5,000	5,000	5,000	5,000
Amortization period for tractors (years)	n_{tr}	8	8	8	8
Maintenance cost of tractors as fraction of capital cost ($/annum)	m_{tr}	0.125	0.125	0.125	0.125
Interest rate	i	0.08	0.08	0.08	0.08
Berth occupancy by vessels as percentage of working time	u	67	67	67	67
Daily cost of average vessel visiting the berth ($) based upon a vessel of 15,000 dwt)	v	4,800	4,800	4,800	4,800
Average weight of cargo in container (tons)	j	12	12	12	12
Daily cost of a container ($)	k	1.71	1.71	1.71	1.71
Number of days a container spends in port	b	10	10	10	10

PART II. Formulae for cost per ton calculations

(A) Labor and staff $= \frac{(d.w)+(x\ s)}{t}$

(B) Capital equipment costs $= (1) + (2) + (3) + (4)$

(1) Berth cost $= \frac{y.c_q(m_q+f_q)}{t}$ in which $f_q = \frac{i(1+i)\ n_q}{(1+i)n_q-1}$

(2) Surfacing cost $= \frac{z.c_z(_z+f_z)}{t}$ in which $f_z = \frac{i(1+i)n_z}{(1+i)n_z-1}$

(3) Gantry-crane cost $= \frac{p_{gc}\cdot c_{gc}(m_{gc}+f_{gc})}{t}$ in which $f_{gc} = \frac{i(1+i)n_{gc}}{(1+i)n_{gc}-1}$

(4) Other equipment cost $= \frac{1}{t}\,[P_{str}\cdot c_{str}(m_{str}+f_{str})+p_{tl}\cdot c_{tl}(m_{tl}+f_{tl})+p_{tr}\cdot c_{tr}(m_{tr}+f_{tr})]$ in which $f_{str} = \frac{i(1+i)n_{str}}{(1+i)n_{str}-1}$

$f_{tl} = \frac{i(1+i)n_{tl}}{(1+i)n_{tl}-1}$

$f_{tr} = \frac{i(1+i)n_{tr}}{(1+i)n_{tr}-1}$

(C) Cost of ships' time at berth $= \frac{v.365.u}{t} + \frac{k.b}{2j}$

PART III. Cost per ton calculations ($ per ton)	Developing Country: 1-Gantry-Crane Berth	Developing Country: 2-Gantry-Crane Berth	Developed Country: 1-Gantry-Crane Berth	Developed Country: 2-Gantry-Crane Berth
Labor and staff costs	0.34	0.29	0.86	0.76
Capital equipment costs	1.32	1.09	1.32	1.09
Cost of ships' time at berth	2.44	1.22	2.44	1.22
Total port cost per ton	4.10	2.60	4.62	3.07

Source: United Nations, Unitization of Cargo, New York, 1970, pp. 132-133.

old conventional facilities,[1] with little, if any, additional investments required; whereas containerships require the greatest investments.[2] This latter finding is reinforced, moreover, by the data in Table 10. The effect this has had on the situations of United States seaports is not covered, however, and will be by this research.

Both studies also treat the operational and investment characteristics and costs of each vessel type in detail, the DOT study utilizing sophisticated dynamic equations designed for its simulation model whereas the United Nations study uses discussion and tables to present a more static analysis of similar material. As this material is only marginally relevant to this research's objectives, mainly as background material, only two UN summary tables are reproduced here in Tables 12 and 13.

The UN study does make one comment regarding these vessel comparisons which is particularly relevant to this study, however:

> It seems to be clear that the above three systems of unitization [pallet ships, which are not significant in U.S. international trade, are included in the UN study] will compete with each other in the near future at least, and that their economic feasibility will finally be proved through competition rather than through theoretical estimates and comparisons of costs. There is no reason that one system will become universally adopted to the exclusion of all others. Different systems may exist side by side, serving different trading needs, with conventional vessels handling small trades and cargoes which cannot be fitted into the unit load system.[3]

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[1]United Nations, p. 5.

[2]*Ibid.*, p. 19.

[3]*Ibid.*, p. 31.

TABLE 12

STRUCTURE OF SPACE COST PER FREIGHT TON OF ONE CUBIC METER

Item/Type	Conventional Ship (%)	Container Ship (%)	Barge-Carrying Vessel (LASH) (%)
Capital cost on investments			
Ships	37.7	29.0	43.6
Container	..	21.3	..
Barge	..	..	17.1
Total capital cost	(37.7)	(50.3)	(60.7)
Operational cost			
Crew cost	28.0	8.3	6.2
Maintenance, insurance and stores (ships, containers and barges)	6.7	9.3	10.7
Fuel expenses	9.6	12.2	9.6
Port charges	8.7	3.3	3.4
Administration expenses	9.3	16.6	9.4
Total operational cost	(62.3)	(49.7)	(39.3)
TOTAL	100.0	100.0	100.0

Source: United Nations, Unitization of Cargo, New York, 1970, p. 26.

TABLE 13

COMPARISON OF ESTIMATED FUTURE COSTS BY TYPE OF VESSEL
(in $ per freight ton of one cubic meter)

Type of Vessel	Costs/Cubic Meter	Current	Ten Years From Now	Assumed Growth Rates (average per year)	
					(%)
Conventional ship	Capital cost	2.30	2.30		0.0
	Operational cost	3.81	6.56	crew cost	10.0
				other costs	5.0
	Cargo handling cost[a]	17.00	34.00		10.0
	Total	23.11	42.86		8.5
Container ship	Capital cost	2.50	2.50		0.0
	Operational cost	2.47	3.96	crew cost	10.0
				other costs	5.0
	Cargo handling cost	5.90	7.97		3.5
	Total	10.87	14.43		3.3
LASH vessel	Capital cost	2.48	2.48		0.0
	Operational cost	1.61	2.54	crew cost	10.0
				other costs	5.0
	Cargo handling cost (palletized cargo)	7.40	11.10		5.0
	Total	11.49	16.12		4.0

Source: United Nations, Unitization of Cargo, New York, 1970, p. 30.

[a]Cargo handling costs are based on door (of developed countries with highest costs) to quay (of developing countries with lowest costs).

Finally, neither the UN nor the DOT study gave extensive treatment to the domestic portions of international movements. The only references to domestic movements in the UN study were their inclusion in the "door-to-door" cost totals found in comparisons throughout the study. No delineations of the inland portion's sub-components or their individual costs were found. The DOT study, while it does develop inland line haul costs equations by certain commodity groups for railroads,[1] trucks[2] and barges,[3] does not directly compare and contrast them as modal alternatives. Nor does it do more than make the single mention of inland ports cited earlier in the barge sub-section.[4] This is no doubt because the study's objective was the construction of a model which could be used for simulating alternative systems, rather than analyzing the geographical and structural characteristics of domestic system components and how they compare and interact competitively.

On the other hand, two studies sponsored by the U.S. Department of Commerce dealt extensively with this area. These studies were published in 1971 and 1972, entitled The Impact of Containerization on the United States Economy and The Impact of Containerization on the United States Transportation System, and performed by the Matson Research Corporation and Manalytics, Inc., respectively. Unfortunately, the former did not bring inland ports, bargeships, or barges into its

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[1]Planning Research Corporation, pp. X-1-X-14.

[2]*Ibid.*, pp. X-30-X-34.

[3]*Ibid.*, pp. X-35-X-43.

[4]See pp. 72-73, *supra*.

analyses, while the latter, though treating barge container movements, did not separately analyze either inland ports, bargeship or bargeship barges.

The Matson study is thorough, however, in its treatment of international commerce which moves inland over land. Figure 1, for example, illustrates 15 alternative routes that a containerized shipment may take to reach its destination. The following description explains the figure's symbols and labelling:

> Representative physical flow alternatives for various container-based freight systems, from origin (O) to destination (D), are shown . . . to consist of different combinations of transportation modes and transfer modes. The modes represented by diamonds (◇) refer to the method of transportation used to move freight between distribution system modes. The major transportation modes are truck (T), rail (R), and ship (S). The modes represented by triangles (△) indicate facilities where freight is transferred between modes. Inland modes are represented by the letter I, port modes by the letter P. Containerized freight is represented by a rectangle (▭) uncontainerized freight by a circle (○). There are two major functional mode categories: one where a container is filled or emptied as a part of the process of changing modes, the other where there is a change in mode only. On the Figure a mode within a container (▭△▭) preceded by a mode within a circle (△) indicates the filling of a container at that mode. The reverse sequence indicates the emptying of a container.[1]

The labels at the origins of the routes are self-explanatory. The figure illustrates both some of the wide variety of possible routes a containerized shipment can take as well as the interdependence of these components of a larger system.

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[1]Matson Research Corporation, The Impact of Containerization on the U.S. Economy: Volume 1, pp. 7-8.

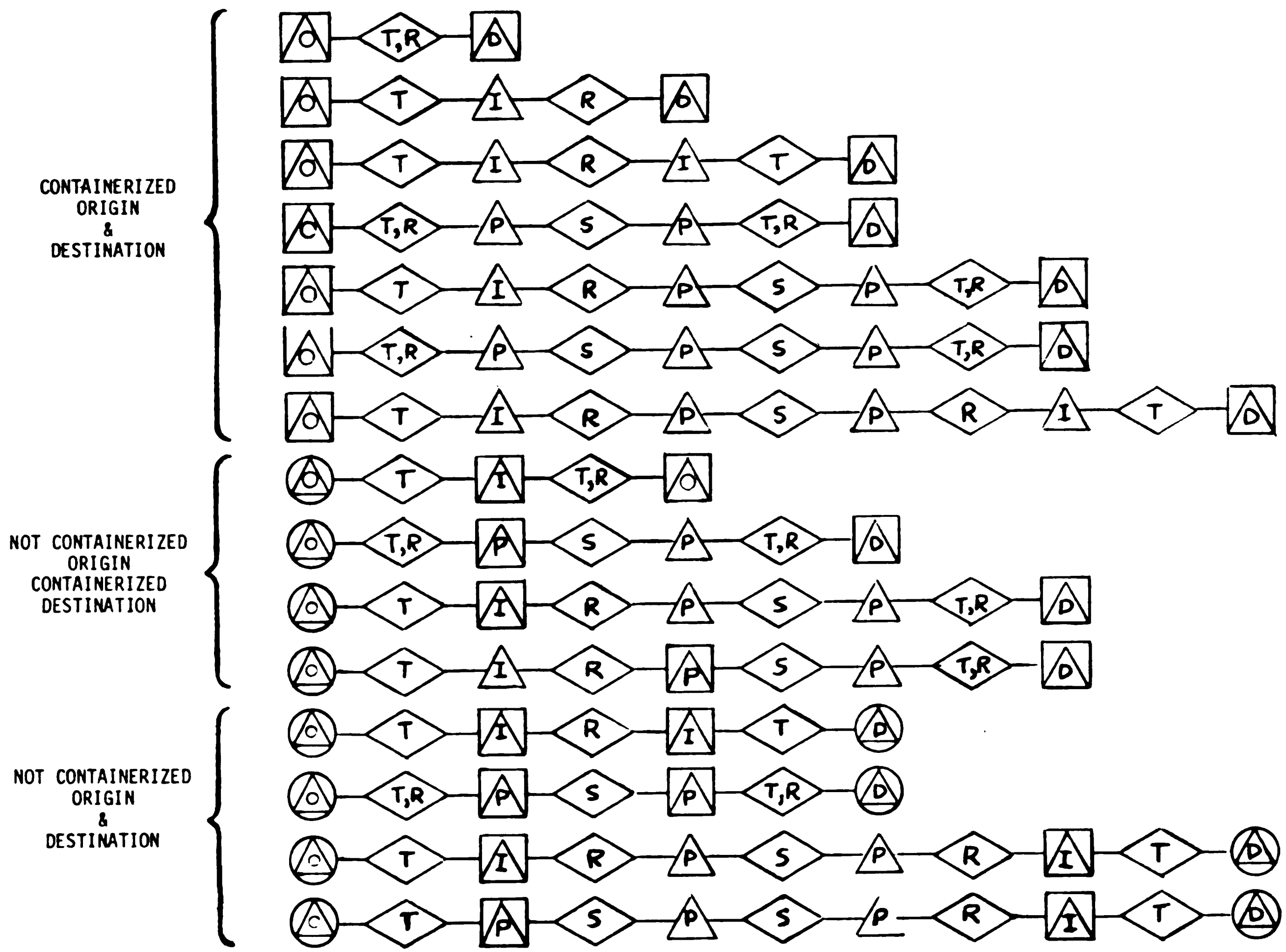

Figure 1. Container-based freight distribution systems--representative flow alternatives.

Source: Matson Research Corporation, The Impact of Containerization on the U.S. Economy, U.S. Department of Commerce, San Francisco, September, 1970, p. 8.

The study also contains numerous other comparisons of movement alternatives. One, for instance, illustrates how in 1970 the same shipment of household goods from a North Atlantic city to the Far East coast $26.95 per unit via container as compared to $39.25 per unit via conventional movement. The difference was shown to be caused mainly by added warehousing, export packing and pier (handling) costs for the latter.[1] Similarly, Figure 2, using the same symbols and labelling as Figure 1, illustrates the comparative direct operating costs of the international movement of a 20-foot container via unit train versus a like quantity of the same goods moving conventionally. The major savings here are shown to be those of the pier savings, since $600 of the $680 conventional port costs were for stevedoring,[2] and the unit train savings.

The study additionally illustrates the comparative transportation costs for moving 40-foot and 20-foot containers inland via different modal alternatives, and these are shown here in Figures 3 and 4, respectively. These figures, incidentally, not only show the modal cost characteristics, but also through the increases in slopes shown, how these costs increase dramatically when the container's size is decreased.

The four figures not only illustrate the general types of analyses done in the study, but also provide a visual presentation of material conducive to a more thorough understanding of potential intermodal flows, cost differences between a unitized versus a conventional

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[1] _Ibid._, pp. 39-40.

[2] _Ibid._, pp. 68-69.

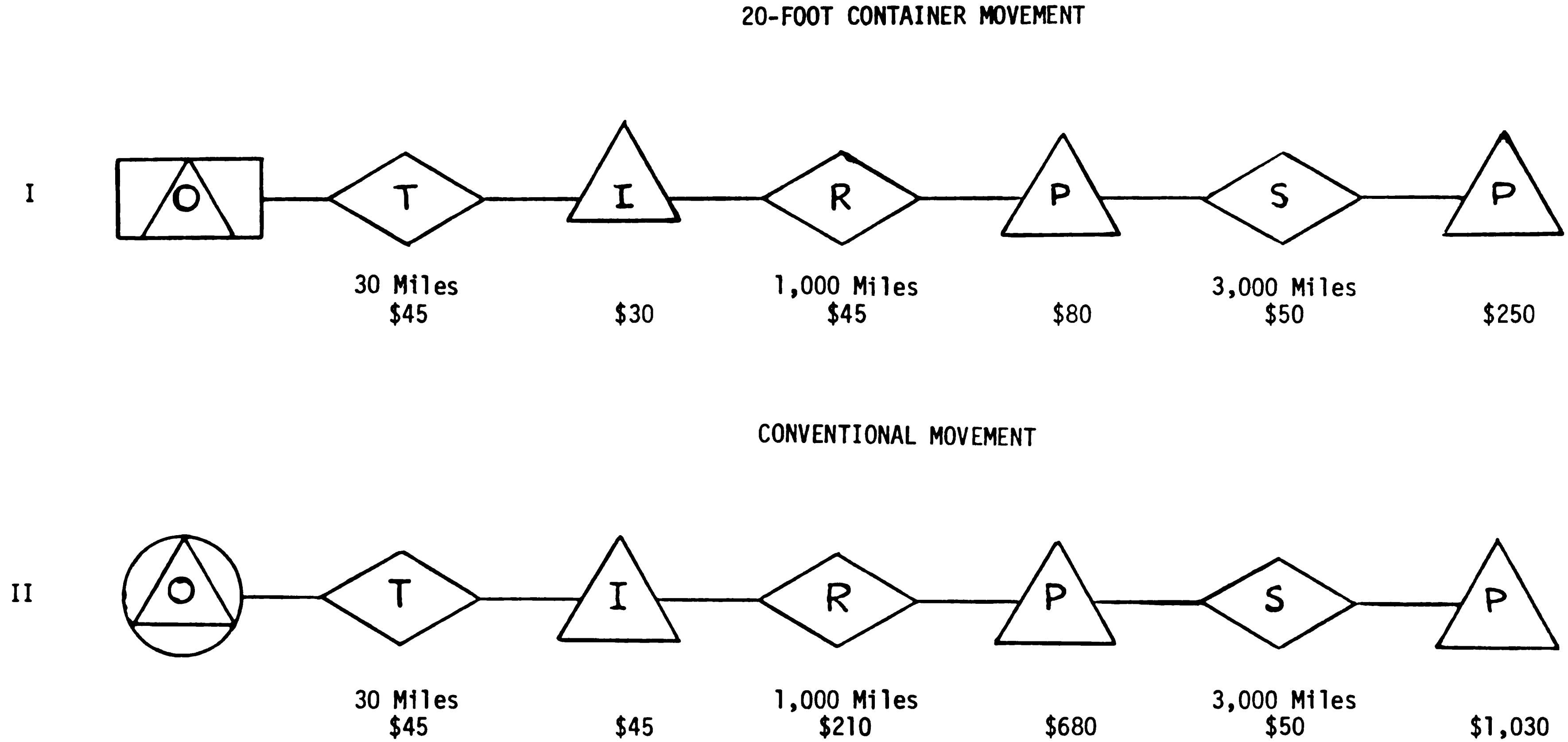

Figure 2. Comparative direct operating costs.

Source: Matson Research Corporation, The Impact of Containerization on the U.S. Economy, U.S. Department of Commerce, San Francisco, September, 1970, p. 68.

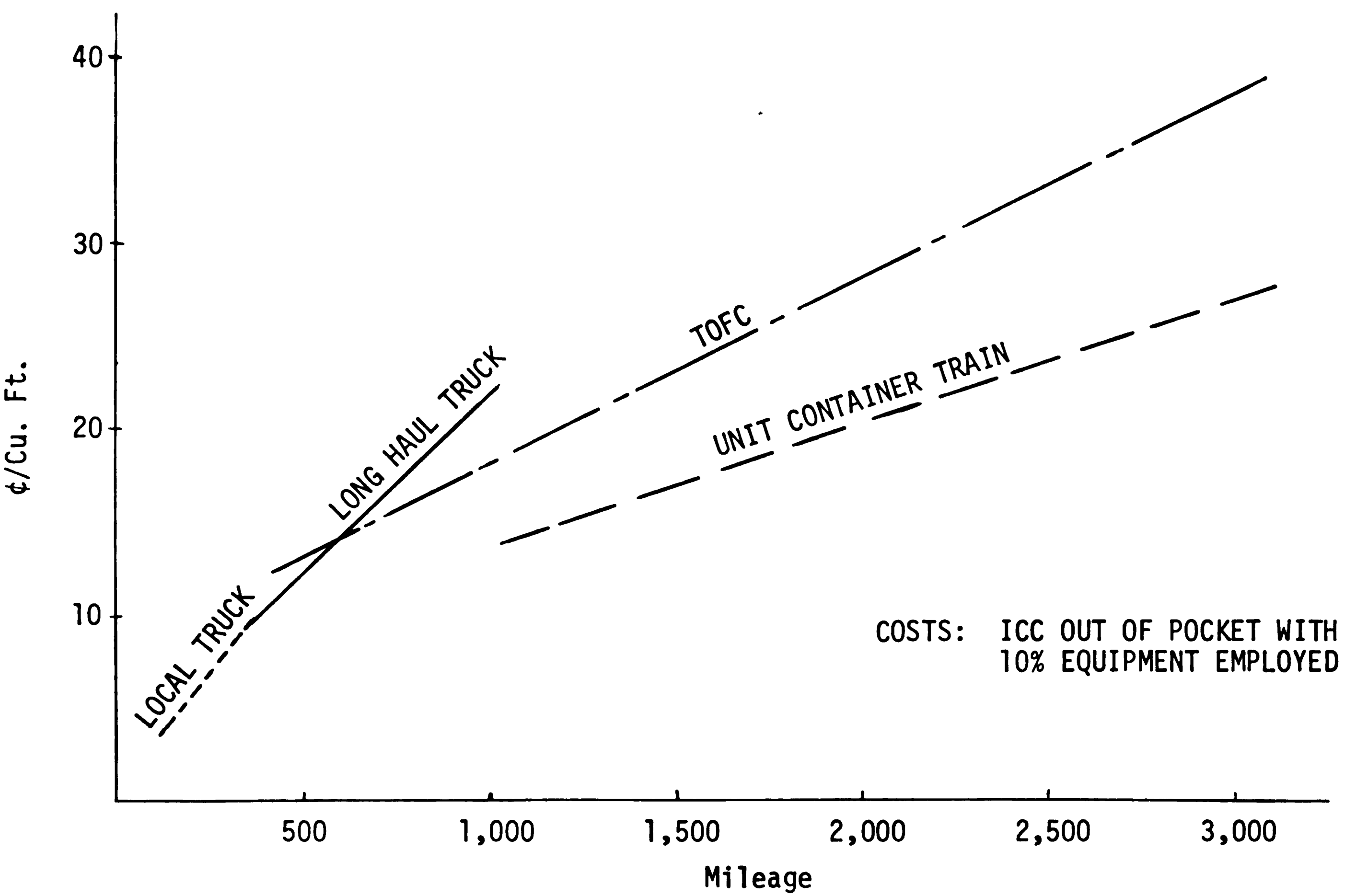

Figure 3. Comparison of transportation costs by inland mode for 40-foot container.

Source: Matson Research Corporation, The Impact of Containerization on the U.S. Economy, Vol. I, U.S. Department of Commerce, San Francisco, September, 1970, p. 68.

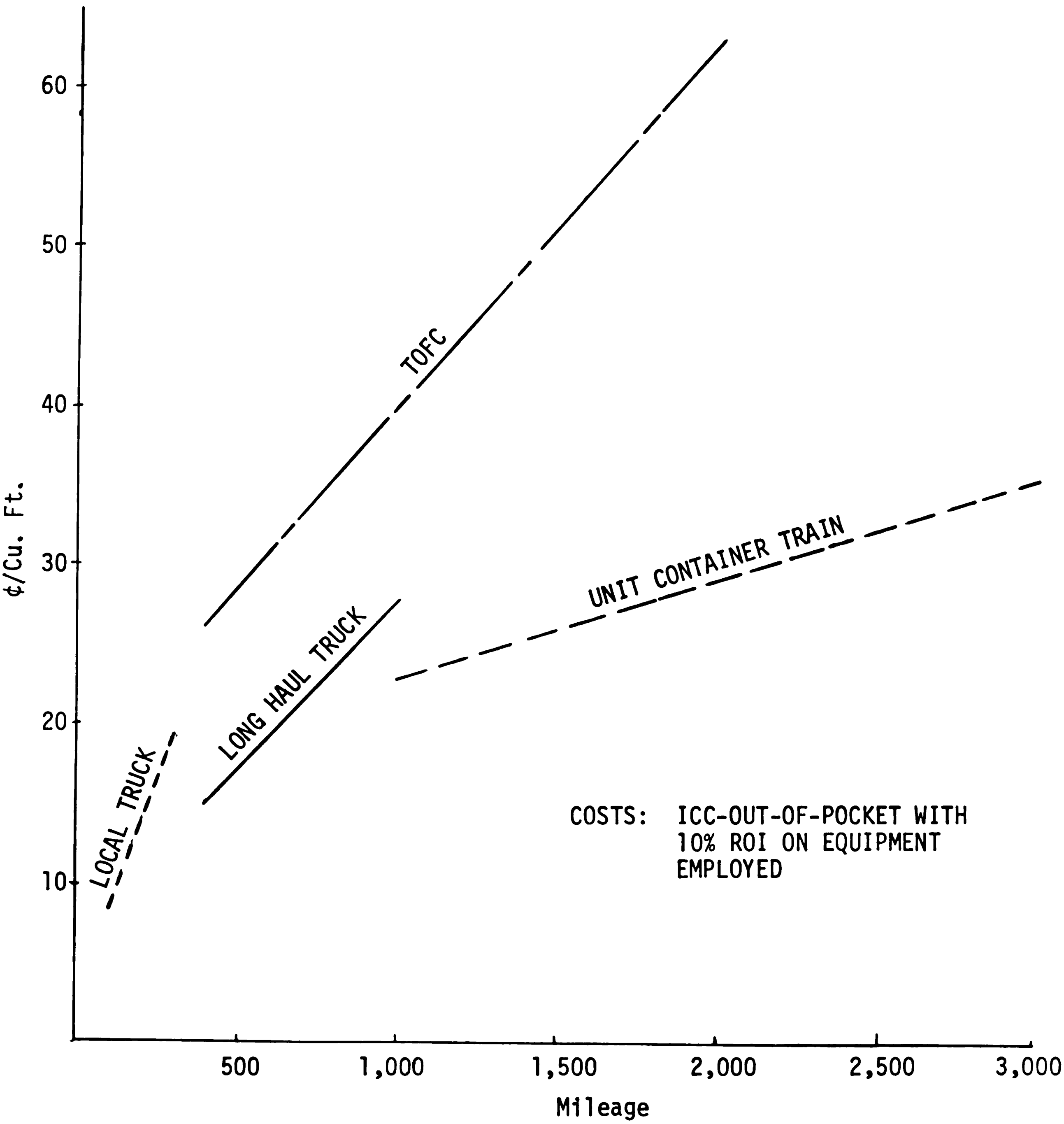

Figure 4. Comparison of transportation costs by inland mode for 20-foot container.

Source: Matson Research Corporation, The Impact of Containerization on the U.S. Economy, Vol. I, U.S. Department of Commerce, San Francisco, September, 1970, p. 68.

movement, and the differing cost characteristics of some inland modal alternatives, the latter two of which were verbally discussed earlier.[1] Such material, when supplemented in this research with similar material regarding inland ports and conventional and bargeship barges, should provide a thorough picture to this research's readers of all the inland transport alternatives available to shippers.

This is not to say, however, that the Matson study does not deal with the seaport components of containerized distribution systems. Indeed, there are extensive surveys of containership facilities at U.S. ports[2] in the study, as well as such analyses as the comparative costs of construction of a new container terminal versus a new conventional, terminal versus a container terminal converted from a conventional terminal.[3]

Similarly, the Manalytics study made some relevant observations regarding U.S. seaports. One of these was already mentioned[4] and stated that container crane lift capacities were chosen by them as the best overall measure of container port capacity. Tables 14 and 15, extracted from the study, illustrate their estimated 1975 container crane situations by individual U.S. seaport and seacoast, respectively (with offshore crane data included for completeness).

The Manalytics study explained, moreover, why the Gulf Coast capacities have lagged and are expected to continue lagging behind the

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[1]See p. 65 and pp. 76-82, 90-97, <u>supra</u>.

[2]<u>Ibid</u>., pp. 88-106.

[3]<u>Ibid</u>., pp. 29-34.

[4]See p. 46, <u>supra</u>.

TABLE 14

1975 CONTAINER LIFT CAPACITY BY PORT

Port	Pure Container Cranes		Multipurpose Cranes		
	Number	Σ Lifts (000)	Number	Σ Lifts (000)	Lifts in Major Container Ports
PACIFIC COAST					
Seattle	12	960	3		90
Tacoma	2	160			
Portland	2	160	5		150
San Francisco	2	160			
Oakland	15	1,200			
Los Angeles	9	720			
Long Beach	17	1,360			
San Diego	1	80			
GULF COAST					
Brownsville			2	60	
Galveston	2	160	2		60
Houston	4	320	6		180
Beaumont			1	30	
Port Arthur			1	30	
New Orleans	6	480			
Mobile			5	150	
ATLANTIC COAST					
Miami			1	30	
Port Everglades	1	80			
Jacksonville	2	160	6		180
Savannah	1	80	2		60
Charleston	2	160	4		120
Wilmington, N.C.			3	90	
Norfolk	5	400			
Portsmouth	5	400			30
Newport News	1	80	1		30
Baltimore	9	720	2		60
Wilmington, Del.			1		30
Philadelphia	3	240	1		30
Camden, N.J.					
Staten Island	5	400	2		60
Brooklyn	2	160			
Port Newark	8	640			
Elizabeth	10	800			
Weehawken	3	240			
Edgewater	1	80			
Port Jersey	2	160			
Boston	3	240	2		60
OFFSHORE					
Honolulu	6	480	1		30
San Juan, P.R.	6	480			
Anchorage	2	160			

Source: Manalytics, Inc., The Impact of Containerization on the U.S. Transportation System, Vol. II (San Francisco: U.S. Department of Commerce, February, 1972), p. 85.

TABLE 15

1975 CONTAINER BERTHS AND PURE CONTAINER CRANES BY SEABOARD

Seaboard	Container Berths		Container Cranes	
	Number	Percent Total	Number	Percent Total
Pacific Coast	73	27	60	40
Gulf Coast	30	11	11	8
Atlantic Coast	154	57	64	43
Offshore	14	5	14	9
Total	271	100	149	100

Source: Manalytics, Inc., The Impact of Containerization on the United States Transportation System, Vol. II (San Francisco: U.S. Department of Commerce, February, 1972, p. 87.

East and West Coasts. Mentioning the fact that a new dimension is added to Gulf Coast cargo movements by their inland waterway connections, the study cites the growing use of LASH and SEABEE barges on these inland waterway connections as a major factor leading to caution by these ports in their decisions regarding container facilities investments.[1] Similarly, the study states that:

> Only on the Great Lakes, where under present plans there will be no pure container cranes, and on the Gulf Coast, where the projected low level of containerization of containerizable cargoes has presumably slowed container facility development, will lift capacity not be sufficient [by 1975] to meet demand (measured as twice the combined foreign and domestic cargo flows in the heavy direction without regard to peak loads due to seasonality or bunched ship arrivals). Similarly, only on the Great Lakes, where direct container service has been uneconomical, and on the Gulf Coast, where low volume trades are not conducive to containerization, is the projected demand for container slots [berths] greater than the projected capacity.[2]

The statements regarding the Great Lakes above helps to explain why they were not included as one of the coasts in this dissertation's analyses. Another obvious reason for their exclusion is the fact that giant containerships and bargeships are too large to travel the St. Lawrence Seaway.

Finally, regarding U.S. ports as a whole, Manalytics observed that "port capital investment in terminal development is being approached with increasing caution, and few speculative investments are likely to made."[3] In the same vein, one of the study's major recommendations was

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[1]Manalytics, Inc., The Impact of Containerization on the U.S. Transportation System: Volume II, p. 89.

[2]Manalytics, Inc., Impact: Volume I, p. 20.

[3]Manalytics, Inc., Impact: Volume II, p. 103.

that regional port commissions be established to coordinate and approve such investments on the basis of regional needs,[1] a recommendation already cited earlier herein as being adopted and advocated by the U.S. Maritime Administration.[2]

Regarding the inland transportation system, some of Manalytics' findings have already been discussed,[3] while others[4] paralleled those cited earlier concerning railroads[5] and trucks.[6] In addition, the study contained data regarding rail and truck capacities at major U.S. seaports (i.e., an incomplete seaport listing) which is shown here in Tables 16 and 17, below.

Another task performed by Manalytics was the development of world trade forecasts for containerizable commodities through 1980. These forecasts include projected total imports and exports between the U.S. and foreign countries. Seaboard shares of such volumes were assumed to remain constant from 1968 through 1980, since the Manalytics forecast was based in large part on the consensus of five other studies' forecasts[7] (one of which was the Transoceanic Cargo Study), which also made this assumption. Manalytics also analyzed and compared the other

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[1]Manalytics, Inc., Impact: Volume I, p. 3.

[2]See p. 122, supra.

[3]See pp. 88, 100, supra.

[4]Manalytics, Inc., Impact: Volume II, pp. 97, 98, 107.

[5]See p. 82, supra.

[6]See p. 95, supra.

[7]Manalytics Inc., Impact: Volume II, pp. 9-23.

TABLE 16

PRESENT RAIL CARRIER CAPABILITIES AT MAJOR PORTS

	RR Serving Port	TOFC/COFC Terminals	Terminal Ownership	Road Distance[a]	Handling Systems				Throughput		
					Ramp	Gantry	Side Lift	Other	Monthly Capacity[b]	Pres. Mo. Volume	Percent I/E[c]
EAST COAST											
Boston	2	3	RR	1-5 Mi	5	0	4		9,500	6,025	1
New York	6	13	RR	0-24	44	2	9	X[d]	49,000	44,000	13
Philadelphia	3	3	RR	1/2-10	20	0	0		12,000	9,800	2
Baltimore	3	3	RR	2 1/2-8	12	0	1		7,800	7,700	61
Hampton Roads	8	5	RR/PA[e]	0-5	8	2	0		8,400	2,800	79
Charleston	2	2	RR	3-6	3	0	0		2,000	1,500	60
WEST COAST											
LA/Long Beach	3	3	RR	15-30	22[f]	5	3		24,900	22,540	10
Oakland	3	3	RR	1-13 1/2	16[f]	2	4		10,700	6,900	30
Portland	4	4	RR	1/2-7	20	0	0		8,400	4,400	1
Seattle	3	3	RR	2-3	3	1	1		9,100	7,200	57
GULF COAST											
Houston	6	6	RR	5-25	24[f]	1	2		11,800	7,095	6
New Orleans	6	6	RR	4-30	18	1	0		8.100	7,750	41

Source: Manalytics, Inc., The Impact of Containerization on the U.S. Transportation System, Vol. II (San Francisco: U.S. Department of Commerce, February, 1972), p. 102.

[a]Road distance from Port to RR Terminal.

[b]Capacity varies widely depending upon the nature of the present operation as discussed in the accompanying report. Units are transfers to or from railcars.

[c]Percent Import/Export Volume to total volume.

[d]Flexivan.

[e]PA = Port Authority.

[f]Handles less than 5 percent of volume.

TABLE 17

PRESENT MOTOR CARRIER CAPABILITIES AT MAJOR PORTS

	Modal Split[a]			Trucking Cos.		Interstate Highways	
	Rail (%)	Truck (%)	Traffic Concent.[b]	Long-Haul	Con-tainer	Arterial Roads[c]	Distance tp Port
EAST COAST							
Boston	9	91	85	25	0	Unres.[d]	1 Mi.
New York	22	78	50	65	12	2 ML	1
Philadelphia	29	71	83	100	Var.	Unres.	1
Baltimore	10	90	20	61	Var.	Unres.	2
Hampton Roads	47	53	60	50	Var.	1 ML	2
Charleston	1	99	90	45	Var.	2 SL	1
WEST COAST							
LA/Long Beach	20	80	70	38	10	3 ML	1
Oakland	73	27	40	24	0	Unres.	1
Portland	10	90	80	53	0	Unres.	1
Seattle	55	45	27	70	1	1 ML	2-3
GULF COAST							
Houston	50	50	85	35	1	Unres.	1
New Orleans	60	40	35	54	Var.	Unres.	1

Source: Manalytics, Inc., The Impact of Containerization on the U.S. Transportation System, Vol. II (San Francisco: U.S. Department of Commerce, February, 1972), p. 99.

[a]Small volumes of air cargo and barge movements were noted in addition to truck and rail movements.

[b]Percent of container traffic terminating within a 200-mile radius.

[c]Roads may be SL (single lane) or ML (multiple-lane).

[d]Unrestricted access to major highway via numerous streets and roads from primary marine container terminals.

studies, finding considerable variations between the overall cargo volume projections of the different studies, as well as between their estimates of cargo containerizabilities. Since only one of the studies made an estimate of the growth rate in containerized portion of total volumes,[1] Manalytics used this estimate as a consensus in its forecast. The only consensus view possible of overall U.S. volumes was basically a moderate growth in imports and a gradual decrease in exports.[2] None of the forecasts included any breakout of bargeship volumes, by port or otherwise and hence while related, are not duplicative of this dissertation's purposes.

Manalytics also forecasted the container capabilities of vessel fleets through 1976. Of interest here were their estimates of some 41 bargeships by 1976, with 12 being constructed in 1975 (which of course were not shown in our Table 1 on page 25, which lists spent or contracted dollar investments). In addition, it is interesting to note that while 583 full container vessels are predicted by 1976, only 71 of these will be equal in capacity to the vast majority (all but one) of the 41 bargeships. Similarly, regarding new construction, only 22 full containerships and only 7 of these equal in size to bargeships are predicted to be built in the 1974-76 period, as compared to 22 bargeships.[3] Such

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[1]<u>Ibid</u>., p. 23.

[2]<u>Ibid</u>., p. 15.

[3]<u>Ibid</u>., pp. 126, 129.

information reinforces the earlier comments in this dissertation[1] regarding bargeship significance.

A major emphasis of the Manalytics study was on the development of an evaluation model designed to analyze the flow of various coded containerized commodities to and from 87 U.S. Standard Metropolitan Statistical Area (SMSA) modes through various U.S. seaports, via various surface transport modes. While the model's 23 pages[2] of input arrays and data, equations, and symbol definitions will not be included here, a general description of its overall purpose, its construction, its components, its operations, its uses, and its limitations are provided.

The overall operational purpose of the model was to enable quantitative evaluation (similations) of the relative dollar, human and time costs of various inland routing patterns, utilizing various combinations of barges, railroads (including unit trains and COFC/TOFC mixed trains) and trucks, shipping between various alternative seaports (alternative oceanborne shipping patterns can also be tested by the model) and inland points, under a number of different labor and organizational (pools, consortia, etc.) situations.[3] These operational capabilities are intended to enable strategic examination of the "potential impact of proposed long-range policy, planning or operating decisions by government and industry on containerizable cargo movements in the U.S. foreign waterborne trades."[4] Such analyses can be performed

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[1]See pp. 2, 23-28, supra.

[2]Ibid., pp. 154-176.

[3]Manalytics, Inc., Impact: Volume I, pp. 25-28.

[4]Manalytics, Inc., Impact: Volume II, p. 182.

by the model on commodity flows between U.S. seaports and 87 Standard Metropolitan Statistical Area (SMSA) modes, which through an allocation process are rendered all-inclusive of U.S. origins and destinations of international cargo traffic. The 87 SMSA nodes are defined and constructed on the basis of population and/or value added, depending on whether a commodity flow to be analyzed is of a consumer good or capital good, respectively.[1] Regarding this dissertation, it is important to note that whether a location is included in the Manalytics system of inland nodes is in no way determined by whether or not it is an inland port, and hence any policy recommendations deriving from the model's simulations are not likely to treat inland ports as a category of locations.

The commodities whose flows are analyzed by the model are defined in terms of a four-digit commodity code constructed through the merging of the two-digit Standard Industrial Commodities (SIC) code and a two-digit containerizability code. This process, plus that in the previous paragraph when combined with assumptions that goods flow to centers of population and industrial activity, enabled estimation of the fractions of SIC commodities contained within an SMSA node and the SIC fractions of containerizable commodities. Computer manipulation was then used to estimate the decimal fraction of each containerizable commodity originating in each SMSA node.[2]

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[1] _Ibid._, p. 147.

[2] _Ibid._, pp. 147-148.

In addition, four classes of transport networks were superimposed on the nodes of the trade network:

1. A rail net on the 85 nodes of the continuous states.

2. A highway net on the same nodes.

3. An inland waterway/barge net, connecting 36 of the nodes that are on the Mississippi River system, on the Gulf and Atlantic Coasts, or along the Sacramento River.

4. A transocean net, connecting 30 U.S. ports with 17 foreign junction points including the distances between each of the U.S. ports and the junction points, corresponding fixed relays, and special transits--Panama Canal and Great Lakes--St. Lawrence Seaway.[1]

The transport networks permit allocation of trade over its links and nodes, as well as enabling allocation of costs, man-hours and elapsed time to nodes, geographic areas, links and nodes, and operations including line hauls, intermodal transfers, switches, port calls and canal transits.[2]

Since the model did produce various modal comparisons such as the one shown in Table 18, as well as numerous specific dollar, man-hour, and elapsed time modal costs, it does provide a vehicle for analysis of the alternative costs of various specific movements inland via competitive inland transport modes. For example, for elapsed times on the rail nodes, the contribution of line-haul and O/D [origin-destination] (terminal) operations are computed, as well as of intra-line, interline and interregional switching and transfer operations.[3]

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[1] *Ibid.*, p. 189.

[2] *Ibid.*, pp. 189-190.

[3] *Ibid.*, p. 206.

TABLE 18

UNIT MARINE TERMINAL COST

Annual Throughput (000 containers)	Connecting Mode Rail or Barge (dollars/container)	Connecting Mode Truck (dollars/container)
25	66.52	51.17
50	49.24	37.88
75	43.72	33.63
100	41.13	31.64
120	39.95	30.73

Source: Manalytics, Inc. The Impact of Containerization on the U.S. Transportation System, Vol. II (San Francisco: U.S. Department of Commerce, February, 1972), p. 250.

This at least in part fulfills the research need mentioned in the introduction chapter of this dissertation for comparative analyses of alternative inland movements. It does not, however, have any specific treatment of bargeship barges as an alternative.

The model also performs what are referred to as "second stage" analyses, involving changes in trade volumes for example, and how the system might have to be altered accordingly. These types of analyses are included because while Manalytics believes

> that minimum cost is the best first approach to evaluation of alternative transportation systems, we recognize that the minimum cost alternative may not be realistic--nor necessarily optimum. Carrier costs have to be balanced against competitive pressures, shipper economics, and revenues.[1]

The model does have certain important limitations which include the facts that the censuses utilized to establish the SMSA nodes and commodity codes were not common in either timing or measuring units (dollars versus tonnages), that international cargo movements as a whole do not usually penetrate very far inland, that no attempt was made to anticipate changes in commodity flow patterns (assuming, for example, that 1969 flows will be roughly equal to 1975 flows), and that Manalytics spurned the development of primary data on flow patterns because of current similar efforts of the U.S. Department of Transportation and Army Corps of Engineers.[2] Nevertheless, the model improves the informational situation regarding decision-making in the containerization-U.S.

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[1] Ibid., p. 224.

[2] Ibid., pp. 150-151.

transportation system area; particularly since the new primary data mentioned above will be able to be inputted into the model.

Finally, in the inland transport mode area, Manalytics does make one major policy recommendation to the Maritime Administration:

> MARAD should sponsor least cost-high technology movements from one port to an inland city in hopes of proving their technological, economic and managerial feasibility.[1]

The use of the word city, however, again indicates a lack of coverage of the specific impacts of bargeship systems and their barges on inland ports.

Regarding inland ports, though these are not treated in the Commerce Department studies, they are the main subject of a 1968 study by Southern Illinois University, entitled "A Study of River Ports and Terminals." The study also directs considerable emphasis toward comparisons of all of the inland transport modes which serve these ports.

This study was undertaken in response to the challenge presented by containerization's anticipated growing demands upon these terminals, their connecting waterways, and their serving inland transport modes.[2] While much of its relevant material has already been discussed in the inland ports and barge sub-sections of this literature search,[3] it does contain certain material applicable to more than one sub-section at a time which will be discussed here.

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[1]Manalytics, Inc., Impact: Volume I, p. 2.

[2]Southern Illinois University, pp. 1-2.

[3]See pp. 52-54, 58, and 67, *supra*.

Perhaps what will prove to be some of the most pertinent findings of the Southern Illinois study were its observations of the critical feeder-line distances within the range of which there was substantial off-waterway patronage of the inland ports' facilities via rail and truck. The study found that off-waterway patronage does vary inversely with distance, and that patronage drops off more rapidly with increases in highway distance than it does with increases in railroad distance. Further, the observations indicated, but not conclusively, that the critical feeder-line distance for trucks was about 50 miles, while the critical distance for railroads was about 100 miles with respect to regional ports, but for sub-regional ports no inference could be drawn.[1] Such information was expected to provide a useful basis for investigating inland port suitabilities for bargeship barges in this research's questionnaires.

Also regarding the inland transport modes, the study also made a direct comparison of 1966-1967 rates in cents per 100 pounds (¢/cwt.) on grain between selected river ports and ocean ports by barge, rail and truck. Some of the results of this comparison are shown in Table 19.

Additionally in the intermodal area, the study made a strong call for the joint rail-barge rates discussed earlier in the government sub-section.[2] Noting that there is an absolute lack of navigability throughout the vast western plains, it asserts that "the benefits of containerization for export and import may become only minimally

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[1] _Ibid_., p. 52.

[2] See pp. 121-122, _supra_.

TABLE 19

INLAND TRANSPORT RATE COMPARISONS FOR GRAIN SHIPMENTS BETWEEN SELECTED U.S. SEAPORTS AND INLAND PORTS--1966-1967

Between		Rates (¢/cwt.)			
River Port	Seaport	Barge	Rail	Truck[a]	Highway Miles
Memphis ←---------→	New Orleans	10.8	20.5	80.2	401
St. Louis ←--------→	New Orleans	13.8	29.1	137.6	688
Minneapolis ←-------→	New Orleans	22.0		248.0	642
Export			54.75		
Domestic			57.2		
Minneapolis (export)↔	Baltimore		49.25		
Omaha ←-----------→	New Orleans	30.0	36.0	205.2	1,026
Kansas City ←-------→	New Orleans	24.2	88.5	164.2	821
Peoria ←-----------→	New Orleans	16.8	22.1	170.0	850
Springfield, Ill. ←-→	Baltimore		24.0		
Springfield, Ill. ←-→	New Orleans		20.5		

Source: Southern Illinois University, A Study of River Ports and Terminals, Carbondale, Illinois, June, 1968, pp. 24, 25.

[a]Truck rates are quotations based on an average of 4¢ per ton mile.

available to the populations of these unwatered hinterlands otherwise."[1] Finally, the study contains extensive compilations of tonnages and of handling facilities available for several commodity groups by both waterways and individual inland ports.[2] Many of these inland ports, moreover, are individually discussed in detail and categorized[3] according to the criteria cited earlier in the inland port sub-section.[4]

Regarding the cost area in general, probably the study which concentrates most on costs and has indeed been cited in both the Transoceanic Cargo Study[5] and Seguin's dissertation[6] regarding costs, is the 1963 study by the Maritime Cargo Transportation Conference for the National Academy of Sciences and entitled Inland and Maritime Transportation of Unitized Cargo. As pointed out in the Transoceanic Cargo Study, the conference study's date requires adjustment of individual cost figures to enable current usefulness for current cost analyses. Its general conclusions remain less affected by inflation, however, since all of the costs upon which they are based can be assumed to have risen by approximately the same proportion. Some of the conference study's more relevant conclusions, which have not already been reaffirmed by the findings of more recent studies and already cited in

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[1] Ibid., p. 17.

[2] Ibid., pp. 38-42, pp.69-98.

[3] Ibid., pp. 53-68.

[4] See pp. 52-53, supra.

[5] Planning Research Corporation, p. IX-49.

[6] Seguin, pp. 66-67.

this research, are as follows: (1) the location at which cargo is unitized has a major influence upon unitization (containerization) costs, with unitizing at the shipper's premises producing the lowest total costs, at the port producing second lowest, and at an inland intermediate unitizing station producing the highest costs; (2) under high van utilization (80 percent), inland carrier costs do not differ significantly for containerized versus conventional shipments, but under low van utilization (50 percent) containerization causes significantly greater inland carrier costs than conventional movements; and (3) the combined cost of packaging and inland cargo claims represents an important fraction of total distribution systems' costs, sometimes exceeding 50 percent, indicating a major area for potential cost savings.[1] Concerning the above, earlier references to the empty container backhauls significantly increasing rail costs in the rail sub-section[2] tend to reinforce number two, while a recent European study has been found which reaffirms number three.[3]

Finally, the majority of the pertinent findings of Schoell's and Seguin's dissertations have already been cited in the barge[4] sub-section and external factors section,[5] respectively. Two of Schoell's effects of increased barge traffic in the 1953-1964 period merit mention

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[1]Maritime Cargo Transportation Conference, p. 5.

[2]See pp. 78-79, supra.

[3]Tor Aadland, "The Total Transportation Cost Concept," ICHCA Journal, December 1969, pp. 6-7.

[4]See pp. 59-60, supra.

[5]See pp. 101-105, and pp. 111-115, supra.

here, however, which are: (1) a broadening of the scope of the commodities economically susceptible to barge transportation, and (2) increased intermodal transfers involving barges and greater perception by shippers of potential combinations of inland transport modes.[1] On the other hand, all of Seguin's relevant conclusions were treated earlier either by direct reference to his work, or by similar findings of other sources. Seguin's questionnaire did provide an analysis of the way freight users, carriers, and container equipment suppliers view the factors inhibiting containerization, however. Inadequate rate structures and empty container movement burdens were considered most important by all groups, and dockside labor was also highly ranked by all groups and coordinative problems between modes were not highly ranked by only freight users. Seguin's respondents groups did not consider the influence of government important[2] even though he,[3] others cited in this research,[4] and this author do.

This concludes the Literature Search chapters and following is the Field Research Methodology chapter.

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[1]Schoell III, p. 2700A.

[2]Seguin, pp. 238-240, 246-250.

[3]Seguin, p. 124.

[4]See pp. 36-37, 114-117, *supra*.

CHAPTER III

FIELD RESEARCH METHODOLOGY

Introduction

The previous chapter, in addition to presenting the first extensive compilation of all relevant published information on bargeship systems and how they relate to competitive shipping systems and exogenous variables, also provided a sound basis for the development of this dissertation's seaport and inland port questionnaires. These questionnaires constituted the major primary data source of this dissertation.

Questionnaire Development

The development of the questionnaires began with combining the knowledge of bargeships and their environments at United States seaports and inland ports gained through the literature search with the questionnaire construction techniques suggested in a manuscript of a forthcoming book entitled Business Research by Vernon T. Clover and Howard L. Balsley, and a book entitled Professional Mail Surveys by Paul L. Erdos and Arthur J. Morgan.[1] Once the questionnaires were constructed, a multi-faceted refining and evaluation process took place.

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[1]Howard L. Balsley and Vernon T. Clover, Business Research, unpublished manuscript; and Paul L. Erdos and Arthur J. Morgan, Professional Mail Surveys (New York: McGraw-Hill, 1970).

The products of the first phase of this development process somewhat differed from most questionnaire designs. This resulted from the fact that they sought to not only question the entire populations of United States seaports and inland ports rather than sample them, but to also design a set of questionnaires which would establish a mutually exclusive set of categories. These categories pertained to port relationships to bargeship systems, and were joined within each questionnaire by questions which created additional port categories, thus enabling multiple analyses of various characteristics and activities of ports based on their relationship to these systems. The result was a set of four questionnaires to be sent to each of the 25 relevant major U.S. seaport authorities (see Appendix A), and a completely separate, though similar set of questionnaires to be sent to each of the 144 ascertainable[1] inland port authorities (see Appendix B). In addition to the inland port authorities, based on pre-test results, 77 inland terminal companies (also see Appendix B) were added to the list of receivers of the sets of inland port questionnaires. These companies were considered to be part of a population of 221 inland ports, since they often perform as "private" inland ports, and are often not included in the data of the public inland port authority for a given location with both public and private terminal facilities. On the other hand, and also based on pre-test results, a mini-questionnaire was developed for the canvassing of inland waterway locations thought to have very limited relevant cargo transfer operations, if any.

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[1]See pp. 172-174, infra.

In addition, since certain ports located on U.S. coastlines agreed with the author's classification of them as functional inland ports and returned inland port questionnaires, while others did not and responded that they were seaports, seaport questionnaires were also sent to the latter. This led to the establishment of a separate hybrid, minor seaport category for certain investment and volume data. Regarding other tables which compared bargeship systems with their competitors, if the information they provided was judged to be relevant and useful by the author and dissertation committee, these ports were specially treated and denoted in either the seaport or inland port tables, or both, depending on whether that port possessed ocean-ship, inland barge, or both traffic types, respectively. Specific cases involving this procedure are set forth in the Research Results chapter. Included in the minor seaports category (see Appendix C) were all coastline-located ports with less than one million long-tons current annual general cargo volume, excluding volume moved by strictly bulk carriers--which are not relevant to this study. Finally, since the minor seaports fit the author's definition of functional inland ports (see page 10) due to lack of relevant facilities and/or volume, they are included in this study's total number of inland ports.

The major similarity between the seaport and inland port questionnaires was the way in which they divided the port populations. In both cases, they established four mutually exclusive categories: ports currently with some form of bargeship system traffic, ports expecting such traffic during 1973, ports expecting such traffic within three (3) years but <u>not</u> during 1973, and ports not expecting such traffic within three (3) years. Also in both cases, a separate questionnaire was developed for each of the four (4) possibilities, so that respondents could merely throw away the three (3) questionnaires that did not apply to them and only answer the one (1) whose title correctly described their port's relationship with bargeship systems.

Further, while specific questions and their results will be discussed in the Research Results chapter to follow, it is noted here that the gist of questions was also similar in both questionnaire sets. Both sought indications of when bargeship traffic either began or is expected and what the volumes of such traffic and/or its competitors were, are and/or are expected to be. The critical part of information for major seaports was the recent and current volume information, which indicated each port's and seacoast's relative utilization of the three systems, and enabled a test of the third hypothesis which in the null form asserted no differences in such utilization. On the other hand, the inland port questionnaires concentrated more on expectations because of the dissertation's second hypothesis, which in the null form asserted no changes in their expectations caused by bargeship systems. In addition, investment data were sought from all ports, with more detail being requested from seaports because of the first hypothesis' null assertion of no difference in seaport investments required by bargeship systems versus those of containerships and conventional ships. Finally, both questionnaire sets treated the factors which encouraged and discouraged bargeship system traffic so that respondent's opinions could be compared by U.S. coastline in order to gain documented insights into which factors are thought by ports to affect a coastal region's suitability for the three above vessel system types.[1]

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[1]See pp. 10-12, *supra*.

Questionnaire Pre-Tests

Once the initial questionnaire sets were developed, a set of "dummy," "mock-up" tables was developed to serve as an illustration of what data analysis of questionnaire results were intended. Upon review and approval of both the initial questionnaire sets and "mock-up" tables by the dissertation committee, they were sent to four (4) carefully chosen pre-testers. A small number of pre-testers, which included one seaport and one inland port, was chosen because given that the survey was attempting a 100 percent return of the entire populations of these ports, it was decided that a large number of port pre-testers would unduly threaten the achievement of this goal.

Specifically, the pre-testers included the Office of International Policy at United States Department of Transportation as the federal government agency representative, the Association of American Port Authorities as the national organization of ports representative, the Virginia Ports Authority as the seaport representative, and the St. Louis Terminal Corporation as the inland port representative. The individuals at these respective organizations who effected review and comments on these pre-test questionnaires were Mr. William Gannon (for Dr. John Hazard, Assistant Secretary-International Policy), Mr. Paul A. Amundsen, Mr. John Hunter, and Mr. Allen P. Bebee. The latter two, incidentally, were chosen as the port representatives because of a very high degree of cooperativeness in prior communications and their expressed willingness to both review the pre-test questionnaires and answer the final questionnaires.

All four pre-testers returned their questionnaires and mock-up tables with relevant, helpful comments, mainly toward simplifying the questionnaires and as expected, including useful items of inside knowledge for improving the questionnaire's content, based on their experience with and at ports. Their suggestions were carefully analyzed and most of them were included in revised sets of questionnaires then presented to the dissertation committee, which after contributing changes based on their technical knowledge, approved the final sets of seaport and inland port questionnaires.

Development of Port Lists

Concurrent with these activities, appropriate lists were developed of public authorities at seaports and inland ports, as well as of inland waterway terminal companies and inland waterway locations, though it was anticipated that most of the latter group would have limited relevant cargo transfer activities, if any, and would have little if any potential for bargeship barge traffic. The seaport list (see Appendix A) was rather easily obtained from the Association of American Ports 1971-1973 Handbooks.[1] Much of the list of inland port authorities was also obtained from this source. This list was considered incomplete, however, by both the dissertation committee chairman and by one of the questionnaire pre-testers, Mr. Allen P. Bebee, President of St. Louis Terminals Corporation. As a result, both the

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[1]American Association of Port Authorities, Inc., Handbook--1971, 1972, 1973 (Washington, D.C.: American Association of Port Authorities, Inc., 1971, 1972, 1973).

Office of Ports and Intermodal Systems (Mr. Armour C. Armstrong, Chief) in the Maritime Administration and the U.S. Army Corps of Engineers were sent inland port lists and were asked for additions, deletions, and/or corrections. In addition, both a Union-Mechling Bargelines map[1] which lists inland waterway locations of uncertain status as ports, and a listing[2] of known inland waterway terminal operators provided by the same recently merged firm, as well as recent copies of an annual publication entitled the Interstate Port Handbook,[3] were used to expand the list of the inland members of the population of potential inland handlers of bargeship barges.

Emerging from the above efforts was a set of three separate lists consisting of (1) ascertainable established inland port authorities, (2) ascertainable port-equivalent inland terminal companies, and (3) inland waterway locations of doubtful status regarding cargo transfer operations. As noted earlier in this chapter, both inland port authorities and inland terminal companies were sent the same set of questionnaires (see Appendix B) and asked to reply for their respective port or terminal, while a "mini-questionnaire" (see Appendix D) was composed and sent to the Chambers of Commerce of inland waterway locations of doubtful status (also see Appendix D). Additionally,

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[1]A. L. Mechling Barge Lines, Inc., Map and geographical list of cities and towns, showing mileages on inland waterways, Joliet, Ill.: A. L. Mechling Barge Lines, Inc., n.d.).

[2]Union Barge Line Corporation, Terminal Information (Pittsburgh, Pa.: Union Bargeline Corporation, 1973).

[3]Rockwell F. Clancy Company, Interstate Port Handbook--1971, 1972, 1973 (Chicago: Rockwell F. Clancy Company, 1971, 1972, 1973).

preliminary introductory letters and "cover letters" (with the questionnaires) were sent to the inland port authorities and terminal companies, as well as to seaports. The inland waterway locations with doubtful status only received a short "cover letter" with their extremely brief, one-page questionnaires. All port and waterway location lists, and preliminary and "cover letters" are included in their respective questionnaire's appendix.

Follow-Up Efforts

The following efforts which were made depended on a combination of the importance of the information sought and a common sense judgment on the cost versus the expected returns of such efforts. Since there was a substantial chance of getting close to a 100 percent return on the seaport questionnaires, because of their large public organizations with substantial research departments, and since such a return would greatly facilitate the tests of the first and third hypotheses, personal telephone calls were used to follow-up the initial questionnaires for each seaport whose return was not received within three weeks of the initial mailing.

On the other hand, since there were far more inland ports and terminals, and pre-test comments had already warned of a lack of records and/or research interest on the part of many of these inland ports and terminals, follow-up letters were used for them. The use of the two letters shown in Appendix E, while respecting the importance of these organizations to the test of the second hypothesis, and being effected when the returns from each previous mailing began to slow, constituted a follow-up effort which respected the principle of diminishing returns.

Finally, there was no follow-up on the "mini-questionnaires" sent to inland waterway locations of doubtful status, since the returns on the initial mailing confirmed with documentary evidence the author's suspicions that the vast majority of these locations were not relevant to the inland port population because of very little traffic, if any, and no LASH/SEABEE traffic or expectations thereof in almost all cases.

Non-response and incomplete response problems will be discussed in the Research Results chapter.

Basic Analysis Methodologies

While the specific hypotheses tests effected with questionnaire data will be discussed in detail in the Research Results chapter which follows, certain basic analysis methodologies were utilized. As a result of the high percentage returns of information achieved by the surveys for testing the dissertation hypotheses, which constituted very large samples of small populations, many basic tables were constructed. These tables are essentially listings which present heretofore unknown port volume, investment, expectation, and environmental influence statistics regarding bargeship systems in relationship to their competitors. Moreover, many seaport analyses include data for almost their entire population, resulting in hypothesis tests consisting of near complete presentations of relevant information, rather than statistical tests. The purpose of these techniques, like those of the preceding Literature

Search chapter, was to not only test the dissertation's hypotheses, but also to compile an extensive, organized body of knowledge regarding the absolute and relative competitive positions of bargeship systems.

Finally, telephone interviews concerning the survey's results were held with the original questionnaire pre-testers and other selected ports where deemed appropriate, in order to aid in the refinement and interpretation of these results.

CHAPTER IV

RESEARCH RESULTS

Introduction

The results of the dissertation's questionnaires, in terms of levels of response, were much as expected. The nation's seaports, for instance, probably because of their public service emphases and research capabilities and interest, were extremely cooperative in their response. Almost the entire population of 25 responded, with 24 of them returning their questionnaires for a response ratio of 96 percent. Only the Port of New York and New Jersey Authority flatly refused to answer its questionnaire, but the author through authoritative contacts within the port, was able to obtain sufficiently accurate estimates of this large and critical port's relevant volume and investment data to enable testing of hypotheses numbers one and three with virtually complete population data.

It should be noted, however, that some ports did not have certain investment data available, while others cautioned the author that their volume data in particular consisted of rough estimates.[1] The reader is therefore cautioned that some data is not quite complete, and other data is not perfectly accurate. The reader can, however,

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[1]See pp. 178, 204-207, *infra*.

be confident that the conclusions drawn regarding hypotheses numbers one and three possess a more than sufficient level of accuracy to warrant the definitive statements of those conclusions. This is because not only were these seaports in the best position possible to make these estimates, but their data indicated extremely obvious hypotheses test results, with the differences being measured proving so substantial that such differences could not be attributed to minor estimate errors.

Similarly, the replies of 112 of 221 inland ports and terminals provided a 50.7 percent sample of this total population, which enabled a definitive test of the second hypothesis regarding their expectations per se, as well as a compilation of responding ports' recent, current and expected volumes at various points in the future.

Some seaport questionnaires and the majority of inland port and terminal questionnaires were returned without all questions fully answered. This resulted from the author's attempt through the questionnaires to obtain much relevant information regarding the nation's seaport and inland port and terminal company situations regarding the relative position of bargeship systems. Even though many data questions not essential to the hypotheses tests were not answered by several ports and terminal companies, sufficient numbers of them did reply to enable the construction and analysis of tables which improve to a significant extent the data available on the relative competitive position of bargeship systems in the United States. Similarly, adequate numbers of seaports and inland ports and terminal companies answered the questions regarding their opinions on which factors encourage or discourage bargeship system traffic at their location. This enabled the construction and analysis of tables which presented their patterns of responses based on categories established according to certain port and/or terminal characteristics.

Finally, 52 percent (109) of the 209 mini-questionnaires sent to the nation's inland waterway locations of doubtful status were returned. Those results and the author's conclusions regarding this large sample of a small population separate from this study's inland port and terminal population are also presented in a separate section.

Seaport Results

Hypothesis 1

The first hypothesis was that there is no difference in U.S. major seaport investments required to implement bargeship versus containership and conventional ship systems under any conditions. The test of this hypothesis considers both absolute and relative investment costs. Absolute investment costs are considered first because as was found in the Literature Search chapter, containership systems require immediate port investments of millions of dollars in specialized berths, cranes and other handling equipment,[1] whereas bargeship systems do not.[2] Rather, it was found that large volumes of bargeship system traffic do tend to cause major investments at some ports, but that such investments

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[1]See p. 46, *supra*.

[2]See pp. 48, 49, *supra*.

are not required at lower levels of bargeship traffic, which can be handled using already existing conventional gear. This is as compared to the expensive, specialized port facilities mentioned above which are required for even low, initial levels of containership traffic. These facts indicated probable differences in the required scales of implementation of the two systems, which absolute cost analyses could analyze. The reasons for relative investment cost analyses are mentioned just prior to those analyses.

Tables 20 and 21 indicate there have been and are considerable differences in recent and planned direct investments in bargeship versus containership and conventional ship systems, by individual major seaport, seacoast, and for the three major U.S. seacoasts combined. These investments shown in Tables 20 and 21, as asked for in the seaport questionnaires, include investments from all relevant sources, namely port authorities, government, and private sources. It is reiterated that these differences are measured by utilizing virtually complete[1] relevant data from the entire population of these seaports. Since they show total major seaport investments of $49 million made in the past decade and $16 million planned over the next seven years for implementation of bargeship systems, versus $693 million made and $297 million planned for

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[1]It should be noted that four respondents, including Savannah, Boston, San Diego, and Long Beach, could not provide complete data. As is shown in Table 20, such data concerned planned investments, except for the recently organized Savannah Port Authority. Tables 20 and 25 (pages 196-200) also indicate that these ports are not of sufficient size to materially alter the results of this hypothesis test. It should also be noted that because of the cross-referencing required in this chapter, references to tables will include their page numbers whenever such tables are not on the page(s) immediately following a text reference.

TABLE 20

MAJOR U.S. SEAPORT AND SEACOAST INVESTMENTS--OVERALL AND BY VESSEL SYSTEM

SEAPORT / SEACOAST (Includ. Inland Waterway Miles)	Vessel Systems Facilities	Investments to Date: Amount ($000)	Investments to Date: Date Commenced	Planned Investments: Amount ($000)	Planned Investments: Time Period
EAST COAST:					
Boston	Overall investments	27,365	1966		
	Containership	22,645	1967		
	Bargeship	1,118	1966	N/A	N/A
	Bargeship barge				
	Conventional ship	3,602	1967		
	Other				
New York (data are estimates from authoritative source within the Port of N.Y.--includes investments by city, port authority, and private sources)	Overall investments	N/A	N/A		
	Containership	270,000		100,000	1973-78
	Bargeship	1,000		0	
	Bargeship barge	0		0	
	Conventional ship	107,000		0	(increased vacancies)
	Other				
Philadelphia	Overall investments	51,665	1966	42,000	1973-80
	Containership	31,382	1966	10,000	1973-80
	Bargeship				
	Bargeship barge				
	Conventional ship	20,283	1966	32,000	1973-80
	Other				
Baltimore	Overall investments	126,000	1910	27,000	1973-76
	Containership	36,000	1965	12,000	1973-76
	Bargeship	3,000	1971	0	
	Bargeship barge	1,000	1971	0	
	Conventional ship	86,000	1910	15,000	1973-76
	Other	0		0	
Virginia	Overall investments	55,000	1963	25,000	1974-78
	Containership	41,250	1963	25,000	1974-78
	Bargeship	0		0	
	Bargeship barge	0		0	
	Conventional ship	13,750	1963	0	
	Other--Ro/Ro	some	1963	0	
Charleston	Overall investments	3,000	1967	2,000	1972-77
	Containership	8,500	1969	10,000	1972-77
	Bargeship	0		0	
	Bargeship barge	0		0	
	Conventional ship	22,500	1969	10,000	1972-77
	Other				
Wilmington	Overall investments	20,000	1963	5,000	1973-75
	Containership	0		0	
	Bargeship	0		0	
	Bargeship barge	0		0	
	Conventional ship	0		0	
	Other	0		0	
Savannah	Overall investments	N/A			
	Containership	N/A			
	Bargeship	1,100	1972-73	N/A	N/A
	Bargeship barge	N/A			
	Conventional ship	N/A			
	Other	N/A			
Jacksonville	Overall investments	39,000	1965	7,500	1973-75
	Containership	12,000	1965	2,800	1973-75
	Bargeship				
	Bargeship barge				
	Conventional ship			4,700	1973-75
	Other				
Port Everglades	Overall investments				
	Containership			5,000	1975-80
	Bargeship				
	Bargeship barge				
	Conventional ship	7,500	1964	4,000	1975-80
	Other				

TABLE 20--Continued

SEAPORT / SEACOAST (Includ. Inland Waterway Miles)	Vessel Systems Facilities	Investments to Date: Amount ($000)	Investments to Date: Date Commenced	Planned Investments: Amount ($000)	Planned Investments: Time Period
Miami	Overall Investments	34,000	1960	21,000	1973-75
	Containership	4,000	1970		
	Bargeship				
	Bargeship barge				
	Conventional ship	30,000	1960		
	Other				
EAST COAST TOTALS (with 7,002 miles of inland waterways)	Overall investments	Non-Descriptive		Non-Descriptive	
	Containership	425,777	1963-73	164,800	1973-80
	Bargeship	6,218	1963-73	0	
	Bargeship barge	1,000	1963-73	0	
	Conventional ship	290,635[a]		65,700	1973-80
	Other	N/A			
GULF COAST:					
Tampa	Overall investments	7,632	1966	None	
	Containership	0			
	Bargeship	0			
	Bargeship barge	0			
	Conventional ship	7,457	1966		
	Other (cattle loading facility)	175	1966		
New Orleans	Overall investments	54344,654	1963	28,550	1973-78
	Containership	8984,862	1971	11,300	1973-78
	Bargeship	4538,211	1972	13,750	1972-78
	Bargeship barge	258,960	1973	2,000	1974-79
	Conventional ship	40562,621	1963	1,500	1974-75
	Other				
Houston	Overall investments	90,000	1914	11,000	1973-78
	Containership	5,800	1967	25,000	1973-78
	Bargeship	5,500	1972		
	Bargeship barge	4,000	1972-74		
	Conventional ship	0			
	Other				
Lake Charles	Overall investments	0		0	
	Containership	0		0	
	Bargeship	0		0	
	Bargeship barge	0		0	
	Conventional ship	10,000	1963	9,000	1972-74
	Other				
Galveston	Overall investments	0		0	
	Containership	6,555	1971	5,000	1973-78
	Bargeship	535	1971	0	
	Bargeship barge	923	1971	0	
	Conventional ship	4,000	1963	8,000	1973-78
	Other				
Gulfport	Overall investments	4,500	1968	None	
	Containership	80	1973		
	Bargeship	0			
	Bargeship barge	0			
	Conventional ship	5,200	1973-74		
	Other				
GULF COAST TOTALS (with 14,383 miles of inland waterways)	Overall investments	Non-Descriptive		Non-Descriptive	
	Containership	21,420	1963-73	41,300	1973-80
	Bargeship	10,573	1963-73	13,750	1973-80
	Bargeship barge	5,182	1963-73	2,000	1973-80
	Conventional ship	63,219	1963-73	18,500	1973-80
	Other	175	1963-73	0	

[a]Includes 1910 Baltimore data.

TABLE 20--Continued

SEAPORT / SEACOAST (Includ. Inland Waterway Miles)	Vessel Systems Facilities	Investments to Date: Amount ($000)	Investments to Date: Date Commenced	Planned Investments: Amount ($000)	Planned Investments: Time Period
WEST COAST:					
Seattle	Overall investments	125,000	1900		
	Containership	50,000	1963	50,000	1973-78
	Bargeship	0			
	Bargeship barge	0			
	Conventional ship	50,000	1900	10,000	1973-78
	Rail & Inland Barge	2,500	1950	5,000	1973-78
Portland	Overall investments	31,500	1965	15,000	1974-80
	Containership	35,000	1965	7,000	1978-80
	Bargeship				
	Bargeship barge	500	1972	1,000	1975-76
	Conventional ship	4,000	1973		
	Auto carriers	2,000	1969	7,000	1974-76
Tacoma	Overall investments	10,000	1967	35,000	1973-77
	Containership	5,000	1968	10,000	1973-75
	Bargeship				
	Bargeship barge				
	Conventional ship	5,000	1967	5,000	1973-75
	Bulk grain tml.			20,000	1973-75
San Francisco	Overall investments	26,000	1969	None within five years	
	Containership	34,000	1972-75		
	Bargeship	22,000	1971		
	Bargeship barge				
	Conventional ship	6,500	1969		
	Other				
Oakland	Overall investments	69,700	1962	14,000	1974-75
	Containership	68,000	1962	14,000	1974-75
	Bargeship				
	Bargeship barge				
	Conventional ship	1,700	1971		
	Other				
Long Beach	Overall investments	100,000	1962	88,000	1973-78
	Containership	45,000	1963	Breakdown not available	
	Bargeship				
	Bargeship barge				
	Conventional ship	10,000	1964		
	Dry bulk, Ro/Ro	45,000	1962		
Los Angeles	Overall investments	21,184	1966	21,350	1972-78
	Containership	16,000	1966	9,800	1973-78
	Bargeship	2,050			
	Bargeship barge	2,050			
	Conventional ship	11,000	1966	7,450	1973-77
	Other (Ro/ro)	184	1966		
San Diego	Overall investments				
	Containership	3,000	1973	Unknown	
	Bargeship				
	Bargeship barge				
	Conventional ship			Unknown	
	Other				
WEST COAST TOTALS (with 3,575 miles of inland waterways)	Overall investments	Non-Descriptive		Non-Descriptive	
	Containership	246,000	1963-73	90,800	1973-80
	Bargeship	24,050	1963-73	0	
	Bargeship barge	2,050	1963-73	0	
	Conventional ship	88,200[b]		22,450	1973-80
	Other	49,684[c]		32,000	1973-80
TOTAL U.S. INVESTMENTS	Overall investments	Non-Descriptive		Non-Descriptive	
	Containership	693,198	1963-73	296,900	1973-80
	Bargeship	40,841	1963-73	13,750	1973-80
	Bargeship barge	8,232	1963-73	2,000	1973-80
	Conventional ship	380,055	1963-73	106,650	1973-80
	Other	49,859	1963-73	27,000	1973-80

[b]Includes 1900 Seattle data. [c]Includes 1950 Seattle data.

TABLE 21

SUMMARY TABLE--ESTIMATED RECENT U.S. SEACOAST INVESTMENTS BY VESSEL SYSTEM

SEACOAST / Inland Waterway Miles	Vessel System Facilities	Investments to Date Amount ($000)	Investments to Date Date Commenced	Planned Investments Amount ($000)	Planned Investments Time Period
East Coast/7,002 miles	Overall investments	Non-Descriptive		Non-Descriptive	
	Containership	425,777	1963-73	164,800	1973-80
	Bargeship (anchored)	6,218	1963-73	0	
	Bargeship barge (towed)	1,000	1963-73	0	
	Conventional ship	290,635[a]		65,700	
Gulf Coast/14,383 miles	Overall investments	Non-Descriptive		Non-Descriptive	
	Containership	21,420	1963-73	41,300	1973-80
	Bargeship (anchored)	10,573	1963-73	13,750	1975-80
	Bargeship barge (towed)	5,182	1963-73	2,000	1973-80
	Conventional ship	63,220	1963-73	18,500	1973-80
West Coast/3,575 miles	Overall investments	Non-Descriptive		Non-Descriptive	
	Containership	246,000	1963-73	90,800	1973-80
	Bargeship (anchored)	24,050	1963-73	0	
	Bargeship barge (towed)	2,050	1963-73	0	
	Conventional ship	88,200[b]		22,450	1973-80
Total U.S. Investments	Overall investments	Non-Descriptive		Non-Descriptive	
	Containership	693,198	1963-73	296,900	1973-80
	Bargeship (anchored)	40,841	1963-73	13,750	1973-80
	Bargeship barge (towed)	8,232	1963-73	2,000	1973-80
	Conventional ship	380,055[c]		106,650	1973-80

[a]Includes 1910 Baltimore data.

[b]Includes 1900 Seattle data.

[c]See (a) and (b) conventional ship totals.

containership systems, and $380 million made and $107 million planned for conventional ship systems, this near-population data disproves the first hypothesis. The null hypothesis' assertion that there is no difference in the investments required to implement these systems has been proven incorrect. Since actual data was asked for, it is assumed that the responses are at least reasonably close to actual. In any event, since the overall differences amount to $925 million for bargeships versus containerships and $422 million for bargeships versus conventional ships, as opposed to $503 million for containerships versus conventional ships, any minor estimating errors would be insignificant in comparison to these differences. These differences indicated that direct, absolute containership implementation investments were approximately 15 times those of bargeships, that conventional ship sustaining investments were about 7 times those of bargeship systems, and that containership implementation investments were almost double those of conventional ship system sustaining investments. The problems encountered with securing the New York estimates, which were obtained through a highly authoritative source in the port of New York, who prefers to remain anonymous, will be discussed in the next section.

Regarding these results, it could be contended that there may be some indirect investments in bargeship systems through the common usage of new containership and/or conventional ship facilities. The total seacoast investments in Table 21 (page 183), however, when combined with the information in Tables 22 (page 185) and 23 (page 186) indicate that even with maximum allocation to bargeship systems of the

TABLE 22

BARGESHIP SYSTEM WORKING FACILITIES BREAKDOWN--COMMON USAGES OF NEW CONTAINERSHIP AND CONVENTIONAL SHIP FACILITIES

SEAPORT	Containership Facilities Usage Percentages					Conventional Ship Facilities Usage Percentages				
SEACOAST / Major Seaports	Common Berths (%)	Common Cranes (%)	Common Other Handling Equipment (%)	Common Surf. and Open Storage Area Costs (%)	Common Stuffing Sheds (%)	Common Berths (%)	Common Cranes (%)	Common Other Handling Equipment (%)	Common Surf. and Storage Area Costs (%)	Common Transit Sheds (%)
EAST COAST:										
Boston	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
New York	0	0	0	0	0	100	100	100	100	100
Philadelphia	← no bargeship system traffic →									
Baltimore	0	0	0	0	0	3	3	3	3	3
Virginia	15	15	15	15	15	85	85	85	85	85
Charleston	0	0	0	0	0	100	100	100	100	100
Wilmington	25	25	25	20	20	75	75	75	20	20
Savannah	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Jacksonville	5	5	5	5	5	10	10	10	10	10
Port Everglades	← no bargeship system traffic →									
Miami	← no bargeship system traffic →									
GULF COAST:										
Tampa	← no bargeship system traffic →									
Gulfport	0	0	0	20	0	0	0	0	80	0
New Orleans	0	0	0	0	0	20	5	3	5	5
Lake Charles	0	0	0	0	0	100	100	100	100	100
Houston	0	0	0	0	0	100	100	100	100	100
Galveston	100	100	100	100	100	0	0	0	0	0
Port Arthur	0	0	0	0	0	100	100	100	100	100
WEST COAST:										
Seattle	← no bargeship system traffic →									
Portland	← no bargeship system traffic →									
Tacoma	100	0	100	100	0	0	0	0	0	0
San Francisco	← unknown →									
Oakland	0	0	0	0	0	0	0	0	0	0
Long Beach	0	0	0	0	0	100	100	100	100	100
Los Angeles	0	0	0	0	0	0	0	0	0	0
San Diego	← unknown →					100	100	100	100	100
Minor Seaports:										
Panama City, Fl.	0	0	0	0	0	100	100	100	100	100
Orange, Texas	0	0	0	0	0	100	100	100	100	100

TABLE 23

COMPUTATION OF BARGESHIP SYSTEM SHARE OF COMMONLY USED CONTAINERSHIP FACILITIES

Tacoma, Washington	
(A) Containership investments to-date	$ 5,000,000
(B) Bargeship percentage of total current containership (40%) and bargeship (10%) shares of port general cargo volume	
(i.e., $\frac{10\%}{50\%}$ = 20%)	20%
(C) (A) multiplied by (B)	$ 1,000,000
(D) Planned investment computations--	
Planned investment	$10,000,000
Bargeship share (20%/80%)	25%
	$ 2,500,000
(E) Total Tacoma indirect investment allocations to bargeship systems, (C) + (D)	$ 3,500,000
Galveston (arrived at as above and using Galveston data)	
To-date	$ 5,900,000
Planned	3,700,000
	$ 9,600,000
Virginia (arrived at as above)	
To-date	$ 1,093,000
Planned	1,079,000
	$ 2,172,000
Wilmington, North Carolina (arrived at as above)	
To-date	$ 8,003,000
Planned	2,350,000
	$10,353,000
Jacksonville, Florida (arrived at as above)	
To-date	$ 240,000
Planned	56,000
	$ 296,000
Total indirectly allocated containership investments to bargeship systems of Tacoma, Washington; Virginia; Wilmington, North Carolina; and Jacksonville, Florida	
To-date	$16,236,000
Planned	9,685,000
	$25,921,000

cost of commonly used facilities, bargeship system implementation cost is far lower than that of containership systems. For example, when total bargeship system and total conventional ship system facilities investments are added, their to-date figure of $429 million is $264 million (38 percent) less than that of containerships ($693 million) and their planned figure of $121 million is $176 million (59 percent) less than that of containerships ($297 million). It is also noted that the conventional ship figures include $86 million invested by Baltimore since 1910 and $50 million invested by Seattle since 1900. This overstates the conventional ship investment total since 1963 by probably $100 million or so. If this $100 million were removed, the to-date gap would be $364 million (53 percent).

Furthermore, included among the 17 responding major seaports there are only two ports (Galveston and Tacoma)--total to-date and future containership investments of $26 million as per Table 20 (pages 180-182)--where the usage of containership facilities is shown to be greater than that of conventional ships (see Table 22, page 185). Additionally, in only three other cases was <u>any</u> containership facilities usage indicated, namely Virginia; Wilmington, North Carolina; and Jacksonville, Florida, and then only for 15, 25, and 5 percent, respectively, as to-date and planned investments of $66, $25, and $15 million, respectively. Thus, even if these jointly used containership facilities costs were allocated to bargeship systems on the basis of their share of such common usage (the bargeship percentage of combined current and future containership and bargeship volumes of these ports as per Tables 20 (pages 180-182) and 27 (pages 202-203)), they would still only amount to \$26 million, as per Table 23 (page 186). This would still leave the overall to-date and future, direct and indirect bargeship investment figures at \$576 million, which is \$388 million less than the reduced containership figures of \$964 million. And as mentioned earlier, due to early 1900's data given by Baltimore and Seattle, this gap is probably understated by \$100 million.

Finally, it is likely that the \$576 million absolute maximum bargeship direct plus indirect investment figure would be grossly overstated given the results of Table 24. This table indicates that while 11 of 17 responding major U.S. seaports report significant common usages of new facilities at present or in the future, 11 of 17 also report significant usages of old, already existing facilities which were defined in their seaport questionnaires as "not specifically required at all for the implementation of bargeship systems." This information indicates that for the latter group at least, not all recent conventional ship investment decisions can be asserted to have been influenced by prospective joint use by bargeships. Therefore, the allocation of a full pro rata share of conventional ship investment to bargeship systems is surely conservative.

Therefore, it can be concluded that direct absolute bargeship system implementation investments by seaports for the United States as a whole have been minute as compared to containership system implementation investments, both of which have already been cited as having been implemented during the period measured by this survey.[1] Moreover, even

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[1]See pp. 22, 30, *supra*.

TABLE 24

BARGESHIP SYSTEM WORKING FACILITIES BREAKDOWN--FACILITIES INVESTMENTS INDIRECTLY REQUIRED, DIRECTLY REQUIRED, AND NOT REQUIRED

SEAPORT	New Commonly Used Other System Investments (Indirectly Required)		Specifically Constructed Bargeship System Facilities (Directly Required)		Already Existing Facilities (Not Required)	
SEACOAST Major Seaports	Present (%)	Future (%)	Present (%)	Future (%)	Present (%)	Future (%)
EAST COAST:						
Boston	←		unknown			→
New York[a]	0	0	0	0	100	100
Philadelphia	←		no bargeship system traffic			→
Baltimore	94	94	0	0	6	6
Virginia	100	100	0	Maybe	0	0
Charleston	0	20	0	0	100	80
Wilmington	95	95	0	0	0	0
Savannah	N/A	N/A	N/A	N/A	N/A	N/A
Jacksonville	10	10	0	0	90	90
Port Everglades	←		no bargeship system traffic			→
Miami	←		no bargeship system traffic			→
GULF COAST:						
Tampa	←		no bargeship system traffic			→
Gulfport	20	30	0	0	80	70
New Orleans	96	85	2	5	2	10
Lake Charles	0	0	0	0	100	100
Houston	0	0	50[b]	50[b]	50[c]	50[c]
Galveston	50[b]	50[b]	50[c]	50[c]		
WEST COAST:						
Seattle	←		no bargeship system traffic			→
Portland	←		no bargeship system traffic			→
Tacoma	100	100	0	0	0	0
San Francisco	0	0	100	100	0	0
Oakland	100	100	0	0	0	0
Long Beach	0	Unknown	0	Unknown	100	Unknown
Los Angeles	0	0	0	100	100	0
San Diego	0	15	0	0	0	85
Minor Seaports						
Searsport, Me.	0	0	0	0	100	100
Albany, N.Y.	0	0	0	0	100	100
Port Arthur, Tex.	50	0	0	100	50	0
Beaumont, Tex.	40	40	0	5	60	55
Orange, Tex.	100	100	0	0	0	0
Panama City, Fl.	100	0	0	100	0	0

[a]Same source as investment data.

[b]Ships.

[c]Barges.

when maximum (and probably overstated) allocation of indirect implementation costs is made to bargeship systems, their direct plus indirect total, absolute implementation costs are far below those of containership systems. Next discussed are the relative investment costs of these vessel systems.

Since an important measure of the comparative efficiency of any investment lies in its relative degree of utilization, bargeship and containership system investments are compared with their relative shares of total U.S. general cargo volumes. For instance, Tables 21 (page 183) and 26 (page 201) indicate that bargeship systems in 1973 will have an estimated 6.2 percent of the total U.S. general cargo volume while having received 4.4 percent of the total port investments to-date (1963-73) in general cargo vessel system facilities. Containership systems, on the other hand, will have an estimated 36.9 percent of the volume as compared to 61.8 percent of total to-date investments. Thus, the bargeship system port investment to volume ratio here is about two-to-three, whereas the comparable containership ratio is about three-to-two. Therefore, on the basis of these direct implementation cost figures, bargeship systems prove to require less to-date investments than containership systems relative to cargo volumes handled, which disproves the first hypothesis under another condition.

There is one condition under which the relative implementation costs of bargeship and containership systems are roughly equal, and that is when indirect costs are allocated to bargeship system in a manner similar to that shown in Table 23 (page 186). The following computations indicate such allocations:

A.	Conventional ship investments, 1973-73[1] (see Table 21, page 183)	$380 million
B.	Bargeship system share of 1973 bargeship plus conventional ship volumes (see Table 26, page)	9.8%
C.	(A) multiplied by (B)	$ 37.2 million
D.	Table 23 (page 186) allocations of indirect to-date containership investment costs to bargeship systems	$ 16.2 million
E.	Direct to-date bargeship system investments (see Table 21, page 183)	$ 49.0 million
F.	(C) plus (D) plus (E)	$102.4 million

The $102.4 million direct plus indirect bargeship system implementation cost figure represents approximately 9.1 percent of the total major seaport investments in general cargo vessel systems over the last decade, which when compared with their 6.2 percent of 1973 general cargo volume, amount to a ratio (three-to-two) roughly equivalent to that of the containership percentages of 60.3 (reduced from 61.8 after allocations to bargeship systems) and 36.9 percent of to-date investments and current volumes, respectively. Therefore, in this particular case, the first hypothesis can be said to be correct, although not "under all conditions" as generalized in the hypothesis, since here bargeship and containership direct plus indirect investments to-date relative to their shares of total general cargo volumes, are roughly equal. Conventional ship investments are not treated separately as an implemented system since the implementation of these systems occurred far before 1963, and their recent port investments have been sustaining rather than implementing in nature.

Since only future estimated percentages of individual port total general cargo volumes by vessel system were asked of respondents, no

[1]Overstated because of 1910 Baltimore data and 1900 Seattle data.

estimated long-ton volume figures are available for similar analyses regarding the future. On the other hand, it should be pointed out that the number of bargeships operating off the Gulf Coast will double from seven to fourteen from 1973 to 1975,[1] and planned bargeship system investments through 1980 only amount to $16 million per Table 21 (page 183). Planned containership system investments for the same period are estimated at $296 million. The entire $16 million planned for investment in bargeship system facilities, incidentally, is on the Gulf Coast.

All of the preceding tests and analyses for hypothesis number one indicate a very important point regarding bargeship systems as compared to those of containerships. This is the required scale of implementation for each. Whereas limited port investments for lower but growing bargeship volumes are a characteristic of that system, containership investments are characteristically far greater and support requisitely far higher volumes in the United States. These characteristics would appear to give bargeship systems the advantage of not only being applicable to developed countries such as the United States with its considerable investment in non-bargeship facilities and heavy general cargo volumes at its major seaports, as well as massive investment capabilities, but they also make this vessel system far more applicable than containership systems to the world's underdeveloped countries where none of the above assets exist. This point will be further elaborated on in the Implications section of the Summation of Study chapter.

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[1]See pp. 24-26, _supra_.

In need of mention here are the special situations that exist for certain specific major seaports that are attempting to facilitate very large bargeship cargo movements. These include the ports of New Orleans, Houston, and San Francisco. As shown in Tables 20 (pages 180-182) and 25 (pages 196-200), these ports have chosen to develop specialized bargeship system facilities in order to maximize their capabilities for handling such traffic even though they had already experienced considerable bargeship system traffic. These capabilities were discussed in the Literature Search chapter.[1] Unlike the vast majority (16 of 19) of U.S. seaports handling bargeship traffic with either no required investments or less than $3 million per port, these ports show investments in specialized facilities of $5 million or more, roughly comparable to their respective containership system investments. It is re-emphasized, however, that these special cases are in a distinct minority, and thus the general statement found in hypothesis number one remains disproved.

Regarding coastline investment totals, the Gulf Coast, with more inland waterway miles than the East and West Coast combined, had the largest bargeship system investments ($30 million). While the West Coast figures ($26 million) was considerably higher than the East Coast's ($7.2 million), this is mainly due to the $22 million invested by San Francisco. The differences in seacoast investments in containership systems was a factor which would seem to indicate that the East and West Coasts are certainly more heavily invested in and therefore probably considered to be more suitable for containership systems than the

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[1]See pp. 48-50, <u>supra</u>.

Gulf Coast. As is obvious in Table 20 (pages 180-182), each of these coasts has invested hundreds of millions of dollars more in containership facilities thus far, and plan to invest far more in them in the future, than does the Gulf Coast. Conventional ship investments, on the other hand, are expected to decrease in their share of the total on all coasts, and lose their dominance on the Gulf Coast to containerships, which are experiencing some growth there.

Additionally, it is pointed out here that the overall investment figures by coastlines and for the United States as a whole are nondescriptive because many seaports interpreted "overall investments" to mean the sum of each vessel system investment added together, rather than investments which were not attributable to any one system, as intended by the author. These investments would not effect the disproof of the first hypothesis, since even if such figures were provided for each seaport, the maximum bargeship system share would be equal to the respective containership and conventional ship shares, thus leaving unchanged the system investment differences cited in preceding paragraphs. In fact, a case could probably be made that since the containership and conventional ship shares of total general cargo are larger than those of bargeships at most seaports, as shall be seen in the next section, they should get a larger allocation of any "overall investment" costs than bargeships, thus increasing the gaps between bargeships and them. And finally, it should be realized that since as shall be seen in the next section, the conventional ship share of the total general cargo volume of most major U.S. seaports has been and is expected to continue decreasing, and it is therefore quite likely that bargeship usages of conventional ship facilities will provide welcome utilization of "sunk" costs which might otherwise go unused.

Hypothesis 3

The third null hypothesis stated that there is no difference in the relative utilization of bargeship systems by major seaports on the U.S. East versus West versus Gulf Coasts. This was disproven by Tables 25 and 26 which indicate a current (1973) utilization rate (total bargeship system volume) of about 3,500,000 long-tons per year on the Gulf Coast, which is over three times that of both the East and West Coasts' individual totals of approximately 1,000,000 long-tons each, and 50 percent higher than their combined total. Furthermore, Table 26 (page 201) indicates that the bargeship system share of current total general cargo volume on the Gulf Coast is 19.8 percent, versus 3.8 percent on the West Coast and 2.2 percent on the East Coast. Table 26 (page 201) also indicates that the Gulf Coast bargeship share of overall coastal volume has been similarly higher since 1971, and Table 27 (pages 202-203) indicates that in 1978, the average major Gulf Coast major seaport (regardless of overall total volume) with bargeship system traffic estimates that there will be a bargeship system share of 22.7 percent versus 10.3 percent on the West Coast and 10.5 percent (excluding New York) on the East Coast.

It is noted in the tables that almost all of the above figures are estimates. Still, the persons supplying these estimates are in the best position to make such overall estimates for each major U.S. seaport. Further, the differences found between the Gulf Coast and the other two

TABLE 25

MAJOR U.S. SEAPORT AND SEACOAST GENERAL CARGO VOLUMES BY VESSEL SYSTEM (ALL DATA INDIVIDUAL PORT ESTIMATES EXCEPT FIGURES SHOWING NON-ZERO TENS DIGITS)

SEAPORT / SEACOAST (Inland Waterway Miles)	Vessel System	1971 Volumes Long-Tons	1971 Volumes % of Total Gen. Cgo. Vol.	1972 Volumes Long-Tons	1972 Volumes % of Total Gen. Cgo. Vol.	1973 Volumes Long-Tons	1973 Volumes % of Total Gen. Cgo. Vol.
EAST COAST:							
Boston	Container ship	318,200	36.4	408,800	43.4	484,100	48.2
	Bargeship (anchored)	0	0	1,033	0.1	8,570	0.8
	Bargeship barge (towed)	451	0.05	0	0.0	2,734	0.3
	Conventional ship	554,400	63.5	530,800	56.5	509,096	51.7
	Other						
	Overall Total	873,051		940,633		1,004,500	
New York	Containership	6,255,000[a]	43.1	7,244,735[a]	45.3	7,900,000[b]	46.5
	Bargeship (anchored)	100-125,000[c]	0.5	125-156,000[c]	0.75	150-200,000[c]	1.0
	Bargeship barge (towed)						
	Conventional ship	8,000,000	56.0	8,500,000[b]	53.1	8,700,000[b]	51.2
	Other						
	Overall Total	14,458,000	100.0	16,000,000[b]		17,000,000[b]	
Philadelphia	Containership	234,821	4.7	488,179	9.0	625,000	10.9
	Bargeship (anchored)	0	0				
	Bargeship barge (towed)	0	0				
	Conventional ship	4,773,054	95.3	4,954,539	91.0	5,090,000	89.1
	Other						
	Overall Total	5,007,875	100.0	5,442,718	100.0	5,715,000	100.0
Baltimore	Containership	1,240,000	24.9	1,630,000	29.6	1,820,000	32.5
	Bargeship (anchored)	73,000	1.5	103,000	1.9	120,000	2.1
	Bargeship barge (towed)	0	0	0	0	0	0
	Conventional ship	3,687,000	73.6	3,767,000	68.5	3,660,000	65.4
	Other						
	Overall Total	5,000,000	100.0	5,500,000	100.0	5.600,000	100.0
Virginia	Containership	880,000	40.0	990,000	45.0	1,375,000	55.0
	Bargeship (anchored)	11,000	0.5	22,000	1.0	37,500	1.5
	Bargeship barge (towed)						
	Conventional ship	1,199,000	54.5	1,070,000	49.0	962,500	38.5
	Other--combination	110,000	5.0	110,000	5.0	125,000	5.0
	Overall Total	2,200,000		2,200,000		2,500,000	

[a]Source: "Intermodal Traffic Booming in Ports of North America," Container News, July, 1973, p. 10.

[b]Author's estimate.

[c]Authoritative source's estimate.

TABLE 25--Continued

SEAPORT / SEACOAST (Inland Waterway Miles)	Vessel System	1971 Volumes Long-Tons	1971 Volumes % of Total Gen. Cgo. Vol.	1972 Volumes Long-Tons	1972 Volumes % of Total Gen. Cgo. Vol.	1973 Volumes Long-Tons	1973 Volumes % of Total Gen. Cgo. Vol.
Charleston	Containership	329,290	24.3	541,004	34.9	852,100	46.0
	Bargeship (anchored)			250	0.025	10,000	0.6
	Bargeship barge (towed)			750	0.075		
	Conventional ship	1,024,010	75.7	1,008,121	65.0	987,900	53.4
	Other						
	Overall Total	1,353,300		1,550,125		1,850,000	
Wilmington	Containership			75,000	4.8	100,000	5.4
	Bargeship (anchored)						
	Bargeship barge (towed)			25,000	1.6	65,000	3.5
	Conventional ship	1,146,638	100.0	1,494,212	93.6	1,700,000	90.1
	Other						
	Overall Total	1,146,638		1,594,212	100.0	1,865,000	
Savannah[e]	Containership	N/A	N/A	690,000	30.0	750,000	30.0
	Bargeship (anchored)	0		230,000	10.0	500,000	20.0
	Bargeship barge (towed)	0					
	Conventional ship	N/A	N/A	1,380,000	60.0	1,250,000	50.0
	Other						
	Overall Total	2,100,000		2,300,000		2,500,000	
Jacksonville	Containership	500,000	20.0	750,000	25.0	1,005,000	30.0
	Bargeship (anchored)	0		0		0	
	Bargeship barge (towed)	0		18	0.6	21,000	0.6
	Conventional ship	2,000,000	80.0	2,250,000	75.0	2,495,000	70.0
	Other						
	Overall Total	2,500,000		3,018,000		3,521,000	
Port Everglades	Containership						
	Bargeship (anchored)						
	Bargeship barge (towed)						
	Conventional ship	932,000	100.0	1,309,000	100.0	2,000,000	100.0
	Other						
	Overall Total						
Miami	Containership	294,415	35.0	310,662	40.0	495,000	45.0
	Bargeship (anchored)						
	Bargeship barge (towed)						
	Conventional ship	546,770	65.0	465,994	60.0	605,000	55.0
	Other						
	Overall Total	841,185		776,656		1,100,000	

[e]All figures combine author's and port estimates.

TABLE 25--Continued

SEAPORT / SEACOAST (Inland Waterway Miles)	Vessel System	1971 Volumes Long-Tons	1971 % of Total Gen. Cgo. Vol.	1972 Volumes Long-Tons	1972 % of Total Gen. Cgo. Vol.	1973 Volumes Long-Tons	1973 % of Total Gen. Cgo. Vol.
EAST COAST TOTALS (with 8,002 miles of inland waterways)	Containership	10,051,726	29.4	13,128,000	32.5	15,406,000	34.8
	Bargeship (anchored)	209,000	0.6	506,283	1.3	876,070	2.0
	Bargeship barge (towed)	451	0.001	43,750	0.1	88,734	0.2
	Conventional ship	23,864,000	69.9	26,729,666	66.1	27,960,000	63.1
	Other	110,000		110,000		125,000	
	Overall Total	34,125,000[d]		40,418,000		44,331,000	
GULF COAST:							
Tampa	Containership	← minimal →					
	Bargeship (anchored)	0		0		0	
	Bargeship barge (towed)	0		0		0	
	Conventional ship	774,678	95.0	966,763	95.0	1,140,000	95.0
	Other barges	40,067	5.0	51,393	5.0	60,000	5.0
	Overall Total	814,745		1,018,156		1,200,000	
New Orleans	Containership	246,000	4.6	365,000	7.2	550,000	8.6
	Bargeship (anchored)	268,500	5.0	507,000	10.0	960,000	15.0
	Bargeship barge (towed)	537,000	10.0	507,000	10.0	640,000	10.0
	Conventional ship	4,320,000	80.4	3,692,000	72.8	4,250,000	66.4
	Other						
	Overall Total	5,371,500		5,071,000		6,400,000	
Houston[e]	Containership	650,000	14.4	1,100,000	21.0	1,300,000	21.0
	Bargeship (anchored)			700,000	13.0	1,300,000	21.0
	Bargeship barge (towed)	384,000	8.5				
	Conventional ship	3,466,000	77.0	3,500,000	66.0	3,600,000	58.0
	Other						
	Overall Total	4,500,000		5,300,000		6,200,000	
Galveston	Containership	50,000	4.0	50,000	4.0	50,000	3.0
	Bargeship (anchored)	0	0	150,000	14.0	450,000	28.0
	Bargeship barge (towed)	0	0	0	0	0	0
	Conventional ship	1,160,000	96.0	900,000	82.0	1,100,000	69.0
	Other						
	Overall Total	1,210,000		1,100,000		1,600,000	
Gulfport, Miss.	Containership	0				75,000	8.0
	Bargeship (anchored)	0					
	Bargeship barge (towed)	1,785	0.2	757	0.1	3,571	0.4
	Conventional ship	1,086,434	99.0	899,301	99.0	1,941,154	91.0
	Other						
	Overall Total	1,088,219		900,038		1,019,725	

[d]Excluding "others" and Savannah.

[e]All figures combine author's and port estimates.

TABLE 25--Continued

SEAPORT / SEACOAST (Inland Waterway Miles)	Vessel System	1971 Volumes Long-Tons	1971 Volumes % of Total Gen. Cgo. Vol.	1972 Volumes Long-Tons	1972 Volumes % of Total Gen. Cgo. Vol.	1973 Volumes Long-Tons	1973 Volumes % of Total Gen. Cgo. Vol.
Lake Charles	Containership						
	Bargeship (anchored)						
	Bargeship barge (towed)	60,000	5.0	100,000	6.0	125,000	10.0
	Conventional ship	1,192,000	95.0	1,251,069	94.0	1,125,000	90.0
	Other						
	Overall Total	1,252,000		1,351,069		1,250,000	
GULF COAST TOTALS (with 14,383 miles of inland waterways)	Containership	946,000	6.7	1,515,000	10.3	1,975,000	11.2
	Bargeship (anchored)	268,500	1.9	1,357,000	9.2	2,710,000	15.4
	Bargeship barge (towed)	982,785	6.9	607,737	4.1	768,571	4.4
	Conventional ship	11,999,112	84.5	11,209,133	76.3	12,156,154	69.0
	Other	40,067		51,393		60,000	
	Overall Total[f]	14,196,397		14,688,870		17,609,725	
WEST COAST:							
Seattle	Containership	1,030,000	57.5	1,310,000	62.0	1,850,000	74.9
	Bargeship (anchored)	0	0	0	0	0	0
	Bargeship barge (towed)	0	0	0	0	0	0
	Conventional Ship	610,000	34.1	600,000	28.4	400,000	16.2
	Other--barges	150,000	8.4	200,000	9.6	220,000	8.9
	Overall Total	1,790,000	100.0	2,100,000	100.0	2,470,000	100.0
Portland	Containership	115,500	10.0	201,150	15.0	282,000	20.0
	Bargeship (anchored)						
	Bargeship barge (towed)						
	Conventional ship	1,139,500	90.0	1,139,850	85.0	1,127,000	80.0
	Other						
	Overall Total	1,155,000		1,341,000		1,409,000	
Tacoma	Containership	36,000	10.3	229,000	35.0	400,000	40.0
	Bargeship (anchored)					100,000	10.0
	Bargeship barge (towed)						
	Conventional ship	314,000	89.7	424,000	65.0	500,000	50.0
	Other						
	Overall Total	350,000		653,000		1,000,000	
San Francisco[e]	Containership	375,000	29.0	900,000	30.0	1,100,000	29.0
	Bargeship (anchored)	75,000	6.0	300,000	10.0	500,000	13.0
	Bargeship barge (towed)						
	Conventional ship	825,000	65.0	1,775,000	60.0	2,200,000	58.0
	Other--bulk carriers	225,000		525,000		700,000	
	Overall Total[f]	1,275,000	100.0	2,975,000		3,800,000	

[e]All figures combine author's and port estimates.

[f]Excluding "others."

TABLE 25--Continued

SEAPORT / SEACOAST (Inland Waterway Miles)	Vessel System	1971 Volumes Long-Tons	1971 % of Total Gen. Cgo. Vol.	1972 Volumes Long-Tons	1972 % of Total Gen. Cgo. Vol.	1973 Volumes Long-Tons	1973 % of Total Gen. Cgo. Vol.
Oakland	Containership	3,887,698	79.7	4,577,451	82.0	4,980,000	83.0
	Bargeship (anchored)						
	Bargeship barge (towed)			41,000	0.8	60,000	1.0
	Conventional ship	989,523	20.3	957,191	17.2	960,000	16.0
	Other						
	Overall Total	4,877,221	100.0	5,575,642	100.0	6,000,000	100.0
Long Beach (fiscal years)	Containership	1,209,142	29.4	1.589,400	45.8	4,329,672	65.7
	Bargeship (anchored)	0	0	0	0	0	0
	Bargeship barge (towed)	0	0	20,088	0.6	20,998	0.3
	Conventional ship	2,901,156	70.6	1,861,812	53.6	2,234,174	34.0
	Other--dry bulk	5,721,241		3,431,075		4,117,290	
	Overall Total[f]	4,110,298		3,471,300		6,584,844	
Los Angeles (fiscal years)	Containership	1,938,000	38.0	1,172,000	25.0	2,232,000	40.0
	Bargeship (anchored)			86,000	1.6	134,000	2.4
	Bargeship barge (towed)						
	Conventional ship	2,779,000	55.0	3,201,000	68.0	2,880,000	51.0
	Other--(Ro/Ro)	336,000	7.0	235,000	5.0	380,000	6.7
	Overall Total	5,053,000		4,694,000		5,626,000	
San Diego (fiscal years)	Containership					71,500	5.0
	Bargeship (anchored)			64,000	5.0	214,500	15.0
	Bargeship barge (towed)						
	Conventional ship	585,000	50.0	704,000	55.0	786,500	55.0
	Other[g]	585,000	50.0	512,000	40.0	357,500	25.0
	Overall Total	1,170,000		1,280,000		1,430,000	
WEST COAST TOTALS (with 3,575 miles of inland waterways)	Containership	8,591,340	45.7	9,979,000	47.2	15,245,172	55.7
	Bargeship (anchored)	75,000	0.4	450,000	2.1	948,500	3.5
	Bargeship barge (towed)			61,088	0.3	81,000	0.3
	Conventional ship	10,143,129	53.9	10,662,853	50.4	11,087,674	40.5
	Others	7,017,241		4,903,075		5,774,900	
	Overall Total[f]	18,809,469		21,152,941		27,362,346	
TOTAL U.S. VOLUMES	Containership	19,589,000	29.1	24,622,000	32.3	32,626,000	36.9
	Bargeship (anchored)	553,000	0.8	2,313,000	3.0	4,535,000	5.1
	Bargeship barge (towed)	983,000	1.5	712,000	0.9	939,000	1.1
	Conventional ship	46,006,000	68.5	48,602,000	63.7	50,204,000	56.9
	Others	7,277,000		5,064,000		5,959,000	
	Overall Total[f]	67,131,000		76,249,000		88,304,000	

[f]Excluding "others."

[g]Combination break-bulk and container.

TABLE 26

SUMMARY TABLE--ESTIMATED U.S. SEACOAST VOLUMES BY VESSEL SYSTEM

SEACOAST		1971 Volumes		1972 Volumes		1973 Volumes	
Inland Waterway Miles	Vessel System	Long-Tons	% of Total Gen. Cgo. Vol.	Long-Tons	% of Total Gen. Cgo. Vol.	Long-Tons	% of Total Gen. Cgo. Vol.
	Containership	10,052,000	29.4	13,128,000	32.5	15,406,000	34.8
	Bargeship (anchored)	209,000	0.6	506,000	1.3	876,000	2.0
EAST COAST	Bargeship barge (towed)	1,000	0.001	44,000	0.1	89,000	0.2
7,002 miles	Conventional ship	23,864,000	69.9	26,730,000	66.1	27,960,000	63.1
	Others	110,000		110,000		125,000	
	Overall Total	34,126,000[a]		40,418,000[b]		44,331,000[b]	
	Containership	946,000	6.7	1,515,000	10.3	1,975,000	11.2
	Bargeship (anchored)	269,000	1.9	1,357,000	9.2	2,710,000	15.4
GULF COAST	Bargeship barge (towed)	983,000	6.9	608,000	4.1	769,000	4.4
14,383 miles	Conventional ship	11,999,000	84.5	11,209,000	76.3	12,156,000	69.0
	Others	40,000		51,000		60,000	
	Overall Total[b]	14,196,000		14,689,000		17,610,000	
	Containership	8,591,000	45.7	9,979,000	47.2	15,245,000	55.7
	Bargeship (anchored)	75,000	0.4	450,000	2.1	949,000	3.5
WEST COAST	Bargeship barge (towed)	0	0	61,000	.3	81,000	0.3
3,575 miles	Conventional ship	10,143,000	53.9	10,663,000	50.4	11,088,000	40.5
	Others	7,017,000		4,903,000		5,775,000	
	Overall Total[b]	18,809,000		21,153,000		27,362,000	
	Containership	19,589,000	29.1	24,662,000	32.3	32,626,000	36.9
	Bargeship (anchored)	553,000	0.8	2,313,000	3.0	4,535,000	5.1
U.S. TOTALS	Bargeship barge (towed)	983,000	1.5	712,000	0.9	939,000	1.1
	Conventional ship	46,006,000	68.5	48,602,000	63.7	50,204,000	56.9
	Others	7,277,000		5,064,000		5,959,000	
	Overall Total[b]	67,131,000		76,249,000		88,304,000	

[a]Excluding "others" and Savannah.

[b]Excluding "others."

TABLE 27

U.S. SEAPORT AND SEACOAST VESSEL CURRENT AND 1978 PROJECTED ESTIMATED SHARES OF TOTAL VOLUMES VS. CARGO FLOW TYPES AND INLAND WATERWAY MILES

SEAPORT / SEACOAST (Inland Waterway Miles) / Major Seaports	Current (1973) Volume Share: Containership Long-Tons (000)	Containership (%)	Bargeship Long-Tons (000)	Bargeship (%)	Conventional Ship Long-Tons (000)	Conventional Ship (%)	1978 Projected Volume Share: Container-ship (%)	Bargeships: Anchored Ships (%)	Bargeships: Towed Barges (%)	Conventional Ship (%)	1971 Customs District Cargo Flow Type[a] (% of Total Dollar Volume): Agricultural	Non-Agricultural
EAST COAST:												
Boston	484	48.2	12	1.1	509	51.7	59.0	5.0	2.0	34.0	9.6	90.4
New York (auth. est.)	7,900	46.5	200	1.0	8,700	51.2	N/A	N/A	N/A	N/A	11.3	88.7
Philadelphia	625	10.9	0	0	5,090	89.1	15.0	0.0	1.0	84.0		
Baltimore	1,820	32.5		2.1	3,660	65.4	50.0	2.5	0	47.5	18.0	82.0
Virginia		55.0		1.5		38.5	65.0	3.0	0	27.0		
Charleston	852	46.0	10	0.6	988	53.4	52.0	3.0	3.0	42.0		
Wilmington	100	5.4	65	3.5	1,700	91.1	45.0	0	40.0	15.0		
Savannah	750	30.0	500	20.0	1,250	50.0	50.0	30.0	0	20.0		
Jacksonville		30.0		0.6		70.0	30.0	0	0.6	70.0		
Port Everglades		0		0	2,000	100.0	30.0	10.0	0	60.0		
Miami		45.0		0		55.0	65.0	3.0	2.0	35.0	16.4	83.6
EAST COAST[b]--7,002 mi. AVERAGE PERCENTAGE		35.0		3.8		65.0[c]	46.1[c]	10.5[c]		43.5[c]		
GULF COAST:												
Tampa	0	0	0	0	1,140	95.0	10.0	5.0	15.0	65.0		
Gulfport	75	8.0	4	0.4	941	91.0	15.0	0	20.0	65.0		
New Orleans	550	8.6	1,600	25.0	4,280	66.4	35.0	20.0	5.0	40.0	52.8	47.2
Lake Charles	0	0	125	10.0	1,125	90.0	0	0	18.0	82.0		
Houston	1,300	21.0	1,300	21.0	3,600	58.0	25.0	25.0	0	50.0	30.5	69.5
Galveston	50	3.0	450	28.0	1,100	69.0	10.0	28.0	0	62.0		
GULF COAST[b]--14,383 mi. AVERAGE PERCENTAGE		10.2		16.9		78.2	19.0	22.7		60.7		
WEST COAST:												
Seattle	1,850	75.0	0	0	400	16.0	85.0	9.0	Unknown	6.0		
Portland	280	20.0	0	0	1,130	80.0	30.0	0	5.0	65.0		
Tacoma	400	40.0	100	10.0	500	50.0	60.0	20.0	0	20.0		
San Francisco	1,100	29.0	500	13.0	2,200	58.0	35.0	25.0	0	25.0	14.7	85.3

[a]Source: U.S. Department of Commerce, Bureau of Census, Highlights of Exports and Imports: December 1971 (Washington, D.C.: Government Printing Office, 1971), pp. 48, 49, 94, 95.

[b]Includes only ports with traffic type being measured.

[c]Excludes New York.

TABLE 27--Continued

SEAPORT / SEACOAST (Inland Waterway Miles)	Current (1973) Volume Share						1978 Projected Volume Share				1971 Customs District Cargo Flow Type[a] (% of Total Dollar Volume)	
	Containership		Bargeship		Conventional Ship		Container-ship	Bargeships		Conventional Ship		
								Anchored Ships	Towed Barges			
Major Seaports	Long-Tons (000)	(%)	Long-Tons (000)	(%)	Long-Tons (000)	(%)	(%)	(%)	(%)	(%)	Agricultural	Non-Agricultural
Oakland	N/A	83.0	N/A	1.0	N/A	16.0	90.0	0	1.0	9.0		
Long Beach	4,330	65.7	21	0.3	2,234	34.0	82.0	0	2.0	16.0		
Los Angeles	2,232	40.0	134	2.4	2,880	51.0	45.0	5.0	0.0	43.0	12.6	87.4
San Diego	72	5.0	215	15.0	787	80.0	35.0	15.0	0.0	50.0		
WEST COAST[b]--3,545 mi. AVERAGE PERCENTAGE		44.7		6.6		48.1	57.7	10.3		29.3		
TOTAL U.S. AVERAGE PERCENTAGE		34.0		8.1		62.8[c]	43.2[c]	16.3[c]		43.1[c]		
Minor Seaports												
EAST COAST:												
New London, Conn.	0	0	0	0	40	100.0	0	0	0	100.0		
Fall River, Mass.	0	0	0	0	24	100.0	0	0	15.0	85.0		
Albany, NY	0	0	1	0.1	0	20.0	0	0	1.0	20.0		
Richmond, Va.	0	0	0	0	128	100.0	10.0	0	10.0	80.0		
GULF COAST:												
Pensacola, Fla.	0	0	4	0.7	298	63.0	N/A	N/A	N/A	N/A		
Panama City, Fla.	0	0	80	23.5	170	50.0	0	50.0	0	50.0		
Port Arthur, Texas	0	0	2	1.0	170	99.0	3.0	0	2.0	95.0		
Brownsville, Texas	0	0	1	0.02	0	0	0	0	5.0	0		
Beaumont, Texas	0	0	6	0.18	510	15.8	0	0	10.0	12.0		
Orange, Texas	0	0	13	8.7	137	91.3	0	0	20.0	80.0		
WEST COAST:												
Longview, Wash.	N/A	25.0	7	0.2		10-15.0	N/A	N/A	N/A	N/A		
Olympia, Wash.	0	0	0	0	0	0	0	0	10.0	10.0		
Vancouver, Wash.	0	0	60	2.9	300	14.6	10.0	0	5.0	10.0		

[a]Source: U.S. Department of Commerce, Bureau of Census, Highlights of Exports and Imports: December 1971 (Washington, D.C.: Government Printing Office, 1971), pp. 48, 49, 94, 95.

[b]Includes only ports with traffic type being measured.

[c]Excludes New York.

seacoasts are so great that any errors due to estimating could not reasonably affect the hypothesis test results. Regarding the above figures, it should also be noted that they only compare bargeship, containership, and conventional ship systems; Table 25 (pages 196-200) excludes all "others" from comparative analysis. This is because the only "others" shown to possess significant volume were West Coast dry bulk carriers, which are generally not considered general cargo vessels due to their specialized cargo emphases. These were not considered general cargo vessels by the vast majority of respondents, which so indicated by not listing dry bulk carriers as an "other."

Certain seaports experienced considerable difficulty in estimating their bargeship, containership, and conventional ship system shares of their total general cargo volumes. These included San Francisco, Houston, Savannah and New York. The first two of these exhibited a high degree of cooperation and the author, using techniques to aid the memory of the respondents, was able to secure rough percentage estimates for these ports. These estimates were then multiplied by the ports' total general cargo volumes to secure estimated volumes by vessel system. The reader should not place as much faith in these particular ports' volume estimates as the others, however, since these ports warned the author that the estimates given were "rough." Savannah gave the same warning to the author about its percentage share of total volume estimates, but its firm questionnaire response of 160 full bargeship barges per month handled does correspond with its approximate 1973 bargeship tonnage figure, when multipled by barge capacities of 370 long-tons and twelve months.

Similarly, the Port of New York data must in large part be taken as a rough estimate. As shall be pointed out, however, the New York data critical to the hypotheses tests is both authoritative and more than sufficiently accurate. Special authoritative sources had to be used here in part because the Port Authority of New York and New Jersey builds facilities and then leases them out to private operators, and thus had problems in getting data on the only bargeship operator's volume at New York. The use of these sources, however, was more a result of the organization's policy of divulging information strictly by policy statement, which severely restricts its capacity to answer questionnaires.

Two authoritative sources, one secured at the suggestion of the Port Authority of New York and New Jersey and the other through the U.S. Department of Transportation, were required in order to obtain the port's volume and investment information, respectively. As the author promised these sources anonymity, their names cannot be divulged to the reader. The reason for stating the New York's bargeship volume in a range is also by agreement with the volume data source, and the maximum figure in the range was used in determining East Coast bargeship system volume totals, which were nevertheless far lower than those of the Gulf Coast. Other New York volume estimates were made by the author on the basis of data secured from a publication of the Port of New York-New Jersey,[1] a letter from an

[1] Foreign Trade During 1971 at the Port of New York-New Jersey, The Port Authority of New York and New Jersey, 1972.

official there,[1] and Container News.[2] It is important to note, however, that the information critical to the tests of the dissertation's hypotheses, namely the investment estimates and the bargeship volume estimates, were both made by the above authoritative sources. Moreover, these sources provided information which quite obviously indicated far higher containership investment requirements at the port, and a bargeship volume figure which was far below comparative Gulf Coast figures.

At the same time, the author is comfortable with a 1973 New York containership volume estimate of 7.9 million long-tons, given an actual 1972 figure of 7.24 million long-tons cited by Container News[3] and the port's official estimate of 8.5 million long-tons by the end of 1974.[4] To get the port's conventional ship 1972 and 1973 volumes, the 1971 estimate was used as a base point, and it can be considered near actual since it was deduced from the port's own 1971 total general cargo figure of 14.4 million long-tons,[5] the Container News 1971 actual 6.2 million long-tons containership volume figure, and the anonymous authoritative source's 1971 bargeship volume figure of 100,000 to 125,000 long-tons. Once the 1971 near-actual figure was arrived at, it was assumed to increase at a rate somewhat below the containership volume increase

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[1]Letter from Jerome Gilbert, trade economist, The Port Authority of New York and New Jersey, June 29, 1973.

[2]"Intermodal Traffic Booming in Ports in North America," July, 1973, p. 10.

[3]*Ibid*.

[4]Gilbert letter.

[5]*Foreign Trade During 1971*.

rate at the port in arriving at the 1972 and 1973 authority estimates of conventional ship volume at the port. Given the prevailing pattern across the United States (indicated in Tables 25 (pages 196-200), 26 (page 201), and 27 (pages 202-203)), this assumption seems quite justified and the estimates seem at least sufficiently accurate for inclusion in overall East Coast data.

Important non-hypothesized conclusions are also evident in this hypothesis test's data. One is the steady decline in the conventional ship share of total general cargo volume in recent years at every major seaport in the United States except Tampa, San Diego and possibly New York, for which data had to be estimated by the author. Furthermore, while absolute conventional volumes are shown still to be increasing slightly, future port estimates show that the conventional ship share will continue to decrease in the next five years, with containerships already having emerged as the dominant form of general cargo shipping on the West Coast (per Table 26, page 201), and being expected to become dominant on the East Coast by 1978 (per Table 27, pages 202-203).

This table indicates that on the East Coast every major seaport expects to have both containership and conventional ship traffic. Seven of the ten responding (New York information was not available) expect containerships to dominate. The three which expect conventional ships to remain predominant (Port Everglades, Jacksonville, and Philadelphia) at present possess less than one-fourth of the Coast's total volume. Similarly, on the West Coast every port also expects both types of traffic; of the eight ports, only San Diego and Portland, which account for only about 10 percent of that coast's current volume, expect conventional ship shares to be larger. Moreover, the responses indicate that the West Coast ports taken together expect in 1978 an average containership percentage share of 58 percent and an average all-ports conventional ship share of 29 percent. Finally, even though the table does show that conventional ships are expected to remain in ascendancy on the Gulf Coast through 1978, the Gulf's volume is considerably smaller than the other two. The average percentage share of all U.S. ports is 43 percent for both containerships and conventional ships. These percentages, while resulting from an averaging technique which is not as good an indicator as volume figures, show that by 1978 containerships are expected to be just about equal to conventional ships in share of total U.S. general cargo volume.

Moreover, Tables 25 (pages 196-200), 26 (page 201), and 27 (pages 202-203) also show that the bargeship system share of total major seaport general cargo volumes has been steadily increasing over the last three years on each of the three coasts, and that it is expected to continue this pattern. For instance, Table 27 (pages 202-203) shows that while the average bargeship system share of ports with such traffic on the Gulf, West and East Coasts is respectively 16.9, 6.6, and 3.8 percent now, for the same coasts by 1978 its share is expected to increase to 22.7, 10.3 (excluding New York) and 10.5 percent, respectively. Regarding the East and West Coasts, the reader should be reminded that while West Coast bargeship percentage shares are higher at present, the West Coast's current total long-ton bargeship volume is approximately the same as the East Coast's, as per Table 25 (pages 196-200). For the United States as a whole, the bargeship system share of traffic at ports with such traffic is 6.2 percent now as per Table 25 (pages 196-200) and is expected to increase considerably by 1978 as per Table 27 (pages 202-203).

In addition, Table 27 indicates that while a few major U.S. seaports do not yet have bargeship system traffic, they all expect to have it by 1978. Finally, one other "average major seaport" figure provides a measure of anticipated bargeship system growth over the next five years (though it should be used with care since it combines ports of substantially varying volumes into this average like those above). The total U.S. average seaport column in Table 27 (pages 202-203) indicates that between 1973 and 1978, the average seaport's bargeship system share of its total general cargo traffic will increase from 8.1 percent to 16.3 percent (excluding New York), or roughly double.

Empirical data has therefore shown that bargeship systems have achieved a significant level of acceptance at U.S. major seaports, especially those of the Gulf Coast. In addition, major seaport estimates of the future indicate that while bargeship systems are not expected to threaten the overall U.S. general cargo dominance of the other two systems, they are expected to grow more significant on each U.S. coastline. Also, regarding the Gulf Coast, bargeship systems already have a larger share of total general cargo volumes than containerships by 19.8 to 11.2 percent, respectively, as per Table 25 (page 196). Similarly, by 1978 the average Gulf Coast major seaport percentage share of bargeship system traffic for ports with such traffic (all of them) is expected to be 22.7 percent versus 19 percent for containership systems as per Table 27 (pages 202-203), which are expected to be at all but one Gulf Coast seaport. Therefore it can be concluded that on the Gulf Coast, bargeship systems are and are expected to remain greater in usage and therefore importance than containership systems. The probable reasons behind this coast's high bargeship volume, as well as other coastal volume patterns, will be discussed in the Seaport Analyses sub-section of this chapter where seaport data in this area is analyzed.

Regarding individual major seaports, Tables 25 (pages 196-200), 26 (page 201), and 27 (pages 202-203) indicate that New Orleans with its Mississippi River mouth location, has the largest bargeship system long-ton volume. Similarly, Houston and San Francisco, having specialized facilities, and Savannah with its location on Gulf Coast originating trade routes, also have experienced high bargeship system volumes. Additionally, certain other major seaports are also expecting large bargeship system shares of their total general cargo volume by 1978; specifically, Wilmington, North Carolina, 40 percent; Gulfport, Mississippi, 20 percent; Lake Charles, Louisiana, 18 percent; Tacoma, Washington, 20 percent; and San Diego, California, 15 percent. The reasons behind these latter port expectations will be discussed in the Seaport Analyses sub-section of this chapter which analyzes various factors which influence bargeship system volumes.

This concludes this section and following is a discussion of the results found for "minor seaports," that is, ports located on the East, West, and Gulf Coasts physically, but not possessing sufficient facilities and/or relevant total general cargo volumes to meet the qualifications set in this dissertation for major seaports.[1] These ports have therefore been classified as minor seaports or functional inland ports, since they possess some of the characteristics of both, and are discussed separately in the next sub-section concerning their relevance to seaport results, as well as in the inland ports section where they possess more relevance according to the port categories established in this dissertation.

Treatment of Minor Seaports (Functional Inland Ports)

During conduct of the literature search for this dissertation, it became obvious to the author that two basic types of seaports exist along the coastlines of the United States--major and minor seaports. Since it was decided that ports such as New London, Connecticut, with a total current general cargo volume of 40,000 long-tons per year, should not be put in the same category as nearby Boston, it was decided to establish a hybrid minor seaports category for the purpose of listing separately the information provided by such ports. Moreover, since it became apparent in the literature search through such surveys as Container News Survey of World's Containerports that such ports do not have the containership traffic which the dissertation seaport questionnaire intended to compare with bargeship traffic, these ports were sent inland port questionnaires. Many of them answered the inland port questionnaires as the Inland Port Results section will indicate. Many of them also replied by stating that they considered themselves seaports, so in

[1]See p. 172, *supra*.

the interests of obtaining maximum data about these ports, they were mailed seaport questionnaires.

Nevertheless, unless one of these seaports had a current annual general cargo volume of at least 1,000,000 long-tons, it was considered minor in terms of seaport results and major in terms of inland port results, being classified as a functional inland port since they lacked either the deep draft facilities or the relevant volume required to regularly accommodate full-sized containerships and bargeships. Only three of these ports so classified met the volume requirement, Tampa, Florida; Lake Charles, Louisiana; and Gulfport, Mississippi; and were reclassified as major seaports. One seaport originally thought to meet the volume requirement, Port Arthur, Texas, did not and was reclassified as a minor seaport and functional inland port. Thus, the classification system supported most of the author's initial evaluations of these ports' statuses with regard to this survey.

In all, 39 of 45 of these ports responded. Only one of the respondents had full-sized containership traffic, confirming the author's belief that containership operators, one of the three vessel systems being analyzed by the seaport questionnaire, do not generally consider these ports as viable users of their system. Moreover, this one port, Longview, Washington, stated that half of its stated containership cargo volume is "trucked in from Portland." The results relevant to this section received from these ports were therefore listed separately on seaport Tables 22 (page 185), 24 (page 189), and 27 (pages 202-203), and placed on their own minor seaport Tables 28 and 29, but <u>not</u> included in the major seaport hypotheses tests. Similar treatment is

TABLE 28

MINOR SEAPORT AND SEACOAST INVESTMENTS--OVERALL AND BY VESSEL SYSTEM

SEAPORT / SEACOAST	Vessel System Facilities	Investments to Date: Amount ($000)	Investments to Date: Date Commenced	Planned Investments: Amount ($000)	Planned Investments: Time Period
EAST COAST:					
Searsport, Maine	Bargeship system	0	--	0	--
Portland, Maine	Bargeship system	0	--	0	--
New London, Conn.	Bargeship system	0	--	0	--
Albany, N.Y.	Bargeship system	0	--	0	--
Richmond, Va.	Bargeship system	0	--	0	--
Brunswick, Ga.	Bargeship system	0	--	0	--
GULF COAST:					
Pensacola, Fla.	Bargeship system	0	--	0	--
Panama City, Fla.	Overall investments	4,842	1966	0	--
" " "	Bargeship barge			250	1974-75
Bay St. Louis, Ms.	Overall investments	1,025	N/A	0	--
Orange, Texas	Conventional ship	7,000	1916	400	1973-78
Beaumont, Texas	Overall investments	34,000	1949	14,500	1970-75
Port Arthur, Texas	Overall investments	9,500	1965	0	--
" " "	Conventional ship			5,400	1973-78
Brownsville, Texas	Bargeship system	0	--	0	--
Texas City, Texas	Bargeship system	0	--	0	--
Corpus Christi, Tex.	Bargeship system	0	--	0	--
WEST COAST:					
Stockton, Calif.	Overall investments	7,900	Late 1960s	N/A	N/A
Sacramento, Calif.	Bargeship system	0	--	0	--
Astoria, Oregon	Overall investments	2,000	1967	0	--
Coos Bay, Oregon	Bargeship system	0	--	0	--
Grays Harbor, Wash.	Overall investments	0	--	11,000	1973-78
" " "	Conventional ship	8,500	1966	3,000	1973-78
Longview, Wash.	Overall investments	15,986	1926	0	--
Olympia, Wash.	Overall investments	2,150	1963	1,000	1974-78
Vancouver, Wash.	Overall investments	15,000	1964	0	--
" "	Containership	0	--	1,500	1974-78
" "	Bargeship barge	200	1972	0	--
" "	Conventional ship	0	--	500	1973-74
Willapa Harbor, Wash.	Bargeship system	0	--	0	--
Bellingham, Wash.	Bargeship system	0	--	0	--
U.S. TOTALS:	Overall investments	92,403	Early	26,500	1973-78
	Containership	0	1900s	1,500	1974-78
	Bargeship barge	200	"	250	1974-75
	Conventional ship	15,500	"	9,300	1973-78

TABLE 29

MINOR SEAPORT AND SEACOAST ESTIMATED VOLUMES BY VESSEL SYSTEM

SEAPORT / SEACOAST (Inland Waterway Miles)	Vessel System	1971 Volumes Long-Tons (000)	1971 Volumes % of Total Volume	1972 Volumes Long-Tons (000)	1972 Volumes % of Total Volume	1973 Volumes Long-Tons (000)	1973 Volumes % of Total Volume
EAST COAST:							
Searsport, ME	Bargeship (anchored)	N/A	N/A	N/A	N/A	4.4	4.0
	Conventional ship	N/A	N/A	N/A	N/A	102	96.0
	Overall Total					106	
Portland, ME	Conventional ship	19	0.6	N/A	N/A	25	0.8
	Other--oil tankers	29,337	99.0	N/A	N/A	31,000	99.0
	Overall Total	29,356					
Fall River, MA	Conventional ship	24	0.5	12	<1.0	10	<1.0
	Other--bulk oil	8,738	99.0				
	Overall Total	8,762					
New London. CT	Conventional Ship	38	100.0	35	100.0	40	100.0
Albany, NY	Bargeship barge (towed)	0	0			1	0.1
	Conventional ship	110	20.0[a]	192	20.0[a]	250	20.0[a]
	Other--dry bulk carriers	395	80.0[a]	766	80.0[a]	1,000	80.0[a]
	--conventional barge	37	7.0	1	0.1	1	0.1
	Overall Total	542		959	1,252		
Richmond, VA	Conventional ship	105.8	100.0	122.1	100.0	128.2	100.0
Brunswick, GA		N/A	N/A	N/A	N/A	N/A	N/A
Fort Pierce, FL	Conventional barge	183.2	100.0	177	100.0	180	100.0
EAST COAST TOTALS	Bargeship barge (towed)	0	Non-Descriptive		Non-Descriptive	5.4	Non-Descriptive
	Conventional ship	272.8		361		515	
	Other--bulk carriers	38,470		766		32,000	
	--conventional barge	220.2		178		181	
	Overall Total	38,963		1,305		32,701.4	
GULF COAST:							
Pensacola, FL	Bargeship barge (towed)	3	1.5	3	0.8	4	0.7
	Conventional ship	168	85.5	245	79.2	298	63.4
	Other--conventional barge	26	13.0	61	20.0	166	35.9
	Overall Total	197		309		463	

[a]Author's estimates from port supplied information.

TABLE 29--Continued

SEAPORT / SEACOAST (Inland Waterway Miles)	Vessel System	1971 Volumes Long-Tons (000)	1971 Volumes % of Total Volume	1972 Volumes Long-Tons (000)	1972 Volumes % of Total Volume	1973 Volumes Long-Tons (000)	1973 Volumes % of Total Volume
Panama City, FL	Bargeship barge (towed)	0	0	14.9	5.1	80	23.5
	Conventional ship	206	78.3	204.9	71.0	170	50.0
	Other--conventional barge	57	21.7	69	23.9	90	26.5
	Overall Total	263		288.8		340	
Pascagoula, MS		N/A	N/A	N/A	N/A	N/A	N/A
Orange, TX	Bargeship barge (towed)	4.3	3.4	4.7	3.3	13	8.7
	Conventional ship	123.8	96.6	138.1	96.7	137	91.3
	Overall Total	128.1		142.8		150	
Port Arthur, TX	Bargeship barge (towed)	1.4	0.3	1.6	1.1	1.9	1.1
	Conventional ship	473	99.7	142	98.9	170	98.9
	Overall Total	475		144		172	
Beaumont, TX	Bargeship barge (towed)			2	0.07	6	0.18
	Conventional ship	400	16.0	446	15.9	510	15.8
	Other--dry bulk carriers	2,100	84.0	2,354	84.0	2,690	84.0
	Overall Total	2,500		2,802		3,206	
Brownsville, TX	Bargeship barge (towed)	N/A	N/A	N/A	N/A	N/A	N/A
	Conventional ship	458	10.0	382	10.0	500	10.0
	Other--conventional barge	1,112	24.0	1,242	30.0	1,500	30.0
	--bulk carriers	2,918	66.0	2,202	60.0	3,000	60.0
	Overall Total	4,588		3,827		5,000	
Texas City, TX	Other--bulk carriers	21,715	100.0	19,135	100.0	21,000	100.0
GULF COAST TOTALS	Containership	0	Non-Descriptive	0	Non-Descriptive	0	Non Descriptive
	Bargeship barge (towed)	8.7		27.2		105.9	
	Conventional ship	2,101.6		1,558.		1,516.8	
	Other--bulk carriers	65,203		24,457		58,690	
	--conventional barges	1,415.2		1,372		1,756	
	Overall Total	68,728.5		27,414.2		62,388.7	
WEST COAST:							
Sacramento, CA	Bargeship barge (towed)	7.1	N/A	35.7	3.2	30	N/A
	Other--container barge	2.1	N/A	1.3	0.1	50	N/A
	Overall Total	N/A	N/A	1,116		N/A	N/A
Richmond, CA		N/A	N/A	N/A	N/A	N/A	N/A
Stockton, CA	← See inland port volume tables →						

TABLE 29--Continued

SEAPORT / SEACOAST (Inland Waterway Miles)	Vessel System	1971 Volumes Long-Tons (000)	1971 Volumes % of Total Volume	1972 Volumes Long-Tons (000)	1972 Volumes % of Total Volume	1973 Volumes Long-Tons (000)	1973 Volumes % of Total Volume
Coos Bay, OR	Other--wood carriers	N/A	99.0	N/A	99.0	N/A	99.0
	--tank barge	257	1.0	N/A	1.0	N/A	1.0
Astoria, OR (Bargeship now anchoring in stream)	Bargeship (anchored)					30	5.0
	Other--wood carriers	1,279	100.0	1,670	100.0	208	95.0
	Overall Total	1,279		1,670		238	
Anacortes, WA	Other--wood carriers	N/A	N/A	N/A	N/A		80.0
	--conventional barges	N/A	N/A	N/A	N/A		20.0
	Overall Total	350		300		300	
Vancouver, WA	Bargeship barge (towed)					60	3.0
	Conventional ship	N/A	N/A	N/A	N/A	300	15.0
	Other--dry bulk carriers	N/A	N/A	N/A	N/A	1,700	82.0
	Overall Total	1,700		2,099		2,060	
Bellingham, WA	Other--dry bulk carriers	215	80.0	268	75.0	178	71.0
	--mini-containers	13	5.0	18	5.0	17	7.0
	--conventional barges	40	15.0	71	20.0	55	22.0
	Overall Total	268		357		250	
Olympia, WA	Other--wood carriers	669	100.0	718	100.0	700	100.0
Longview, WA (Note: 50% of containers are trucked in from Portland.)	Containership	385	15.0	638	20.0	875	25.0
	Bargeship barge (towed)					7	0.2
	Conventional ship	300	12.0	N/A }	80.0	N/A }	75.0
	Other--dry bulk carriers	1,900	73.0	N/A }		N/A }	
	Overall Total	2,585		3,190		3,500	
Everett, WA	Other--wood carriers	N/A	99.0	N/A	99.0	N/A	99.0
Walla Walla, WA	Other--grain carriers	N/A	100.0	N/A	100.0	N/A	100.0
Willapa Harbor, WA	Other--bulk carriers	153	100.0	136	100.0	150	100.0
Grays Harbor, WA	Conventional ship			0.4	1.0	0.4	1.0
	Other--tankers	42	100.0	40	99.0	45	99.0
	Overall Total			41		46	
WEST COAST TOTALS	Containership	385[b]	Non-Descriptive	638[b]	Non-Descriptive	875[b]	Non-Descriptive
	Bargeship (anchored)	0		0		30	
	Bargeship barge (towed)	7.1		35.7		37	
	Conventional ship	300		N/A		N/A	
	Other--bulk carriers	4,258		2,832+		2,937+	
	--conventional barges	299.1		72+		105+	
	--mini-containerships	13-		18-		17-	

[b]Fifty percent trucked into port.

given in the final section of this chapter. Rather, according to the author's original scientific intention, they were included in the inland port hypothesis test as functional inland ports, because their inherently small relevant volume potentials made them more akin to inland ports than to major seaports. This decision was reaffirmed, as will be pointed out in the next section, by the fact that bargeship operators do view many of these ports as possessors of some, non-mothership, limited volume potentials for their system, as indicated by volume data which was comparable to that of geographic inland ports.

Before going to the next section, let us examine Tables 22 (page 185), 23 (page 186), 27 (pages 202-203), 28 (page 213), and 29 (pages 214-216) in order to determine any similarities in the data of major and minor seaports. These tables will indicate another way in which minor seaports are in general more akin to inland ports than major seaports, namely in non-availability of data, because of a lack of research capacity. Table 22 (page 185) shows us that, similar to major seaports, Orange, Texas and Panama City, Florida, also commonly use conventional ship facilities to discharge the bargeship barges which are towed to them. Table 23 (page 186) shows that many minor seaports tend to use "old, already existing facilities" to discharge bargeship barges, some use new conventional ship facilities, and three of them, Port Arthur and Beaumont, Texas, and Panama City, Florida, plan to construct specialized bargeship system facilities. Panama City, moreover, may achieve major seaport status in the future after its channel is dredged to a depth deep enough to accommodate full-sized bargeships.

Table 27 (pages 202-203) indicates the bargeship system percentage shares of total port general cargo volume of nine of these ports. Significant percentage shares exist in Panama City and Orange, and are expected at Olympia, Washington; Beaumont, Texas; Fall River, Massachusetts; and Richmond, Virginia. Table 28 (page 213) indicates no containership system investments by any minor seaports, small bargeship system investments by Panama City and Vancouver, Washington, and a few significant conventional ship and overall facilities investments made and/or planned by some ports. The table's totals by vessel system indicate that responding minor seaports conventional ship investments are considerably more significant than bargeship system investments and that containership investments are non-existent.

Table 29 (pages 214-216) indicates a general lack of data on the part of minor seaports, but despite this, certain basic characteristics of these ports are evident. One of these characteristics is a predominance of bulk carriers, liquid and dry, at most of these ports and for all three coastlines. Another is a somewhat small share of each coast's volume being equally divided by conventional ships and conventional barges. A third is an even smaller but growing volume of towed bargeship barges on each coastline, and at a growing number of these ports.

Some individual minor seaport situations merit special attention. Both Searsport, Maine and Astoria, Oregon did have a full-sized bargeship call on their port, but both of these may have been one-time events. This is almost certainly true at Astoria, where the port indicated in its questionnaire that rather than dock in any port at the Columbia

River mouth, bargeships are now anchoring "in the stream" and discharging barges which are towed to and from various ports along the river. Similarly, Pascagoula, Mississippi and Richmond, Virginia have had towed bargeship barge traffic in the past, but both indicate that they are now no longer receiving such traffic. So there is no certainty that this traffic will continue and grow at an individual port. On the other hand, the minor seaports which have experienced substantial amounts of this traffic have even larger expectations for the future, as cited earlier.

On an overall basis for the 39 of 45 minor seaports (see Appendix C) responding, the above tables indicate patterns of common facilities usage similar to those of major seaports where bargeship system traffic exists; an overall pattern of small but growing amounts of such traffic at growing numbers of these ports; expectations of either the inception of such traffic or continued growth of such traffic in the future; virtually no containership traffic or expectations thereof; a steady past and future conventional ship and barge traffic; and a predominance of specialized, bulk carrier traffic.

These ports, which bargeship operators obviously consider to be not potential ports-of-call for their motherships, but rather potential receivers or senders of their barges from or to their motherships' ports-of-call, are therefore viewed by these operators in much the same category as geographic inland ports. This is why they are considered as the functional members of the nation's inland port population for the test of the second hypothesis, in the section which follows.

Inland Port Results

Hypothesis 2

At the outset of this section the reader is reminded that since public inland terminal companies operate and keep separate traffic records often not possessed by the public inland port authority at their port, they were included in the total population of inland ports. Another reason for this inclusion is that at many locations there is no public port authority, and these terminal companies basically act as private ports.[1] Moreover, in all of the following comparisons which state percentages of the inland port population, each potential respondent is treated as one port, even though as many as four are sometimes located in the same port area.

Bargeship systems have not had an effect on the international traffic expectations of the majority of U.S. geographic and functional inland ports and terminal companies. The majority (68) of the 112 respondents from this population of 221 separate locations (see Appendix B) do not have or expect such traffic for at least the next three and often five years, as per Table 30. The functional members of this population are defined and explained both at the end of the preceding section and in the next sub-section. Table 30 also shows, however, that 19 of these responding inland ports (terminals) answered "yes" to the question asking whether they expected their port to experience a significant effect on their port's (terminal's) international cargo traffic because of LASH/SEABEE barges. This indicates that there has been an

[1]See pp. 167, 172, 173, *supra*.

TABLE 30

STATUS OF U.S. INLAND PORTS REGARDING INTERNATIONAL LASH/SEABEE TRAFFIC AND EXPECTATIONS

Inland Ports With LASH/SEABEE Traffic	Inland Ports Expecting LASH/SEABEE Traffic Within 3 Years	Inland Ports Not Expecting LASH/SEABEE Traffic Within 3 Years	Probabilities Against LASH/ SEABEE Traffic (%)	Inland Ports Expecting Significant International Traffic Increase Via LASH/SEABEE
GEOGRAPHIC INLAND PORTS	GEOGRAPHIC INLAND PORTS	GEOGRAPHIC INLAND PORTS		GEOGRAPHIC INLAND PORTS
GULF COAST:[a]	EAST COAST:	EAST COAST:[b]		EAST COAST:
Natchez, Miss.	Bay City, Mich.	Ogdensburg, N.Y.	70	Bay City, Mich.
Vicksburg, Miss.		Buffalo, N.Y.	N/A	
Greenville, Miss.	GULF COAST:	Rochester, N.Y.	100	GULF COAST:[c]
Pine Bluff, Ark.	Paducah, Ky.	Cleveland, Ohio	90	Natchez, Miss.
Helena Ark.	East St. Louis, Ill.	Lorain, Ohio	100	Vicksburg, Miss.
Little Rock, Ark.	Portage, Ind.	Huron, Ohio	100	Greenville, Miss.
Memphis, Tenn.	Cincinnati, Ohio	Toledo, Ohio	100	Memphis, Tenn.
Fort Smith, Ark.	Omaha, Nebr.	Monroe, Mich.	75	Muskogee, Okla.
Muskogee, Okla.	Sioux City, Ia.	Detroit, Mich.	90	Tulsa-Catoosa, Okla.
Tulsa-Catoosa, Okla.		St. Joseph, Mich.	75	Granite City, Ill.
Granite City, Ill.	WEST COAST:			East St. Louis, Ill.
St. Louis, Mo.	Pasco, Wash.	GULF COAST:[d]		St. Louis, Mo.
Nashville, Tenn.		Harvey, La.	100	Cincinnati, Ohio
Chicago, Ill.	FUNCTIONAL INLAND PORTS	Dardanelle, Ark.	50	Kansas City, Kan.
Rock Island, Ill.	GULF COAST:	Shawneetown, Ill.	100	Sioux City, Iowa
Kansas City, Kan.	Bay St. Louis, Miss.	Evansville, Ind.	N/A	
		Sheffield, Ala.	N/A	FUNCTIONAL INLAND PORTS
FUNCTIONAL INLAND PORTS	WEST COAST:	Decatur, Ala.	N/A	EAST COAST:
EAST COAST:	Anacortes, Wash.	Pekin, Ill.	N/A	Albany, N.Y.
Searsport, Maine		Joliet, Ill.	N/A	
Albany, N.Y.	----Within 5 Years----	Guntersville, Ala.	N/A	GULF COAST:
Brunswick, Ga.		Madison, Ind.	100	Orange, Texas
	(See continuation on	Conneaut Harbor, Ill.	95	
GULF COAST:	next page)	Waukeegan, Ill.	N/A	WEST COAST:
Pensacola, Fla.		Clinton, Iowa	75	Stockton, Calif.
Panama City, Fla.		Milwaukee, Wis.	80	
Orange, Texas		Holland Harbor, Mich.	100	
Corpus Christi, Texas		Sheboygan, Wisc.	100	
Brownsville, Texas		Muskegon, Mich.	N/A	
Freeport, Texas		Dubuque, Iowa	98	
Port Arthur, Texas		Coal Grove, Ohio	N/A	
		Port Amherst, W. Va.	100	
WEST COAST		Winona, Minn.	90	
Stockton, Calif.		Nebraska City, Neb.	70	
Sacramento, Calif.		Green Bay, Wis.	100	
Astoria, Ore.		Wheeling, W. Va.	99	
Vancouver, Wash.		Minneapolis, Minn.	N/A	
Longview, Wash.		Leetsdale, Pa.	90	

TABLE 30--Continued

Inland Ports With LASH/SEABEE Traffic	Inland Ports Expecting LASH/SEABEE Traffic Within 5 Years	Inland Ports Not Expecting LASH/SEABEE Traffic Within 3 Years	Probabilities Against LASH/SEABEE Traffic (%)	Inland Ports Expecting Significant International Traffic Increase Via LASH/SEABEE
	GEOGRAPHIC INLAND PORTS	New Kensington, Pa.	95	
	EAST COAST:	Pittsburgh, Pa.	100	
	Ogdensburg, N.Y.	Donora, Pa.	95	
		Point Marion, Pa.	95	
	GULF COAST:	Ashland, Wis.	95	
	Dardanelle, Ark.	Duluth, Minn.	N/A	
	Evansville, Ind.			
	Minneapolis, Minn.	FUNCTIONAL INLAND PORTS		
	Leetsdale, Pa.	EAST COAST:		
		Portland, Maine	N/A	
	FUNCTIONAL INLAND PORTS	Portsmouth, N.H.	N/A	
	EAST COAST:	Fall River, Mass.	N/A	
	Fall River, Mass.	New London, Conn.	N/A	
		Annapolis, Md.	N/A	
	WEST COAST:	Cambridge, Md.	N/A	
	Olympia, Wash.	Alexandria, Va.	100	
		Richmond, Va.	75	
		Fort Pierce, Fla.	90	
		Palm Beach, Fla.	N/A	
		GULF COAST:		
		Pascagoula, Miss.	N/A	
		Port Lavaca, Texas	N/A	
		Texas City, Texas	100	
		WEST COAST:		
		Richmond, Calif.	N/A	
		Port Angeles, Calif.	N/A	
		Coos Bay, Ore.	100	
		Grays Harbor, Wash.	100	
		Willapa Harbor, Wash.	100	
		Everett, Wash.	N/A	
		Walla Walla, Wash.	95	
		Bellingham, Wash.	99	
		Olympia, Wash.	50	

[a]Five locations had multiple respondents.

[b]One location had multiple respondents.

[c]Two locations had multiple respondents.

[d]Two locations had multiple respondents.

effect on their international cargo traffic expectations because of bargeship systems, which disproves the second hypothesis. All of the above numbers of the population do not exactly match those shown on the table because a total of 17 respondents answered from seven port areas, and the author does not indicate what these areas are in order to protect the anonymity of data promised inland terminal company operators.

The second hypothesis in the null form asserted that there has been no effect on U.S. inland port international cargo traffic expectations because of bargeship systems. The findings reported above, though minimal in terms of percentage of the total population, are significant for that portion of the population, disproving the universal statement in the hypothesis.

Moreover, Table 30 (pages 221-222) indicates that at the 54 responding U.S. inland ports (terminals) which have or expect international LASH/SEABEE barge traffic, such traffic is expected to increase to about 1,220,000 long-tons in 1973 from about 822,000 long-tons in 1972 as per Table 31, and to maximums of about 2,500,000 long-tons in 1978 and 4,000,000 long-tons in 1983 as per Table 32 (pages 226-229). This suggests that while very few of these ports answered "yes" to the above-mentioned question, the expected increases in international LASH/SEABEE barge traffic at U.S. inland ports are considerable, although the 1978 and 1983 projections may be overstated somewhat, as discussed below.

Furthermore, the 54 inland ports (terminals) with or expecting LASH/SEABEE traffic mentioned above represent 48 percent of the respondents and 25 percent of the total population, and 36 of these 54 state that they already have such traffic. Bargeship barge traffic in at

TABLE 31

U.S. INLAND PORT LASH/SEABEE VOLUME TO-DATE DATA BY COASTAL REGION, WATERWAY MILES FROM NEAREST SEAPORT, AND SIZE OF INLAND PORT[a]

INLAND PORT / COASTAL REGION	# Waterway Miles From Nearest Seaport	Size[b] of Inland Port	Date LASH/SEABEE Traffic Began	1971 LASH/SEA-BEE Traffic		1971 Port Total Long-Ton Volume	1972 LASH/SEA-BEE Traffic		1972 Port Total Long-Ton Volume	1973 LASH/SEA-BEE Traffic		1973 Port Total Long-Ton Volume
				Long-Tons	% of Total Vol.		Long-Tons	% of Total Vol.		Long-Tons	% of Total Vol.	
GEOGRAPHIC INLAND PORTS												
GULF COAST:												
Natchez, Miss.	265	S	Late 1969	148,866	73.0	205,474	199,418	58.6	340,609	205,000	40.0	512,520
Vicksburg, Miss.	336	S	Early 1970	240,000	60.0	N/A	310,000	52.7	589,000	350,000	58.0	604,000
Greenville, Miss.[c]	438	R	Early 1970	11,000	6.0	186,886	20,000	7.0	284,377	30,000	85.0	360,000
Greenville, Miss.[d]					1.0	1,793,973		1.0	1,950,000		1.5	2,100,000
Pine Bluff, Ark.	550	N	N/A	← Very Small Traffic →								
Helena, Ark.	564	S	1970	15,000	N/A	N/A	15,000	N/A	N/A	15,000	N/A	N/A
Little Rock, Ark.	596	S	Mid-1971	3,000	2.0	163,000	9,000	10.0	91,000	5,000	10.0	N/A
Memphis, Tenn.	637	R	Early 1971	3,500	0.5	600,000	3,700	0.5	650,000	30,000	3.0	900,000
Fort Smith, Ark.	782	S	Late 1970	1,500	5.0	30,000	2,800	5.0	56,000	2,000	5.0	40,000
Muskogee, Okla.	864	N	Early 1972	0	0	64,346	9,284	22.0	42,696	13,000	26.0	50,000
Tulsa-Catoosa, Okla.	916	S	Early 1972	0	0	87,000	20,000	6.5	330,000	25,000	N/A	N/A
Granite City, Ill.	1,050	S	Late 1972	0	0	N/A	N/A	N/A	N/A	44,000	15.0	300,000
St. Louis, Mo.	1,053	R	Mid-1970	N/A	N/A	N/A	75,000	7.5	1,000,000	150,000	17.0	875,000
Nashville, Tenn.	1,104	R	Mid-1971	N/A	20.0	N/A	N/A	20.0	N/A	35,000	1.0	3,500,000
Chicago, Ill.	1,303	R	Mid-1973	0	0	39,500,000	0	0	38,200,000	1,500	0.01	35,660,000
Rock Island, Ill.	1,355	S	Mid-1971	1,800	0.2	1,330,000	1,900	0.2	1,100,000	1,000	0.5	500,000
Kansas City, Kansas	1,433	R	Late 1972	0	0	130,000	500	0.33	140,000	2,000	1.3	153,000
GEOGRAPHIC INLAND PORTS LASH/SEABEE LONG-TON TOTALS:				424,666+			666,603+			908,500		
FUNCTIONAL INLAND PORTS												
EAST COAST:												
Searsport, Maine			Mid-1972	0	0	N/A	4,400	4.0	106,000	N/A	N/A	N/A
Albany, N.Y.			Early 1973	0	0	542,000	0	0	959,000	5,000	0.5	1,258,000
Brunswick, Ga.			Mid-1972	0	0	1,059,102	15,000	1.2	1,273,000	N/A	N/A	N/A

[a]Individual port data is in estimates except where figures down to the last two digits are given.

[b]R = Regional Port; S = Sub-Regional Port; and N = Non-Port Terminal.

[c]Public port authority data.

[d]Overall port data.

TABLE 31--Continued

INLAND PORT / COASTAL REGION	Date LASH/ SEABEE Traffic Began	1971 LASH/SEA-BEE Traffic Long-Tons	1971 LASH/SEA-BEE Traffic % of Total Vol.	1971 Port Total Long-Run Volume	1972 LASH/SEA-BEE Traffic Long-Tons	1972 LASH/SEA-BEE Traffic % of Total Vol.	1972 Port Total Long-Run Volume	1973 LASH/SEA-BEE Traffic Long-Tons	1973 LASH/SEA-BEE Traffic % of Total Vol.	1973 Port Total Long-Ton Volume
GULF COAST:										
Pensacola, Fla.	Early 1970	2,829	1.5	196,896	2,734	0.8	308,739	3,540	0.7	463,091
Panama City, Fla.	Early 1970	0	0	263,000	14,850	5.1	288,804	80,000	23.5	340,000
Orange, Texas (Gen. cgo. only)	Early 1970	4,300	3.4	128,125	4.697	3.3	142,763	13,000	8.7	150,000
Corpus Christi, Texas	Mid-1973	N/A	N/A	N/A	N/A	N/A	N/A	2,000	0.1	30,000,000
Beaumont, Texas	Mid-1972	0	0	2,500,000	2,000	0.007	2,802,000	6,000	0.18	3,206,000
Brownsville, Texas	Early 1972	0	0	4,588,663	1,000	0.02	3,827,389	1,000	0.02	5,001,000
Freeport, Texas								1,000		
Port Arthur, Texas (Gen. cgo. only)	Mid-1971	1,454	0.3	472,000	1,607	1.1	143,367	1,928	1.1	172,000
WEST COAST:										
Stockton, Calif. (Barge traffic only)	1971	N/A	N/A	N/A	74,000	27.0	270,000	88,000	N/A	N/A
Sacramento, Calif.	Late 1971	7,143	N/A	N/A	35,716	3.2	1,100,000	30,000	N/A	N/A
Astoria, Ore.	1973	0	0	1,278,694	0	0	1,607,657	11,000	5.0	238,144
Vancouver, Wash.	Early 1973	0	0	N/A	0	0	N/A	60,000	2.9	2,060,000
Longview, Wash.	Mid-1973	0	0	2,585,000	0	0	3,190,000	5,400	0.2	3,500,000
FUNCTIONAL INLAND PORTS LASH/SEABEE LONG-TON TOTALS:		15,726			156,004			311,868		
OVERALL LASH/SEABEE LONG-TON TOTALS:		440,392+			822,607+			1,220,668+		

TABLE 32

U.S. INLAND PORT LASH/SEABEE EXPECTATIONS AND POTENTIAL DATA BY TRAFFIC STATUS, COASTAL REGION, WATERWAY MILES FROM NEAREST SEAPORT, AND SIZE OF INLAND PORT

TRAFFIC STATUS AND COASTAL REGION / INLAND PORT	Size[a] of Inland Port	# Waterway Miles From Nearest Seaport	Date LASH/ SEABEE Traffic Began	1978 LASH/ SEABEE % of Total Volume	1978 Max. LASH/SEABEE Long-Ton Vol.	1983 Max. LASH/SEABEE Long-Ton Vol.	% per Year Anticipated LASH/SEABEE Vol. Increase	% of Current Vol. Shippable Via LASH/SEABEE
"WITH LASH/SEABEE" GEOGRAPHIC INLAND PORTS								
GULF COAST:								
Natchez, Miss.	S	265	Late 1969	40.0	224,000	250,000	5.0	40.0
Vicksburg, Miss.	S	336	Early 1970	60.0	620,000	900,000	12.0	60.0
Greenville, Miss.[b]	R	438	Early 1970	unknown	100,000	150,000	10.0+	50.0
Pine Bluff, Ark.	N	550	N/A	←		small traffic		→
Helena, Ark.	S	564	1970		20,000+	N/A	N/A	N/A
Little Rock, Ark.	S	596	Mid-1971	N/A	30,000[c]	N/A	20.0	50.0
Memphis, Tenn.	R	637	Early 1971	10.0	175,000	300,000	10.0	10.0
Fort Smith, Ark.	S	782	Late 1970	5.0	10,000[c]	15,000[c]	5.0	5.0
Muskogee, Okla.	N	864	Early 1972	10.0	20,000[c]	30,000[c]	10.0	25.0
Tulsa-Catoosa, Okla.	S	916	Early 1972	30.0	55,000[c]	110,000[c]	5.0	60.0
Granite City, Ill.	S	1,050	Late 1972	N/A	100,000[c]	200,000[c]	25.0	N/A
St. Louis, Mo.	R	1,053	Early 1970	25.0	300,000	400,00	N/A	95.0
Nashville, Tenn.[d]	R	1,104	Mid-1971	25.0	N/A	N/A	3.0	95.0
Chicago, Ill.	R	1,303	Mid-1973	N/A	10,000	20,000	2.0	80.0
Rock Island, Ill.	S	1,355	Mid-1971	5.0	N/A	N/A	0.0	5.0
Kansas City, Kansas	R	1,433	Late 1972	10.0	14,000	30,000	2.0	10.0
GEOGRAPHIC INLAND PORTS LASH/SEABEE LONG-TON TOTALS:					1,678,000+	2,405,000+		
FUNCTIONAL INLAND PORTS								
EAST COAST:								
Searsport, Maine			Mid-1972	N/A	N/A	N/A	possibly	100.0
Fall River, Maine								
Albany, N.Y.			Early 1973	1.0	20,000	40,000	50.0	25.0
Richmond, Va.				10.0	N/A	N/A	N/A	75.0
Brunswick, Ga.			Mid-1972	N/A	N/A	N/A	N/A	N/A

[a] R = Regional Port; S = Sub-Regional Port; and N = Non-Port Terminal.

[b] Public terminal.

[c] Author used port-supplied information to deduce volume estimate.

[d] Private terminal.

TABLE 32--Continued

TRAFFIC STATUS AND COASTAL REGION / INLAND PORT	Size of Inland Port	# Waterway Miles From Nearest Seaport	Date LASH/SEABEE Traffic Began	1978 LASH/SEABEE % of Total Volume	1978 Max. LASH/SEABEE Long-Ton Vol.	1983 Max. LASH/SEABEE Long-Ton Vol.	% per Year Anticipated LASH/SEABEE Vol. Increase	% of Current Vol. Shippable Via LASH/SEABEE
GULF COAST:								
Pensacola, Fla.			Early 1970	unknown	40,000	90,000	9.0	unknown
Panama City, Fla.			Early 1970	50.0	N/A	N/A	N/A	N/A
Orange, Texas			Early 1970	20.0	40,000	50,000	N/A	20.0
Corpus Christi, Texas			Mid-1973	0.5	5,000	5,000	0	0.5
Beaumont, Texas			Mid-1972	10.0	N/A	N/A	N/A	N/A
Brownsville, Texas			Early 1972	5.0	10,000	50,000	1.0	5.0
Freeport, Texas								
Port Arthur, Texas[e]			Mid-1971	2.0	10,000	20,000	N/A	2.0
WEST COAST:								
Stockton, Calif.[f]			1971	N/A	N/A	N/A	'73 17.0	27.0
Sacramento, Calif.			Late 1971	N/A	N/A	N/A	N/A	N/A
Astoria, Oregon			1973	N/A	N/A	N/A	N/A	N/A
Vancouver, Wash.			Early 1973	N/A	N/A	N/A	N/A	N/A
Longview, Wash.			Mid-1973	N/A	N/A	N/A	N/A	N/A
FUNCTIONAL INLAND PORTS LASH/SEABEE VOLUME TOTALS:					125,000+	255,000+		
"EXPECTING LASH/SEABEE WITHIN 3 YEARS" GEOGRAPHIC INLAND PORTS								
EAST COAST:								
Bay City, Mich.	R	842	Early 1976	1.0	100,000	250,000	15.0	90.0
GULF COAST:								
Paducah, Ky.	S	817	Late 1974	10.0	100,000	475,000	100.0	15-20.0
East St. Louis, Ill.	S	1,053	1975	10.0	100,000	150,000	25.0	100.0
Portage, Ind.	N/A	1,311	N/A	N/A	N/A	N/A	N/A	N/A
Cincinnati, Ohio	R	1,382	Late 1973	4.0	360,000[g]	400,000[g]	Yes	5.0
Omaha, Neb.	S	1,683	N/A	N/A	N/A	N/A	N/A	N/A
Sioux City, Iowa	S	1,780	Mid-1975	5.0	10,000	20,000	10.0	90.0
WEST COAST:								
Pasco, Wash.	S	330	Mid-1974	10.0	7,000	15,000	10.0	10.0
GEOGRAPHIC INLAND PORTS LASH/SEABEE LONG-TON TOTALS:					677,000	1,310,000		

[e]General cargo only.

[f]Barge traffic only.

[g]Author used port-supplied information to deduce volume estimate.

TABLE 32--Continued

TRAFFIC STATUS AND COASTAL REGION / INLAND PORT	Size of Inland Port	# Waterway Miles From Nearest Seaport	Date LASH/ SEABEE Traffic Began	1978 LASH/ SEABEE % of Total Volume	1978 Max. LASH/SEABEE Long-Ton Vol.	1983 Max. LASH/SEABEE Long-Ton Vol.	% per Year Anticipated LASH/SEABEE Vol. Increase	% of Current Vol. Shippable Via LASH/SEABEE
FUNCTIONAL INLAND PORTS								
GULF COAST:								
Bay St. Louis, Miss.	N		Late 1974	N/A	N/A	N/A	10.0	N/A
WEST COAST:								
Anacortes, Wash.			Mid-1975	10.0	20,000	30,000	3.0	20.0
FUNCTIONAL INLAND PORTS LASH/SEABEE LONG-TON TOTALS:					20,000+	30,000+		
OVERALL LASH/SEABEE LONG-TON TOTALS					2,500,000+	4,000,000+		
"EXPECTING LASH/SEABEE WITHIN 5 YEARS" GEOGRAPHIC INLAND PORTS								
EAST COAST:								
Ogdensburg, N.Y.	S	120	N/A	10.0	N/A	N/A	N/A	70.0
GULF COAST:								
Dardanelle, Ark.	S	680	N/A	5.0	N/A	N/A	N/A	100.0
Milwaukee, Wis.	R	1,400	N/A	10.0	N/A	N/A	N/A	41.0
Minneapolis, Minn.	R	1,724	N/A	5.0	N/A	N/A	N/A	5.0
Leetsdale, Pa.	S	1,839	N/A	20.0	N/A	N/A	N/A	80.0
FUNCTIONAL INLAND PORTS								
WEST COAST:								
Olympia, Wash.			N/A	10.0	N/A	N/A	N/A	N/A

TABLE 32--Continued

TRAFFIC STATUS AND COASTAL REGION / INLAND PORT	Size of Inland Port	# Waterway Miles From Nearest Seaport	Date LASH/ SEABEE Traffic Began	1978 LASH/ SEABEE % of Total Volume	1978 Max. LASH/SEABEE Long-Ton Vol.	1983 Max. LASH/SEABEE Long-Ton Vol.	% per Year Anticipated LASH/SEABEE Vol. Increase	% of Current Vol. Shippable Via LASH/SEABEE
"NOT EXPECTING LASH/SEABEE" GEOGRAPHIC INLAND PORTS								
EAST COAST:								
Rochester, N.Y.	S	400	----	----	----	----	----	30.0
Cleveland, Ohio	R	600	----	----	----	----	----	90.0
Detroit, Michigan	R	800	----	----	----	----	----	100.0
GULF COAST:								
Guntersville, Ala.	S	1,275	----	----	----	----	----	20.0
Clinton, Iowa	S	1,391	----	----	----	----	----	75.0
Winona, Minn.	R	1,596	----	----	----	----	----	80.0
Nebraska City, Neb.	S	1,630	----	----	----	----	----	10.0
FUNCTIONAL INLAND PORTS								
EAST COAST:								
Portland, Maine		----	----	----	----	----	----	1.0
New London, Conn.		----	----	----	----	----	----	100.0
Richmond, Va.		----	----	----	----	----	----	75.0
Fort Pierce, Fla.		----	----	----	----	----	----	80.0
WEST COAST:								
Bellingham, Wash.		----	----	----	----	----	----	10.0

least some volume, therefore, has reached considerable numbers of inland ports (terminals).

It is important that the reader realize that the impact of bargeship systems on U.S. inland ports is not expected to be anywhere near universal, at least within the next three to five years. This fact is evident in results shown in Table 30 (pages 221-222), which indicate that of the 68 inland ports (terminals) not expecting LASH/SEABEE barge traffic within three years, 31 estimate the probabilities against their receiving such traffic at 90 percent or more, seven at 70 percent or more, and only two cited a 50 percent probability. The rest of these ports did not cite any probabilities, but judging from the tone of their replies, their probabilities against such traffic also seemed quite high in most cases. The reasons why some ports have or expect LASH/SEABEE traffic and others do not will be treated in the next section of this chapter.

Regarding the 1978 and 1983 LASH/SEABEE projected volumes shown in Table 32 (pages 226-229), it should be pointed out that those figures with asterisks were derived by the author from incomplete yet related information given by the port. Cincinnati, Ohio, for example, estimated a somewhat constant total traffic rate of nine million long-tons per year over the last three years, and that LASH/SEABEE traffic would be 4 percent of their overall volume in 1978. Multiplying these two figures resulted in the 360,000 long-ton 1978 estimate, and since the port stated it did expect an annual increase in such traffic, 400,000 long-tons were projected for 1983. Some of the estimates in Table 32 (pages 226-229) are therefore of direct port (terminal) origin, while others were derived from the limited information made available by some of these ports (terminals). Both estimates, as such, are not to be viewed as concrete predictions of the future, but rather indicators of a basic expected upward trend in such traffic, possibly to the extent of the estimates, which may well be overstated.

As indicated in Tables 31 through 35, LASH/SEABEE international traffic has proven to be far greater at the nation's inland ports thus far when compared to international containers moving via conventional barges as well as "mini-containerships," is expected to continue being greater in terms of future volumes, and is considered to have greater potential. Specifically, Tables 31 (pages 221-222) and 33 (which follows) indicate that over the last three years, LASH/SEABEE volume has been consistently higher than the above-mentioned alternatives, both in terms of total volume, which currently stands at about 1,220,000 long-tons for LASH/SEABEE traffic versus about 331,000 long-tons for conventionally barged and mini-containerships combined, and that currently at 24 of 30 ports (terminals) having any combination of these traffic types, the LASH/SEABEE share of port (terminal) volume is greater, with similar patterns existing for 1971 and 1972. Additionally, Tables 32 and 34, using the albeit very rough data available, indicate that in 1978 and 1983, the approximate respective volumes of 2,500,000 and 4,000,000 long-tons for LASH/SEABEE would probably be considerably greater than international containers moving via conventional barges. Though the latter figures were not asked for these years, such an assumption is probable since Table 35 (pages 235-236) indicates that at 27 of 33 ports (terminals), the LASH/SEABEE share of total volume

TABLE 33

U.S. INLAND PORT CONVENTIONAL BARGE INTERNATIONAL CARGO VOLUME TO-DATE BY COASTAL REGION, WATERWAY MILES TO NEAREST SEAPORT, AND SIZE OF INLAND PORT

INLAND PORT / COASTAL REGION	Size[a] of Inland Port	# Waterway Miles From Nearest Seaport	1971 International Cargo Long-Ton Volume		1971 Intn'l. Cargo % of Total Port Vol.		1972 International Cargo Long-Ton Volume		1972 Intn'l. Cargo % of Total Port Vol.		1973 International Cargo Long-Ton Volume		1973 Intn'l. Cargo % of Total Port Vol.	
			Non-Ctnr.	Ctnr.	Non-Ctnr.	Ctnr.	Non-Ctnr.	Ctnr.	Non-Ctnr.	Ctnr.	Non-Ctnr.	Ctnr.	Non-Ctnr.	Ctnr.
GEOGRAPHIC INLAND PORTS														
EAST COAST:														
Buffalo, N.Y.[b]	S	400	60,000	60,000	10.0	10.0	N/A	N/A	N/A	N/A	100,000	100,000	10.0	10.0
Cleveland, Ohio[c]	R	600	784,000		5.0		863,000		5.0		920,000	20,000	5.0	
Bay City, Mich.	R	950	4,500	0	N/A	0	10,000	0	00.02	0	15,000	0	0.03	0
GULF COAST:														
Harvey, La.	S	3	20,000	0	5.0	0	15,000	0	5.0	0	15,000	0	5.0	0
Greenville, Miss.[b]	R	438	0	70,000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Little Rock, Ark.	S	596	144,000	0	89.0	0	81,000	0	88.0	0	N/A	55	N/A	1.0
Memphis, Tenn.	R	637	27,000	0	6.0	0	33,000	0	6.0	0	55,000	0	8.0	0
Muskogee, Okla.	N	864	14,528	0	25.0	0	19,002	0	40.0	0	20,000	0	40.0	0
Tulsa-Catoosa, Okla.	S	916	12,000	0	20.0	0	10,000	0	3.3	0	N/A	N/A	N/A	N/A
Granite City, Ill.	S	1,050	60,000	0	40.0	0	90,000	0	50.0	0	160,000	0	45.0	0
St. Louis, Mo.	R	1,053	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nashville, Tenn.[d]	R	1,104	N/A	N/A	40.0	0	N/A	N/A	40.0	0	N/A	N/A	20.0	0
Chicago, Ill.	R	1,303	4,400,000	160,000	10.0	0.5	4,400,000	200,000	11.5	0.5	3,500,000	160,000	10.0	0.5
Clinton, Iowa	S	1,391	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	30.0	0
Milwaukee, Wis.	R	1,400	922	2,577	<1.0	0.3	N/A	N/A	<1.0	0.5	N/A	N/A	<1.0	2.0
Kansas City, Kan.	R	1,433	6,000	0	5.0	0	7,000	0	5.0	0	7,500	0	5.0	0
Sioux City, Iowa	S	1,780	95,254	0	45.0	0	57,957	0	31.0	0	75,000	0	31.0	0
New Kensington, Pa.	S	1,872	34,000	0	20.0	0	39,200	0	20.0	0	27,500	0	15.0	0
WEST COAST:														
Pasco, Wash.	S	330	160,000	0	36.0	0	182,000	0	30.0	0	185,000	0	30.0	0
GEOGRAPHIC INLAND PORTS TOTAL LONG-TON VOLUMES:			5,032,804+	292,577+			4,944,151+	200,000+			4,895,000+	280,055+		

[a]R = Regional Port; S = Sub-Regional Port; and N = Non-Port Terminal.

[b]Mini-Containerships.

[c]Ships only.

[d]Private only.

TABLE 33--Continued

INLAND PORT / COASTAL REGION	Size of Inland Port	# Waterway Miles From Nearest Seaport	1971 International Cargo Long-Ton Volume		1971 Intn'l. Cargo % of Total Port Vol.		1972 International Cargo Long-Ton Volume		1972 Intn'l. Cargo % of Total Port Vol.		1973 International Cargo Long-Ton Volume		1973 Intn'l. Cargo % of Total Port. Vol.	
			Non-Ctnr.	Ctnr.	Non-Ctnr.	Ctnr.	Non-Ctnr.	Ctnr.	Non-Ctnr.	Ctnr.	Non-Ctnr.	Ctnr.	Non-Ctnr.	Ctnr.
FUNCTIONAL INLAND PORTS														
EAST COAST:														
Albany, N.Y.	R	----	1,000	0	0.1	0	1,000	0	0.1	0	1,000	1,000	0.1	0.1
Fort Pierce, Fla.	S	----	183,134	0	100.0	0	177,827	0	100.0	0	180,000	0	100.0	0
WEST COAST:														
Stockton, Calif.	R	----	N/A	n/A	N/A	N/A	N/A	14,617	N/A	5.0	N/A	N/A	N/A	N/A
Sacramento, Calif.	R	----	N/A	2,350	N/A	N/A	N/A	1,510	N/A	0.1	N/A	50,000	N/A	N/A
FUNCTIONAL INLAND PORTS TOTAL LONG-TON VOLUMES:			184,134+	2,350+			178,827+	16,117			181,000+	57,000+		
OVERALL TOTAL LONG-TON VOLUMES:			5,122,986+	294,927+			5,122,986+	216,117+			5,076,000+	331,055+		

TABLE 34

U.S. INLAND PORT CONVENTIONAL BARGE AND MINI-CONTAINERSHIP INTERNATIONAL CARGO EXPECTATIONS AND POTENTIAL DATA BY COASTAL REGION, WATERWAY MILES FROM NEAREST SEAPORT, AND SIZE OF INLAND PORT

INLAND PORT / COASTAL REGION	Size[a] of Inland Port	# Waterway Miles From Nearest Seaport	1978 Intn'l. Cargo % of Total Port Vol.		% of Total Port Volume Shippable Via Ctnr.	Mini-Containership % of Total Volume	
			Non-Ctnr.	Ctnr.		1973	1978
GEOGRAPHIC INLAND PORTS							
EAST COAST:							
Ogdensburg, N.Y.	S	120	10.0	10.0	60.0	0.0	0.0
Rochester, N.Y.	S	350	0	0	5.0	0	0
Buffalo, N.Y.	S	400	9.0	12.0	60.0	10.0	15.0
Cleveland, Ohio	R	600	5.0	0.5	50.0	3.1	3.9
Toledo, Ohio	R	750	0	0	0	N/A	1.0
Monroe, Mich.	S	790	2.0	0	0	0	2.0
Detroit, Mich.	R	800	0.16	0.04[b]	60.0	0	0
Bay City, Mich.	R	950	0.05	2.0[b]	80.0	2.0	0.03
GULF COAST:							
Harvey, La.	S	3	5.0	0	0	0	0
Vicksburg, Miss.	S	336	10.0	10.0	10.0	0	0
Greenville, Miss.	R	438	N/A	N/A	50.0	33.0	N/A
Memphis, Tenn.	R	637	4.0	4.0	6.0	0	0
Dardanelle, Ark.	S	680	0	0	100.0	0	0
Paducah, Ky.	S	717	0	0	10-12.0	0	0
Muskogee, Okla.	N	864	15.0	0	0	0	0
Tulsa-Catoosa, Okla.	S	916	30.0	10.0	10.0	0	0
Granite City, Ill.	S	1,050	45.0	0	0	0	0
St. Louis, Mo.[c]	R	1,053	N/A	N/A	30.0	0	0
Nashville, Tenn.	R	1,104	20.0	0	5.0	0	0
Chicago, Ill.	R	1,303	N/A	N/A	80.0	0	0
Cincinnati, Ohio	R	1,382	0	0	5.0	1.0	1.0
Clinton, Iowa	S	1,391	50.0	0.0	0	0	0
Milwaukee, Wis.	R	1,400	61.0	0	36.0	2.0	25.0
Kansas City, Kan.	R	1,433	10.0	5.0	5.0	0	0
Nebraska City, Neb.	S	1,630	N/A	0	0	0	0
Omaha, Neb.	S	1,683	0	0	5.0	0	0
Minneapolis, Minn.	R	1,724	15.0	0	1.0	0	0
Sioux City, Iowa	S	1,780	50.0	0	10.0	0	0
Leetsdale, Pa.	S	1,839	8.0	8.0	80.0	0	0
New Kensington, Pa.	S	1,872	15.0	0	0	0	0
WEST COAST:							
Pasco, Wash.	S	330	30.0	5.0	5.0	0	0
FUNCTIONAL INLAND PORTS							
East Coast:							
Portland, Maine			N/A	0	1.0	N/A	N/A
Searsport, Maine			N/A	0	100.0	N/A	N/A
New London, Conn.			0	0	65.0	0	0
Albany, N.Y.			0	1.0[b]	25.0	0	0
Richmond, Va.			10.0	10.0[b]	50.0	0	10.0
Fort Pierce, Fla.			N/A	N/A	10.0	N/A	N/A
GULF COAST:							
Brownsville, Texas			N/A	0	0	0	0
Texas City, Texas			0	0	1.0	0	0
WEST COAST:							
Stockton, Calif.			N/A	N/A	5.0	N/A	N/A
Sacramento, Calif.			N/A	N/A	N/A	N/A	N/A
Bellingham, Wash.			0	0	10.0	0	0
Anacortes, Wash.			0	5.0	20.0	0	0
Longview, Wash.			N/A	N/A	25.0	0	0
Walla Walla, Wash.			94.0[d]	5.0	5.0	0	0

[a]R = Regional Port; S = Sub-Regional Port; and N = Non-Port Terminal.

[b]Mini-ship. [c]Private. [d]Bulk.

TABLE 35

U.S. INLAND PORT LASH/SEABEE VS. CONVENTIONAL BARGE INTERNATIONAL CARGO VOLUMES AND POTENTIAL BY COASTAL REGION AND NUMBER OF WATERWAY MILES FROM NEAREST SEAPORT

INLAND PORT / COASTAL REGION	# Waterway Miles From Nearest Seaport	1973 International Long-Ton Volumes			1973 International % of Total Volume			1978 International % of Total Volume			% of Total Volume Shippable Via	
		Non-Ctnr.	Ctnr.	LASH/SEABEE	Non-Ctnr.	Ctnr.	LASH/SEABEE	Non-Ctnr.	Ctnr.	LASH/SEABEE	Ctnr.	LASH/SEABEE
GEOGRAPHIC INLAND PORTS												
EAST COAST:												
Ogdensburg, N.Y.	120	0	0	0	0	0	0	10	10	10	60	70
Rochester, N.Y.	350	0	0	0	0	0	0	0	0	0	5	30
Buffalo, N.Y.	400	100,000	100,000	0	10	10	0	9	12	0	10	5
Cleveland, Ohio	600	920,000[a]	20,000	0	5	0.1	0	5	0.5	unknown	50	90
Monroe, Mich.	790	0	0	0	0	0	0	0	2[b]	0	0	0
Detroit, Mich.	800	N/A	N/A	0	N/A	N/A	0	N/A	N/A	N/A	60	100
Bay City, Mich.	950	15,000	N/A	0	0.03	2[b]	0	0.05	0.03[b]	0.03	80[c]	90[c]
GULF COAST:												
Harvey, La.	3	15,000	0	0	5	0	0	5	0	0	0	0
Natchez, Miss.	265	0	0	205,000	0	0	40	0	0	40	0	40
Vicksburg, Miss.	336	N/A	0	350,000	N/A	0	58	N/A	5	60	5	60
Greenville, Miss.	438	N/A	N/A	30,000	N/A	N/A	8.5[d]	N/A	N/A	N/A	50[d]	50[d]
Pine Bluff, Ark.	550	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Helena, Ark.	564	N/A	N/A	15,000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Little Rock, Ark.	596	N/A	55	5,000	N/A	0.5	10	N/A	N/A	N/A	N/A	50
Memphis, Tenn.	637	55,000	0	30,000	8	0	3	4	5	10	6	10
Dardanelle, Ark.	680	0	0	0	0	0	0	0	0	0	100	100
Fort Smith, Ark.	782	0	0	2,000	0	0	5	0	0	5	0	5
Paducah, Ky.	817	0	0	0	0	0	0	0	0	10	11	17
Muskogee, Okla.	864	20,000	0	13,000	40	0	26	15	0	10	0	100
Tulsa-Catoosa, Okla.	916	10,000	0	20,000+[e]	N/A	0	N/A	30	10	30	10	60
Granite City, Ill.	1,050	160,000	0	44,000	45	0	15	45	0	35[e]	0	55[e]
East St. Louis, Ill.	1,053	0	0	0	0	0	0	0	0	10	0	100
St. Louis, Mo.	1,053	N/A	N/A	150,000	N/A	N/A	17	N/A	N/A	25	30	95
Nashville, Tenn.	1,104	N/A	N/A	35,000[d]	20	0	1[d]	20	0	25[f]	5[f]	95[f]
Guntersville, Ala.	1,275	0	0	0	0	0	0	0	0	0	40	20
Chicago, Ill.	1,303	3,500,000[a]	160,000[a]	1,500	10	0.5	0.01	N/A	N/A	0.1	<1	<1
Portage, Ill.	1,311	← expects LASH/SEABEE--only information given →										
Rock Island, Ill.	1,355	0	0	1,000	0	0	0.5	0	0	5	0	5
Cincinnati, Ohio	1,382	0	0	some	0	0	1	0	0	4	yes	5
Clinton, Iowa	1,391	N/A	0	0	30	0	0	50	0	0	0	75
Milwaukee, Wis.	1,400	N/A	N/A	0	<1	2[b]	0	<1	25[b]	10	36	41
Kansas City, Kan.	1,433	7,500	0	2,000	5	0	1	10	5	10	5	10
Winona, Minn.	1,596	0	0	0	0	0	0	0	0	0	0	80
Nebraska City, Neb.	1,630	6,000	0	0	6	0	0	10	0	0	0	10
Omaha, Neb.	1,683	0	0	0	0	0	0	N/A	N/A	N/A	5	10

TABLE 35--Continued

INLAND PORT / COASTAL REGION	# Waterway Miles From Nearest Seaport	1973 International Long-Ton Volumes			1973 International % of Total Volume			1978 International % of Total Volume			% of Total Volume Shippable Via	
		Non-Ctnr.	Ctnr.	LASH/SEABEE	Non-Ctnr.	Ctnr.	LASH/SEABEE	Non-Ctnr.	Ctnr.	LASH/SEABEE	Ctnr.	LASH/SEABEE
Minneapolis, Minn.	1,724	166,535	0	0	25	0	0	15	0	5	1	5
Sioux City, Iowa	1,780	75,000	0	0	31	0	0	50	0	5	10	90
Leetsdale, Pa.	1,839	0	0	0	0	0	0	8	8	20	80	80
New Kensington, Pa.	1,872	27,500	0	0	15	0	0	15	0	0	0	0
WEST COAST:												
Pasco, Wash.	330	185,000	0	0	30	0	0	30	5	10	5	10
FUNCTIONAL INLAND PORTS												
EAST COAST:												
Searsport, Maine		102,000[a]	0	4,400	96[a]	0	4	N/A	N/A	N/A	100	100
Portland, Maine		N/A	0	0	1	0	0	N/A	N/A	N/A	1	1
Fall River, Mass.		100%[a]	0	0	100[a]	0	0	N/A	0	10	N/A	N/A
New London, Conn.		38,000[a]	0	0	100	0	0	100	0	0	65	100
Albany, N.Y.		1,000	1,000	5,000	0.1	0.1	0.5	1	1	1	25	25
Richmond, Va.		128,000	0	0	100	0	0	10	10	10	50	75
Brunswick, Ga.		N/A	0	30,000	0	0	1	N/A	N/A	N/A	N/A	N/A
Fort Pierce, Fla.		180,000	0	0	100	0	0	N/A	N/A	N/A	10	80
GULF COAST:												
Pensacola, Fla.		0	0	3,540	0	0	0.7	0	0	5[e]	N/A	N/A
Panama City, Fla.		260,000[a]	0	80,000	76.4	0	23.5	50	0	50[a]	N/A	N/A
Orange, Texas		137,000[a]	0	13,000	91.3[a]	0	8.7	80[a]	0	20	N/A	N/A
Corpus Christi, Texas		N/A	0	2,000	0	0	0.1	N/A	0	0.5	N/A	N/A
Beaumont, Texas		510,000[a]	0	6,000	15.8[a]	0	0.18	12[a]	0	10	N/A	N/A
Brownsville, Texas		N/A	0	1,000	N/A	0	0.02	N/A	0	5	0	5
Freeport, Texas		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Texas City, Texas		0	0	0	00	0	0	0	0	0	1	0
Port Arthur, Texas		170,000[a]	0	1,928	98.9[a]	0	1.1	95[a]	3[a]	2	N/A	N/A
WEST COAST:												
Stockton, Calif.		N/A	N/A	88,000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sacramento, Calif.		N/A	50,000	30,000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Astoria, Oregon		0	0	30,000	0	0	5	0	0	0	N/A	N/A
Bellingham, Wash.		N/A	16,500[a]	0	N/A	5	0	7	10	0	10	10
Anacortes, Wash.		N/A	N/A	0	N/A	N/A	0	N/A	N/A	N/A	N/A	N/A
Longview, Wash.		N/A	N/A	7,000	N/A	25[a]	0.2	N/A	N/A	N/A	N/A	N/A
Vancouver, Wash.		300,000[a]	0	60,000	14.6[a]	0	2.9	10[a]	5[a]	10	N/A	N/A
Walla Walla, Wash.		0	0	0	0	0	0	5	0	0	5	0

[a]Ships. [b]Mini-ship. [c]International only. [d]Public terminal.

[e]Author estimate derived from port supplied information. [f]Private

was expected to be greater in 1978 than either international containers via conventional barge or mini-containerships, with four showing equal expectations for both.

Another finding of Table 31 (pages 224-225) is that the size of an inland port did not seem to affect whether or not a port received bargeship system traffic, except as regards the smallest category established by the Southern Illinois study cited in the Literature Search.[1] Table 31 indicates that roughly equal numbers of large regional ports (6) and smaller sub-regional ports (8) were found to have bargeship system traffic. Two of the smallest category, non-port terminals, were found to have such traffic.

Regarding basic potentials attributed to LASH/SEABEE barges versus containers, Tables 32 (pages 226-229), 34 (page 234), and 35 (pages 235-236) indicate that 30 of 42 inland ports (terminals) indicate they consider more of their total port volume shippable via LASH/SEABEE than this alternative, with four ports (terminals) considering the containers' potential greater, and eight ports (terminals) considering their potential equal. Additionally, 29 of 37 inland ports (terminals) indicated that international non-container traffic is currently (1973) higher than LASH/SEABEE traffic, and 18 of 32 of them expect the same situation to exist in 1978, with six citing equal shares of volume expected. Functional inland ports and Great Lakes ports included in these figures quite naturally indicated higher international non-container volumes via conventional ships.

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[1]See pp. 52-54, supra.

So for these substantial samples of the nation's inland port population at least, LASH/SEABEE traffic has greater volumes, expectations and evaluated potential than international containers via conventional barges or "mini-containerships." At the same time, non-containerized international traffic via conventional barges and conventional ships at these ports (terminals) has been, is, and is expected to continue at greater levels than LASH/SEABEE international barge traffic. For all of the above comparisons except those relating past data, Table 35 (pages 235-236) is a summary table which combines highlight information from Tables 31 (pages 224-225) through 34 (page 234).

While the above findings are definitely from a highly representative sample of the nation's inland ports (terminals), the author does not assert that the listing of inland ports (terminals) with LASH/SEABEE traffic that is shown in the tables is an all-inclusive one. This is because an advertisement of LASH Systems, Inc. cites the following additional inland ports as having LASH traffic:

*Port Harvey, Louisiana	Davenport, Iowa
Baton Rouge, Louisiana	*Decatur, Alabama
Chalmette, Louisiana	Birmingham, Alabama
Lake Providence, Louisiana	Calvert City, Kentucky
Morgan City, Louisiana	Louisville, Kentucky
*Joliet, Illinois	East Liverpool, Ohio
Peoria, Illinois	*Evansville, Indiana
Cairo, Illinois	Jeffersonville, Indiana

Only the above ports (terminals) with asterisks answered this survey, so the LASH/SEABEE volumes shown in the above tables should be considered incomplete, although 21 of the ports listed in the LASH Systems, Inc. advertisement did answer. Another fact which should be noted is that the advertisement cites its listed ports as having already been served by LASH. Since the above listed ports with asterisks have replied that they do not have LASH traffic at present, two explanations for this inconsistency are possible. One is that as Richmond and Pascagoula, these ports also once had such traffic, but no longer do. The other possibility is illustrated by the case of Freeport, Texas, which indicated a very small volume via LASH, but referred the author to a representative of the Dow Chemical Company which has private docks near Freeport. Since determination of bargeship system impact on waterway located non-terminal firms was not one of the goals of this dissertation, Dow was the only such firm contacted. As will be mentioned in this study's recommendations for further research, a study of such private firm usages of bargeship systems would probably be quite valuable. The results of this telephone inquiry were indeed revealing and suggest the fertility and potential usefulness of a future study of bargeship system impact on firms with only their own strictly private operations via bargeship barges. The Dow executive indicated that his firm has had LASH operations for the last two years at an annual rate of approximately 30,000 long-tons per year, and expects this annual rate to increase to about 150,000 long-tons per year in the near future when Delta Steamship Lines begins its South American LASH operations.[1] It is quite possible that in the future this Dow situation may prove to be merely the proverbial "tip of the ice-berg" regarding strictly private LASH operations,

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[1]Interview (telephone) with R. L. Massey, Texas Division, Dow Chemical Company, Freeport, Texas, August 29, 1973.

particularly because of the new bargeship vessels recently and currently being launched as discussed in the Literature Search chapter.[1]

Regarding individual inland ports with bargeship barge traffic, two in particular which have realized the ambition of becoming "world ports" through bargeship systems[2] are Vicksburg and Natchez, Mississippi. Vicksburg now handles approximately 350,000 long-tons of LASH/SEABEE barge traffic per year, which is about 58 percent of its volume, and expects this traffic to grow to about a 600,000 long-ton per year rate by 1978 and 900,000 per year by 1983. While the projections could be inflated, the current figures are not, and mean that Vicksburg's bargeship system traffic is almost three times that of New York. Further, the projections are an extension of the port's current growth rate in this traffic which has shown no sign of abating. Natchez has achieved a current LASH/SEABEE volume of 205,000 long-tons per year and expects a somewhat smaller rate of growth, reaching 250,000 long-tons annually by 1983. These ports are quite near the Mississippi River mouth and therefore ideally located for such traffic, which will be discussed in more depth in the final section of this chapter, and they do indicate that considerable LASH/SEABEE barge traffic is possible at an inland port, given the right conditions.

The preceding paragraph, when combined with the earlier mentioned results of the test of the second hypothesis, tend to indicate that whether an inland port experiences and/or expects to experience

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[1]See pp. 24-26, <u>supra</u>.

[2]See p. 54, <u>supra</u>.

significant international cargo traffic via bargeship barges is a function of certain factors. Since it is quite likely that such factors will very well be similar between inland ports and major seaports, especially since they are interacting components in the same overall bargeship system for a given coastal region, the discussion of such factors for inland ports and major seaports are combined in the final section of this chapter. This will facilitate the drawing of interrelationships between such factors.

Certain other discussions relate strictly to the test of inland port hypothesis, namely the treatment of functional inland ports and the results of the "mini-questionnaire" sent to inland waterway locations of doubtful status. These are therefore discussed in the following two sub-sections.

Treatment of Functional Inland Ports (Minor Seaports)

As mentioned in previous discussions in this dissertation,[1] functional inland ports were defined here as ports located on the U.S. coastlines analyzed, but not possessing sufficient relevant facilities or volume to be viewed as potential seaports-of-call by bargeship and/or containership operators for their mother ships. Since they have been treated as functional inland ports by bargeship operators, and have received bargeship barge traffic in a manner similar to ports located geographically inland, they have been treated as inland ports of a special type in the test of the second hypothesis.

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[1]See pp. 169, 211-212, 217, *supra*.

This treatment has resulted in the separate listing of functional inland ports, by seacoast, on all of the analysis tables in the previous sub-section. At the same time, these functional inland ports were included in all overall inland port data tables. It should be noted that even if one were to disagree with this treatment by the author, the results of the test of the second hypothesis would not be affected, since only three of the nineteen inland ports listed in Table 30 (pages 221-222) as expecting LASH/SEABEE barge traffic to significantly affect their international cargo traffic were functional inland ports. Further, it should be noted that these functional inland ports will receive identical treatment in the discussions in the section which follows on seaport and inland port data which seem to indicate basic patterns of certain potentially influencing factors of bargeship system traffic. Separate identification of functional inland port and minor seaport opinions is made in a separate table which accumulates such opinions in order to indicate their effects on overall totals, and these effects were found to be minor.

Regarding the functional inland port results as compared to the inland port results discussed in the previous sub-section, they tend to follow some of the same overall patterns and differ from others. For example, as shown in Table 30 (pages 221-222) 19 of the 39 responding functional inland ports, or 49 percent as compared to 48 percent for the inland port (terminal) population as a whole, stated that they had or expected bargeship system traffic. Tables 31 (pages 224-225) and 32 (pages 226-229) indicate that individual and overall functional inland port total current, expected, and potential bargeship system traffic tends to be generally lower than those of geographic inland ports. Similarly, as Tables 33 (pages 232-233) and 34 (page 234) indicate and as might be expected, these ports tend in general not to have any significant international container movements via conventional barge. In Table 35 (pages 235-236), which included in parentheses conventional ship international cargo traffic, almost all functional inland port international general cargo traffic is via small conventional ships. Thus, it can be concluded that while bargeship systems tend to compete with international containers moved via conventional barges at geographic inland ports, they compete with conventional ships at functional inland ports. Similarly, the estimated and realized volume potential for bargeship systems tends to be generally higher at geographic inland ports. The factors which influence such situations will be discussed in the final section of this chapter.

The next sub-section discusses the results of the "mini-questionnaire" sent to inland waterway locations of doubtful status and explains why they were not included in the nation's inland port (terminal) population.

Waterway Locations of Doubtful Status Results

As mentioned in the Research Methodology chapter,[1] a "mini-questionnaire" was sent to 209 Chambers of Commerce of towns located on the nation's inland waterways but not having a public inland port authority or terminal company according to the sources used by the author to develop the list of the inland port (terminal) population.

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[1]See p. 172, *supra*.

Since the 109 of 209 of these locations represented a very large sample or 52.2 percent of this small population, and since they overwhelmingly indicated that they not only did not have or expect LASH/SEABEE barge traffic, but generally had no traffic or had private non-terminal company traffic not relevant to this survey, they were excluded from the dissertation's inland port population.

For example, the results indicated only a total of seven public terminal docks and 16 plus terminal company docks, as compared to 226 plus private user docks among the 109 respondents. These figures do not include docks indicated but uncounted by respondents which were also mainly private user docks. Similarly, 49 of the 109 respondents indicated that they had no traffic at all and an additional 39 of the respondents indicated that while they had traffic, they did not have or expect LASH/SEABEE traffic. These two totals made a combined total of 88 of the 109 total respondents. This was compared to only four of these locations with LASH/SEABEE barge traffic, and another 10 of them expecting such traffic. These figures indicated that any further relevant information that could be obtained from these locations would be minute at best, certainly not worth the cost of obtaining such information, and no follow-up survey was made of these locations.

The results of this survey are shown in Table 36. They will receive some further discussion in terms of how they compare with those of other inland ports (terminals) not expecting LASH/SEABEE barge traffic in the next section of this chapter which follows.

TABLE 36

INLAND WATERWAY LOCATIONS WITH DOUBTFUL STATUS--BARGE TRAFFIC INFORMATION

Location	Barge Traffic		Number of Docks			LASH/SEABEE Traffic		
	Long-Tons	Bargeloads per Year	Public	Terminal Companies	Private User	Current	Expected Within 3 Years	Major Cargo Items
Bangor, Maine	225 mill. gls.	325			✓	No	No	oil
Belfast, Maine						no traffic		
August, Maine								
Bath, Maine						no traffic		
Concord, New Hampshire						no traffic		
Burlington, Vermont								
Newport, R.I.								
New Haven, Conn.								
Bridgeport, Conn.								
Troy, N.Y.								
Schenectady, N.Y.						no traffic		
Plattsburg, N.Y.								
Syracuse, N.Y.						unknown		
Niagara Falls, N.Y.						no traffic		
Brackenridge, Pa.								
Allenport, Pa.	130,000	---	0	0	numerous	No	No	steel, coal
Monessen, Pa.	900,000	---	0	0	numerous	No	No	steel, coal
Freeport, Pa.								
East Brady, Pa.						no traffic		
Brownsville, Pa.								
Glassport, Pa.								
McKeesport, Pa.								
Clairton, Pa.	10,120,000	11,000	0	0	1	No	No	coal, chemicals, ore
Neville Island, Pa.	N/A	N/A	0	0	✓	No	No	fabricated metals
Kittaning, Pa.								
Cumberland, Md.						no traffic		
St. Augustine, Fla.								
West Palm Beach, Fla.								
Milton, Fla.	1,300	20-30	0	0	2	No	No	soybeans
Fort Myers, Fla.	1,000,000	1,200	0	✓	✓	No	Yes	oil, equipment, sand
Charlotte Harbor, Fla.						no traffic		
St. Petersburg, Fla.						no traffic		
St. Marks, Fla.								
Carrabelle, Fla.								
Apalachicola, Fla.						no traffic		
Florence & Sheffield, Muscle Shoals, Ala.	2,300,000	---	1	3	10	No	unknown	coal and coke, petroleum products, sand and gravel
Eufaula, Ala.								
Clarksville, Tenn.	43,000+	40	0	0	2	Yes		sand, soybeans, tobacco

TABLE 36--Continued

Location	Barge Traffic		Number of Docks			LASH/SEABEE Traffic		Major Cargo Items
	Long-Tons	Bargeloads per Year	Public	Terminal Companies	Private User	Current	Expected Within 3 Years	
Covington, Tenn.	N/A	N/A	N/A	N/A	N/A	No	Possibly	N/A
Loudon, Tenn.	---	100	0	0	2	No	Yes	sand, gravel
Perryville, Tenn.								
Calhoun, Tenn.								
Harriman, Tenn.								
Johnsonville, Tenn.	3,492,889	2,388	0	0	4	No	Yes	coal, alumina, carbon blocks
Rockwood, Tenn.								
Catlettsburg, Ky.								
Calvert City, Ky.	---	500	0	0	5	No	No	chemicals, ore, natural gas
Covington, Ky.								
Burnside, Ky.								
Maysville, Ky.	250,000	2,500	0	0	2	No	No	sand, gravel, coal
Kenoya, Ky.								
Smithland, Ky.								
Carrollton, Ky	unknown	unknown	0	2	0	No	No	coal
Bowling Green, Ky.	no traffic							
Frankfort, Ky.								
Livermore, Ky.								
Beattyville, Ky.	no traffic							
Rockport, Ky.								
Ashland, Ky.								
Moundsville, W. Va.	unknown	unknown	0	0	✓	No	No	coal
Nitro, W. Va.								
Charleston, W. Va.								
Point Pleasant, W. Va.	7,700,000	5,500	0	0	10	No	No	coal, aggregates, petroleum
Parkersville, W. Va.	500,000	1,000	0	2	3	No	No	sand, gravel
Morgantown, W. Va.	916,320	---	0	0	3	No	No	coal, sand, gravel
Ravenswood, W. Va.								
Fairmont, W. Va.								
Huntington, W. Va.								
Benwood, W. Va.								
New Boston, Ohio	no traffic							
Martins Ferry, Ohio								
Hannibal, Ohio	no information							
Ironton, Ohio	unknown	unknown	0	0	2	No	No	coal, oil
Ashtabula, Ohio	no traffic							
Marietta, Ohio								
Sandusky, Ohio								
Fairport Harbor, Ohio								

TABLE 36--Continued

Location	Barge Traffic: Long-Tons	Barge Traffic: Bargeloads per Year	Number of Docks: Public	Number of Docks: Terminal Companies	Number of Docks: Private User	LASH/SEABEE Traffic: Current	LASH/SEABEE Traffic: Expected Within 3 Years	Major Cargo Items
Steubenville, Ohio	4,230,000	5,000	0	2	2	No	No	coal, steel prod.
Wellsville, Ohio	788,000	524	0	0	3	No	No	fuel oil, lime, liquid sulphur
Benton Harbor, Mich.								
Traverse City, Mich.								
Petoskey, Mich.	546,000	88	0	0	1	No	No	coal
Lawrenceburg, Ind.								
Terre Haute, Ind.	no traffic							
Mt. Vernon, Ind.								
Indiana Harbor, Ind.	14,209,518	---	0	0	6	No	No	iron ore, gasoline, fuel oil
New Albany, Ind.								
Tell City, Ind.	---	189	0	0	1	No	No	sand, gravel, pipe
Vincennes, Ind.								
Gary, Ind.								
Burns Harbor, Ind.	no traffic							
Appleton, Wisc.	no traffic							
Genoa, Wisc.								
Cassville, Wisc.	---	660	0	1	0	No	No	coal
Prarie De Chien, Wisc.	70,000	---	1			No	No	phosphate, road salt
De Pere, Wisc.	no traffic							
Stillwater, Wisc.								
Kamesville, Ill.								
Kingston, Ill.								
Morris, Ill.								
Henry, Ill.	N/A	N/A	N/A	N/A	2	N/A	N/A	N/A
Ottawa, Ill.	---	1,250	0	0	5	No	Yes	corn, soybeans, chemicals
Spring Valley, Ill. / La Salle, Ill. / Peru, Ill.	57,500	---	0	numerous	0	Yes	Yes	coal, oil, steel
Lemont, Ill.								
Joppa, Ill.	---	1,890	0	0	3	No	No	coal, cement
Havana, Ill.								
Oquawka, Ill.	---	700	0	0	5	No	No	grain
Beardstown, Ill.								
Keithsburg, Ill.	---	108	0	0	1	No	No	grain
Hardin, Ill.								
Savanna, Ill.	no traffic							
Grafton, Ill.								

TABLE 36--Continued

Location	Barge Traffic		Number of Docks			LASH/SEABEE Traffic		Major Cargo Items
	Long-Tons	Bargeloads	Public	Terminal Companies	Private User	Current	Expected Within 3 Years	
Alton, Ill.	54,000	---	0	0	7	Yes	Yes	oil, coal, grain
Chester, Ill.								
Moline, Ill.	no information							
Meredosia, Ill.								
Biloxi, Miss.	750,000	---	0	0	10	No	No	coal, steel, wood products
Greenwood, Miss.	68,000	---	0	0	1	No	No	soybeans, wheat
Rosedale, Miss.	no traffic							
Jackson, Miss	no traffic							
St. Claude, Minn.	no traffic							
Hastings, Minn.								
Lake City, Minn.	no traffic							
Red Wing, Minn.	447,026	326	1	0	0	No	No	corn, soybeans
Wabasha, Minn.	no traffic							
Dresbach, Minn.								
Council Bluffs, Iowa	1,200	6			1	No	No	ethlene
" " "		10			3	No	No	glycol, fertilizer
Lansing, Iowa	---	100	0	0	1	No	No	coal
Keokuk, Iowa	---	200	0	1	1	No	Yes	coal, salt, paper
Ft. Madison, Iowa	no information							
Muscatine, Iowa								
Davenport, Iowa	N/A	N/A	0	0	3	No	No	grain, sand, metal scrap
Guttenberg, Iowa	13,500,000	9,500	0	0	nearby	No	Don't Know	coal, grain, petroleum products
St. Genevieve, Mo.								
Hannibal, Mo.								
New Madrid, Mo.	676,000	520	1	0	0	No	?	coal
Boonville, Mo.	---	9	0	Yes	Yes	No	No	fertilizer
Palmyra, Mo.								
Jefferson City, Mo.								
St. Charles, Mo.	no traffic							
Cape Girardeau, Mo.		110	0	1	1	No	No	oil, gas, grain
Herculaneum, Mo.								
West Memphis, Ark.								
Clarksville, Ark.	no traffic							
Blythevill, Ark.		45-55						soybeans
" "	9,200	4	0	1	✓	No	?	wheat, fuel
Arkansas City, Ark.	unknown	unknown	0	0	✓	No	No	oil
Fulton, Ark.	no traffic							

TABLE 36--Continued

Location	Barge Traffic: Long-Tons	Barge Traffic: Bargeloads per Year	Number of Docks: Public	Number of Docks: Terminal Companies	Number of Docks: Private User	LASH/SEABEE Traffic: Current	LASH/SEABEE Traffic: Expected Within 3 Years	Major Cargo Items
Osceola, Ark.	---	240	0	0	2	No	No	soybean prod.
Barfield, Ark.								
Van Buren, Ark.								
Sioux Falls, S.D.	no traffic							
Yankton, S.D.	no traffic							
Plattsmouth, Nebr.								
Falls City, Nebr.	no traffic							
Leavenworth, Kansas	14,000	---	0	0	1	No	Yes (possibly)	fertilizer, steel
Witchita, Kansas								
St. Francisville, La.								
Plaquemine, La.								
Houma, La. (tons--est.)	4,300,000	---	0	0	100+	No	Yes	crude oil, mfd. prod., pipes
Monroe, La.	no traffic yet							
LaRose, La.	no traffic							
Angola, La.								
Melville, La.	no traffic							
Slidell, La.	no traffic							
Krotz Springs, La.								
Shreveport, La.	no traffic							
Lake Providence, La.								
Simmesport, La.								
Lake Arthur, La.	no traffic							
Lockfort, La.								
Port Sulphur, La.								
Alexandria, La.								
Lafayette, La.	1,321,027	---	0	0	5	No	Yes	crude petrol, shells, distillate
Abbeville, La.	---	100	0	0	0	No	No	clam shells
New Iberia, La.								
Cameron, La.								
Thibodeaux, La.								
Pilottown, La.								
Burnside, La.	3,600,000	3,000	0	1	0	Yes (15-20/yr.)	Yes	ores
Boise, Idaho								
Lewiston, Idaho	no traffic							
Port Neches, Texas								
Dallas, Texas	no traffic							

TABLE 36--Continued

Location	Barge Traffic: Long-Tons	Barge Traffic: Bargeloads per Year	Number of Docks: Public	Number of Docks: Terminal Companies	Number of Docks: Private User	LASH/SEABEE Traffic: Current	LASH/SEABEE Traffic: Expected Within 3 Years	Major Cargo Items
Fort Worth, Texas	← no traffic →							
Sabine Pass, Texas								
Port O'Connor, Texas	← no traffic →							
Baytown, Texas								
Liberty, Texas	100,000	---	--[a]	0	2	No	Hopefully	fertilizer, shells
Port Arkansas, Texas								
Sweeney, Texas	← no traffic →							
Point Comfort, Texas								
Seadrift, Texas	← no traffic →							
Victoria, Texas								
Gregory, Texas								
Sweetwater, Texas	← no traffic →							
Austin, Texas	← no traffic →							
Port Mansfield, Texas								
El Paso, Texas	← no traffic →							
Richland and Pasco and Kennewick, Wash.	2,000,000	1,355	2	1	4	No	Yes	petroleum, grain, fertilizer
Wenatchee, Wash.	← no traffic →							
Lewiston, Wash.								
Salem, Oregon	---	50-55	0	0	✓	No	No	grain
Albany, Oregon	← no traffic →							
St. Helens, Oregon								
Marysville, Cal.								
Santa Barbara, Cal.	← no traffic →							
TOTALS 109 of 209 responding	Non-Descriptive		7	16+	226+	49 no traffic 54 "no" 4 "yes"	49 no traffic 39 "no" 10 "yes" 3 "maybe" 5 unknown	

[a]In process.

Seaport and Inland Port Opinions and Other Relevant Information

Introduction

At the outset of this section, it should be noted that heavy use of the table of contents by the reader may be required because the highly complex mixture of facts and opinions which go into the following analyses requires the citing of many tables in preceding and/or subsequent pages. The bringing together of factual data shown earlier with the information on port opinions, plus the fact that it was decided to place all seaport and inland port opinion tables in groups which pertained particularly to one analysis but were nevertheless relevant to another analysis many pages away, has necessitated these cross-references.

Overall Coastal Region Analyses

While the test of the third hypothesis indicated a very definite difference in the relative utilization of this study's three vessel system types by coastline, it is the purpose of this section to analyze the probable reasons behind these differences. Though the statement of definite cause and effect relationships belongs to the physical sciences and cannot be strictly applied to vessel systems and the factors which influence their usage, there are certain very probable factors which the factual data presented previously, when combined with related port opinions, tend to indicate as encouraging or discouraging a certain vessel system's traffic in a certain geographic area. Further, once we have analyzed the relevant factors for each region, they will be combined into a well-documented assertation about the suitability of each U.S. coastline for each vessel system studied.

One factor which almost assuredly exerts a strong influence on bargeship system traffic is the number of inland waterway miles possessed by a certain coastal region. Table 26 (page 201), for example, shows the considerably greater volume of bargeship systems on the Gulf Coast, which is triple that of each of the other two coasts, while at the same time showing that the Gulf Coast's inland waterway miles are approximately double those of the East and four times those of the West Coast. These facts provide strong support for bargeship advocate statements about the superior suitability of the Gulf Coast for bargeship system movements as compared to the East and West Coasts.

Similarly, Table 37 indicates that individual Gulf Coast ports started receiving bargeship system traffic earlier than those on the other two coasts. It also shows that New Orleans, with its Mississippi River mouth location, and the largest bargeship volumes in Table 20 (pages 180-182), has 70 percent of its present and expects 50 percent of its future bargeship system cargoes to move directly inland, i.e., up the Mississippi. These cargoes therefore move directly to their origin or destination in barges, and represent the type of bargeship system movement indicated as most economical in the United Nations' study cited in the Literature Search chapter.[1]

Similarly, Table 37 indicates generally higher "pure barge" movements via bargeship systems on the Gulf Coast than the other two

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[1]See p. 134, <u>supra</u>.

TABLE 37

SEAPORT AND SEACOAST BARGESHIP SYSTEM INFORMATION

SEAPORT / SEACOAST (Inland Waterway Miles)	Date Traffic Commenced or Expected: Bargeship	Date Traffic Commenced or Expected: Bargeship Barge	Barges Handled or Expected per Month: Loaded	Barges Handled or Expected per Month: Unloaded	Direct System Barge Movements Inland: Present (%)	Direct System Barge Movements Inland: Future (%)	% Pure Barge Traffic	Number of Bargelines Serving Port
EAST COAST:								
Boston	Late 1972	Early 1971	0	7	0	0	N/A	N/A
New York	Early 1971		N/A	N/A	N/A	N/A	N/A	N/A
Philadelphia		By 1978	←			none		→
Baltimore	Early 1971	Early 1971	30	30	0	0	100	4
Virginia	Early 1971	Early 1971	3	5	minimal	minimal	67	unknown
Charleston	Late 1972	Late 1972	15	10	0	0	60	3[a]
Wilmington		Late 1972	none	unknown	0	0	N/A	0
Savannah	Early 1972	Early 1972	80	80	2	10	N/A	4
Jacksonville		Late 1972	34	17	60	60	--	3
Port Everglades		By 1978	--	--	--	--	--	--
Miami	Late 1975	Mid-1974	--	--	--	50[b]	40	0
GULF COAST:								
Tampa		By 1978	--	--	--	--	--	18
Gulfport		Mid-1971	2	5	0	0	100	4
New Orleans	Late 1969	Late 1969	199	170	70	50	85	20
Lake Charles		Mid-1969	20	2	0	0	100	1
Houston	June 1972	Mid-1971	N/A	N/A	0	0	90	4
Galveston	1972	1970	10	10	10	10	80	N/A
WEST COAST:								
Seattle		By 1978	--	--	--	--	--	--
Portland		By 1978	--	--	--	--	--	5
Tacoma		Early 1973	10	10	0	0	100	1
San Francisco	1970		83	90	signif.	signif.	majority	2
Oakland		Early 1972	0.5	3.25	0	0	--	1
Long Beach		Early 1972	4	1	0	0	1	0
Los Angeles	Late 1971		50	20	0	0	75	0
San Diego	Mid-1972	Mid-1972	24	12	0	0	75	3[a]
MINOR SEAPORTS								
EAST COAST:								
Searsport, Maine	Mid-1972		1	--	0	0	100	0
Albany, N.Y.		Early 1973	7	2	N/A	N/A	N/A	3
Brunswick, Ga.		Mid-1972	1	--	N/A	N/A	N/A	N/A
GULF COAST:								
Pensacola, Fla.		Early 1970	0.5	0.5	N/A	N/A	N/A	N/A
Panama City, Fla.	1974	Early 1970	35	0	0	0	100	0
Beaumont, Texas		Mid-1972	6	1	N/A	N/A	50	N/A
Brownsville, Texas		Early 1972	0.3	0	N/A	N/A	N/A	N/A
Port Arthur, Texas		Mid-1971	1	2	N/A	N/A	N/A	8
Orange, Texas		Early 1970	5	0	N/A	N/A	N/A	5
WEST COAST:								
Longview, Wash.		Mid-1973	N/A	N/A	N/A	N/A	N/A	N/A
Vancouver, Wash.		Early 1973	12	10	0	0	100	5
Tacoma, Wash.		Early 1973	10	10	0	0	100	1
Astoria, Oregon	Early 1973	Early 1973	0	0	100	100	N/A	1
Sacramento, Calif.		Late 1971	8	N/A	N/A	N/A	N/A	1

[a]Coastal. [b]Bargeship barge and barge.

coasts. These figures verify a point made by Henry Broadnax, Director of Trade Development at the Port of Houston, that bargeships on the East and West Coasts carry more containers that are unloaded by port container cranes, rendering bargeships more similar to containerships on these coasts than the Gulf Coast.[1] In addition, as shown in the next sub-section, both major seaports and minor seaports tend to consider the inland waterways serving their ports as an influential factor for bargeship traffic, with the factor growing in favorability as the number of such miles increases.[2]

Finally, Tables 30 (pages 221-222), 31 (pages 224-225) and 32 (pages 226-229) indicate that only Gulf Coast geographic inland ports have bargeship system traffic, and that the past, present, and expected future overall bargeship system traffic of these ports tends to be higher than that of the functional inland ports located on the other two coasts. Incidentally, the vast majority of inland ports on the other two coasts were functional because of the lack of waterways penetrating significantly inland, which therefore enabled them to meet the definition of inland in terms of function only. The only exceptions were Great Lakes ports, located closer to the Atlantic Ocean than the Gulf of Mexico, and a West Coast port located very far inland on the Columbia River.

Both the major seaport and inland port members of the three coastal regions, therefore, provide strong evidence indicating the

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[1]Letter, June 15, 1972.

[2]See pp. 268, 269, 273, 274, *infra*.

important effect of total inland waterway miles of a coastal region on bargeship system traffic.

The other major influence by U.S. coastal region on bargeship traffic is a combination of factors. The far greater degree of past, present and expected acceptance bargeship system traffic on the Gulf Coast discussed above seems to result from a combination of the facts, one of which is that not only is the Gulf Coast's agricultural share of its total cargo volume far greater than those of the East and West Coasts, but it is precisely these items which Virginia cites in Table 38 as necessary for items to move through its port via bargeship system. Moreover, Virginia is in the Baltimore district, which Table 27 (pages 202-203) shows with only 18 percent of its dollar volume agricultural, and Baltimore's answer on Table 38 explained their heavy containership share of total general cargo with the fact that 70 percent of their general cargo is easily containerizable. Therefore, sophisticated containership systems, which were conceived and developed years before bargeship systems, made heavy inroads into these ports' general cargo volumes before bargeship systems were even developed.

In addition, these ports and all other East Coast ports have nothing comparable to the Mississippi River inland waterway network. Therefore, since bargeship systems have been initiated on the East Coast, they have had to compete there without the inland waterways which maximize their efficiency, against the sophisticated port, rail and trucking systems which maximize containership system efficiency. It is therefore quite understandable that this lack of waterways, lack of agricultural items which move profitably via bargeship barge, and

TABLE 38

SEAPORT OPINIONS ON WHETHER NATURE OF PORT'S GENERAL CARGO ITEMS IS MAJOR DETERMINANT OF VESSEL SYSTEM'S GENERAL CARGO SHARES

SEAPORT / SEACOAST	Reply	Explanation (if Given)
EAST COAST:		
Boston, Mass.	No	
New York, N.Y.	N/A	
Philadelphia, Pa.	Yes	Port commodities are best for tramp ships.
Baltimore, Md.	Yes	70% of port commodities are easily containerizable.
Virginia	Yes	Must have agricultural base for bargeship cargo flows.
Charleston, S.C.	Yes	Historical breakdown.
Wilmington, N.C.	Yes	Because of type of vessels calling.
Savanah, Ga.	No	
Jacksonville, Fla.	No	
Port Everglades, Fla.	Yes	
Miami, Fla.		
GULFCOAST:		
Tampa, Florida	Yes	
Gulfport, Miss.	Yes	
New Orleans, La.	Yes	
Lake Charles, La.	No	See no relationship between adaptability of cargo to barge movement and division of total port volume.
Houston, Texas	No	Mainly bulk items and facilities rely on break-bulk cargo.
Galveston, Texas	Yes	Commodities mainly agricultural, not easily containerizable.
WEST COAST:		
Portland, Ore.	No	
Seattle, Wash.	No	
Tacoma, Wash.	No	
San Francisco, Calif.	No	
Oakland, Calif.	Yes	Commodities of port easily containerizable.
Long Beach, Calif.	Yes	Some commodities, because of physical make-up and weight, can only be handled by certain vessel types.
Los Angeles, Calif.	Yes	Have easily containerizable commodities.
San Diego, Calif.		
MINOR SEAPORTS		
EAST COAST:		
Fall River, Mass.	Yes	
Brunswick, Ga.	Yes	
GULF COAST:		
Panama City, Fla.	Yes	Largest customer signed contract with Lykes [SEABEE].
Orange, Texas	Yes	
Port Arthur, Texas	Yes	Due to container shortages, have no container cargoes at present.
Beaumont, Texas	Yes	84% of cargo is bulk grain.
WEST COAST:		
Astoria, Oregon	No	
Vancouver, Wash.	Yes	Plywood, lumber, and steel products move on conventional ships.
Longview, Wash.	No	Bargeship systems still in infancy on Columbia River, cannot evaluate.
Grays Harbor, Wash.	Yes	
Olympia, Wash.	Yes	Forest products (logs) dominate area around port.

entrenchment of sophisticated containership systems which were already moving the items which can be moved across oceans at about the same costs by either containerships or bargeships,[1] would tend to favor the former system in competition between the two. It is also quite likely that it is this combination of reasons that has resulted in the considerably greater continued acceptance of containership systems over bargeship systems on the East Coast. The same arguments could be made for the West Coast, where Los Angeles and Oakland both cited high percentages of easily containerizable cargoes for their considerably greater, continued acceptance of containership systems.

Conversely, Galveston on the Gulf Coast cites in Table 38 (page 256) its lack of easily containerizable items as the reason for its greater bargeship share of total general cargo, and New Orleans, while stating in Table 38 that the nature of its general cargo items is a major determinant of the division of this cargo among vessel system types, cites steel as its major bargeship import item in Table 48 (pages 286-291). Moreover, New Orleans predicts it will have a 35 percent containership system share versus a 25 percent bargeship system share five years from now, as shown in Table 27 (pages 202-203). This would seem to suggest that while the Gulf Coast waterways and cargo types are far more favorable for bargeship systems than the East and West Coasts', they do not indicate that these systems are expected to continue to dominate at all Gulf Coast ports in the future. Similarly, the New Orleans information indicates that the number of waterway miles available probably has a stronger positive influence on such traffic than

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[1]See pp. 137-139, supra.

types of cargo flow. Table 27 also shows a generally high expected acceptance of bargeship systems on the Gulf Coast, in most cases greater than that of containerships. In some cases, however, this acceptance is equal to that of containerships, as at Houston, and slightly less than that of containerships, as at New Orleans.

Therefore, while the acceptance of bargeship systems has been quite strong on the Gulf Coast and is expected to continue growing, it is not expected to universally continue dominating acceptance of containership systems on that coastline, but rather vary by major seaport. Further, it is quite likely that the combination of inland waterway mileage, high agricultural share of total general cargo commodities, and lack of already developed containership systems greatly aided the introduction of bargeship systems there.

This is as opposed to containership systems, which are developing far later on the Gulf Coast than the other two coasts as per Tables 20 (pages 180-182), 21 (page 183), 25 (pages 196-200), 26 (page 201), and 27 (pages 202-203). Galveston's lack of containerizable cargo comment, when combined with the high agricultural share of cargo flows of the Gulf Coast shown in Table 27, plus the reluctance of Gulf Coast ports to make the investments required to develop containership systems shown in Tables 20 and 21, would seem to account for the slow development of containership systems on the Gulf Coast. Moreover, this situation has also been contributed to by the "mini-bridge" operations of the West Coast as per a telephone conversation with O. L. Selig, Director of Administration and Finance at Galveston.[1] These operations,

[1]Interview with O. L. Selig, Director of Administration and Finance, Port of Galveston, September 5, 1973.

which are designed to fill containers which might otherwise return to the Far East empty, grant shippers water rates from the Gulf Coast on these containers, while shipping them by rail to ports of debarkation on the Gulf Coast far more quickly than they would otherwise move. "Mini-bridges" were also discussed in the Literature Search chapter.[1] On the other hand, the predominant shares of non-agricultural, containerizable commodities of general cargo flows on the East and West Coasts were already mentioned above, while Tables 20 (pages 180-182) and 21 (page 183) indicate the strong willingness of these coasts to invest in such systems.

Regarding conventional ship systems, their declining share on all three coasts is evident in Tables 25 (pages 196-200), 26 (page 201), and 27 (pages 202-203), has been discussed in the preceding section,[2] and is further indicated in the declining investments in these system facilities shown in Tables 20 (pages 180-182) and 21 (page 183). The reasons for these declines are economic, as was shown in Figure 2 (page 145) and Table 13 (page 140).

Finally, the author points out that Table 38 (page 256) shows that while 13 of 24 major seaports considered the nature of the general cargo items that flow through their port to affect the division of such cargoes among vessel systems, 11 did not. However, the only explanation given for a no answer was that of Lake Charles, Louisiana, where no relationship was seen between the adaptability of cargo to barge movements and the division of total port volumes. The author disagrees

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[1]See pp. 80, 81, <u>supra</u>.

[2]See pp. 207-208, <u>supra</u>.

with this opinion and agrees with the ports who did see the above-mentioned relationship.

In the same table, 9 of 11 functional inland ports saw nature of cargo to be a major determinant of vessel system usage. This was probably a result of heavy bulk cargo flows which have rendered them minor general cargo seaports, and indicate that many of the no answers were the result of misinterpretation of the question. For Longview, Washington, like Lake Charles as cited above, interpreted the question strictly in terms of cargo effects on bargeship systems, rather than making an overall analyses of the three vessel systems as was done above. The no answers do make an instructive point, however, which is that the division of vessel system shares of general cargo volumes, by port and seacoast, is not a result of any single factor, but various combinations of factors, which vary in importance by seaport and seacoast.

While the above analyses concentrated on these overall relationships, the immediately following sub-sections concentrate more heavily on seaport and inland port (terminal) opinions regarding bargeship systems and the factors which influence these systems specifically.

Seaport Analyses

The main purpose of this sub-section is to analyze the opinion responses on factors influencing bargeship traffic at the nation's major seaports according to where these ports fall in various categories, in order to determine their response patterns by category. The basic categories established, in addition to that of U.S. major seaports as a whole, were the major seaports on each seacoast and major seaports with, expecting, and not expecting bargeship system traffic within the next three years. The reader is reminded, however, that Table 27 (pages 202-203) indicates that all major U.S. seaports expect bargeship system traffic by 1978. Finally, the reader is advised that all seaport opinion ranking tables are placed at the end of this sub-section in order to facilitate analysis of one opinion at a time. In fact, the reader is urged to glance through these tables now, noting particularly their titles which identify U.S. major seaport categories and which are referred to numerous times in the next few pages with phrases such as "Tables 40 through 45."[1]

Since some of the 24 responding major seaports did not answer certain sub-questions on their questionnaire's opinion ranking question, none of the rows in Table 39 (page 277) total to 24, but since all of the rows total to at least 18, this table represents a 72 percent and up sample of the major U.S. seaport population. Since Table 39 combines the results of the seaport tables which follow it, similar situations exist for them. It indicates that all of the influencing factors listed were considered to have favorable overall effects on bargeship system at these individual ports except the ability of bargeship barges to bypass a port and move directly to inland destinations and the cost to construct bargeship system facilities. The first of these had the most unfavorable ratings. The author notes here that "favorable" and "extremely favorable" versus "unfavorable" and "extremely unfavorable" are combined in these analyses and those that follow.

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[1]The first reference in a text area to each table placed at the end of this section and the next will include its page number.

Regarding bargeship barges bypassing of ports, since Tables 40 (page 278), 41 (page 279), and 42 (page 280), which list opinions by seacoast, indicate uniformly unfavorable response ratings for this factor, it must be considered as a basically unfavorable factor on each U.S. seacoast. Tables 40, 41, and 42 had sample sizes for this question of 73, 100, and 100 percent for the East, Gulf and West Coasts, respectively. It should be mentioned that New Orleans, with its best location in the United States at the mouth of the Mississippi, rated this factor favorable as might be expected. Also worthy of note was that six ports ranked this factor as extremely unfavorable, while no other factor received more than one such ranking. Finally, as shown in Tables 43 (page 281) and 44 (page 282), respectively, ports with bargeship system traffic also ranked this factor unfavorably, although to not quite the same extent as ports not expecting bargeship system traffic within three years. These tables had sample sizes for this question of 89 and 80 percent, respectively. Miami, the only port expecting this traffic within three years, ranked this factor as having "no effect," and minor seaport rankings for this factor, as all others, will be discussed at the end of this sub-section.

Regarding the other unfavorably ranked factor, the cost to construct bargeship system facilities, the author discounts much of this unfavorability because ports ranking this factor unfavorable quite probably did so because any cost of implementing a system is an unfavorable aspect of it. On the other hand, Tables 20 (pages 180-182) and 21 (page 183) indicate the relatively minute cost of implementing these systems as compared to containership systems. Further, Table 43, which presents the opinions of major seaports with bargeship system traffic, indicates more of these ports considering this factor favorable than unfavorable. It also shows more of them considering it as having "no effect" than unfavorable.

Regarding the factors considered favorable to bargeship systems on an overall basis, Table 39 (page 277) indicates the one with most favorable ranking and having no unfavorable responses is "port interest in bargeship system traffic." Table 39 had a response rate of 92 percent of the population on this question. These rankings are as might be expected since any such traffic will increase net port volumes even if some bargeship system volumes are merely switched to it from other vessel systems. Further, this factor is shown to be regarded as favorable by each of the categories (all with very high response rates) for major seaports here, as well as by responding minor seaports, as shown in Tables 40 through 46.

The factors receiving the next most favorable ratings are shown by Table 39 to be suitability of export cargo flows through ports, inland transport modes serving port, and suitability of import cargo flows through ports, in that order. The response rates for these factors were 88, 84, and 84 percent, respectively, of the overall population of U.S. major seaports. These factors followed very closely behind in total favorable ratings, with actually more "extremely favorable" responses but less overall favorable responses. While the cargo flow results would appear to contradict somewhat the author's analyses in the preceding sub-section,[1] it is noted that the Virginia Port

[1]See pp. 255-258, <u>supra</u>.

Authority, the very East Coast port which stated that bargeship traffic flowing through its port usually must have an agricultural base, and showed a small percentage of dollar volume with an agricultural base in Table 27 (pages 202-203), was one of the ports giving export flow suitability an "extremely favorable" ranking. The author is therefore of the opinion that, just as many of these ports considered any cost of implementing bargeship systems unfavorable, in the same manner they considered the fact that they have export and import flows which are capable of being moved via bargeship systems at all favorable to bargeship systems. Moreover, a recent telephone conversation with John Hunter, Director of Research at the Virginia Port Authority, confirmed this as the reason for his response given.[1] Table 48 (pages 286-291), also shown at the end of this sub-section, indicates that on the Gulf Coast, where containership systems have been so slow in developing as per Tables 20 (pages 180-182), 21 (page 183), 25 (pages 196-200), and 26 (page 201), agricultural items dominate their limited containership volumes, as well as bargeship system and conventional ship volumes. This supports the author's earlier assertions,[2] as does the fact that both original questionnaire port representative pre-testers, Mr. Bebee from St. Louis[3] and Mr. Hunter from the Virginia Port Authority,[4] agreed with these assertions when they were presented to them after the survey

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[1]Interview, September 10, 1973.

[2]See pp. 255-258, supra.

[3]Interview with Allan Bebee, President, St. Louis Terminals Corporation, September 8, 1973.

[4]Interview with John Hunter, Director of Research, Virginia Port Authority, September 10, 1973.

was concluded. Further, these assertions are consistent with the views expressed by Dr. John Hazard, international ocean shipping expert and government representative pre-tester, when this dissertation was in the pre-proposal stage.[1] So while these assertions are no more provable than ones concerning the causes of the Civil War, they are far better documented now than they were in 1972.

The number of inland transport modes serving ports followed the same favorable response patterns as those for cargo flows on Tables 40 through 44 (pages 278-282), with all response percentages being high once again. Table 45 (page 283) showed Miami favoring the inland transport mode factor while considering the cargo flow factors to have no effect on bargeship system traffic there. Once again, their serving inland transport mode networks are something which all seaports value as encouraging of vessel traffic at their port generally, but Table 37 (page 253) shows significantly greater numbers of bargelines serving Gulf Coast ports as a whole.

The next most favorable for bargeship systems ratings were given to the bargeship barge working facilities factor by the overall U.S. major seaport population. While it had the same number of overall favorable responses as the suitability of import cargo flows, it had only half as many "extremely favorable" responses, though it did have no unfavorable responses as compared to two for the latter. The Table 39 (page 277) response rate was 84 percent of the population for this question. The favorability of this factor is probably due to the ease

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[1]Interview with Dr. John Hazard, Assistant Secretary for International Policy, U.S. Department of Transportation, April 15, 1972.

with which bargeship barge cargoes can be worked using already existing equipment. Similarly, Table 20 (pages 180-182) indicates those individual ports who have expanded their specialized facilities for working these barges, and such facilities were discussed in the Literature Search chapter.[1] Finally, this factor's favorability holds for all categories of major seaports established in Tables 40 through 45, with each table having sample sizes approaching the total population of that category.

Bargeship operator interest in port has the next most favorable ratings on Table 39, which had a sample size of 84 percent of the population on this question. The same pattern of favorability and response rate held for Tables 40 through 43, but Table 44 indicated that there quite understandably was not an overall favorable pattern among major seaports without bargeship traffic for this factor. The point has therefore finally been reached where not all categories view a factor with an overall favorable pattern favorably. This new pattern will be repeated for succeeding factors.

Bargeship facilities available is the next most often rated favorable factor on Table 39, with an 88 percent sample size. Surprisingly, Tables 40 through 42, with the usual high response rates, indicate more unfavorable responses given this basically favorable factor on the Gulf Coast than either the East or West Coasts. This, no doubt, is because the Gulf Coast ports of Gulfport, Mississippi and Tampa, Florida, which rated themselves unfavorably for this factor,

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[1]See p. 50, <u>supra</u>.

consider themselves at a competitive disadvantage with New Orleans and Houston and their specialized facilities indicated by Table 20 (pages 180-182). On the other hand, regardless of whether ports had bargeship system traffic, they gave basically favorable ratings to their port bargeship facilities available, as shown in Tables 43 through 45, with the usual high rate of response percentages.

The interest by port shippers is the next most often favorable rated item in Table 39, and was so rated by an 80 percent sample size of the overall U.S. major seaport population. Further, Tables 40 through 42 show that ports on the Gulf Coast rank this factor universally favorable for a 100 percent sample, whereas the East Coast shows a number of no effect and unfavorable rankings which when totaled equal its favorable rankings for its 74 percent sample. Similarly, the West Coast shows almost as many no effect and unfavorable rankings for this factor as favorable for its 88 percent sample. Thus it can be concluded that Gulf Coast shippers are more interested in the bargeship system mode, and that more than likely bargeship operator promotion of such traffic on the Gulf Coast is heavier and more universal than on the other two coasts. In a similar fashion, Tables 43 through 45 indicated that ports with bargeship system traffic have 12 favorable versus only two unfavorable rankings for this factor, while ports expecting or not expecting such traffic within three years show this factor as having basically no effect. These tables had similarly large samples of their populations. Thus, the lack of a high overall favorability ranking for this factor was the result of low rankings given by ports which were not located on the Gulf Coast and/or do not have bargeship system traffic.

The next most often rated favorable factor on Table 39 is the cost to construct containership facilities, with almost as many ports saying this factor has had no effect on their bargeship system traffic as those stating a favorable effect. Table 39 had an 80 percent sample of the population for this question. The reason for these overall major seaport population results, which incidentally rank next-to-last among favorable factor results, is probably because these containership facilities have already been built at most major U.S. general cargo seaports since these systems were developed before bargeship systems. It is quite likely, therefore, that this factor will prove far more favorable for bargeship systems at other ports around the world without already developed containership system facilities.

This assertion is supported, moreover, by Tables 43 and 44. Table 43 (page 281), for example, indicates that four ports with bargeship system traffic give this factor an extremely favorable rating, although the overall favorable responses of these ports only outnumbered the no effect responses by seven to six. Table 43 had a 74 percent response ratio. Table 44 (page 282), moreover, indicates that ports not expecting bargeship traffic within the next three years, but which Table 27 (pages 202-203) indicates expect such traffic within five years, rank this factor favorable over unfavorable by a margin of three to one. Table 44 had an 80 percent sample size of its population for this question. Miami, the lone port expecting bargeship traffic within three years, said the factor had no effect in Table 45. Similarly, two ports on both the East and Gulf Coasts considered this factor extremely favorable, though fairly equal numbers of overall favorable and no effect responses were received from all three coasts as shown in Tables 40 through 42 with the usual high rate of response percentages.

Finally, the lowest ranking factor with an overall favorable rating on Table 39 is the amount of waterways serving the U.S. major seaport population. Table 39 had an 80 percent response from this population on this question. The probable reason for this low favorability ranking lies in the fact that for the United States as a whole, though any such waterways favor bargeship system traffic, except for the Mississippi River network, the United States is not particularly blessed with natural waterways. While this factor was discussed in depth in the preceding sub-section, certain items shown in the tables of this study's categories warrant further attention.

In Tables 40 through 42, all having high response rates on this question, though the Gulf Coast had the best favorable versus unfavorable response ratio of five to one, the East and West Coasts had more favorable patterns than expected. This was because on the East Coast, four ports considered their limited serving waterways favorable, including Baltimore, Charleston, Miami and Jacksonville. This was in spite of the fact that only the latter, with Florida's St. John River, had any major penetration inland by their serving waterways. Table 37 (page 253) shows that only Jacksonville has had any substantial percentage of its total movements moving directly inland thus far, and its total bargeship system volume is still quite small as indicated in Table 25 (pages 196-200).

Similarly, on the West Coast, Oakland, San Francisco, and Portland rated this factor favorably. The information on the functional inland ports of Stockton and Sacramento in the next sub-section explains the former two rankings, and San Francisco, while it could not cite a specific percentage of total bargeship system movements directly inland, is shown in Table 37 (page 253) as having a "significant" percentage of such movements. Portland, moreover, is located inland on the Columbia River, the West Coast's largest inland waterway.

Finally, a large number of ports with bargeship system traffic in Table 43 (page 281) cited the waterways factor as having an unfavorable effect (four responses) or no effect (four responses), while seven rated it favorably. This represented a 79 percent response from this population. So the existence of such traffic at a port does not necessarily mean that a port considers its serving inland waterways as a positive factor. Considering the limited amounts of such waterways possessed by many U.S. major seaports with such traffic as per Table 25 (pages 196-200), this is not surprising. Table 44 indicated a fairly even split between ports not expecting such traffic within three years as to whether they considered it favorable, having no effect, or unfavorable.

Finally, Table 47 (page 285) shows the overall major U.S. general cargo seaport favorability and unfavorability rankings of the factors discussed above. The reader is advised to consider these rankings with extreme care, especially the items marked with asterisks. For the items so marked, as discussed previously,[1] have quite possibly hindered the development of bargeship systems relatively, except on the Gulf Coast, because they aided the development of containership

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[1]See pp. 263-265, supra.

systems, their most formidable economic competitor. Similarly, these rankings often were the result of a difference of just one or two favorable ratings or slightly more "extremely favorable" ratings. Similarly, for the analysis of these factors by coastline or by whether or not a port has, expects, or does not expect such traffic within three years, the reader is directed to Tables 40 through 45 (pages 278-283) and the discussions on the immediately preceding pages.

In contrast to the opinion data discussed throughout most of this sub-section, Table 48 (pages 286-291) shows the actual major cargo items of major U.S. seaports listed individually and by coastline, as well as presenting the same data on responding minor U.S. seaports. While the predominance of agricultural items in the cargo flows of all major seaport general cargo vessel system types on the Gulf Coast has already been discussed,[1] some other patterns of interest are also present.

First, while non-agricultural items tend to predominate all vessel system cargoes on the East Coast, bargeship systems are cited far more frequently than containerships systems as having steel as a major item, and about as much as conventional ship systems. This is also true on the Gulf Coast, and is indicative of the point made by Alan Bebee, President of St. Louis Terminals Corporation in a telephone conversation regarding the overall inland port results,[2] which are discussed in the next sub-section. His point was that steel has traditionally been moved via barge, which explains why most inland ports with

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[1]See pp. 255-260, supra.

[2]Interview, September 8, 1973.

bargeship system traffic cited steel as a major item, as is shown in Table 63 (pages 332-337) later. Table 48 (pages 286-291) indicates, therefore, that bargeship systems are apparently getting at least a significant portion of their business by taking steel movements away from conventional barges and conventional ship systems, rather than containership systems.

Another interesting pattern shown in Table 48 is that major West Coast seaports show cotton, which is a major Gulf Coast export, particularly in Texas, as a major containership system export item. This indicates one of the major items the West Coast is using via their "mini-bridge" operations cited earlier as an inhibiting factor for Gulf Coast containership systems by O. L. Selig of the Port of Galveston,[1] as well as in the Literature Search chapter,[2] to fill otherwise empty containers returning to the Far East. Military items tend to be the most popular West Coast bargeship system cargo item, with a somewhat even split being shown for agricultural and non-agricultural items. Finally, readers interested in individual major seaports have available in this table an overall picture of port major general cargo items and the items by vessel system.

Also available in this table, and all others in this sub-section is the basically sketchy information provided by minor seaports, many of whom cited lack of research facilities as the reason for such sketchiness in their answers. Insofar as this information will increase the

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[1]See pp. 258, 259, <u>supra</u>.

[2]See pp. 80, 81, <u>supra</u>.

knowledge of how bargeship systems affect the nation's ports, it is presented anyway. Moreover, some conclusions are made possible by this information.

First, Table 48 (pages 286-291) indicates why many of these ports, though indicated earlier in Table 29 (pages 214-216) as having huge volumes, are defined here as minor general cargo seaports. Gulf Coast ports such as Brownsville and Corpus Christi, Texas, for example, list oil as their major commodity, while Portland, Maine, on the East Coast, does likewise. On the West Coast, all minor seaports in Washington and Oregon list logs, wood chips, aluminum or grain as their major commodities. All of the above are liquid or dry bulk items carried by highly specialized vessels, which only marginally compete, if at all, with general cargo vessels. This is because at these ports the volume of such items enables the utilization of such specialized vessels and shipment of such cargoes by these vessels is economically far superior to their shipment, even where physically possible, via general cargo vessels.

Before further discussing minor seaports, it should be pointed out that Table 49 (page 292) provides the reader a handy listing of all listed major cargo items of bargeship systems, by seacoast, that were in Table 48 (pages 286-291). This is included mainly to show concisely the types of cargoes moving via bargeship systems on these seacoasts, information which the author has tried unsuccessfully to get from bargeship operators.

Regarding minor seaport opinions on factors influencing bargeship systems, Table 46 (page 284) presents their responses separately in a single place, while Tables 39 through 45 (pages 277-283) show them next to major seaport responses, but in parentheses. Table 46 represents a very small sample of the minor seaport population, with as few as five responses to a given question, representing an 11 percent response rate. Conclusions based on such small numbers of responses cannot be drawn with anywhere near the certainty as those made concerning the near-population major seaport responses, and so only a few illustrative responses are discussed here.

First, as might be expected based on the results of Table 48 discussed above, the factor listed by the most minor seaports as unfavorable to bargeship traffic at their port is lack of bargeship operator interest in their port. Similarly, these ports by definition have low (under one million long-tons) general cargo volumes,[1] which no doubt is heavily contributed to by the next most often cited unfavorable factors, suitability of import cargo flows and ability of bargeship barges to bypass port and move directly inland. The fourth most cited unfavorable factor, suitability of export cargo flows, also tends to limit general cargo volumes. However, many of these minor seaports have small overall cargo volumes, which accounts for the large numbers of them citing as favorable bargeship operator interest in their port [probably with towed barges to them as functional inland ports], port interest in bargeship traffic, and suitability of import and export cargo flows, all of which tied for second most favorable behind inland transport modes serving port. The latter, as mentioned concerning major

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[1]See pp. 10, 169, <u>supra</u>.

seaports,[1] tends to be universally valued by ports as a promoter of all vessel system traffic.

Before closing out this sub-section, mention is given to the two factors which seaports, one major and one minor, listed in the "others" section for factors influencing bargeship system traffic. The first was listed as favorable by Seattle, Washington, a West Coast major seaport not expecting bargeship system traffic within three years, but rather by 1978. The factor was suitability of Pacific rim [Far East] trading partners for bargeship system traffic. This factor, like the suitability of Northern Europe for such traffic, was mentioned in the Literature Search[2] as favorable to bargeship system traffic. This is in contrast to the Mediterranean, which many East Coast ports serve, and which was mentioned in a post-survey interview by the Director of Research at the Virginia Ports Authority as an overseas variable which contributed to the East Coast's smaller volume than the Gulf Coast's, which has more shipline routes to Northern Europe.[3]

The other factor was added by Beaumont, Texas, a minor Gulf Coast seaport with very small volume of bargeship system traffic. Beaumont ranked the factor unfavorable, and it was quantity of cargo required to attract bargeships. This reinforces the author's categorizing of ports such as Beaumont as minor seaports (functional inland ports).

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[1]See p. 265, _supra_.

[2]See pp. 29, 30, _supra_.

[3]Interview (telephone) with John Hunter, Director of Research, Virginia Port Authority, September 10, 1973.

This concludes the analysis of seaport opinion and non-hypothesized data. The next section is a discussion of the results of the letters sent to the nation's bargeship operators at the suggestion of the dissertation committee, followed by the final inland port analyses.

Bargeship Operator Correspondence

As mentioned at the end of the last sub-section, correspondence was sent to each of the seven bargeship operators serving the United States in order to try to gain additional information on the percentage of bargeship system cargoes loaded into barges at inland ports versus at seaports. Since prior experience with these companies had consisted of replies stating that almost any information, whether with regard to inland ports and/or customers served, cargoes carried, volumes or whatever was confidential and could not be released, information on solely the one item mentioned above was requested.

Though only three of the seven responded positively to this request, these results including who did not respond, are useful. First, the non-respondents included Central Gulf Lines which in earlier correspondence[1] refused to supply any information, wanting no information to reach competitors which might detract from the advantages it has over them on the Gulf Coast as the innovator of bargeship systems. Second, Pacific Far East Lines and Lykes Lines also did not respond. Pacific Far East Lines, which serves the West Coast, probably has little

[1]Letter from E. F. Johnson, President, Central Gulf Lines, New Orleans, June 22, 1972.

TABLE 39

ALL SEAPORTS (UNCLASSIFIED BY SEACOAST OR EXPECTATIONS) FAVORABILITY RANKINGS OF BARGESHIP AND BARGESHIP BARGE TRAFFIC INFLUENCERS

Influencing Items	Extremely Favorable	Favorable	No Effect	Unfavorable	Extremely Unfavorable
Bargeship facilities available	4(2)[a]	10(1)	6(1)	2(1)	0
Bargeship barge working facilities available	4(2)	12(1)	5(2)	0	0
Inland transport modes serving port	9(3)	7(3)	3(3)	1	1
Suitability of import cargo flows through port	8(2)	8(3)	4(3)	1(2)	1(1)
Suitability of export cargo flows through port	9(4)	8(1)	4(2)	(2)	1(1)
Amount of inland waterways serving port	3(1)	8(1)	4(2)	4(1)	1
Interest in bargeship mode by port's shippers	1	11(3)	5(2)	3	0
Interest in bargeship traffic by port	5(2)	13(3)	5(1)	(1)	0
Bargeship operator interest in port	4(2)	11(3)	5	1(4)	0
Cost to construct bargeship system facilities	1(1)	4(3)	6(2)	7	(1)
Cost to construct containership facilities	4(2)	7	7(2)	1(1)	1(1)
Ability of bargeship barges to by-pass port and move directly to inland destinations	1	4(1)	5(1)	5(2)	6(1)
Other--suitability of Pacific rim trading partners for LASH	1				

[a]Numbers in parentheses ( ) are minor seaport (functional inland port) responses. Major seaport responses are those without parentheses.

TABLE 40

U.S. EAST COAST SEAPORTS FAVORABILITY RANKINGS OF BARGESHIP AND BARGESHIP BARGE TRAFFIC INFLUENCERS

Influencing Item	Extremely Favorable	Favorable	No Effect	Unfavorable	Extremely Unfavorable
Bargeship facilities available	1	3	4	0	0
Bargeship barge working facilities available	2	2	3	0	0
Inland transport modes serving port	3	3	2(1)[a]	0	0
Suitability of import cargo flows through port	3	2(1)	3	0	0
Suitability of export cargo flows through port	4(1)	1	3	0	0
Amount of inland waterways serving port	0	4	1	2	1
Interest in bargeship mode by port's shippers	0	4	2	2	0
Interest in bargeship traffic by port	2	4(1)	2(1)	0	0
Bargeship operator interest in port	1	6(1)	2	0	0
Cost to construct bargeship system facilities	0	1	4	2	0
Cost to construct containership facilities	2(1)	2	2	1	0
Ability of bargeship barges to by-pass port and move directly to inland destinations.	0	2	2	3	1

[a]Numbers in parentheses ( ) are minor seaport (functional inland port) responses. Major seaport responses are those without parentheses.

TABLE 41

U.S. GULF COAST SEAPORTS FAVORABILITY RANKINGS OF BARGESHIP AND BARGESHIP BARGE TRAFFIC INFLUENCERS

Influencing Item	Extremely Favorable	Favorable	No Effect	Unfavorable	Extremely Unfavorable
Bargeship facilities available	1(2)[a]	3(1)	(1)	2	0
Bargeship barge working facilities available	1(1)	5(1)	(2)	0	0
Inland transport modes serving port	2(2)	3(1)	(1)	1	0
Suitability of import cargo flows through port	3(2)	2(1)	(2)	1	(1)
Suitability of export cargo flows through port	3(2)	3(1)	(1)	(1)	0
Amount of inland waterways serving port	2(1)	3(1)	(1)	1(1)	0
Interest in bargeship mode by port's shippers	1	4(3)	(1)	0	0
Interest in bargeship traffic by port	2(1)	3(2)	1(1)	0	0
Bargeship operator interest in port	3(1)	1(1)	2	(3)	0
Cost to construct bargeship system facilities	0	2(1)	2(1)	2(1)	(1)
Cost to construct containership facilities	2	1	3(2)	(1)	(1)
Ability of bargeship barges to by-pass port and move directly to inland destinations.	0	1(1)	1(1)	2(2)	2(1)

[a]Numbers in parentheses ( ) are minor seaport (functional inland port) responses. Major seaport responses are those without parentheses.

TABLE 42

U.S. WEST COAST SEAPORTS FAVORABILITY RANKINGS OF BARGESHIP AND BARGESHIP BARGE TRAFFIC INFLUENCERS

Influencing Item	Extremely Favorable	Favorable	No Effect	Unfavorable	Extremely Unfavorable
Bargeship facilities available	1	5	2	(1)[a]	0
Bargeship barge working facilities available	1(1)	4	2	0	0
Inland transport modes serving port	3(1)	2	1	0	1
Suitability of import cargo flows through port	2	4(1)	1	(1)	1
Suitability of export cargo flows through port	2(1)	4	1(1)	(1)	1(1)
Amount of inland waterways serving port	1	2	3	1(1)	0
Interest in bargeship mode by port's shippers	0	4	2(1)	1	0
Interest in bargeship traffic by port	1(1)	5	2	0	0
Bargeship operator interest in port	1	5(1)	1	1(1)	0
Cost to construct bargeship system facilities	1(1)	2	2	2	0
Cost to construct containership facilities	(1)	3	3	0	1
Ability of bargeship barges to by-pass port and move directly to inland destinations.	1	1	2(1)	2	2
Other--suitability of Pacific rim trading partners for LASH	1				

[a]Numbers in parentheses are minor seaport (functional inland port) responses. Major seaport responses are those without parentheses.

TABLE 43

U.S. SEAPORTS WITH BARGESHIP SYSTEM TRAFFIC--FAVORABILITY RANKINGS OF BARGESHIP SYSTEM TRAFFIC INFLUENCERS

Influencing Item	Extremely Favorable	Favorable	No Effect	Unfavorable	Extremely Unfavorable
Bargeship facilities available	5(2)[a]	6(1)	5(1)	1	0
Bargeship barge working facilities available	3(1)	8(1)	4(2)	0	0
Inland transport modes serving port	7(2)	6(1)	1(2)	1	1
Suitability of import cargo flows through port	7(2)	7(1)	1(1)	1(1)	1(1)
Suitability of export cargo flows through port	7(3)	7	2(1)	(1)	1
Amount of inland waterways serving port	2(1)	5(1)	4(2)	4	0
Interest in bargeship mode by port's shippers	1	11(3)	1(1)	2	0
Interest in bargeship traffic by port	5(1)	9(2)	3	(1)	0
Bargeship operator interest in port	4(1)	9(1)	3	(3)	0
Cost to construct bargeship system facilities	1	4(1)	5(2)	4	(1)
Cost to construct containership facilities	4(1)	3	6(1)	(1)	1(1)
Ability of bargeship barges to by-pass port and move directly to inland destinations	0	5(1)	4	5(2)	3(1)

[a]Numbers in parentheses ( ) are minor seaport (functional inland port) responses. Major seaport responses are those without parentheses.

TABLE 44

U.S. SEAPORTS NOT EXPECTING BARGESHIP SYSTEM TRAFFIC WITHIN THREE (3) YEARS--FAVORABILITY RANKINGS OF BARGESHIP SYSTEM TRAFFIC INFLUENCERS

Influencing Items	Extremely Favorable	Favorable	No Effect	Unfavorable	Extremely Unfavorable
Bargeship facilities available	0	2	1	1(1)[a]	0
Bargeship barge working facilities available	1(1)	2	1	0	0
Inland transport modes serving port	2(1)	1	1(1)	0	0
Suitability of import cargo flows through port	2	(1)	2	(1)	0
Suitability of export cargo flows through port	2(1)	1	1	(1)	(1)
Amount of inland waterways serving port	1	1	1	(1)	1
Interest in bargeship mode by port's shippers	0	1	3(1)	0	0
Interest in bargeship traffic by port	(1)	2(1)	2(1)	0	0
Bargeship operator interest in port	(1)	1(1)	2	1(1)	0
Cost to construct bargeship system facilities	(1)	1	1	2	0
Cost to construct containership facilities	(1)	3	0	1	0
Ability of bargeship barges to by-pass port and move directly to inland destinations	1	0	(1)	1	2
Other--suitability of Pacific rim trading partners for LASH		1			

[a]Numbers in parentheses ( ) are minor seaport (functional inland port) responses. Major seaport responses are those without parentheses.

TABLE 45

U.S. SEAPORTS EXPECTING BARGESHIP SYSTEM TRAFFIC WITHIN THREE (3) YEARS (BUT NOT DURING 1973)--FAVORABILITY RANKINGS OF BARGESHIP SYSTEM TRAFFIC INFLUENCERS

Influencing Items	Extremely Favorable	Favorable	No Effect	Unfavorable	Extremely Unfavorable
Bargeship facilities available		1			
Bargeship barge working facilities available		1			
Inland transport modes serving port		1			
Suitability of import cargo flows through port		(1)[a]	1		
Suitability of export cargo flows through port			1(1)		
Amount of inland waterways serving port		1			
Interest in bargeship mode by port's shippers			1		
Interest in bargeship traffic by port		1			
Bargeship operator interest in port		1(1)			
Cost to construct bargeship system facilities			1		
Cost to construct containership facilities			1		
Ability of bargeship barges to by-pass port and move directly to inland destinations			1		

[a]Numbers in parentheses ( ) are minor seaport (functional inland port) responses. Major seaport responses are those without parentheses.

TABLE 46

U.S. MINOR SEAPORTS (FUNCTIONAL INLAND PORTS) BARGESHIP SYSTEM TRAFFIC FAVORABILITY RANKINGS OF BARGESHIP SYSTEM TRAFFIC INFLUENCERS

Influencing Items	Extremely Favorable	Favorable	No Effect	Unfavorable	Extremely Unfavorable
Bargeship facilities available	2	1	1	1	0
Bargeship barge working facilities available	2	1	2	0	0
Inland transport modes serving port	3	3	3	0	1
Suitability of import cargo flows through port	2	3	3	2	1
Suitability of export cargo flows through port	4	1	2	2	0
Amount of inland waterways serving port	1	1	2	1	0
Interest in bargeship mode by port's shippers	0	3	2	0	0
Interest in bargeship traffic by port	2	3	1	1	0
Bargeship operator interest in port	2	3	0	4	0
Cost to construct bargeship system facilities	1	3	2	0	1
Cost to construct containership facilities	2	0	2	1	1
Ability of bargeship barges to by-pass port and move directly to inland destinations	1	1	1	2	1
Other--quantity of cargo required to attract bargeships				1	

TABLE 47

SUMMARY OF FACTORS WITH OVERALL FAVORABLE VERSUS UNFAVORABLE RANKINGS IN ORDER OF FAVORABILITY AND UNFAVORABILITY
(At Between 18 to 23 Major U.S. Seaports)

Factors with Overall Favorable Rankings in Order of Favorability

Rank	Factor	Total Overall Favorable Responses
1.	Interest in bargeship traffic by port	18
*2.	Suitability of export cargo flows	17
*3.	Inland transport modes serving port	16
*4.	Suitability of import cargo flows through port	16
5.	Bargeship barge working facilities available	16
6.	Bargeship operator interest in port	15
7.	Bargeship facilities available	14
8.	Interest in bargeship mode by port's shippers	12
9.	Cost to construct containership facilities	11
10.	Amount of inland waterways serving port	11

Factors with Overall Unfavorable Rankings in Order of Unfavorability

Rank	Factor	Total Overall Unfavorable Responses
1.	Ability of bargeship barges to by-pass port and move directly to inland destinations	11
2.	Cost to construct bargeship and/or bargeship barge working facilities	7

*The rankings shown for these items should be considered with extreme caution as they also encouraged the development of now already entrenched containership systems, thus hindering bargeship systems relatively, except on the Gulf Coast.

TABLE 48

SEAPORT MAJOR GENERAL CARGO ITEMS--OVERALL AND BY VESSEL SYSTEM

SEAPORT / SEACOAST	Major Overall Cargo Items		Major Containership Cargo Items		Major Bargeship Cargo Items		Major Bargeship Barge Cargo Items		Major Conventional Ship Cargo Items	
	Import	Export	Import	Export	Import	Export	Import	Export	Import	Export
EAST COAST:										
Boston	Steel prod., Footwear, Meat and meat prod.	Paper prod., Leather, Plastics	Footwear, Frozen meat, Wool	Paper prod., Leather, Plastics	Prepared vegetables, Footwear, Wine	Waste paper, Fabric waste, Printing paper	Footwear, Prepared vegetables, Wine	Waste paper, Fabric waste, Printing paper	Steel mill, products Forest products, Glass	Chemicals, Wood pulp, Building materials
New York	N/A									
Philadelphia	Iron and steel, Lumber, Cocoa beans. beans	Iron and steel, Scrap metal, Lube oils, & grease	N/A		none		none		Iron and steel, Lumber, Cocoa beans	Iron and steel, Scrap metal, Lube oil, & grease
Baltimore	Iron and steel, Lumber, Autos	Iron and steel, Cereal grain, Cars, Trucks, Busses	Clothing, Textiles, Appliances, Machinery, Liquor/Beer	Machinery, Liquor/Beer, Food stuffs (Army)	Shoes/ sandals, (Tomato paste), Canned gds. Turkish tobacco	Steel prod., Tinflate, Copper, Misc. gen. cargo			Iron and steel prod., Lumber, Autos	Iron and steel prod., Cereal grain, Cars, Trucks, and Busses
Virginia	Plywood & wood veneer, Crude materials, Organic chemicals	Tobacco unmfg., Iron and steel scrap, Soybean oil	Chemicals, Textile products, Meats	Textile products, Paper and paperboard, Manuf. tobacco products	Household goods, Turkish tobacco, Bagged cement	Scrap steel, Bulk clay, Military dry goods			Standard newsprint, Plywood veneer, Crude minerals	Unmfg. leaf tobacco, Iron and steel scrap, Soy bean oil
Charleston	Plywood, Steel and steel prod., Textiles	Woodpulp, Clay, Paper and paper prod.	unknown		Steel and steel prod., Machinery, Textiles	Lumber, Waste materials, Linerboard			Plywood, Steel and steel prod., Textiles	Woodpulp, Clay, Paper and paper products
Wilmington	Steel, Lumber, Misc.	Wood prod., Tobacco, Misc.	Machinery, Chemicals, Mgfd. gds.	Tobacco, Wood prod., Misc.			Steel, Chemicals, Misc.	None	Lumber, Steel, Plywood	Wood prod., Tobacco, Misc.

TABLE 48--Continued

SEAPORT / SEACOAST	Major Overall Cargo Items		Major Containership Cargo Items		Major Bargeship Cargo Items		Major Bargeship Barge Cargo Items		Major Conventional Ship Cargo Items	
	Import	Export	Import	Export	Import	Export	Import	Export	Import	Export
Savannah	Steel, Jute, Plywood	Clay, Paper prod., Naval stores	Liquors, Machinery, Fibers	Clay, Naval stores, Misc. gen'l.	Iron and steel, Liquors, Machinery	Paper prod. Clay, Peanuts			Steel, Jute, Plywood	Clay, Paper prod., Naval stores
Jacksonville	Steel, Wire, Misc.	Paper, Clay, Misc.	N/A		N/A		N/A		N/A	
Port Everglades	Cement, Lumber, Steel	Scrap metal, Waste paper	none		none		none		Cement, Lumber, Steel	Scrap metal, Waste paper
Miami	Newsprint, Meat/ Foodstuffs, Steel and, Steel prod.	Foodstuffs, Vehicles, Building supplies	Meat Foodstuffs, Glass and Tires	Foodstuffs, Household supplies, Manufact. products	N/A		N/A		Newsprint, Steel and steel prod., Lumber	Foodstuffs, Building materials Steel and steel prod.
GULF COAST:										
Tampa	Meats, Lumber, Newsprint	Scrap metal, Bagged fertilizers, Citruses	N/A		none		none		Meats, Lumber, Newsprint	Scrap metal, Bagged fertilizers Citruses
New Orleans	Iron and steel prod., Coffee, Bananas	Paper and paperboard, Cotton, Non-defat oilseed flour and meal	Liquor, Machined parts, Tile	Cotton, Foodstuffs, Fertilizers	Steel, Machinery, Rubber products	Paper prod. Carbon black, Petro-chemicals			Sugar, Residual fuel oil, Iron and steel sheets	Corn, Soybeans, Wheat
Lake Charles	Cresote	Linerboard, Bagged rice, Petroleum, Coke (raw)	none		none			Linerboard, Bagged rice, Petroleum, Coke (raw)	Autos, Steel, Veg. oil	Bagged rice, Linerboard, Petroleum, Coke (raw)
Houston	Steel prod., Iron ore, Molasses	Wheat, Fertil., Organic chemicals	Alcoholic beverages, Tires, Giftware	Petro-chemicals, Cotton, Misc.	Steel, Bagged coffee, Ore	Bagged rice, Drum chem.	Steel, Bagged coffee, Ores	Bagged rice, Drum chem.	Steel prod., Autos, Coffee	Grain (bag.), Petro-chem., Oil well supplies
Galveston	Bananas, Plywood, Steel	Flour, Cotton, Rice	Bananas, Alcoholic beverages	N/A	Steel	Cotton			Bananas, Plywood, Steel	Flour, Cotton, Rice

TABLE 48--Continued

SEAPORT / SEACOAST	Major Overall Cargo Items		Major Containership Cargo Items		Major Bargeship Cargo Items		Major Bargeship Barge Cargo Items		Major Conventional Ship Cargo Items	
	Import	Export	Import	Export	Import	Export	Import	Export	Import	Export
Gulfport	Bananas, Meat, Lumber	Linerboard, Meat, Cotton	Bananas		none	none	Ammonium sulphate, Steel, Fertil.	Lumber	Bananas, Meats, Lumber	Linerboard, Meats, Cotton
WEST COAST:										
Seattle	Bananas Autos, Radios, Tvs	Flour, Wheat, Woodpulp, Hides	Radios, TVs, Motorcycles, Earthenware	Flour, Wheat, Woodpulp, Hides	none	none	none	none	Bananas, Autos	Wheat flour, Woodpulp, Hides
Portland	Iron and steel prod., Autos, Trucks, Wire	Metal scrap, Paper and mfg. Lumber	Electronics, Wire, Earthenware	Seed, Hides, Canned goods	none	none	none	none	Iron and steel prod. Iron ore, Autos, Trucks	Wheat, Logs, Metal scrap.
Tacoma	Alumina, Rubber, Froz. meats	Logs, Grain	Electronics	Pulp, Lumber	Military cargo	Pulp			Frozen meats, Hides	Grain, Logs
San Francisco	Newsprint, Coffee, Oilseeds	Machinery, Tallow and oils, Fresh fruit and nuts	N/A		N/A		N/A		N/A	
Oakland	Plywood, Fruit, Alcoholic beverages	Dried and canned nuts, fruits and vegetables, Hides, Cotton	Plywood, Fruit, Alcoholic beverages	Dried and can. fruits, Hides, Cotton			Dry goods, Meat, Steel goods, Canned fruit		Clothes, Can. foods, Alcoholic beverages	Cotton, Machinery, Nuts, Chemicals
Long Beach	Steel and steel prod., Lumber, Paper, Newsprint	Fresh fruit, Feed and grain, Cotton	Plastic mfg., Machinery and parts, Clothing	Scrap, Cotton, Paper			Ore	Grain, Military cargo	Steel and steel prod., Lumber, Newsprint	Fresh fruit, Steel scrap, Foodstuffs
Los Angeles	Mfg. food, Food, Chemicals	Food, Chemicals, Mfg. goods	Farm prod., Beverages, Textiles, Chemicals	Cotton, Hides, Fertil.	Motorcycles, Electronic equipment, Canned food	Cotton, Pkgd. goods, Machines			N/A	
San Diego	Toys and sport. gds., Clothing, Chinaware	Chemicals Hides, Mfg.goods	General, Fish	Hides, General, Chemicals	General, Fish	Hides, Chemicals, General	General, Bulk	Bulk, Military, General	Fuels, Lumber, General	Bulk, Scrap, General

TABLE 48--Continued

SEAPORT / SEACOAST	Major Overall Cargo Items		Major Containership Cargo Items		Major Bargeship Cargo Items		Major Bargeship Barge Cargo Items		Major Conventional Ship Cargo Items	
	Import	Export	Import	Export	Import	Export	Import	Export	Import	Export
MINOR SEAPORTS										
EAST COAST:										
Portland, Maine	Oil	Sardines	none	none	none	none	none	none	none	Sardines.
Searsport, Maine	Tapioca, Flour	Newsprint, Woodpulp	none	none	none	Newsprint	none	none	Tapioca, Flour	Newsprint, Woodpulp
Fall River, Mass.	Liquid latex, Chemicals, Cotton prod.	none	none	none	none	none	none	none	Liquid latex, Chemicals, Cotton prod.	none
New London, Ct.	Hemp, Plywood, Pulp and paper prod.	none	none	none	none	none	none	none	Hemp, Plywood, Pulp and paper prod.	none
Albany, N.Y.	Molasses, Bananas	Grain.	none	none	none	none	Motorcycles,	none	Molasses, Bananas	Grain
Richmond, Va.	Tobacco raw, Coal by-prod.	Paper Paperboard	none	none	none	none	none	none	Tobacco raw, Coal by-prod.	
Brunswick, Ga.	Gypsum rock, Coal by-product	General cargo	none	none	none	none	none	none	Gypsum rock, Sodium chloride	General cargo
Fort Pierce, Fla.	See Inland Port Major Cargo Items Table 64									
GULF COAST:										
Pensacola, Fla.	Oil	Paper	none	none	none	none	Steel	Rosin		Paper
Panama City, Fla.	Lumber, Steel	Linerboard, Scrap metal, Peanuts	none	none	none	none	Steel	Linerboard, Peanuts	Lumber, Steel	Linerboard, Scrap metal, Peanuts
Bay St. Louis, Ms.	See Inland Port Major Cargo Items Table 64									
Beaumont, Texas	Lead, Coffee, Machinery	Grain, Flour, Scrap iron	none	none	none	none	none	Synthetic rubber, Paper, Govt. cgo.	Lead, Coffee, Machinery	Bulk grain, Flour, Scrap iron

TABLE 48--Continued

SEAPORT / SEACOAST	Major Overall Cargo Items		Major Containership Cargo Items		Major Bargeship Cargo Items		Major Bargeship Barge Cargo Items		Major Conventional Ship Cargo Items	
	Import	Export	Import	Export	Import	Export	Import	Export	Import	Export
Brownsville, Texas	Oil, Ores	Grains, Misc.	none	none	none	none	none	Cotton, Linters	N/A	
Corpus Christi, Tx.	Oil, Ores	Grain	none	none	none	none	none	none	N/A	
Orange, Texas	none	Rice, Containerbd. Resin	none	none	none	none	none	Containerbd. Resin		Rice Containerbd. Resin
Port Arthur, Tx.	Lumber, Steel prod., Misc.	Linerboard, Flour, Synthetic rubber	Auto parts, Furniture, Whiskey	Synthetic rubber, Flour (bag), Petroleum products	none	none	Iron and steel prod.	Synthetic rubber	Lumber, Iron and steel prod., Misc.	Linerboard, Flour, Synthetic rubber
Texas City, Tx.	Bulk oil, Bulk chem.	Bulk oil, Bulk chem.	none	none	none	none	none	none	none	none
WEST COAST:										
Stockton, Calif. Sacramento, Calif.	{See Inland Port Major Cargo Types Table 63									
Anacortes, Wash.	Canned salmon	Logs, Lumber	none	none	none	none	none	none	Canned salmon	none
Bellingham, Wash.	Solar salt	Logs, Chemicals	none	none	none	none	none	none	none	none
Everett, Wash.	Timber, Alumina	none	none	none	none	none	none	none	none	none
Grays Harbor, Washington	Petroleum, Oyster seed	Logs, Wood pulp, Lumber	none	none	none	none	none	none	Oyster seed	Wood pulp

TABLE 48--Continued

SEACOAST	Major Overall Cargo Items		Major Containership Cargo Items		Major Bargeship Cargo Items		Major Bargeship Barge Cargo Items		Major Conventional Ship Cargo Items	
SEACOAST	Import	Export	Import	Export	Import	Export	Import	Export	Import	Export
Longview, Wash.	Bulk alumina, Plywood, Canned goods	Bulk grain, Bulk wood chips, Logs	Canned goods, Earthen-ware Dry goods	Paper	none	none	none	Paper	Plywood, Canned goods	none
Vancouver, Wash.	Bulk alumina, Wood prod.	Bulk grain	none	none	none	none	none	Paper pulp	Plywood, Steel prod., Autos	Flour, Plywood, Aluminum
Willapa Harbor, Washington	none	Logs	none	none	none	none	none	none	none	none
Coos Bay, Ore.	none	Bulk wood chips, Lumber, Logs	none	none	none	none	none	none	none	none
Astoria, Ore.	none	Rafted logs, Bulk grain	none	none	none	none	N/A	N/A	N/A	none

TABLE 49

U.S. SEAPORT CARGO ITEMS CITED AS MAJOR ITEMS MOVING THROUGH PORT VIA BARGESHIP SYSTEMS
(Items unranked on this table)

East Coast Port Items	Gulf Coast Port Items	West Coast Port Items
Major Seaports	Major Seaports	Major Seaports
Footwear (2)[a]	Steel (4)	Dry Goods (2)
Prepared vegetables	Machinery	Meat
Wine	Rubber products	Steel goods
Waste paper	Paper products	Canned fruit
Fabric waste	Carbon black	Ore
Printing paper	Petro-chemicals	Grain
Canned goods	Bagged rice (2)	Military (2)
Turkish tobacco	Ore	Motorcycles
Steel products (2)	Bagged coffee	Electronic equipment
Copper	Drum chemicals	Canned food
Household goods	Ammonium sulphate	Cotton
Bagged cement	Fertilizer	Machines
Lumber	Lumber	Hides
Bulk clay (2)	Linerboard	Chemicals
Military dry goods	Petroleum coke	
Steel (3)	Cotton	
Scrap steel		
Machinery (2)		
Textiles		
Waste materials		
Linerboard		
Iron		
Liquors		
Paper products		
Peanuts		
Chemicals		
Minor Seaports	Minor Seaports	Minor Seaports
Newsprint	Steel (3)	N/A
Motorcycles	Rosin (2)	
	Linerboard	
	Peanuts	
	Synthetic rubber (2)	
	Paper	
	Government cargo	
	Cotton linters	
	Containerboard	
	Iron products	

[a]Parentheses indicate number of ports listing commodity as a major cargo item.

overall directly inland movements as shown in Table 37 (page 253), so it had little motivation to respond, and Lykes Lines is just now commencing its service and so very likely had no basis for an answer. Prudential-Grace Lines, which serves the East Coast and also has little in the way of direct inland movements according to Table 37, responded negatively, stating that they did not have the research available to do the work required.[1]

The three respondents included Combi Lines, Waterman Steamship Company, and Delta Line. Combi Line, indicating their mother vessels dock at "Savannah or Charleston, New Orleans, and Houston," indicated that at present only 15 percent of their cargoes penetrate inland via bargeship barge, but that in the future they hope to reach at least 30 percent penetration.[2] Waterman Steamship Company, which will soon operate off the U.S. East and Gulf Coasts, anticipates a 10 percent initial inland penetration, and hopes that quite possibly as its customers gain experience and familiarity with bargeship systems it will increase this figure to 50 percent within two or three years.[3] These two sets of figures, combined with the direct inland movements of New Orleans of 50 percent now and 70 percent in the future shown in Table 37, would seem to indicate that Central Gulf Lines has achieved considerably

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[1]Letter from J. R. Morano, Executive Vice President--Operations, Prudential-Grace Lines, New York, June 6, 1973.

[2]Letter from B. Boll, Owner's Representative, Combi Line, New Orleans, La., May 31, 1973.

[3]Letter from L. A. Renahan, Vice President, Waterman Steamship Company, New Orleans, La., June 13, 1973.

more inland penetration on the Gulf Coast. Further support for this view is evident in massive contract Central Gulf has long had with International Paper to move barges directly to and from its U.S. inland plants.[1]

Finally, Delta Lines, though operating off the Gulf Coast as well as the East Coast, indicated that the freight conference it is in limits its direct movements to major and what are defined in this study as functional inland ports, thus severely restricting its inland penetration. It states further that in the future it will move few if any barges on U.S. inland waterways.[2]

On an overall basis, therefore, these responses and non-responses would seem to indicate support for the most unfavorable ranking given the ability of bargeship barges to by-pass seaport and move directly inland factor by the nation's seaports. One other point made in the Delta letter is worthy of note here, however, and that was Mr. Harrelson's warning to not exclude the economic and legalistic considerations which affect bargeship operators. These factors, which were discussed in depth throughout the Inland Transport Mode, Labor, and Government sections of the Literature Search chapter, will be brought together with the port information gathered by this study's questionnaires in the Summation of Study chapter. Following now, however, is the Inland Port Analyses sub-section which will conclude this chapter.

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[1]See pp. 22, 23, <u>supra</u>.

[2]Letter from Thomas W. Harrelson, Assistant to the President, Delta Line, New Orleans, La., May 31, 1973.

Inland Port Analyses

As in the preceding Seaport Analyses sub-section, all new tables relevant here will be placed at the end of this sub-section, in order to facilitate an item-by-item analysis of the factors considered here. Extensive cross-referencing will also be required here. Also as previously, the factors considered influence bargeship systems, but at the nation's inland ports (terminals). Also as before, these factors were ranked by ports (terminals) on a scale ranging from extremely favorable to extremely unfavorable. Finally, the factors are analyzed on an overall population basis as well as according to their status in the same coastal categories and bargeship systems traffic situation categories.

Unlike the Seaport Analyses tables, however, the response levels in the tables of this sub-section, with the exception of Table 50 (pages 317-318), nowhere near approach the proportions of their total populations that earlier seaport opinion tables did. In this sub-section, therefore, except for a few overwhelmingly obvious patterns, statements of the tendencies of opinions on factors will be made, rather than the far more positive statements about how well they describe the state of the world which were possible regarding many seaport opinions.

In this respect, the author has decided to do pattern and trend analyses of the opinion data herein in the interests of both clarity and manageability. This is because on the whole, statistical tests would only draw out what is already a quite lengthy discussion, and such tests were not considered necessary to accomplish the author's objectives regarding inland port (terminal) opinions, namely to be able to make the above-mentioned statements of tendencies. These objectives were the result of the favorable bias expected to be shown in the opinions on most factors, as well as an expected low response level because of the research work required to answer the more useful volume information presented earlier in Tables 31 (pages 224-225), 32 (pages 226-229), 33 (pages 232-233), 34 (page 234), and 35 (pages 235-236). Concrete volume estimate data on recent and expected volumes therefore took precedence over protracted evaluations of inland port opinions, although some brief analysis of these opinions was desired to form a reasonably accurate picture of the patterns and trends of such opinions.

This sub-section also differs from the Seaport Analyses sub-section because the author anticipated that inland port opinions regarding the favorability of factors influencing bargeship system factors would tend to be far more optimistic regarding the future. It was therefore decided to risk lower response levels because of increased question difficulty, and ask for opinions on the past, present, and future influence of each factor. The time period of a factor's influence was shown on Tables 51 through 58 (pages 319-326) by placing it in the "P" column for past, "C" for current, and "F" for future. The trends shown for opinions by time period have rendered this decision a useful one.

In addition, the influencing factors analyzed differ somewhat from those of the Seaport Analyses sub-section, because of the different nature of the inland port (terminal) situation.

Moreover, these analyses differ from the seaport analyses because the nation's hybrid, functional inland ports (minor seaports) are included in the population about which statements of tendency are made. This is because this study's definitions place these ports in this population. The author's reasons concerning why these ports relate to bargeship systems as basically functional inland ports have already been stated.[1] In addition, the inclusion of inland terminal companies in this population has also been already explained.[2] Finally, the reader is advised that Table 54 (page 322), which presents the only three responding West Coast inland ports' opinions, is not included in any of the following analyses.

Looking at the factors with significant numbers of unfavorable responses in the overall inland port (terminal) population, though there are four of them with a past, present, or future number of overall unfavorable responses of 10 or more, only one of these has more unfavorable than favorable responses. This factor, the distance of an inland port from the nearest seaport, is therefore the only factor which Table 51 (page 319) indicates is ranked unfavorably by the majority of all responding inland ports (terminals), with 11 unfavorable versus 10 favorable for past influence, 13 each for the present influence, and 15 unfavorable versus 13 favorable for future influence.

Moreover, Table 50 (pages 317-318) shows that 31 of the 45 geographic inland ports (terminals) not expecting bargeship system traffic within three years are over 1,000 miles from the nearest

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[1]See pp. 168, 211, 212, 217, *supra*.

[2]See pp. 167, 171, 172, *supra*.

seaport. In addition, this figure could effectively be increased to 41 of 45, since 10 of these ports are located on the Great Lakes and were considered part of the East Coast inland port population because they are closer to the Atlantic Ocean than the Gulf of Mexico. Since all of these ports are less than 1,000 miles from the East Coast and more than 1,000 miles from the Gulf Coast, and since the Great Lakes are not expected to have bargeship system traffic via the East Coast in the foreseeable future,[1] these ports can effectively be considered currently more than 1,000 miles from the nearest relevant seaport. However, it should be pointed out that Table 50 shows that a large distance from the nearest major seaport does not necessarily preclude bargeship system traffic. For the ports (terminals) listed as having bargeship system traffic on the table indicate that even those well over 1,000 miles from the nearest seaport have had such traffic. Further, one such port (terminal) is listed at about every 100 miles further from the nearest major seaport up to 1,433 miles.

This data not only supports the opinion rankings above, it transcends them because many ports (terminals) not having bargeship system traffic did not bother to answer this question and hence are not shown in Table 51 (page 319). Almost assuredly, they would add significantly to the margin of unfavorable versus favorable rankings there. Despite this, Tables 55 (page 323) and 57 (page 325) show that ports with this traffic ranked this factor distinctly favorably, while ports not expecting this traffic within three years generally ranked it unfavorably.

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[1]See p. 313, *infra*.

Before analyzing the next factor with a significant number of unfavorable rankings, it is pointed out that there is a significant trend of opinions over time in the sample of the overall inland port (terminal) population of Table 51, and to a lesser extent in its mutually exclusive categories in Tables 52 through 57.[1] This pattern, while not pronounced for the preceding factor, is apparent for the next one and most others in these tables. For instance, the next factor, type of non-agricultural items produced locally, while receiving the second highest number of unfavorable ratings, shows in Table 51 its overall favorable rankings increasing from 13 in the past, to 16 currently, to 24 in the future. A visual check of these tables by the reader will confirm this trend for most items, particularly in Table 51. The trend, of course, indicates the increasing optimism, particularly for the future, of responding inland ports (terminals) as a whole, and even in Table 57 for ports not expecting bargeship system traffic within three years. In the interests of brevity, therefore, succeeding analyses of this sub-section, rather than citing numerical increases over time of factor's favorable rankings, will use phrases similar to "increasing favorability over time" to describe such increases.

Among the categories of the overall inland port (terminal) population, the one with the heaviest number of unfavorable ratings for non-agricultural items produced locally, as might be expected, was ports (terminals) not expecting bargeship system traffic within

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[1]Table 54 is excluded from analysis because of insufficient data.

three years. The number of unfavorable rankings here was high enough to consistently equal or exceed favorable rankings over time. This was not true for Tables 51 through 56, however, where favorable rankings tended to dominate and increase over time, especially in Tables 53 and 55, at Gulf Coast ports (terminals) and those with bargeship system traffic. In conclusion, therefore, this factor tends to have a mixed influence in the opinions of respondents, with the sample of the overall inland port population ranking it basically favorable, but with a large number of unfavorable rankings, with all categories following overall favorable patterns except ports (terminals) not expecting bargeship traffic within three years.[1] Further, Gulf Coast locations with bargeship system traffic were found to contribute most to overall sample favorability rankings.

These opinions are also reinforced by factual data, as was the inland waterway distance from seaport data. The reader is referred to Tables 63 (pages 332-337) and 64 (pages 338-340), which present the major overall cargo items and major bargeship system cargo items of inland port (terminal) respondents with, expecting, or citing potential for such traffic, versus those respondents citing no potential for such traffic. It is noted that in Table 63, 10 of 16 geographic, inland, Gulf Coast ports with bargeship system traffic had steel as a major overall cargo item, while 11 of 16 of these had steel as <u>the</u> major bargeship barge import cargo item at their location. This non-agricultural item, already cited as a traditionally barged item in

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[1]Table 54 is excluded from analysis because of insufficient data.

the Seaport Analyses sub-section,[1] was when compared by individual questionnaire returns, a major reason for the favorable ratings for this factor. On the other hand, in Table 64, the prevalence of items such as coal, sand and gravel, and petroleum shown as major overall port (terminal) cargo items have quite likely led to the unfavorable rankings for the non-agricultural items produced locally factor. These latter items, incidentally, were the main cargo items of most of the inland waterway locations of doubtful status without any traffic at all in Table 36 (pages 245-250) which were excluded from the inland port (terminal) population. While many cross-checks of Table 64 port responses matched (11), many of this group did not answer the opinion questions. Tables 63 and 64 will be discussed later regarding inland transport modes, also.

Two factors shared the last position having 10 or more unfavorable ratings in a time period, neither having more than 11 such ratings. These were the type of agricultural items produced locally and the number of bargeship barges available. The first of these, while indicating that most of its Table 51 (page 319) overall sample unfavorability came from ports not expecting bargeship traffic within three years as shown in Table 57 (page 325), further showed this factor to be increasing significantly over time in favorability at these latter ports and the Gulf Coast ports in Table 53 (page 321) in particular. Future developments may indicate reasons for these trends, but the author sees none at this time. On the other hand, the major overall

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[1]See p. 271, <u>supra</u>.

and bargeship barge cargo items at Gulf Coast ports (terminals) shown in Table 63 (pages 332-337) indicate the probable main reason for the large contributions of Tables 53 (page 321) and 55 (page 323) to overall sample favorability shown in Table 51 (page 319) for this factor.

The number of bargeship barges available factor, which equaled the above factor in its highest number of overall unfavorable responses for a given time period in Table 51, had its worst ratings in Table 57. That category, ports not expecting bargeship system traffic gave this factor six "extremely unfavorable" ratings in each and all of its time periods. Such rankings were enough to equal favorable ratings over time for this category and similarly, in Tables 51, 53, 55, and 56 (page 324), unfavorable rankings tended to dominate in the past and present, with favorable rankings only showing dominance in the future. "No effect" rankings were also high in these tables. In fact, since even future favorable ratings in Table 51 are exceeded by no effect plus unfavorable ratings, this factor is shown as basically unfavorable in Table 59 (page 327), which summarizes these discussions. Finally, in Table 52 (page 320), the East Coast and its Great Lakes contingent ranked this factor unfavorably in all of its time periods, contributing heavily to the ports not expecting bargeship traffic figures above.

These findings are consistent with the shortages to date of these barges mentioned in the Literature Search chapter,[1] and the statement of an inland port questionnaire pre-tester after the survey

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[1]See p. 58, supra.

results were totaled and discussed with him.[1] This terminal company president stated that while he could not prove it, he had heard from authoritative sources within the bargeship business that while it was originally planned to have three sets of barges for each Gulf Coast to Europe bargeship, one for inland United States, one for in-transit on the Atlantic Ocean, and one for inland Europe, it has developed that two sets are needed for the inland United States for each such bargeship. In addition, this executive stated that because of the rising price of steel, particularly in Japan, bargeship barge prices have almost doubled in recent years, from about $30,000 to $60,000 per barge. Therefore, even though a large number (14) of bargeships are now and soon to be commencing service on the Gulf Coast, it is quite clear why many inland ports (terminals) have considered the numbers of bargeship barges inadequate to date, and though the situation is expected to improve in the future, a marginally unfavorable situation will probably continue in this area in the future.

The remaining factors analyzed had either a large predominance of favorable ratings which increased over time or a large number of "no effect" ratings, or both. These will be analyzed in the order of the greatest number of overall favorable ratings for any time period for the first group, and the greatest number of no effect ratings for the second group.

As expected, the nation's basically optimistic inland ports (terminals) who responded gave the most favorable rankings, 27 for the

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[1]Interview (telephone) with Allan Bebee, President, St. Louis Terminals Corporation, September 8, 1973.

future, by the largest margin over unfavorable rankings, to their own port volume potential factor in Table 51. Further, not only this overall sample, but the categories in all tables except the ports not expecting bargeship system traffic in Table 57 (page 325) had similar patterns.[1] Table 57, on the other hand, showed that it had the largest contribution to the overall sample's total unfavorable rankings. For this group of ports (terminals), moreover, unfavorable, no effect, and favorable rankings were roughly equivalent for all time periods. So only these respondents as a group among the overall sample did not see their volume potential as a favorable factor for bargeship system traffic.

Three factors tied for the next largest number of overall favorable ratings, 24 in the future, for the overall sample in Table 51 (page 319). All three related to port (terminal) local cargo items produced or demanded. Specifically, these items were the types of agricultural and non-agricultural items demanded locally.[2] All three of these factors showed increased favorability rankings over time both for the overall sample in Table 51 and each of its component categories in Tables 52 through 56 (pages 320-324).[3] Substantial margins over both unfavorable and "no effect" ratings were also shown. Notably, Table 57

[1]Table 54, West Coast ports, was excluded from analysis because of insufficient data.

[2]See Appendix B, inland port questionnaire opinion ranking question on page 406 for definitions of agricultural and non-agricultural items.

[3]Table 54 was excluded from analysis because of insufficient data.

showed that only ports not expecting bargeship system traffic within three years had favorable ratings which only about equaled those of both unfavorable and no effect ratings over time. For most categories of inland ports responding, however, these factors were ranked very favorably. These results, once again, are supported by the factual data on inland port (terminal) major overall and bargeship barge cargo items shown in Tables 63 (pages 332-337) and 64 (pages 338-340).

The two factors with the next highest numbers of overall favorable rankings, 23 and 22 in the future, for the overall sample in Table 51 (page 319), were port and bargeship operator promotional efforts for bargeship system traffic, respectively. These factors also increased in favorability over time, and had large margins over all unfavorable responses and future "no effect" responses, although they were roughly equivalent to "no effect" responses for the past and current periods. Table 55 (page 323), ports (terminals) with bargeship system traffic, had large favorable margins over both no effect and unfavorable ratings for all time periods, however, while ports (terminals) not expecting such traffic in Table 57 (page 325) generally ranked this most as having no effect, second as unfavorable, and only slightly favorable in the future. Responding East Coast ports (terminals) in Table 53 (page 321) showed this factor as tending to have no effect in the past but a favorable one in the future. Gulf Coast ports (terminals) and those expecting such traffic in Tables 53 and 56 (page 324), respectively, showed the same patterns as Table 51.

These findings tend to indicate that while these factors tend to be ranked favorably over time by respondents, the most promotional efforts are probably taking place at ports with such traffic, with growing amounts being made at Gulf Coast inland ports (terminals) in general, and with responding ports (terminals) expecting such traffic showing the same trend. Inland port (terminal) promotional efforts are also discussed later regarding Table 62 (pages 330-331). Bargeship operator promotional efforts were discussed in the Literature Search chapter.[1]

The number of trucklines serving inland ports (terminals) factor was the one with the next highest overall number of favorable ratings, 20 for the future, in Table 51 (page 319). These overall sample results show this factor as having roughly equivalent favorable and no effect ratings for past and present time periods, but with greater favorable ratings for the future. The categories in Tables 52 through 56 (pages 320-324) show similar patterns,[2] indicating that while having some trucklines serving an inland port (terminal) is probably favorable on the whole to such traffic, they probably do not have a significant positive influence. This lack of effect is somewhat evident in Tables 63 (pages 332-337) and 64 (pages 338-340), where ports both with and without such traffic are shown to have widely varying numbers of serving trucklines.

Bargeline operator promotional efforts for such traffic was the factor with the next highest number of overall favorable rankings, 19 in the future, in the overall sample in Table 51. These overall sample

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[1]See p. 58, <u>supra</u>.

[2]Table 54 was excluded from analysis because of insufficient data.

favorable ratings are shown to be prevalent only in the future, however, as Table 51 indicates that this factor has been considered by respondents to have had no effect in the past and current periods. Tables 52 and 57 (page 325) show that non-expecting and East Coast respondents show the past and current ratings to be mainly "no effect" with unfavorables placing second, while favorable ratings barely rank highest for the future. Tables 53 and 55 show that Gulf Coast and respondents with bargeship traffic give this factor roughly equal numbers of favorable and no effect ratings for the past and current periods, while the favorable rankings prevail by a large margin in the future. Finally, Table 56 (page 324) shows that respondents expecting such traffic rank this factor predominately as favorable for both the current and future time periods. A pattern of probable selected promotional efforts, as was shown for the ports (terminals) and bargeship operators factors just discussed, is shown by the bargeline operators factor. Such efforts are also most often expected to have their favorable effects in the future. Worthy of note here, moreover, was the high proportion of respondents expecting such traffic, five of five, who considered the current influence of this factor favorable in Table 56, particularly in view of bargeline efforts in this area cited in the Literature Search chapter.[1]

While three factors tied with the same number of favorable plus extremely favorable responses, 17 for the future, in the overall sample in Table 51, two of them probably have a more favorable effect in the opinion of the author. The factors which are considered more favorable

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[1]See pp. 59, 71, supra.

are bargeship barge cargo rate structures and damage ratios. The author's opinion is based on findings in the Literature Search chapter,[1] a comment on a questionnaire, Tables 63 and 64 (to be discussed later), and comments in a post-survey telephone interview.[2] All of this information, while indicating that the absolute number of railroads serving an inland port (terminal) probably has little effect on bargeship system traffic as long as there are some, the level of cooperation of railroads can have a considerable effect. The number of railroads factor will therefore be discussed after the bargeship barge cargo rate structure and damage ratio factors.

These latter factors, while having less favorable ratings than "no effect" ratings for the past and current periods, have predominantly favorable ratings for the future, and these favorable ratings have a large margin over unfavorable ratings in all three time periods. Most indicative of the probable favorable effect of these factors on bargeship system traffic are the results of Table 55 (page 323), showing results from respondents with such traffic, and therefore having the most experience as a category with these factors. This table shows these respondents giving this factor a favorable ranking for all three time periods with wide margins over both no effect and unfavorable ratings.

On the other hand, Table 53 has results in between those of Tables 51 and 55, showing this factor as having roughly the same number

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[1]See pp. 66, 76, 77, 88, 89, 120, and 121, supra.

[2]Interview (telephone) with Allan Bebee, September 8, 1973.

of favorable and no effect ratings at these Gulf Coast ports for the past and current time periods, with favorable ratings becoming predominant for the future. Tables 52 and 56 indicate that East Coast and ports (terminals) expecting bargeship system traffic within three years follow the same pattern as Table 51. Finally, Table 57 shows that respondents not expecting this traffic show no effect ratings highest over all three time periods, with favorable and unfavorable ratings roughly equal to each other over all periods.

These results tend to indicate that while such rate structures and damage ratios can have quite favorable effects for such traffic in some cases, these results apparently make no difference in many other cases. These other cases no doubt involve those ports far from major seaports and/or having major overall cargo items which are not suitable for bargeship barges.

The number of railroads serving port factor shows roughly an equivalent number of favorable and no effect ratings for all time periods in Tables 51 (page 319), 53 (page 321), 55 (page 323), and 56 (page 324). It shows the same pattern for the past and present time periods in Tables 53 and 57 (page 325), while showing favorable ratings predominant for the future for East Coast and non-expecting respondents. In the author's opinion, this factor probably has little effect on bargeship traffic. This is supported by Tables 31 (pages 224-225), 32 (pages 226-229), 63 (pages 332-337), and 64 (pages 338-340), which show no pattern of numbers of railroads at locations with or without various volumes of bargeship system traffic, except that ports with such traffic tend to have at least one railroad. This is because while they are good to have available as connecting modes with shippers, their absolute number is not nearly as important as how cooperative they are in adjusting their rates to promote such traffic. As cited in the Literature Search chapter, railroads have been reluctant historically to adjust their rates in order to promote containerization for fear of undermining their overall rate structures and traffic base,[1] and a comment on the questionnaire return from Muskogee, Oklahoma, as well as a post-survey interview[2] indicate that this situation definitely exists for bargeship systems. It is therefore quite probable that this reluctance to adjust rates by railroads is an unfavorable factor for these systems.

Finally, two factors on Table 51 showed predominant "no effect" ratings over all time periods for this overall sample. These factors were number of bargelines serving port and type of imported agricultural items. Moreover, Tables 52 through 56[3] showed the same pattern with one exception. Table 55 showed a slight margin of future favorable ratings for the bargeline effect over combined no effect and unfavorable ratings for respondents with bargeship traffic, indicating that large numbers of bargelines serving a port tend to have a favorable effect on such traffic. Table 63, which shows almost all ports with such traffic having at least three serving bargelines, tends to reinforce this statement. On the whole, however, these two factors apparently have basically no effect on such traffic.

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[1]See pp. 66, 76, 77, 88, 89, 120, 121, *supra*.

[2]Interview (telephone) with Allan Bebee, September 8, 1973.

[3]Table 54 was excluded from analysis because of insufficient data.

Regarding the functional port members of the overall inland port (terminal) population, Table 58 (page 326) presents their replies to these questions, but shows no really significant patterns. It does indicate some tendency to agree with Table 51, but response levels for these numbers of the population were low, and Table 58 and author checks by category mainly demonstrate that this group did not have a great effect on Tables 51 through 57.

Table 59 (page 327) summarizes the nation's inland port results discussed above. It lists first the factors which were considered favorable and/or extremely favorable, i.e., overall favorable, most often by respondents. Notes are also included here to show factors which had high numbers of overall unfavorable ratings from respondents, indicating probable mixed effects for those factors. Similarly, certain factors rated overall favorable most often by ports with bargeship system traffic, and therefore probably having a more favorable effect than its position in Table 59 (page 327) would tend to indicate, are also noted. Next, the factors with the most no effect ratings, which dominated for these factors, are listed separately. Finally, the factors which had the most basically unfavorable ratings, namely overall unfavorable plus no effect ratings, are listed separately.

The author does not give these factors absolute rankings, first, because such rankings were not the purpose of this survey, and second, because many factors differed by so little in terms of numbers of favorable and/or other ratings, that such rankings would not have much analytic value. The differences shown between the most favorably ranked and some of those ranked favorably but far less so, however, are instructive. Similarly, the factors shown as have no effect or basically unfavorable ratings contrast significantly enough in their ratings with favorably rated factors to be reasonably excluded from the list of factors favorable to bargeship system traffic.

Tables 60 (page 328) and 61 (page 329) present the basically low level of responses to the question which asked which factors most encourage and discourage bargeship system traffic. No really definite conclusions can be drawn from these tables, although Table 60 does indicate that the most often cited encouraging factor was the type of imported non-agricultural items demanded locally. Agricultural items produced locally had the second highest number of mentions, with all of them being as first most encouraging, as compared to the mixture of first, seconds and thirds for the non-agricultural imports. Port (terminal) promotion efforts and bargeship barge cargo damage ratios were mentioned third and fourth most frequently, respectively.

In Table 61, distance of port (terminal) from nearest seaport was mentioned most frequently as one of the top three discouraging factors for bargeship system traffic at their location. Type of non-agricultural items produced locally was mentioned second most often here. Number of bargeship barges available, number of bargelines serving port, and bargeship operator promotion efforts tied for third most mentioned. As might be expected, Gulf Coast respondents and those with bargeship system traffic supplied the most encouraged responses, while Gulf Coast respondents and those not expecting such traffic provided most of the discouraged responses.

Before leaving the analysis of these factors, mention should be made of the "others" which respondents wrote as influencing bargeship system traffic. First, Little Rock found its future bargeship system traffic highly uncertain because of fluctuating world currencies and prices. A post-survey interview[1] supported the existence of this "discouraging" uncertainty at other inland ports (terminals). The other written-in factors were by ports (terminals) located on the Great Lakes and all cited discouraging aspects of this location for bargeship system traffic. Specific items mentioned were Great Lakes' storms which were considered too rough for small bargeship barges, regulations against multiple-barge tows on the Lakes, and the fact that since the Lakes are generally not served by bargeship systems, their ports (terminals) are unlikely to receive such traffic.

Regarding Great Lakes bargeship system traffic, a letter from the General Manager of the Chicago Regional Port District indicated to the author that Delta Line has proposed medium sized feeder vessels for Great Lakes traffic.[2] This individual stated that such vessels would have great potential on the Great Lakes.

Regarding investments by inland ports (terminals) in order to promote bargeship system traffic, Table 62 (pages 330-331) indicates that such investments by respondents have generally been infrequent, under one million dollars, and to promote overall traffic at a location, which included bargeship system traffic. This is somewhat consistent

[1]Interview (telephone) with Allan Bebee, September 8, 1973.

[2]Letter from Maxim M. Cohen, August 8, 1973.

with the discussions of such investments in the Literature Search chapter,[1] except that the majority of inland port (terminal) investments must on the whole be attributed to the desires to increase traffic in general, rather than international bargeship system traffic specifically. The table does, however, indicate some construction of special LASH docks and purchases of large cranes for handling barged containers.

Table 62 also indicates that the main "other activity" of respondents designed to increase bargeship system traffic has been "increased sales efforts," although Kansas City did conduct a shipper seminar. In addition, the table indicated that there have been some shipper actions in the area of plans and contracts which will increase bargeship system traffic at these locations. Finally, the table indicates that the distance from the nearest major seaport was not an overwhelming determinant of whether these ports (terminals) were willing to invest, and that even Sioux City, Iowa, which is 1780 miles from New Orleans, harbors enough optimism to make investments designed at least partially to increase bargeship system traffic and has increased its sales efforts on behalf of such traffic.

Tables 63 (pages 332-337) and 64 (pages 338-340), which have been referred to repeatedly already, nevertheless warrant separate discussion here. These tables are included in the dissertation not only for their contributions to the discussions and evaluations of inland port (terminal) opinions, but also because they present a wide range of information on these ports and terminals not otherwise available. For instance, while the U.S. Army Corps of Engineers includes

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[1]See pp. 56-57, _supra_.

inland ports in its statistics on waterborne commerce in the United States,[1] the latest available edition of this publication is for 1971, whereas these tables contain estimated 1973 percentages of the major import, export and domestic cargo items at 71 U.S. geographic and functional inland ports (terminals). Moreover, next to these items in Table 63 are shown port (terminal) major bargeship barge import and export cargo items, so the two can be compared. While this study gained actual and estimated long-ton volume data for 1972 and 1973 at many of these ports, and much of this data is shown for many of these ports in Tables 31 (pages 224-225), 32 (pages 226-229), 33 (pages 232-233), 34 (page 234), and 35 (pages 235-236), volume data for those ports not included in Tables 31 through 35 has been excluded here in the interest of manageability.

Tables 63 and 64 also include, however, the numbers of railroads, trucklines, and bargelines serving these 71 ports (terminals) and while this information proved useful earlier in the discussions of port (terminal) opinions on factors influencing bargeship system traffic at inland ports, it also provides a useful reference source for this information for use regarding other purposes. Table 63 also indicates that of the 26 ports (terminals) citing the types of conventional barges at their location, 19 ranked covered dry cargo barges first, three ranked deck and hopper barges first, and one ranked tanker barges first. Covered barges, at respondents with bargeship barge traffic, had 15 of

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[1]U.S. Army Corps of Engineers, Waterborne Commerce of the United States: Calendar Year 1971, Parts 1-5 (New Orleans: Division Engineer, U.S. Army Engineer District, 1972).

the 19 total most competitive ratings for these barges, indicating that at responding ports (terminals) with such traffic, these types of barges competed most against each other. On the other hand, at a few locations bargeship barges compete most against the other types of barges mentioned.

Finally, Tables 63 (pages 332-337) and 64 (pages 338-340) present the above data for ports (terminals) classified by coastal region, number of waterway miles from nearest major seaport and status regarding bargeship system traffic. Regarding this latter factor, ports (terminals) which did not expect bargeship system traffic within five years but expressing positive potential percentages on total cargo shippable via bargeship barges, had a column citing these percentages substituted for the major bargeship barge cargo items column.

This concludes this chapter, and following is the Summation of Study chapter.

TABLE 50

U.S. INLAND PORT DISTANCES FROM NEAREST EAST, WEST OR GULF COAST PORT VS. LASH/SEABEE TRAFFIC AND EXPECTATIONS STATUS

Inland Ports With LASH/SEABEE Traffic	# Waterway Miles From Nearest Seaport	Inland Ports Expecting LASH/SEABEE Traffic Within 3 Years	# Waterway Miles From Nearest Seaport	Inland Ports Not Expecting LASH/SEABEE Traffic Within 3 Years	# Waterway Miles From Nearest Seaport	Inland Ports Expecting Significant International Traffic Increase Via LASH/SEABEE	# Waterway Miles From Nearest Seaport
GULF COAST:		EAST COAST:		EAST COAST:		EAST COAST:	
Natchez, Miss.	265	Bay City, Mich.	950	Ogdensburg, N.Y.	120	Bay City, Mich.	950
Vicksburg, Miss.	336	GULF COAST:		Buffalo, N.Y.	350	GULF COAST:	
Greenville, Miss.	438			Rochester, N.Y.	400		
Pine Bluff, Ark.	550	Paducah, Ky.	817	Cleveland, Ohio	600	Natchez, Miss.	265
Helena, Ark.	564	East St. Louis, Ill.	1,053	Lorain, Ohio	650	Vicksburg, Miss.	336
Little Rock, Ark.	596	Portage, Ind.	1,311	Huron, Ohio	680	Greenville, Miss.	438
Memphis, Tenn.	637	Cincinnati, Ohio	1,382	Toledo, Ohio	750	Memphis, Tenn.	637
Fort Smith, Ark.	782	Omaha, Neb.	1,683	Monroe, Mich.	790	Muskogee, Okla.	864
Muskogee, Okla.	864	Sioux City, Iowa	1,780	Detroit, Mich.	800	Tulsa-Catoosa, Okla.	916
Tulsa-Catoosa, Ore.	916	WEST COAST:		St. Joseph, Mich.	900	Granite City, Ill.	1,050
Granite City, Ill.	1,050			GULF COAST:		East St. Louis, Ill.	1,053
St. Louis, Ill.	1,053	Pasco, Wash.	330			St. Louis, Mo.	1,053
Nashville, Tenn.	1,104			Harvey, La.	3	Cincinnati, Ohio	1,382
Chicago, Ill.	1,303	FUNCTIONAL INLAND PORTS:		Dardanelle, Ark.	680	Kansas City, Kan.	1,433
Rock Island, Ill.	1,355	GULF COAST:		Evansville, Ind.	961	Sioux City, Iowa	1,780
Kansas City, Kan.	1,433			Shawneetown, Ill.	996		
		Bay St. Louis, Miss.		Sheffield, Ala.	1,170	FUNCTIONAL INLAND PORTS:	
FUNCTIONAL INLAND PORTS:		WEST COAST:		Decatur, Ala.	1,221	EAST COAST:	
EAST COAST:				Pekin, Ill.	1,228		
		Anacortes, Wash.		Joliet, Ill.	1,262	Albany, N.Y.	
Searsport, Maine				Guntersville, Ala.	1,275	GULF COAST:	
Albany, N.Y.		----Within 5 Years----		Madison, Wis.	1,296		
Brunswick, Ga.				Conneaut Harbor, Ill.	1,300	Orange, Texas	
		GEOGRAPHIC INLAND PORTS:		Waukeegan, Ill.	1,350		
GULF COAST:				Clinton, Iowa	1,391	WEST COAST:	
		EAST COAST:					
Pensacola, Fla.				Milwaukee, Wis.	1,400	Stockton, Calif.	
Panama City, Fla.		Ogdensburg, N.Y.	120	Holland Harbor, Mich.	1,400		
Orange, Texas		GULF COAST:		Sheboygan, Wis.	1,450		
Corpus Christi, Texas				Muskegon, Mich.	1,450		
Brownsville, Texas		Dardanelle, Ark.	680	Dubuque, Iowa	1,452		
Freeport, Texas		Evansville, Ind.	961	Coal Grove, Ohio	1,523		
Port Arthur, Texas		Milwaukee, Wis.	1,400	Port Amherst, W. Va.	1,547		
WEST COAST:		Minneapolis, Minn.	1,724	Winona, Minn.	1,596		
		Leetsdale, Pa.	1,839	Nebraska City, Neb.	1,630		
Stockton, Calif.		WEST COAST:		Green Bay, Wis.	1,650		
Sacramento, Calif.				Wheeling, W. Va.	1,662		
Astoria, Ore.		Pasco, Wash.		Minneapolis, Minn.	1,724		
Vancouver, Wash.				Leetsdale, Pa.	1,839		
Longview, Wash.				Pittsburgh, Pa.	1,853		

TABLE 50--Continued

Inland Ports with LASH/SEABEE Traffic	# Waterway Miles From Nearest Seaport	Inland Ports Expecting LASH/SEABEE Traffic Within 5 Years	# Waterway Miles From Nearest Seaport	Inland Ports Not Expecting LASH/SEABEE Traffic Within 3 Years	# Waterway Miles From Nearest Seaport	Inland Ports Expecting Significant International Traffic Increase Via LASH/SEABEE	# Waterway Miles From Nearest Seaport
		FUNCTIONAL INLAND PORTS:		New Kensington, Pa.	1,872		
				Donora, Pa.	1,890		
		EAST COAST:		Point Marion, Pa.	1,943		
		Fall River, Mass.		Ashland, Wis.	2,000		
				Duluth, Minn.	2,100		
		WEST COAST:					
		Olympia, Wash.		FUNCTIONAL INLAND PORTS:			
				EAST COAST:			
				Portland, Maine			
				Portsmouth, N. H.			
				Fall River, Mass.			
				New London, Conn.			
				Annapolis, Md.			
				Cambridge, Md.			
				Alexandria, Va.			
				Richmond, Va.			
				Fort Pierce, Fla.			
				Palm Beach, Fla.			
				GULF COAST:			
				Pascagoula, Miss.			
				Port Lavaca, Texas			
				Texas City, Texas			
				WEST COAST:			
				Richmond, Calif.			
				Port Angeles, Calif.			
				Coos Bay, Ore.			
				Grays Harbor, Wash.			
				Willapa Harbor, Wash.			
				Everett, Wash.			
				Bellingham, Wash.			
				Olympia, Wash.			
				Walla Walla, Wash.			

TABLE 51

ALL INLAND PORTS (UNCLASSIFIED BY COASTAL REGION OR EXPECTATIONS)--FAVORABILITY RANKINGS OF LASH/SEABEE BARGE TRAFFIC INFLUENCERS

Influencing Item	Extremely Favorable			Favorable			No Effect			Unfavorable			Extremely Unfavorable		
	"P"	"C"	"F"[a]	"P"	"C"	"F"	"P"	"C"	"F"	"P"	"C"	"F"	"P"	"C"	"F"
Type of agricultural items produced locally	2	5	6	11	10	18	15	17	10	3	4	4	6	6	5
Type of non-agricultural items produced locally	1	1	1	12	15	23	10	13	6	4	6	4	7	6	6
LASH/SEABEE cargo rate structure	0	0	0	9	11	17	13	16	9	1	1	1	2	3	3
LASH/SEABEE cargo damage ratio	4	4	4	6	6	13	15	17	12	0	0	0	1	2	2
Distance of port from nearest East, West, or Gulf Coast seaport	1	2	1	9	11	12	9	9	8	3	6	8	8	7	7
Port (terminal) promotional efforts for such traffic	4	5	5	7	8	18	13	15	7	2	0	0	2	3	3
LASH/SEABEE operators promotion efforts for such traffic	1	1	1	8	13	21	9	14	5	3	2	2	3	3	2
Bargeline efforts to promote such traffic	3	3	3	5	7	16	12	15	7	0	2	1	5	3	3
Number of railroads serving port (terminal)	3	4	4	9	13	13	14	17	14	1	1	2	1	1	1
Number of trucklines serving port (terminal)	4	5	4	9	13	16	14	18	11	2	3	3	0	0	1
Number of bargelines serving port (terminal)	3	4	3	7	9	10	15	17	14	3	4	6	2	2	2
Type of imported agricultural items demanded locally	2	2	4	3	6	8	20	23	17	2	3	4	4	4	4
Type of imported non-agricultural items demanded locally	2	2	3	9	9	21	11	16	6	1	3	2	5	4	4
Port (terminal) volume potential	4	5	5	12	16	22	9	8	4	2	3	1	2	3	4
Number of LASH/SEABEE barges available	2	2	4	2	6	12	9	12	5	4	3	3	7	7	6
No LASH service on Great Lakes													2	2	2
Other--world prices				1							1				
Other--Great Lakes anti-multiple ton regulations													2	2	2
Other--Great Lakes storms													3	3	3

[a] "P" = Past; "C" = Current; and "F" = Future.

TABLE 52

U.S. EAST COAST INLAND PORTS--FAVORABILITY RANKING OF LASH/SEABEE BARGE TRAFFIC INFLUENCERS

Influencing Item	Extremely Favorable			Favorable			No Effect			Unfavorable			Extremely Unfavorable		
	"P"	"C"	"F"[a]	"P"	"C"	"F"	"P"	"C"	"F"	"P"	"C"	"F"	"P"	"C"	"F"
Type of agricultural items produced locally	0	1	2	2	3	3	5	4	4	2	3	2	1	0	0
Type of non-agricultural items produced locally	0	0	0	3	5	8	3	4	2	2	2	2	1	0	0
LASH/SEABEE cargo rate structure	0	0	0	1	2	4	5	5	4	0	0	0	0	0	0
LASH/SEABEE cargo damage ratio	0	0	0	2	3	3	4	4	4	0	0	0	0	0	0
Distance of port from nearest East, West, or Gulf Coast seaport	0	0	0	3	5	4	2	1	2	0	1	2	2	2	2
Port (terminal) promotional efforts for such traffic	1	1	1	1	1	6	3	4	1	1	0	0	1	1	1
LASH/SEABEE operators promotion efforts for such traffic	0	0	0	1	1	5	3	4	2	1	1	1	2	2	1
Bargeline efforts to promote such traffic	0	0	0	1	1	4	4	4	3	0	1	0	3	2	2
Number of railroads serving port (terminal)	1	1	1	5	6	7	2	3	2	0	0	0	0	0	0
Number of trucklines serving port (terminal)	1	1	1	4	5	7	3	4	1	0	0	1	0	0	0
Number of bargelines serving port (terminal)	0	0	0	0	0	0	5	5	5	1	1	2	2	2	2
Type of imported agricultural items demanded locally	0	0	0	2	2	5	8	8	6	0	0	0	0	0	0
Type of imported non-agricultural items demanded locally	0	1	1	4	4	8	5	5	2	0	0	0	0	0	0
Port (terminal) volume potential	1	1	2	4	7	7	3	2	1	0	0	0	0	0	1
Number of LASH/SEABEE barges available	1	1	1	0	0	2	1	1	1	1	1	1	3	3	3
Other--Great Lakes anti-multiple ton regulations													1	1	1
Other--Great Lakes storms													1	1	1

[a]"P" = Past; "C" = Current; and "F" = Future.

TABLE 53

U.S. GULF COAST INLAND PORTS--FAVORABILITY RANKINGS OF LASH/SEABEE BARGE TRAFFIC INFLUENCERS

Influencing Item	Extremely Favorable			Favorable			No Effect			Unfavorable			Extremely Unfavorable		
	"P"	"C"	"F"[a]	"P"	"C"	"F"	"P"	"C"	"F"	"P"	"C"	"F"	"P"	"C"	"F"
Type of agricultural items produced locally	2	4	4	9	8	13	9	11	6	0	0	1	5	5	4
Type of non-agricultural items produced locally	1	1	1	9	10	15	7	8	4	1	3	1	6	5	5
LASH/SEABEE cargo rate structure	0	0	0	9	10	13	6	7	4	1	1	1	2	2	2
LASH/SEABEE cargo damage ratio	4	4	4	5	5	8	9	10	7	0	0	1	1	1	1
Distance of port from nearest East, West, or Gulf Coast seaport	2	3	3	7	6	8	6	8	4	2	3	3	6	6	5
Port (terminal) promotional efforts for such traffic	3	4	3	6	6	10	8	10	5	1	0	0	1	1	1
LASH/SEABEE operators promotion efforts for such traffic	1	1	1	7	9	14	5	9	2	2	1	1	1	1	1
Bargeline efforts to promote such traffic	3	3	4	7	9	12	5	8	2	0	0	1	3	2	2
Number of railroads serving port (terminal)	2	3	2	5	6	7	5	13	10	1	1	1	1	1	2
Number of trucklines serving port (terminal)	3	4	3	4	5	8	10	13	9	2	2	2	0	0	0
Number of bargelines serving port (terminal)	3	4	4	8	10	9	8	11	7	1	1	2	0	0	0
Type of imported agricultural items demanded locally	2	2	4	0	1	3	11	17	10	3	2	2	3	2	2
Type of imported non-agricultural items demanded locally	2	2	4	5	6	12	5	8	2	1	1	1	4	2	2
Port (terminal) volume potential	3	4	5	7	9	15	4	4	2	2	2	1	2	2	2
Number of LASH/SEABEE barges available	2	2	4	2	6	8	5	7	3	3	2	2	4	3	2
Other--no LASH service on Great Lakes													2	2	2
Other--Great Lakes anti-multiple ton regulations													1	1	1
Other--Great Lakes storms													2	2	2

[a]"P" = Past; "C" = Current; and "F" = Future.

TABLE 54

U.S. WEST COAST INLAND PORTS--FAVORABILITY RANKINGS OF LASH/SEABEE BARGE TRAFFIC INFLUENCERS

Influencing Items	Extremely Favorable			Favorable			No Effect			Unfavorable			Extremely Unfavorable		
	"P"	"C"	"F"[a]	"P"	"C"	"F"	"P"	"C"	"F"	"P"	"C"	"F"	"P"	"C"	"F"
Type of agricultural items produced locally						1	1	2						1	1
Type of non-agricultural items produced locally						1	1	2						1	1
LASH/SEABEE cargo rate structure						1	1	2						1	1
LASH/SEABEE cargo damage ratio						1	1	2						1	1
Distance of port from nearest East, West or Gulf Coast seaport							1	1	2		1	1			
Port (terminal) promotional efforts for such traffic					1	1	2							1	1
LASH/SEABEE operators promotion efforts for such traffic . .					3	2	1								
Bargeline efforts to promote such traffic					2	1	1				1	1			
Number of railroads serving port (terminal)					2	1	1	1	1						
Number of trucklines serving port (terminal)					2	1	1	1	1						
Number of bargelines serving port (terminal)					1		1	1	1		1	1			
Type of imported agricultural items demanded locally					1		1	1	1					1	1
Type of imported non-agricultural items demanded locally . .							1	2	1					1	1
Port (terminal) volume potential						1	1	1			1			1	1
Number of LASH/SEABEE barges available						1	1	2						1	1

[a]"P" = Past; "C" = Current; and "F" = Future.

TABLE 55

U.S. INLAND PORTS WITH LASH/SEABEE BARGE TRAFFIC--FAVORABILITY RANKINGS OF LASH/SEABEE BARGE TRAFFIC INFLUENCES

Influencing Item	Extremely Favorable			Favorable			No Effect			Unfavorable			Extremely Unfavorable		
	"P"	"C"	"F"[a]	"P"	"C"	"F"	"P"	"C"	"F"	"P"	"C"	"F"	"P"	"C"	"F"
Type of agricultural items produced locally	1	3	2	9	8	11	5	5	3	0	0	0	1	2	2
Type of non-agricultural items produced locally	1	1	1	7	7	11	4	4	2	0	1	0	2	2	2
LASH/SEABEE cargo rate structure	0	0	0	9	10	10	1	1	1	1	1	1	1	2	2
LASH/SEABEE cargo damage ratio	4	4	4	5	5	5	4	4	4	0	0	0	0	1	1
Distance of port from nearest East, West, or Gulf Coast seaport	1	1	1	7	7	8	2	3	2	1	3	2	2	1	1
Port (terminal) promotional efforts for such traffic	3	3	3	7	7	10	2	2	1	1	0	0	0	1	1
LASH/SEABEE operators promotion efforts for such traffic	1	1	1	8	10	12	2	4	1	2	1	1	0	0	0
Bargeline efforts to promote such traffic	3	3	3	4	4	7	4	7	3	0	1	1	2	1	1
Number of railroads serving port (terminal)	2	3	2	4	5	5	6	7	7	1	1	1	1	1	0
Number of trucklines serving port (terminal)	3	4	3	4	5	6	5	6	5	2	2	2	0	0	0
Number of bargelines serving port (terminal)	2	2	3	5	5	6	6	6	5	1	2	2	0	0	0
Type of imported agricultural items demanded locally	2	2	3	0	1	2	8	11	8	1	0	0	2	2	2
Type of imported non-agricultural items demanded locally	2	2	3	6	6	9	2	3	1	0	1	0	3	2	2
Port (terminal) volume potential	4	4	4	6	7	9	1	1	1	1	1	0	0	1	1
Number of LASH/SEABEE barges available	3	3	4	2	3	6	1	3	0	3	2	2	2	2	1
Other--world prices				1							1				
Other--no LASH service on Great Lakes													1	1	1

[a]"P" = Past; "C" = Current; and "F" = Future.

TABLE 56

U.S. INLAND PORTS EXPECTING LASH/SEABEE BARGE TRAFFIC WITHIN THREE (3) YEARS--FAVORABILITY RANKINGS OF LASH/SEABEE BARGE TRAFFIC INFLUENCERS

Influencing Item	Extremely Favorable			Favorable			No Effect			Unfavorable			Extremely Unfavorable		
	"P"	"C"	"F"[a]	"P"	"C"	"F"	"P"	"C"	"F"	"P"	"C"	"F"	"P"	"C"	"F"
Type of agricultural items produced locally		1	2			1	3	4	1			1	1	1	
Type of non-agricultural items produced locally				2	3	4	1	3	1						
LASH/SEABEE cargo rate structure					1	4	2	4							
LASH/SEABEE cargo damage ratio					1	4	2	4							
Distance of port from nearest East, West or Gulf Coast seaport		1			1	2	3	2	2			1			
Port (terminal) promotional efforts for such traffic		1			1	4	4	2							
LASH/SEABEE operators promotion efforts for such traffic . .					3	4	3	2							
Bargeline efforts to promote such traffic			1	1	5	2	2					1			
Number of railroads serving port (terminal)				1	3	2	2	2	1						1
Number of trucklines serving port (terminal)					2	3	3	3	1						
Number of bargelines serving port (terminal)			1	1	4	1	3	2	2			1			
Type of imported agricultural items demanded locally			1		1	2	3	4	1						
Type of imported non-agricultural items demanded locally . .		1	11		1	1	3	3	1						
Port (terminal) volume potential		1	1		2	3	3	1			1				
Number of LASH/SEABEE barges available			1		2	2	2	2							

[a]"P" = Past; "C" = Current; and "F" = Future.

TABLE 57

U.S. INLAND PORTS NOT EXPECTING LASH/SEABEE BARGE TRAFFIC WITHIN THREE (3) YEARS--FAVORABILITY RANKINGS OF LASH/SEABEE BARGE TRAFFIC INFLUERS

Influencing Items	Extremely Favorable			Favorable			No Effect			Unfavorable			Extremely Unfavorable		
	"P"	"C"	"F"[a]	"P"	"C"	"F"	"P"	"C"	"F"	"P"	"C"	"F"	"P"	"C"	"F"
Type of agricultural items produced locally	1	1	2	1	1	6	7	8	6	3	4	3	5	5	5
Type of non-agricultural items produced locally	0	0	0	3	4	9	6	7	3	3	4	3	6	6	6
LASH/SEABEE cargo rate structure	0	0	0	0	0	3	9	11	9	0	0	0	1	2	2
LASH/SEABEE cargo damage ratio	0	0	0	1	1	3	8	8	8	0	0	0	2	2	2
Distance of port from nearest East, West, or Gulf Coast seaport	0	0	1	2	3	3	4	6	4	2	3	4	5	6	6
Port (terminal) promotional efforts for such traffic	1	1	1	0	0	4	7	11	6	2	0	0	2	3	3
LASH/SEABEE operators promotion efforts for such traffic	0	0	1	0	1	6	5	8	5	1	1	1	3	3	2
Bargeline efforts to promote such traffic	0	0	0	1	1	7	6	8	5	0	1	0	3	2	2
Number of railroads serving port (terminal)	1	1	1	3	7	10	6	9	5	0	0	0	0	0	0
Number of trucklines serving port (terminal)	1	1	1	1	2	2	6	9	5	1	0	0	0	0	0
Number of bargelines serving port (terminal)	0	0	0	2	2	4	8	11	9	1	1	1	2	2	2
Type of imported agricultural items demanded locally	0	0	0	3	3	10	7	10	8	3	3	3	2	3	3
Type of imported non-agricultural items demanded locally	0	0	0	5	9	4	5	9	4	2	2	2	3	4	4
Port (terminal) volume potential	0	0	1	5	6	3	5	6	3	1	1	1	3	4	4
Number of LASH/SEABEE barges available	0	0	0	6	7	5	6	7	5	1	1	1	6	6	6
Other--no LASH service on Great Lakes													1	1	0
Other--Great Lakes anti-multiple ton regulations													2	2	2
Other--Great Lakes storms													3	3	3

[a]"P" = Past; "C" = Current; and "F" = Future.

TABLE 58

U.S. FUNCTIONAL INLAND PORTS--MINOR SEAPORTS: LASH/SEABEE BARGE TRAFFIC--FAVORABILITY RANKINGS OF LASH/SEABEE BARGE TRAFFIC INFLUENCERS

Influencing Item	Extremely Favorable			Favorable			No Effect			Unfavorable			Extremely Unfavorable		
	"P"	"C"	"F"[a]	"P"	"C"	"F"	"P"	"C"	"F"	"P"	"C"	"F"	"P"	"C"	"F"
Type of agricultural items produced locally	1	1	2	2	2	2	2	4	2	0	0	0	3	3	3
Type of non-agricultural items produced locally	0	0	0	2	2	4	1	4	1	0	0	0	3	3	3
LASH/SEABEE cargo rate structure	0	0	0	1	1	2	0	2	0	1	1	1	0	0	0
LASH/SEABEE cargo damage ratio	1	2	1	1	1	1	2	2	3	0	0	1	0	0	0
Distance of port from nearest East, West or Gulf Coast seaport	1	2	1	1	1	1	2	2	3	0	0	1	0	0	0
Port (terminal) promotional efforts for such traffic	0	1	0	2	2	4	3	3	1	0	0	0	0	0	0
LASH/SEABEE operators promotion efforts for such traffic	0	0	1	1	3	3	0	1	0	1	1	1	0	0	0
Bargeline efforts to promote such traffic	0	0	0	0	2	1	2	2	2	0	0	0	0	0	0
Number of railroads serving port (terminal)	1	1	1	1	3	3	2	3	2	0	0	0	1	1	1
Number of trucklines serving port (terminal)	1	1	1	1	3	3	2	3	2	0	0	0	0	0	0
Number of bargelines serving port (terminal)	1	1	1	0	2	0	2	2	3	1	1	1	0	0	0
Type of imported agricultural items demanded locally	0	0	0	0	2	1	2	2	2	0	0	0	2	2	2
Type of imported non-agricultural items demanded locally	0	0	0	1	1	3	1	4	1	0	0	0	2	2	2
Port (terminal) volume potential	1	2	1	0	0	2	1	2	0	0	0	0	0	0	1
Number of LASH/SEABEE barges available	1	1	1	0	1	2	1	2	0	0	1	0	0	0	0

[a]"P" = Past; "C" = Current; and "F" = Future.

TABLE 59

SUMMARY OF INLAND PORT (TERMINAL) OPINIONS ON FACTORS INFLUENCING BARGESHIP SYSTEMS OVER TIME
(Respondent levels ranged from 30 to 43 respondents out of population of 221 inland ports (terminals))

Factors Rated Favorable Most Often By Respondents

Rank	Factor	Maximum Overall Favorable Ratings[a]	Time Period of Maximum Rating
1.	Port (terminal) volume potential	27	Future
2.	Type of agricultural items produced locally[b]	24	Future
3.	Type of non-agricultural items produced locally[b]	24	Future
4.	Type of imported non-agricultural items demanded locally	24	Future
5.	Port (terminal) promotion efforts for such traffic	23	Future
6.	LASH/SEABEE operators promotion efforts for such traffic	22	Future
7.	Number of trucklines serving port (terminal)	20	Future
8.	Bargeline operators promotion efforts for such traffic	20	Future
9.	LASH/SEABEE cargo rate structure[c]	17	Future
10.	LASH/SEABEE cargo damage ratio[c]	17	Future
11.	Number of railroads serving port (terminal)	17	Future

Factors Rated With "No Effect" Most Often By Respondents

Rank	Factor	Maximum No Effect Ratings	Time Period of No Effect Rating
1.	Type of imported agricultural items demanded locally	23	Current
2.	Number of bargelines serving port (terminal)	17	Current

Factors Rated Basically Unfavorable Most Often By Respondents[d]

Rank	Factor	Maximum Basically Unfavorable[d] Ratings	Maximum Basically Unfavorable[d] Time Period	Maximum Overall Unfavorable[e] Ratings	Maximum Overall Unfavorable[e] Time Period	Maximum No Effect Ratings	Maximum No Effect Time Period
1.	Distance of your port from nearest East, West, or Gulf Coast seaport	23	Future	15	Future	9	Past & Current
2.	Number of LASH/SEABEE barges available	22	Current	11	Past	12	Current

[a]Overall favorable = favorable plus extremely favorable.

[b]Had 10 or more overall unfavorable (see note "d") ratings.

[c]Ports (terminals) with bargeship system traffic had most favorable ratings for these items.

[d]Basically unfavorable ratings = unfavorable plus extremely unfavorable, plus no effect ratings.

[e]Overall unfavorable = unfavorable plus extremely unfavorable.

TABLE 60

FACTORS SPECIFIED AS MOST ENCOURAGING FOR BARGESHIP SYSTEMS TRAFFIC BY INLAND PORT GROUPS

Influencing Item	All Inland Ports			East Coast Inland Ports			Gulf Coast Inland Ports			West Coast Inland Ports			Inland Ports With LASH/SEABEE			Inland Ports Expecting LASH/SEABEE			Inland Ports Not Expecting LASH/SEABEE		
	1st[a]	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
Type of agricultural items produced locally	9(1)[b]	0	0	4(1)	0	0	5	0	0	0	0	0	1	0	0	2	0	0	6(1)	0	0
Type of non-agricultural items produced locally	2	2	2(1)	2	2(1)	0	2	0	0	0	0	0	1	0	0	0	1	0	1	1	2(1)
LASH/SEABEE cargo rate structure	4	0	1	0	0	0	4	0	1	0	0	0	4	0	0	0	0	1	0	1	0
LASH/SEABEE cargo damage ratio	2	4	1	0	0	0	2	4	1	0	0	0	2	3	0	0	0	1	1	0	0
Distance of port from nearest East, West or Gulf Coast seaport	2	1	1	0	0	0	2	1	1	0	0	0	1	0	1	1	0	0	0	1	0
Port (terminal) promotional efforts for such traffic	5	2	1	1	1	0	4	1	0	0	0	1	3	1	0	1	0	1	1	1	0
LASH/SEABEE operators promotion efforts for such traffic	3	1	1	0	0	0	2	1	1	1	0	0	2	1	1	1	0	0	0	0	0
Bargeline efforts to promote such traffic .	3	1	0	0	0	0	3	0	0	0	1	0	2	0	0	0	1	0	1	0	0
Number of railroads serving port (terminal)	3	1	0	1	0	0	1	1	0	0	0	0	0	0	0	0	1	0	3	0	0
Number of trucklines serving port (terminal)	0	3	2	0	1	0	0	1	2	0	0	0	0	0	0	0	0	1	0	3	1
Number of bargelines serving port (terminal)	1	1	2	0	0	0	1	1	1	0	0	0	0	1	0	1	0	0	0	0	2
Type of imported agricultural items demanded locally	0	3(1)	1	0	(1)	1	0	2	0	0	0	0	0	0	0	0	1	0	0	2(1)	1
Type of imported non-agricultural items demanded locally	2	5	4	0	1	2	0	4	2	0	0	0	0	1	2	0	2	1	1	0	1
Port (terminal) volume potential	1	2(1)	2	0	0	1	1	1	1	0	0	0	0	1	0	0	0	1	0	0	0
Number of LASH/SEABEE barges available . . .	0	0	2(1)	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0

[a]1st = 1st most favorable; 2nd = 2nd most favorable; and 3rd = 3rd most favorable.

[b]Number in parentheses ( ) are functional inland port responses included in overall totals.

TABLE 61

FACTORS SPECIFIED AS MOST DISCOURAGING FOR BARGESHIP SYSTEMS TRAFFIC BY INLAND PORT GROUPS

Influencing Item	All Inland Ports			East Coast Inland Ports			Gulf Coast Inland Ports			West Coast Inland Ports			Inland Ports With LASH/SEABEE			Inland Ports Expecting LASH/SEABEE			Inland Ports Not Expecting LASH/SEABEE		
	1st[a]	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
Type of agricultural items produced locally	5	1	0	1	0	0	2	1	0	2(1)	0	0	0	0	0	1	0	0	3	1	0
Type of non-agricultural items produced locally	8	1	1	1	0	0	7	0	1	0	1	0	1	0	0	0	0	1	6	0	0
LASH/SEABEE cargo rate structure	5	1	0	0	0	0	3	1	0	0	0	0	2	0	0	0	0	0	1	1	0
LASH/SEABEE cargo damage ratio	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	1	1	0
Distance of port from nearest East, West or Gulf Coast seaport	8	4	2	2	(1)	0	6	3	1	0	0	0	2	2	0	0	0	0	5	(1)	1
Port (terminal) promotional efforts for such traffic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
LASH/SEABEE operators promotion efforts for such traffic	3	3	1	3	1	1	0	2	0	0	0	0	0	1	0	0	2	0	2	2	1
Bargeline efforts to promote such traffic .	0	4	0	0	4(1)	0	0	1	1	0	0	0	0	0	0	1	0	1	0	3	0
Number of railroads serving port (terminal)	4	0	2	0	0	0	5	0	1	0	0	1	3	0	1	0	1	0	0	0	0
Number of trucklines serving port (terminal)	0	2	0	0	0	0	0	2	0	0	1	0	0	1	0	1	0	1	0	0	0
Number of bargelines serving port (terminal)	1	2	4	0	2	3	0	0	2	1	0	0	0	0	0	0	0	0	0	2	3
Type of imported agricultural items demanded locally	1	1	2	(1)	0	0	1	1	2	0	0	0	0	0	2	0	0	0	1	0	0
Type of imported non-agricultural items demanded locally	1	0	3(1)	0	0	(1)	1	0	1	0	0	1	0	0	0	0	0	0	1	0	(1)
Port (terminal) volume potential	4(2)	1	0	(1)	0	0	2	1	0	(1)	0	0	1	1	0	0	0	0	2(1)	0	0
Number of LASH/SEABEE barges available . . .	5	1	1	1	0	1	4	1	0	0	0	0	3	0	0	0	0	(1)	2	1	1
Other--no LASH service on Great Lakes . . .	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0
Other--world prices	1	0	0	1	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Other--Great Lakes anti-multiple ton reg. .	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Other--Great Lakes storms.	2	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	0	0

[a]1st = 1st most favorable; 2nd = 2nd most favorable; and 3rd = 3rd most favorable.

[b]Number in parentheses ( ) are functional inland port responses included in overall totals.

TABLE 62

RECENT AND PLANNED (WITHIN 3 YEARS) U.S. INLAND PORT (TERMINAL) INVESTMENTS DESIGNED TO INCREASE LASH/SEABEE BARGE TRAFFIC

INLAND PORT / COASTAL REGION	# Waterway Miles From Nearest Seaport	Dollars ($000)	Items	Sources	Dollars ($000)	Items	Sources	LASH/SEABEE Barge Traffic Status	Other Activities	Shipper Actions: Action	Shipper Actions: Potential Annual Long-Ton Volume (000)
EAST COAST:											
Albany, N.Y.	--	--	--	--	--	--	--	With	Increased sales effort	Contract Contract	1 10
GULF COAST:											
Panama City, Fla.	--	--	--	--	250	Barge facilities	Unstated	With	Dredging channel	Contract biggest customer	--
Natchez, Miss.	265	<100	Fork lifts, trucks, pallets, banding machine	Port authority, private	500	Expanded facilities	Port authority partially for LASH	With	--	--	--
Vicksburg, Miss.	336	500	Overall facilities	Warren County, Miss.	0	--	--	With	--	--	--
Greenville, Miss.	438	200	Handling equipment, terminal facilities	Port authority	3,000+	Terminal facilities	Unstated	With	Increased sales effort	--	--
Helena, Ark.	564	1	Miscel- laneous	Private	0	--	--	With	--	--	--
Memphis, Tenn.	637	100	Additional cargo space	Terminal company	120	New dock Unstated	Terminal company & possibly city & co.	With	Increased sales effort	--	--
Paducah, Ky.	817	0	--	--	274-1,000	Land, docks, equipment, warehouses	Port authority	Expecting	--	--	--

TABLE 62--Continued

INLAND PORT / COASTAL REGION	# Waterway Miles From Nearest Seaport	Dollars ($000)	Items	Sources	Dollars ($000)	Items	Sources	LASH/SEABEE Barge Traffic Status	Other Activities	Shipper Actions: Action	Shipper Actions: Potential Annual Long-Ton Volume (000)
Tulsa-Catoosa, Okla.	916	600	200 ton crane	Port authority	--	--	--	With	Increased sales effort	--	--
Cincinnati, Ohio	1,382	Yes	Unstated	Truck-rail terminal operator	Yes	Unstated	Unstated	With	-- immediately expecting	--	--
Kansas City, Kansas	1,433	330	New transit storage building	Terminal company	0	--	--	With	conducted shipper seminar	Plans Plans	25 20
Sioux City, Iowa	1,780	0	--	--	35	Loading and/or unloading equipment	Terminal company	Expecting	Increased sales effort		
WEST COAST:											
Vancouver, Wash.	--	200	Low LASH dock	Port authority	0	--	--	With	--	--	--
Pasco, Wash.	330	300	LASH dock	Port authority	0	--	--	Expecting	Trips to San Francisco	--	--

TABLE 63

U.S. INLAND PORTS MAJOR OVERALL VS. LASH/SEABEE BARGE CARGO ITEMS VS. INLAND TRANSPORT MODE AVAILABILITIES AND COMPETITION

INLAND PORT / LASH/SEABEE TRAFFIC Status & COASTAL REGION	# Waterway Miles From Nearest Seaport	Major Overall		Cargo Items % of Total Volume	Major LASH/SEABEE Barge Cargo Items		Number of Serving Inland Transport Modes			Most Competitive Barge Types
		Items	Type		Import	Export	Rail-roads	Truck-lines	Barge-Lines	First and Second
"With LASH/SEABEE" Geographic Inland Ports:										
GULF COAST:										
Natchez, Miss.	265	Baled wood pulp, plywood & lumber, steel & pipe	Export Domestic Import	80 8 8	Steel Fencing Tires	Wood pulp Fiberboard Plywood	1	3	5	Covered
Vicksburg, Miss.	336	Steel Paper Lumber	Import Export Domestic	50 40 10	Steel Zinc Wire rods	Paper Carbon black Rubber	1	8	10	Covered, tanker
Greenville, Miss.	438	Steel Cotton Glass and Gen. mdse.	Import Export Import	0.5 0.1 0.4	Steel Glass Gen. Mdse.	Cotton Ceiling tile	1	12+	6+	Covered, hopper
Pine Bluff, Ark.	550	N/A	N/A	N/A	Soybeans	N/A	N/A	N/A	N/A	
Little Rock, Ark.	596	Bauxite ore Lumber Steel	Import Export Import	50 10 5	Steel Hardboard	Lumber	2	20	12	Covered
Helena, Ark.	564	N/A	N/A	N/A	Soybeans Rice	N/A	N/A	N/A	N/A	Covered
Memphis, Tenn.	637	Steel Caustic soda (liquid) Electrodes	Imp.,Dom. Domestic Imp.,Dom.	40 25 15	Steel Machinery Household Gds.	Cotton	3	25	12	Covered, Tanker
Fort Smith, Ark.	782	N/A	N/A	N/A	Steel	N/A	N/A	N/A	N/A	
Muskogee, Okla.	864	Iron & steel Newsprint Fertilizer	Imp.,Dom. Imp., Dom. Imp., Dom.	10 20 9	Iron & Steel	Peanuts	1	6	6 active 11 inactive	Covered, open
Tulsa-Catoosa, Okla.	916	Steel Peanuts	Import Export	N/A N/A	Steel	Peanuts	2	33	17	Covered

TABLE 63--Continued

INLAND PORT / LASH/SEABEE Traffic Status & COASTAL REGION	# Waterway Miles From Nearest Seaport	Major Overall: Items	Major Overall: Type	Cargo Items % of Total Volume	Major LASH/SEABEE Barge Cargo Items: Import	Major LASH/SEABEE Barge Cargo Items: Export	Number of Serving Inland Transport Modes: Rail-Roads	Number of Serving Inland Transport Modes: Truck-lines	Number of Serving Inland Transport Modes: Barge-lines	Most Competitive Barge Types: First and Second
Granite City, Ill.	1,050	Grain Fertilizer Soda ash	Imp.,Dom. Export Domestic	60 30 10	N/A	N/A	1 connect with 7	165	N/A	Covered, tanker
Nashville, Tenn.	1,104	Non-metallic mineral Gasoline Kerosene	N/A N/A N/A	33 35 8	Steel	N/A	2	7	3	Covered, hopper
St. Louis, Mo.	1,053	Steel Sugar	Export Export	50 20	Steel Sugar	Mfgd. Gds.	N/A	N/A	N/A	Covered
Chicago, Ill.	1,303	Iron & steel products, Whole grains Grain Mill products	Import Export Export	35 29 15	Steel Cocoa beans Mfgd. prod.	Grain Petroleum products Chemicals	16	837	9	Hopper, covered
Rock Island, Ill.	1,355	Dicalcium phosphate, Fertilizer, Lumber and steel	Domestic Domestic Import	75 20 5	Steel	N/A	1	15	8	Covered
Kansas City, Kansas	1,433	Bulk fert. Bulk salt Iron & steel	Domestic Domestic Dom.,Exp.	70 20 10	Tea	N/A	N/A	N/A	4	Covered, hopper
Functional Inland Ports:										
EAST COAST:										
Searsport, Maine		Newsprint Woodpulp Tapioca flour	Export Export Import	50 25 25	none	Newsprint	1	6	0	
Albany, New York		Grain Molasses Bananas	Export Import Import	50 15 12	Motorcycles	N/A	2	20	3	Deck, hopper
Brunswick, Georgia		Caustic soda Gypsum rock Petroleum products	Import Import Domestic	27 18 33	N/A	N/A	N/A	N/A	N/A	N/A

TABLE 63--Continued

INLAND PORT / LASH/SEABEE Traffic Status & COASTAL REGION	# Waterway Miles From Nearest Seaport	Major Overall Items	Major Overall Type	Cargo Items % of Total Volume	Major LASH/SEABEE Barge Cargo Items: Import	Major LASH/SEABEE Barge Cargo Items: Export	Number of Serving Inland Transport Modes: Rail-roads	Truck-lines	Barge-lines	Most Competitive Barge Types: First and Second
GULF COAST:										
Pensacola, Fla.		Liquid sulphur Fuel oil Paper	Domestic Import Export	29 17 13	Steel	Rosin	2	10	0	
Panama City, Fla. Beaumont, Texas Orange, Texas Brownsville, Texas		See Minor Seaports Cargo Types, Table 48								
Brownsville, Texas		Oil Ores Grains and Misc.	Import Import Export	70 15 15		Cotton linters	3	6	12	Covered, tanker
Port Arthur, Texas		See Minor Seaports Cargo Types, Table 48								
Corpus Christi, Texas		Oil Grain } Cotton }	N/A N/A N/A	75 25	N/A	N/A	N/A	N/A	N/A	
WEST COAST:										
Stockton, Calif. (barge only)		Molasses Grain Safflower seed	Import Export Export	38 17 10	Grain	Grain Safflower seed Beet pulp	3	186	N/A	Covered
Sacramento, Calif.		Wood chips Rice Alfalfa	Export Export Export	30 30 7		Rice Potash	3	N/A	1	Deck, covered
Astoria, Oregon Vancouver, Wash. Longview, Wash.		See Minor Seaports Cargo Types, Table 48								
"Expecting LASH SEABEE Within 3 Years" Geographic Inland Ports:										
EAST COAST:					(expected)					
Bay City, Michigan	950	Limestone Coal Sand & gravel	Domestic Domestic Domestic	41 22 10	Chem.prod. Textiles Fab. metal products	Chem.prod. Navy beans Plastic materials	3	N/A	0	Covered, tanker

TABLE 63--Continued

INLAND PORT / LASH/SEABEE Traffic Status & COASTAL REGION	# Waterway Miles From Nearest Seaport	Major Overall Items	Major Overall Type	Cargo Items % of Total Volume	Major LASH/SEABEE Barge Cargo Items: Import	Major LASH/SEABEE Barge Cargo Items: Export	Number of Serving Inland Transport Modes: Rail-roads	Truck-lines	Barge-lines	Most Competitive Barge Types: First and Second
GULF COAST:										
Paducah, Ky.	817	Petroleum products	Domestic	60	Chemicals	Chemicals	2	10	5	Covered, hopper
					Carbon electrodes	Paper				
		Chemicals	Domestic	25						
		Metal and metal prod.	Domestic	15	(expected)					
East St. Louis, Ill.	1,053	Ore	N/A	50	Steel	Lumber	1	N/A	N/A	Hopper
		Salt	N/A	30		Pipe				
		Fertilizer	N/A	20	(expected)					
Cincinnati, Ohio	1,382	Petroleum products	Domestic	40	N/A	N/A	6	15	10	
		Coal	Domestic	15						
		Stone & gravel	Domestic	9						
Omaha, Nebraska	1,683	Fertilizer	Domestic	60	unknown (expected)		1	7	4	Covered, hopper
		Salt	Domestic	20						
		Steel	Export	10						
Sioux City, Iowa	1,780	Fertilizer	Domestic	30	N/A	Ferrous phosphate	1	12	5	Covered, tanker
		Salt-dry bk.	Domestic	20						
		Grain and grain prod.	Export	30		Grain (expected)				
WEST COAST:					(expected)					
Pasco, Washington	330	Petroleum	Domestic	69	Agri. mach.	Peas/lintels	1	7	3	Tanker, covered
		Grain	Export	29	Agri. supp.	Hay cubes				
		Paper prod.	Import	2	Misc. Gen. cargo	Grain				
Functional Inland Ports:										
GULF COAST:										
Bay St. Louis		Minerals	Import	25	N/A	N/A	1	4	5	Hopper
		Wood prod.	Imp.,Exp.	25						
		Steel	Import	50						
WEST COAST:										
Anancortes, Wash.		Logs	Export	65	N/A	N/A	1	3	1	
		Can. salmon	Domestic	20						
		Lumber	Export	15						

TABLE 63--Continued

INLAND PORT / LASH/SEABEE Traffic Status & COASTAL REGION	# Waterway Miles From Nearest Seaport	Major Overall		Cargo Items % of Total Volume	Major LASH/SEABEE Barge Cargo Items		Number of Serving Inland Transport Modes			Most Competitive Barge Types
		Items	Type		Import	Export	Rail-roads	Truck-lines	Barge-lines	First and Second
"Expecting LASH/SEABEE Within 5 Years" Geographic Inland Ports:										
EAST COAST:										
Ogdenburg, New York	120	Baler twine	Import	25	N/A	N/A	1	9	0	
		Powdered milk	Export	15						
		Coffee and cocoa	Import	15						
GULF COAST:										
Dardanelle, Arkansas	680	Corn	Import	N/A	N/A	N/A	1	3	9	
		Beans	Imp.,Exp.	N/A						
		Fertilizer	Import	N/A						
Minneapolis, Minn.	1,724	Coal	Domestic	27	N/A	N/A	1	8	10	
		Salt	Domestic	19						
		Linseed oil	Export	13						
Leetsdale, Penn.	1,839	Syn. rubber	Domestic	30	N/A	N/A	1	25	6	
		Fertilizer	Domestic	20						
		Newsprint	Domestic	20						
Functional Inland Ports:										
WEST COAST:										
Olympia, Wash.		Logs	Export	100	N/A	N/A	N/A	N/A	0	
"Not Expecting LASH/SEABEE" Geographic Inland Ports:					% of Total Cargo Shippable Via LASH/SEABEE					
EAST COAST:										
Rochester, New York	400	Cement	N/A	55	30		1	30	0	
		Salt	N/A	30						
		Newsprint	N/A	5						
Cleveland, Ohio	600	Unfinished steel	{ Import	80	90		3	130	0	Common carriers
			Export	20						
		Minerals and ores	Import	9						
		Machinery	{ Import	70						
			Export	30						

TABLE 63--Continued

INLAND PORT / LASH/SEABEE Traffic Status & COASTAL REGION	# Waterway Miles From Nearest Seaport	Major Overall Items	Major Overall Type	Cargo Items % of Total Volume	% of Total Cargo Shippable Via LASH/SEABEE	Number of Serving Inland Transport Modes: Rail-roads	Truck-lines	Barge-lines	Most Competitive Barge Types First and Second
Detroit, Michigan	800	Iron ore	Dom., Imp.	34	100	12	200	6	
		Coal	Domestic	29					
		Limestone	Domestic	20					
GULF COAST:									
Guntersville, Arkansas	1,275	Steel	Domestic	75	20	1	7	6	
		Caustic soda	Domestic	20					
		Crude oil	Domestic	5					
Clinton, Iowa	1,391	Salt	Domestic	30	75	1	4	12	
		Soybean meal	Export	25					
		Petroleum	Domestic	25					
Winona, Minn.	1,596	Small grain	Export	70	80	4	7	10 approx.	
		Fertilizer	Domestic	15					
		Salt	Domestic	15					
Nebraska City, Neb.	1,630	Fertilizer	Domestic	70	100	2	4	3	
		Molasses	Import	20					
		Steel	Import	10					
Functional Inland Ports:									
EAST COAST:									
Portland, Maine		Crude oil	Import	83	1	3	25-30	0	
		Refined oil	Dom.,Imp.	16					
		Can. sardines	Import	1					
Richmond, Virginia		Tobacco,raw	Import	20	75	5	50	0	
		Paper, paperboard	Export	15					
		Coal by-prod.	Import	15					
WEST COAST:									
Bellingham, Washington		Logs	Export	34	10	2	5	2	Deck
		Industrial chemicals	Export	25					
		Salt	Import	24					

TABLE 64

U.S. INLAND PORTS WITH NO LASH/SEABEE TRAFFIC, EXPECTATIONS OR POTENTIAL--MAJOR OVERALL CARGO ITEMS, WATERWAY MILES FROM NEAREST SEAPORT, AND INLAND TRANSPORT MODE AVAILABILITIES

INLAND PORT / COASTAL REGION	# Waterway Miles From Nearest Seaport	Major Overall Cargo Items: Item	Type	% of Total Volume	Number of Serving Inland Transport Modes: Railroads	Trucklines	Bargelines
Geographic Inland Ports:							
EAST COAST:							
Buffalo, New York	400	Steel coils	Domestic	60	6	N/A	1
		Flour	N/A	20			
		Mfgd. goods	N/A	20			
Lorain, Ohio	650	Iron ore pellets	Domestic	50	2	3	0
		Coal	Domestic	40			
		Stone	Domestic	10			
Huron, Ohio	680	Iron ore	N/A	75	2	20	N/A
		Limestone	N/A	22			
		Grain	N/A	3			
Toledo, Ohio	750	Coal	Exp., Dom.	61	6	101	2
		Iron ore	Imp., Dom.	22			
		Grain	Exp., Dom.	10			
Monroe, Michigan	790	Coal	Domestic	65	2	many	1
		Salt	Import	32			
		Misc.	Import	3			
St. Joseph, Michigan	900	Aggregate	Import	65	1	6	2
		Cement	Import	20			
		Petroleum	Import	15			
GULF COAST:							
Harvey, Louisiana	3	Oilfield pipe	Domestic	90	1	10+	5
		Oilfield pipe	Import	5			
		Structure steel	Import	2			
Shawneetown, Illinois	996	Grain	N/A	70	2	N/A	5
		Coal	N/A	30			
Decatur, Alabama	1,221	Cast iron pipe	Domestic	100	1	1	2
Conneaut Harbor, Ill.	1,300	Coal	Export	54	1	0	0
		Iron ore	Import	42			
		Stone	Import	4			
Waukegan, Illinois	1,350	Gypsum	N/A	N/A	N/A	N/A	N/A
		Cement	N/A	N/A			

TABLE 64--Continued

INLAND PORT / COASTAL REGION	# Waterway Miles From Nearest Seaport	Major Overall Cargo Items: Item	Type	% of Total Volume	Number of Serving Inland Transport Modes: Railroads	Trucklines	Bargelines
Milwaukee, Wisconsin	1,400	General cargo Bulk grain Heavy lifts and steel	N/A N/A N/A	45 42 15	5	363	2
Holland, Michigan	1,400	Coal-coke Aggregates Scrap iron	Domestic Domestic Export	43 42 15	1	14	0
Sheboygan, Wisconsin	1,450	Oil Coal Grain	N/A N/A N/A	N/A N/A N/A	1	10	0
Dubuque, Arkansas	1,452	Fertilizer Molasses Animal fats	Domestic Domestic Domestic	30 25 15	3	10	4-5
Port Amherst, West Va.	1,547	Coal Stone Aggregate	Domestic Domestic Domestic	N/A N/A N/A	N/A	N/A	N/A
Green Bay, Wisconsin	1,650	Coal Petroleum prod. Cement	Domestic Domestic N/A	60 12 9	3	20	1
Wheeling, West Virginia	1,662	Coal Sand & gravel Misc. steel	Domestic Domestic Domestic	50 40 10	2	N/A	N/A
Pittsburgh, Pennsylvania	1,390	Fabricated steel Steel from mills	Domestic Domestic	95 5	1	8	4
New Kensington, Penn.	1,853	Rock salt Fluorspar Ferro-alloys	Domestic Imp., Dom. Imp., Dom.	60 25 15	1	18	4
Donora, Pennsylvania	1,890	Sand Gravel Coal	Domestic Domestic Domestic	N/A N/A N/A	N/A	N/A	N/A
Point Marion, Penn.	1,943	Sand Gravel Coal	Domestic Domestic Domestic	N/A N/A N/A	N/A	N/A	N/A
Ashland, Wisconsin	2,000	Coal Limestone Logs	Domestic Domestic Domestic	95 1 5	3	1	0

TABLE 64--Continued

INLAND PORT / COASTAL REGION	# Waterway Miles From Nearest Seaport	Major Overall Cargo Items: Item	Type	% of Total Volume	Number of Serving Inland Transport Modes: Railroads	Trucklines	Bargelines
Functional Inland Ports:							
EAST COAST:							
New London, Conn.		Hemp	Import	40	2	8	0
		Plywood	Import	25			
		Wood pulp	Import	15			
Alexandria, Virginia		Newsprint paper	Import	98	6	N/A	N/A
		Paper products	Export	1			
		Plywood	Import	1			
Palm Beach, Florida		Fuel oil	Import	60	1	10	3
		Gen. cargo	Export	22			
		Bulk cement	Import	18			
Fort Pierce, Florida		Aragonite	Import	58	1	2	1
		General cargo	Export	21			
		Silica sand	Export	18			
GULF COAST:							
Texas City, Texas		Bulk oil	Imp., Exp., Domestic	70	6	6	many
		Bulk chemicals	Imp., Exp., Domestic	28			
		Miscellaneous	Imp., Dom.	2			
WEST COAST:							
Coos Bay, Oregon		Chips	Export	60	1	3	4
		Lumber	Export	25			
		Logs	Export	5			
Everett, Washington; Gray Harbor, Wash.; Willapa Harbor, Wash.		See Minor Seaports Cargo Types, Table 48					
Walla Walla, Washington		Grain	Export	100	1	5	2

CHAPTER V

SUMMATION OF STUDY

Summary and Conclusions

Introduction

This study's purpose was to increase the organized knowledge of bargeship systems in the United States. A comprehensive, organized compilation and presentation of all recent literature relating to these new systems was made. This information was then combined with analyses which compared bargeship systems to the other two major general cargo vessel systems, containerships and conventional ships, and determined bargeship system's to-date and anticipated impacts on the nation's seaports and inland ports.

Secondary Research

Much valuable secondary data was gathered in the literature search which was useful in later analyses of primary research data. This information indicated how bargeship, containership and conventional ship systems relate to each other, the nation's ports, its inland transport modes, and the external variables of labor and government. The trade literature was thoroughly canvassed and cited where relevant. In addition, several related government sponsored and/or conducted studies were discussed extensively, and certain individual's relevant research were also cited.

Primary Research

The study's primary research utilized hypotheses tests as a major vehicle for gathering data, but the study's questionnaires went far beyond those tests regarding information sought for and obtained. This information was in the form of both facts and opinions supplied by the nation's ports. It is summarized and utilized, along with the above-mentioned secondary data, in the drawing of conclusions in the remainder of this chapter.

Hypotheses Tests and Related Information

The study's null hypotheses were that there: (1) is no difference in major seaport investments required to implement bargeship versus containership and conventional ship systems, (2) has been no effect on the international cargo traffic expectations of U.S. inland ports because of bargeship systems, and (3) is no difference in the relative utilization of the above three vessel systems on the U.S. East, West and Gulf Coasts. The tests of these hypotheses were part of a larger inquiry into the overall impacts of bargeship systems on the nation's ports. Other information gathered was discussed either with hypothesis test data when related, or in separate analyses in other sections.

Hypothesis 1

The tests of the seaport hypothesis regarding implementation investments required by major U.S. seaports for general cargo vessel systems found containership system requirements to be the greatest by far. On an absolute, direct cost basis, these amounted to about $990 million, with $693 million of this being made or committed over the last decade, during which time such systems have received their major implementation.[1] In addition, $297 million is planned by these ports for containership systems over the next five to seven years. Bargeship system requirements were found to be smallest, amounting to about $49 million to-date and about $16 million planned over the same periods. Conventional system requirements over the last decade were approximately $380 million, with $107 million planned over the next five to seven years, for a $487 million total.

Even when bargeship and conventional ship system's costs are combined under an assumption that conventional ship system costs are indirectly costs of bargeship systems because of the latter's usage of the former, the gap between their combined last decade to-date, future, and overall totals and those of containerships amount to hundreds of millions of dollars. Some such allocations probably are in order, because of study results indicating numerous common usages of new conventional ship system facilities by bargeship systems. Similarly, five ports indicated bargeship system common usages of containership system facilities. On the other hand, bargeship systems were often found to use conventional ship systems facilities older than 10 years, representing "sunk" costs not allocable to bargeship systems as indirect costs.

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[1]Implementation investments were analyzed using both absolute dollar investment costs and investment costs relative to each vessel system's share of total general cargo volumes. Absolute dollar seaport investment costs were utilized because the Literature Search chapter showed that expensive, specialized facilities were required for even small, initial containership system movements, whereas limited bargeship system volumes required no such investments. These facts indicated probable differences in the required scales of implementation for the two systems, which absolute costs could analyze. Implementation investments were also analyzed relative to vessel system shares of total general carge because an important measure of the comparative efficiency of investments is their relative degree of utilization.

Nevertheless, even when bargeship systems received maximum, and probably overstated, allocation of conventional ship implementation costs combined with appropriate allocation of the costs of jointly used containership facilities at these ports, their requirements were found to be $387 million less than those of containerships. Therefore the first hypothesis which asserted no difference in the investment requirements of the three vessel systems under any conditions, was disproved on both a direct absolute cost basis and on a direct plus indirect absolute cost basis. Regarding direct costs, critical information for virtually the complete population of 25 major seaports was obtained, while a minimum of 68 percent of the population responded to indirect cost questions.

On a direct cost basis, bargeship system implementation investments were also found to be considerably less than those of containerships relative to shares of total general cargo volumes. Bargeship systems were found to have 6.2 percent of estimated 1973 total general cargo vessel volumes while receiving 4.4 percent of the last decade's major seaport direct investments in general cargo facilities. Containership systems' volume share was estimated at 36.9 percent versus 61.8 percent of total direct investment costs. The one analysis which indicated roughly equivalent bargeship and containership system implementation investments was when appropriate conventional ship and containership investments commonly used by bargeships were allocated to the latter as indirect costs and compared with relative bargeship and containership shares of total general cargo volumes. In this instance, the direct plus indirect bargeship system investments totaled $102.4 million, or 9.1 percent of the last decade's general cargo facilities investments, while the system's share of such cargo volumes is currently 6.2 percent. The containership system shares of 60.3 and 36.9 percent of investments and cargo volumes, respectively, are in approximately the same ratio. Only in this case can the first hypothesis be considered approximately correct, while in all other cases it was disproven.

It should be noted also that both conventional ships as an implemented system per se and future comparisons were excluded from the relative analyses, because conventional ship systems have basically been sustained rather than implemented over the last decade, and no concrete, future, long-ton volume figures were available for total U.S. comparisons, respectively. The point was made, however, that $297 million in major seaport investments are planned through 1980 for containership systems, whereas only $16 million is planned for bargeship systems for the same period, with these investments planned on the Gulf Coast for bargeship systems, where they are expected to grow most. In addition, while on relative scales containership and bargeship direct plus indirect implementation investments are roughly equal, bargeship systems need not exist on the same massive scale, either in terms of investments or volumes to sustain such investments, as containership systems. This will be discussed further in the Implications section of this chapter.

Hypothesis 3

The other seaport hypothesis, which in the null form asserted no difference between the relative utilization of bargeship systems by the major seaports of U.S. East, West, and Gulf Coasts, was also disproved.

This was determined by comparing the total bargeship volumes of these three coasts over the last three years. Since the Gulf Coast bargeship system volume was found to be estimated at about 3,500,000 long-tons, representing 19.8 percent of total volume on the Gulf Coast, versus about 1,000,000 each on the East (2.2 percent) and West (3.8 percent) Coasts, with data based on a complete enumeration of the population, such differences prove greater relative Gulf Coast utilization of such systems. The same patterns, as well as overall bargeship system traffic growth, were found for 1971 and 1972, and were estimated for the future.

The overall bargeship system share of total 1973 U.S. general cargo traffic was found to be 6.2 percent, with the "average" U.S. major seaport having such volume expecting it to be 16.3 percent in 1978 versus 8.1 percent in 1973, of its total general cargo volume. The above average figure should be used with care since it combines large major seaports like Houston with somewhat smaller ones like Charleston. Nevertheless, since the percentage based on the current bargeship system share of total U.S. general cargo tonnages (6.2) is only slightly below the current average share of a port with such traffic (8.1), the above estimate of the future represents a forecast of considerable growth of bargeship system traffic in the United States. In addition, by 1978 bargeship systems are expected to have 22.7 percent of the average Gulf Coast major seaports' general cargo volume, versus 10.5 and 10.3 percent of the average East and West Coast ports' volume, respectively. Current coastal differences in bargeship system utilization are therefore expected to be maintained, while such traffic is expected to increase its share of each coast's general cargo volume.

Similarly, the containership system share of total general cargo was found to be increasing on all three coasts and for the United States as a whole, while the conventional ship system share of such volume was found to be almost universally decreasing. For example, containerships already have the dominant share of total general cargo on the West Coast (55.7 percent), are expected to have a dominant "average" share at East Coast (46.1 percent) ports with such traffic by 1978, and are expected to roughly equal the average share (about 43 percent) of conventional ships at all U.S. major seaports having both of these forms of traffic by 1978.

Special Definitions

Minor U.S. seaports, those defined by the study as located on the surveyed U.S. coastlines but having less than one million long-tons of current general cargo volume, were treated as functional inland ports in the test of the second hypothesis, which is summarized next. These ports and their insufficient relevant volumes and/or facilities were judged by the author, as they have been almost universally viewed by containership and bargeship operators, as not viable ports-of-call for their motherships. Since bargeship operators have functionally treated these ports as inland ports by serving them with towed barge operations, they were defined as such by the author.

In the same vein, the nation's inland terminals were included in the inland port population because questionnaire pre-test results indicated that public inland port authorities either did not exist at many locations with substantial relevant traffic or if they did exist, did so side-by-side with inland terminal companies of whose records they had no knowledge. Since these terminal companies act as basically "private" ports, they were defined as inland ports for this study.

Hypothesis 2

The test of the inland port hypothesis, while indicating no or little effect on the international traffic expectations of the inland port (terminal) population as a whole, did indicate a significant effect on 19 of the population of 221 inland ports (terminals). These 19 respondents answered "yes," they did expect their international cargo traffic to significantly increase as a result of bargeship systems. Therefore, while these 19 represent only a minimal 8.6 percent of the population and 17 percent of the sample size of 112, they disprove the second hypothesis which in the null form asserted no such changes in expectations.

The fact that such expectations are not a generalized phenomenon for this population was underscored by the fact that 31 of the 68 respondents indicating they did not expect bargeship system traffic within three years estimated their probabilities against getting such traffic at 90 percent or more, seven at 70 percent or more, and only two at 50 percent. The rest of this group did not estimate such probabilities, but provided statements indicating very high probabilities.

Additionally, the survey indicated that 54 respondents, or 48 percent of the sample and 24 percent of the population, have or expect bargeship system traffic, with 36 of the 54 already having experienced such traffic. The 16 of these 36 which were geographically inland and found to have such traffic were found to consist of roughly equal numbers of small sub-regional and large regional inland ports. Further, the 1973 bargeship system traffic at the responding U.S. inland ports (terminals) is estimated for 1973 at about 1,220,000 long-tons, up from 822,000 long-tons in 1972. In addition, this traffic is estimated at maximums of about 2,500,000 long-tons for 1978 and 4,000,000 long-tons in 1983. Therefore, while a small percentage of the population answered "yes" to whether they expected significant increases in their international traffic volumes because of bargeship systems, the total of all respondent maximum volume expectations for the next decade amount to considerable tonnages.

Comparisons were also made between inland port (terminal) recent volume, expectations, and estimates of potential for bargeship barges versus international containers on conventional barges and "mini-containerships," with bargeship barges showing far higher ratings in all categories by most respondents. Comparisons of these factors by respondents concerning bargeship systems versus non-containerized international cargo via conventional barges at geographic inland ports (terminals) and via conventional ships at functional and Great Lakes geographic inland ports (terminals) showed both of the latter modes generally rated more favorably than bargeship barges.

Two inland ports located quite near New Orleans on the Mississippi already have indicated realization bargeship system potentials on a large scale already. These were Vicksburg and Natchez, Mississippi. Vicksburg now handles approximately 350,000 long-tons per year in bargeship barge cargoes, and expects their annual volume to rise to a maximum of 600,000 long-tons in 1978 and a maximum of 900,000 in 1983. Natchez has a 205,000 current long-ton bargeship barge volume and expects a slower growth rate, reaching a maximum annual volume of 250,000 long-tons by 1983.

Inland Waterway Locations of Doubtful Status

Finally, a group of 209 inland waterway locations of doubtful status were surveyed, with responses from 109 (a 52 percent sample) indicating the vast majority of them have only private docks, if any. Moreover, 49 of the respondents had no traffic at all and an additional 39 of them had no bargeship system traffic or expectations thereof, with most of these handling domestic cargo items like coal, sand, and gravel. This group was therefore excluded from the inland port (terminal) population.

Opinion Analyses and Other Related Information

Three additional analyses were then made of the questionnaire results, and results of the Literature Search and hypotheses tests were combined into these analyses in order to identify probable factors influencing bargeship systems. These identifications were made regarding factors which appear to affect bargeship system performance by coastal region and at certain categories of seaports and inland ports. Factual data was emphasized in the former analysis, while port opinions were stressed in the latter analyses.

Overall Coastal Region Analyses

The results of the overall coastal region analyses indicated total waterway miles of a region as probably the single most influential factor for bargeship systems, with the favorability of this influence increasing with the amount of such mileages available to bargeship barges. Hypotheses test data were presented comparing the approximate 3,500,000 long-tons current annual volume of the U.S. Gulf Coast with its 14,383 inland waterway miles, versus the approximate 1,000,000 long-ton volumes each of the U.S. East and West Coasts, with their 7,002 and 3,575 inland waterway miles, respectively. This data plus similar, related expectations data lent strong support to many assertations cited in the Literature Search of the superior suitability of the Gulf Coast region for bargeship system traffic. On the other hand, it should be noted that at lower levels of inland waterway mileages, as on the East and West Coasts, this factor did not make a difference in tonnages.

Individual U.S. seaport opinion data were also cited as ranking this factor as favorable, especially when a particular port had large inland waterway mileages connecting with it. Similarly, inland port volume data were found to show the vast majority of geographic inland ports with such volume as being in the Gulf Coast region, whereas the vast majority of inland ports on the other two coasts were shown to be functional inland ports in that hypothesis' test data.

The other main influence on bargeship system traffic by coastal region was found to result from a combination of factors. This combination of factors has apparently also contributed heavily to the far greater acceptance received by bargeship systems in the Gulf Coast region than in the other two regions. These factors are the predominance of agricultural versus non-agricultural commodities in a region's cargo flows, the presence or absence of entrenched, sophisticated containership systems in a region, and the above-mentioned extensiveness of inland waterway networks in a region. Moreover, these factors are interrelated.

The interrelationship between the first two factors on the East and West Coasts was found to be a high proportion of the predominantly non-agricultural items moving internationally through these coasts which was found to be able to be containerized, thus aiding the early development of sophisticated containership systems on these coasts. Conversely, the large proportion of agricultural items moving internationally through the Gulf Coast was found to have inhibited the growth of containership systems there.

As a result of these interactions, sophisticated containership systems became entrenched on the East and West Coasts, and pre-tapped much of the potential cargo volume otherwise available for bargeship systems. On the Gulf Coast, this competitive advantage did not exist for containerships, while bargeships were aided competitively by the massive Mississippi River network, a situation which does not exist on the other two coasts as discussed in preceding pages. Therefore, interrelated factors were found to act in favor of containerships in the East and West Coast regions, and in favor of bargeships in the Gulf Coast region.

Finally, the past, present, and expected volume shares for all coasts reaffirmed Literature Search conclusions that conventional ship shares of general cargo volume were declining universally. Conventional ship absolute volumes were found to be remaining about constant. Studies cited in the Literature Search chapter have long since established the reasons for the volume share declines to be economic.

Seaport Opinion Analyses

Port opinions on factors influencing bargeship systems were analyzed next. No definite rankings were given to either seaport or inland port opinions on these factors, although both sets of opinions were shown on separate summary tables which listed factors according to the patterns of responses on them. Further, each factor was analyzed regarding its response pattern for its relevant population as a whole, as well as its relative position on tables set up for each of a set of categories. These categories included ports located on or inland from the East, West, and Gulf Coasts, and ports with bargeship system traffic, expecting it within three years, and not expecting it within three years.

The summary tables point out the most and least often favored and disfavored items, as well as those with large no effect totals. The seaport summary is based on a minimum of 74 percent of the seaport population responding for any one factor. For seaports the factors most often rated as unfavorable to bargeship systems at their port are the ability of bargeship barges to by-pass port and move directly inland and the cost to construct bargeship system facilities. The ability to by-pass ports factor ratings were supported by estimates of such abilities provided by both individual seaports and by three bargeship operators. Therefore, while this ability was found in the Literature Search chapter to be an optimizing factor for bargeship systems, it only exists to a large degree rarely in the United States. New Orleans was the rare case found in this research, and estimates direct inland flows of bargeship barges at 70 percent now and 50 percent in the future.

The factor most often rated favorably by seaports was port interest in bargeship system traffic which bodes well for these systems. Other factors which were often rated favorably and indicate probable favorable influences on all ocean-shipping systems were as follows, in the order listed:

- Bargeship barge working facilities
- Bargeship operator interest in port
- Bargeship facilities available
- Shipper interest in bargeship system traffic
- Cost to construct containership facilities
- Amount of inland waterways serving individual port.

The differences in the number of favorable responses given these factors was often quite small, and the above list should not be considered an absolute item-by-item ranking, although the factors most often favorably ranked can be considered as more favorably ranked for the nation's seaports than the least often favorably ranked items and the frequent unfavorably ranked ones.

Significant patterns in the port ratings given by categories included low numbers of favorable ratings given bargeship operator interest in port and shipper interest in port by ports not expecting bargeship traffic within three years and those located on the East and West Coasts, respectively. This tends to indicate selective promotional efforts by bargeship operators on the East and West Coast. In contrast, Gulf Coast ports generally more often rated these two factors favorably, although some of them rated bargeship facilities available unfavorably, indicating probably heavy competition from the extensive facilities at New Orleans and Houston. Finally, the port interest factor was rated generally favorable by all categories, while inland waterway miles serving port received far less favorable ratings by individual seaports without extensive serving waterway networks.

Inland Port Opinion Analyses

Responding inland ports ranked most of their factors generally favorable, except for two factors receiving basically unfavorable ratings and two more receiving predominately no effect ratings. Inland port (terminal) ratings were given by a maximum of 43 of them out of the population of 221 for any single factor, so their summary table of opinions should be regarded even more warily than that of the seaports. However, large gaps in numbers of favorable, unfavorable, and no effect ratings can also be considered fairly good indicators of respondent opinions.

Some of the factors given the nation's inland port (terminal) population to rate differed from the seaport factors because of the differences in the situation of the former as determined in the Literature Search and questionnaire pre-tests. The only factor which had more unfavorable than favorable ratings given it by inland ports (terminals) was the number of waterway miles from the nearest seaport. These opinions serve to reaffirm the results of the hypothesis test when analyzed by respondent's inland distances from the nearest major seaport. Such analysis indicated that 31 of the 45 geographic inland ports (terminals) not expecting bargeship system traffic within three years were more than 1,000 miles away from the nearest major seaport. Moreover, these figures would change to 41 of 45 if certain Great Lakes respondents not likely to be served by bargeship systems through the St. Lawrence Seaway in the near future were re-classified as effectively Gulf Coast geographic inland ports (terminals). Additionally, hypothesis test data analyses by distance also indicated that a large distance from a major seaport has not precluded bargeship barge traffic for an inland port (terminal). The geographic inland ports with bargeship system traffic were found to be located at approximately 100 mile increments from each other, up to 1,433 miles inland.

One other factor had enough unfavorable and no effect ratings to exceed favorable ratings and was therefore shown as basically unfavorably rated in the summary table. This was the number of bargeship barges available. This result also provides support for assertions cited in the Literature Search. These assertions were further supported by a post-survey interview which indicated that bargeship operators are finding that they need two sets of barges instead of the anticipated one to serve the inland United States for every ship, and that the cost of these barges has risen dramatically because of increases in the price of Japanese steel.

As might be expected, the factor given the largest number of favorable ratings by inland port (terminal) respondents was their own port volume potential. This factor also had substantial margins of favorable over unfavorable and no effect ratings.

Five other factors which had numbers of favorable ratings somewhat below the port potential factor, but equal or almost equal to each other, were as follows:

- Types of agricultural items produced locally
- Types of non-agricultural items produced locally
- Types of non-agricultural items demanded locally
- Port promotional efforts for bargeship system traffic
- Bargeship operator promotional efforts for bargeship system traffic.

These factors were followed somewhat closely by the following:

- Number of trucklines serving port
- Bargeline promotional efforts for bargeship system traffic.

Finally, the following three factors were tied for the final position for factors with basically favorable ratings:

- Bargeship barge cargo damage ratios
- Bargeship barge cargo rate structures
- Number of railroads serving port.

Two factors showed a predominance of no effect ratings, and these were number of bargelines serving port and type of imported agricultural items demanded locally.

All of the factors were analyzed not only according to the aforementioned coastal and bargeship system traffic status categories, but also over time, since many respondents did rank each factor for the past, present, and future. Regarding these analyses of ratings, perhaps the most significant results were the ratings given bargeship barge cargo damage ratios and rate structures by ports with such traffic. These ratings were quite high over all three time periods, indicating that these factors, while low on the overall list of favorable rated items, seem to have a strong positive reaction at ports in the position of having experienced bargeship system traffic.

Port and bargeship operator promotional efforts were similarly given substantial majorities of favorable ratings for all time periods by ports with such traffic. Bargeline promotional efforts were given increasing numbers of favorable ratings over time, especially by Gulf Coast ports and those with bargeship system traffic. On the other hand, East Coast ports and those without such traffic show all promotion efforts receiving mainly no effect ratings for the past and current time periods, and only a slight margin of favorable ratings over no effects in the future. These results tend to indicate rather selective though probably increasing promotional efforts by these three parties over time.

The types of cargo items which were generally rated favorably tended to show similar patterns of increased favorability over time in all categories except ports not expecting bargeship system traffic, where no effect and unfavorable ratings each equaled favorable ratings over time. This tends to indicate that type of cargo items have a basically mixed effect as a whole on bargeship system traffic, varying with the particular items handled at a particular location.

The numbers of railroads and trucklines, while generally rated favorably, were shown by factual information to vary considerably regardless of whether or not a location has bargeship traffic. Ports (terminals) with such traffic do tend to have at least three bargelines, however. A lack of cooperation of railroads regarding rate structures, however, was mentioned by a questionnaire respondent, as well as in a post-survey interview and in the Literature Search.

To the list of factors which influence bargeship system traffic should be added certain ones discussed in the Literature Search and "others" added by questionnaire respondents. Unanimous opinions, even those of unions, regarding the strong unfavorable influence of longshoremen's unions on bargeship systems, as well as containership systems were cited in the Literature Search. This factor, moreover, related to all ports rather than individual ones. Similarly, the strong mixed effects, some favorable, some unfavorable, of government actions related to all ports, and was covered in depth in the Literature Search. In addition, a West Coast major seaport respondent cited the favorable effect of Far East trading partners on bargeship system traffic at its port, while a minor Gulf Coast port cited the lack of sufficient cargo volumes to attract bargeships as an unfavorable factor at its port. Finally, many Great Lakes inland ports cited the rough storms and regulations against multiple barge tows of the Great Lakes, as well as general lack of bargeship system service to the Great Lakes, as unfavorable factors at their ports.

Functional inland ports (minor seaports) response levels were small on opinion questions, having a negligible effect on the inland port results while showing roughly the same patterns as major seaport results. Finally, inland port (terminal) opinions were noted generally to increase in favorability over time.

Investments made by responding inland ports (terminals) were found to be both small and intended to increase overall traffic, not specifically that of bargeship barges, with few exceptions.

The main form of other information gathered by the survey was presented in the form of listings of major cargo types, overall and by bargeship systems and other general cargo vessel systems at responding seaports and inland ports (terminals).

Implications

United States Foreign Policy

One of the major areas in which this study has implications is for United States foreign policy. The Gulf Coast region, with its large numbers of inland waterways, large agricultural share of international cargo flows, and lack of developed, expensive, and sophisticated containership systems was found to be experiencing the greatest level of acceptance and utilization of bargeship systems. Therefore, aiding in the development of bargeship systems at countries with situations similar to that of the Gulf Coast appears to be a potentially quite fertile area for United States foreign policy.

Although such action could be asserted to be discriminatory against containership and conventional ship systems, it is likely that the former is just inappropriate for many smaller, poor, predominantly agricultural foreign coastal countries, and objective containership operators might just agree to not oppose such economic aid given some of their statements cited in the Literature Search. In addition, many containership operators also operate bargeships.

Furthermore, such economic aid, as indicated by the relative seaport investment requirements of bargeship systems versus those of containership systems would require minimal dollar investments compared to those required for implementation of containership systems. In fact, for countries with substantial inland waterway networks, because bargeships need not dock, such aid could consist largely of small cranes and other handling equipment for both seaports and inland ports. Such equipment has recently been made available as military surplus items by the cessation of the Vietnam war. Seaports with natural deep drafts would also need no more than the above equipment. Shipping experts analyzing the cargoes of such countries in terms of potential international bargeship system movements could be another form of such aid.

Finally, any equipment aid to underdeveloped country seaports would also aid conventional ship systems since they and bargeships utilize the same port handling equipment. Of course, the above recommendations for aid do not preclude these countries developing such systems on their own as much as possible, and no doubt the shiplines cited in this research as having operations to South America, for instance, are no doubt active in this respect.

United States Domestic Policies

Regarding United States domestic policies, the first point which should be made is that this study did not compare the merits of barges, bargeship or conventional, with those of railroads or trucklines. Hence, no recommendations are made favoring one of these three over the others. Instead, the study looked at the effect of bargeship systems on ports, and the implications of this research lie mainly in this area.

The first domestic policy implication of this research lies in confirmation of the merits of the direction of this policy. The Merchant Marine Act of 1970, through spurring the construction of both containership and bargeships as shown in this study, has led to a more economic handling of cargo on the continental U.S. coastline through the growth of their shares of general cargo as documented here.

Similarly, the loan guarantees given for the construction of barges, bargeship and conventional, has helped at least somewhat to encourage the development of this mode. Whether such action on behalf of railroads and/or trucklines is needed in the form of passage of the Surface Transportation Act of 1973 is for legislators to decide according to the results of studies in that particular area.

On the whole, however, United States domestic policy seems to be heading in the right direction as regards the development of both bargeship and containership systems. Active cooperation of customs officials and improvements in customs procedures were also cited in the study. Similarly, the Interstate Commerce Commission (ICC) and Federal Maritime Commission (FMC) have both been shown to be working toward resolving their jurisdictional disputes over regulation of such systems. Still, considerable progress in this area, particularly regarding through bills of lading, is needed.

In addition, the establishment of Free Trade Zones in places like Kansas City and Little Rock, which were cited in this study, should also do much to encourage the foreign trade of these areas. Similarly, this study indicates that the economy as a whole will be benefitted if the recommendations of the Maritime Administration (MA) for the establishment of regional port commissions is followed. Study results do not give blanket concurrence to the MA recommendation for cessation of federal funds for seaport construction until 1985 since ports such as Panama City, Florida, might be able to make excellent use of such funds.

One particular area which appears to need domestic legislation, according to the results of this study, is regarding unions. While union bargaining rights must not be neglected, it would seem that there should be some way of encouraging longshoremen's unions not to inhibit the development of efficient containerization systems, both bargeship and containership, as they have been shown to do in the past.

Other Implications

Finally, one area where some local governments can aid their economies is in the fostering of foreign trade seminars such as that cited as being held in Kansas City. Similarly, the fostering of promotional efforts in general by their local ports or terminals and/or their Chambers of Commerce could help make local businessmen aware of new developments in international trade opportunities. While this study showed that significant international trade increases because of bargeship systems are and are expected to be a selective phenomenon, such activities could increase the pervasion of such growth in the future.

In conclusion, a major implication of this study is that whatever questions any individual or organization might have on how bargeship systems effect or are expected to effect the nation's ports, they should be able to use this study as a useful reference source.

Recommendations for Further Research

Inland Transport Mode Research

The first recommendation for further research is in the inland transport mode area. The introduction of bargeship systems and their barges have added a new dimension to competition between barges, railroads, and trucklines. Further, lack of cooperation by railroads regarding rate adjustments and disinterest by trucklines in the development of international shipping systems were cited in this study. The author did not pursue these complaints any further in the interests of manageability of the study, but it would appear that some objective investigation of the competitive situation between these modes as regards international trade would be useful. Such an investigation could probably do much to aid government policy regarding the impact of these modes on international trade.

Follow-Up Study

Another research recommendation of this study is for a similar follow-up study in 1978 which would compare actual cargo volumes with those currently expected by the nation's major seaports and its inland ports (terminals). Such a study could evaluate the further growth of bargeship and containership systems, as well as how close port (terminal) expectations came to predicting reality. Expectations could also be asked in 1978 and evaluated using the level of accuracy of 1973 expectations.

Bargeship System Private User Research

Finally, a more current research recommendation is for a study of the current bargeship system volumes and expected volumes of private users of this system. The example of Dow Chemical's major usages of this system in Freeport, Texas indicated this to be another major, non-public port form of acceptance of these systems, which might indeed prove a fertile area of investigation. While finding such private users might indeed be a problem, particularly because of bargeship operator reluctance to divulge competitive information, inquiries at the nation's inland ports and other river towns might enable development of a fairly comprehensive listing of such firms. Moreover, once such firms were known, their cooperation regarding their bargeship system volumes would probably be quite high, since divulging such information would probably not be harmful to their competitive positions.

APPENDICES

APPENDIX A

U.S. MAJOR SEAPORTS ADDRESSES LIST, PRELIMINARY AND COVER LETTERS, AND QUESTIONNAIRE SET

APPENDIX A

U.S. MAJOR SEAPORTS ADDRESSES

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MICHIGAN STATE UNIVERSITY EAST LANSING • MICHIGAN 48823

GRADUATE SCHOOL OF BUSINESS ADMINISTRATION
DEPARTMENT OF MARKETING AND TRANSPORTATION ADMINISTRATION • EPPLEY CENTER

In a few days you will be receiving a set of questionnaires. This letter is intended to notify you in advance that you should not be overly concerned about the size or weight of the envelope they arrive in, since you will only be asked to answer one of the four questionnaires inside--the one appropriate for your port.

The purpose of the questionnaire will be explained in the letter which will accompany it. Thank you for your time and consideration.

Sincerely yours,

K. M. Bertram

MICHIGAN STATE UNIVERSITY EAST LANSING · MICHIGAN 48823

GRADUATE SCHOOL OF BUSINESS ADMINISTRATION
DEPARTMENT OF MARKETING AND TRANSPORTATION ADMINISTRATION · EPPLEY CENTER

First, please note that you are only being asked to fill out one of the four enclosed questionnaires. Please answer the one questionnaire whose title describes your port's relationship (or lack thereof) with bargeship systems.

This survey's overall purpose is to compare the new bargeship systems with those of containerships and conventional ships on the U.S. East, West, and Gulf Coasts. Previous communications during the construction of the questionnaires and development of port listings have secured the solid interest, support, and inputs of the cited individuals in the U.S. Dept. of Transportation (Dr. John Hazard, Assistant Secretary for International Policy), the Office of Ports and International Systems (Mr. Armour C. Armstrong, Chief) in the U.S. Maritime Administration, the Association of American Port Authorities (Mr. Paul A. Amundsen, Executive Director) which mentions this survey in its May 28, 1973 weekly bulletin and the Virginia Port Authority (Mr. John Hunter, Director of Research).

Since you will be sent a copy of the survey's results, broken down by coastline, answering the questionnaire and returning it should enable you to increase your knowledge of your competitive position relative to the other ports on your seacoast, as well as the other two coasts. On a broader scale, the information you provide will contribute to the public knowledge "pool" of how these new vessel systems have affected your port and have been affected by your coastline's characteristics. More specific purposes are explained in the introductions to some of the questionnaire's critically important questions whose purposes may not be altogether clear to you. Finally, it is emphasized that this survey is not a sample, but is attempting a 100 percent return of all questionnaires sent to seaports physically capable of handling full-sized bargeships and/or containerships, whether or not they work such ships.

Besides accomplishing all of the aforementioned purposes, your answering and returning of this questionnaire will enable me to achieve the goals set for my Ph.D. dissertation here at Michigan State University. It will be entitled "A Comparative Analysis of Bargeship Systems: With Emphasis on Their Impacts on United States Seaports and Inland Ports." (A separate set of questionnaires is being sent to inland ports.) If you have any questions, please call me at work (517-355-4460) or at home (517-355-4159).

Your help and cooperation will be very deeply appreciated. A stamped, self-addressed envelope is enclosed for your convenience.

Sincerely yours,

K. M. Bertram

SEAPORT QUESTIONNAIRE I

SEAPORTS WITH BARGESHIP AND/OR BARGESHIP BARGE TRAFFIC

(Please assume that you received this questionnaire prior to 1973 spring flooding while answering all questions.)

1. When did your port start having bargeship and/or bargeship barge traffic? (Include "early," "mid-," or "late" with calendar year.)

   Bargeships _____ 19____
   Bargeship Barges _____ 19____

2. How many full bargeship barges are loaded with cargo at your port per month on the average? (*Note: If 100 barges are 1/2 filled, your answer would be 50.*) Unloaded? (SEABEE barges count double.)

   ______ Barges Loaded

   ______ Barges Unloaded

3. What are your port's three (3) major import and export general cargo items handled in terms of volume?

	Import Items		Export Items
1st	________________	1st	________________
2nd	________________	2nd	________________
3rd	________________	3rd	________________

4. Do you think the nature of the general cargo items listed in question 3 is a major determinant of the division of the total general cargo volumes through your port by vessel types? Why? (*Please answer here and/or on overflow sheet at end of questionnaire, if needed.*)

   Yes _____
   No _____

   ____

   ____

5. This question is designed to enable us to compare as precisely as *practicable* the relative volumes of bargeship versus containerships and conventional ships by coastline (East vs. Gulf vs. West), so estimates and/or percentages are desired where actual tonnage data is not available.

   Please indicate your port's 1971 general cargo volume in actual or estimated long-tons or, if necessary, in an estimated percentage of total general cargo volume, for each of the following general cargo vessel types. (*Note that bargeship cargoes originating at or destined for a mothership anchored at your port are requested to be kept separate from those cargoes moving between a bargeship anchored at another U.S. seaport and yours via bargeship barge.*)

Please Circle Appropriate Choice			1971 Long-Ton Volume	Estimated % of 1971 Gen. Cargo Volume
Actual	Estimate	Bargeships (anchored at your port)	_______	_____%
Actual	Estimate	Bargeship barges (towed to or from another seaport) Please name other seaport(s) ____________________ . .	_______	_____%
Actual	Estimate	Containerships	_______	_____%
Actual	Estimate	Conventional ships	_______	_____%
Actual	Estimate	Others, please specify ____________________ . .	_______	_____%
Actual	Estimate	Total general cargo vessel volume in long-tons . . . (*Please attempt to answer even if only percentage estimates are able to be given for other items.*)	_______	100 %

6. Please indicate your port's 1972 actual or estimated, or percentage estimate volumes as above, for:

Please Circle Appropriate Choice			1972 Long-Ton Volume	Estimated % of 1972 Gen. Cargo Volume
Actual	Estimate	Containership	____	____%
Actual	Estimate	Conventional ships	____	____%
Actual	Estimate	Others, please specify ____________________ . .	____	____%
Actual	Estimate	Total general cargo volume in long-tons . . . . *(Please attempt to answer even if only percentage estimates were able to be given for other items.)*	____	100 %

7. This question is designed to enable us to compare as precisely as *practicable* the trend of relative volumes of bargeships versus containerships and conventional ships by coastline (East vs. Gulf vs. West).

What are your estimated 1973 long-ton or percentage estimate volumes as in question 5 above for the following which now include as *separate* categories, bargeship cargoes originating at or destined for a mothership anchored at your port, and bargeship barge cargoes moving between a bargeship anchored at another U.S. seaport and yours via bargeship barge.

	1973 Long-Ton Volume	Estimated % of 1973 Gen. Cargo Volume
Bargeships (anchored at your port)	____	____%
Bargeship barges (towed to or from another seaport) Please indicate . . . other seaport(s) ______________________________	____	____%
Containerships	____	____%
Conventional ships	____	____%
Other, please specify ______________________________ . .	____	____%
Total general cargo volume in long-tons (*Please attempt to answer even if only percentage estimates were able to be given for other items.*) . .	____	100 %

8. **What do you estimate will be the percentage share of the total general cargo volume of your port of each of the following vessel types five (5) years from now?**

Bargeships (anchored at your port)	____%
Bargeship barges (towed to or from another seaport)	____%
Containerships	____%
Conventional ships	____%
Others, please specify ______________________________ . . .	____%

9. **What *annual* volumes do you expect to initially receive in bargeship (anchored at your port) and/or bargeship barge (towed from another seaport) traffic?**

	Estimated Initial Annual Volume in Long-Tons	Estimated % of Annual Total Gen. Cargo Volume
Bargeship	__________	____%
Bargeship barge	__________	____%

10. **How many inland bargelines serve your port?** . . . . ______ Bargelines

11. This question is designed to enable us to estimate the percentage of bargeship cargoes which will flow directly inland without requiring intermediate handling in the seaport area, by coastline.

What percentage of your bargeship (anchored at your port) cargoes and bargeship barge (towed to or from another seaport) cargoes do you *estimate* will be moved directly to or from U.S. inland destinations via barge, rather than requiring transfer to rail or truck lines?

______ Bargeship cargoes

______ Bargeship barge cargoes

12. Excluding replacements required by the wearing out of old facilities, what have been the recent total capital investments from all sources (i.e., your port, federal, state, and local governments, private corporations, and any other significant sources) in the following vessel system facilities additions at your port: berths, handling equipment including cranes, surfacing and storage areas, and stuffing stations? Investments made as far back as ten (10) years, if known, should be included in totals. Otherwise include earliest known investments and identify year of first investment. Also include investments for projects that are in process now, *where funds are committed.* (*Note: Separate bargeship and bargeship barge facilities' totals.*)

	Total Capital Investment to Date	Year of First Investment in Total
Overall facilities for all vessel systems	$ ______	19____
Containership facilities	$ ______	19____
Bargeship facilities	$ ______	19____
Bargeship barge working facilities	$ ______	19____
Conventional ship facilities	$ ______	19____
Other general cargo ship facilities	$ ______	19____

Please specify type ship(s) ______________________

____

13. Excluding replacements required by the wearing out or flooding of old facilities, do the same sources as in question 12 plan to make any major capital investments in the near future (within 5 years) in the same facilities as those in question 12, for any of the following general cargo vessel systems at your port? If so, when?

	Total Capital Investment Planned	Time Period
Overall facilities for all vessel systems	$ ______	19__ to 19__
Containership facilities	$ ______	19__ to 19__
Bargeship facilities	$ ______	19__ to 19__
Bargeship barge working facilities	$ ______	19__ to 19__
Conventional ship facilities	$ ______	19__ to 19__
Other general cargo ship facilities	$ ______	19__ to 19__

(Please specify type ship(s)) ______________________

____

14. How do you assess the impact of each of the following on the flow of bargeship (anchored at your port) and/or bargeship barge (towed to or from another seaport) cargoes through your port? *Use checks (✓) to indicate answers. If the impact is the same for both types of cargo use one check in that row. If different responses are desired for impacts on bargeships and bargeship barges, use one check for each in that row with a "B" next to the bargeship check and a "BB" next to the bargeship barge check. See illustrative example (*) in first row below.*

	Extremely Favorable	Favorable	No Effect	Unfavorable	Extremely Unfavorable
*Illustrative example	____	✓ B	✓BB	____	____
a. Bargeship facilities available	____	____	____	____	____
b. Bargeship barge working facilities available	____	____	____	____	____
c. Inland transport modes serving port . .	____	____	____	____	____
d. Suitability of import cargo flows through port	____	____	____	____	____

14. This question is designed to enable us to estimate the percentage of all bargeship and bargeship barge (including those towed to or from other seaports) cargoes handled which are worked using the types of equipment listed below. This is to enable analysis of bargeship system investments in terms of whether they consist of those which are (a) indirectly required, (b) directly required, or (c) not specifically required at all for the implementation of bargeship systems.

What percentage of bargeship and bargeship barge cargoes are or will be (five years from now) handled using each of the following:

(Note that both present and future percentages should total to 100% apiece.)

	Total Bargeship and Bargeship Barge Cargoes Worked	
	Present	Future
a. All of the commonly used new (i.e., modified or added) equipment and facilities invested in originally for containership or conventional ship systems	____%	____%
b. Specially constructed bargeship and/or bargeship barge equipment and facilities	____%	____%
c. Already existing (unmodified old or replaced) equipment and facilities (including conventional barge facilities)	____%	____%
d. Totals (a + b + c)	100 %	100 %

15. How do you assess the impact of each of the following on the flow of bargeship (anchored at your port) and/or bargeship barge (towed to or from another seaport) cargoes through your port? *Use checks (✓) to indicate answers. If the impact is the same for both types of cargo use one check in that row. If different responses are desired for impacts on bargeships and bargeship barges, use one check for each in that row with a "B" next to the bargeship check and a "BB" next to the bargeship barge check. See illustrative example (*) in first row below.*

	Extremely Favorable	Favorable	No Effect	Unfavorable	Extremely Unfavorable
*Illustrative example		✓B	✓BB		
a. Bargeship facilities available					
b. Bargeship barge working facilities available					
c. Inland transport modes serving port					
d. Suitability of import cargo flows through port					
e. Suitability of export cargo flows through port					
f. Amount of inland waterways serving port					
g. Interest in bargeship mode by port's shippers					
h. Interest in bargeship traffic by port					
i. Bargeship operator interest in port					
j. Cost to construct bargeship and/or bargeship barge working facilities					
k. Cost to construct containership facilities					
l. Ability of bargeship barges to bypass port and move directly to inland destinations					
m. Others, please specify					
____________					
____________					

If changes in any of the above impacts have recently taken place or are soon expected to take place, please indicate here and on overflow sheet, if needed.

____

____

____

Question 14--Continued

	Extremely Favorable	Favorable	No Effect	Unfavorable	Extremely Unfavorable
e. Suitability of export cargo flows through port	________	________	______	__________	__________
f. Amount of inland waterways serving port	________	________	______	__________	__________
g. Interest in bargeship mode by port's shippers	________	________	______	__________	__________
h. Interest in bargeship traffic by port .	________	________	______	__________	__________
i. Bargeship operator interest in port . .	________	________	______	__________	__________
j. Cost to construct bargeship and/or bargeship barge working facilities .	________	________	______	__________	__________
k. Cost to construct containership facilities	________	________	______	__________	__________
l. Ability of bargeship barges to bypass port and move directly to inland destinations	________	________	______	__________	__________
m. Others, please specify					
______________________________ . .	________	________	______	__________	__________
______________________________ . .	________	________	______	__________	__________

If changes in any of the above impacts have recently taken place or are soon expected to take place, please indicate here and on overflow sheet, if needed.

____

____

____

15. *Note: Answer this question only if you expect bargeships to anchor at your port.*
This question is designed to enable us to verify secondary source reports of bargeships consisting of up to 100% pure barges calling on Gulf Coast ports versus 50% barge-50% container loaded bargeships calling on East and West Coast ports.

What percentage of the total bargeship cargo flowing through your port via bargeships do you estimate will do so in barges versus in 20- to 40-foot van containers not loaded in barges but rather handled by container cranes? *(Your answer to this question should not cause any changes in your answers to questions 5-8 unless you put containerized bargeship cargoes into the containership total there, in which case please check (✓) here _____.)*

__________ %
Barge flows

__________ %
Container flows

16. This question is designed to indicate which types of bargeship cargo items will be flowing through ports with heavy versus light bargeship cargo volumes, in order to analyze and compare such patterns by coastline.

What do you think are the major bargeship (anchored at your port) and/or bargeship barge (towed to or from another port) cargo import and export items which will flow through your port, in order of importance by volume?

	Bargeship		Bargeship Barge	
	Import Items	Export Items	Import Items	Export Items
	1st ____________	1st ____________	1st ____________	1st ____________
	2nd ____________	2nd ____________	2nd ____________	2nd ____________
	3rd ____________	3rd ____________	3rd ____________	3rd ____________

17. What are the major containership cargo import and export items flowing through your port, in order of importance by volume?

	Import Items		Export Items
1st	________________	1st	________________
2nd	________________	2nd	________________
3rd	________________	3rd	________________

18. What are the major conventional ship cargo import and export items flowing through your port, in order of importance by volume?

	Import Items		Export Items
1st	________________	1st	________________
2nd	________________	2nd	________________
3rd	________________	3rd	________________

NOTE OVERFLOW SHEET ATTACHED

Thank you for your cooperation.

SEAPORT QUESTIONNAIRE III

SEAPORTS EXPECTING TO RECEIVE BARGESHIP AND/OR BARGESHIP BARGE TRAFFIC WITHIN THREE (3) YEARS (BUT NOT DURING 1973)

(Please assume that you received this questionnaire prior to 1973 spring flooding while answering all questions.)

1. When does your port expect to start having bargeship and/or bargeship barge traffic? (Include "early," "mid-," or "late" with calendar year.)

   Bargeships _____ 19____
   Bargeship Barges _____ 19____

2. How many full bargeship barges are loaded with cargo at your port per month on the average? (*Note: If 100 barges are 1/2 filled, your answer would be 50.*) Unloaded? (SEABEE barges count double.)

   ________ Barges Loaded

   ________ Barges Unloaded

3. What are your port's three (3) major import and export general cargo items handled in terms of volume?

	Import Items		Export Items
1st	________	1st	________
2nd	________	2nd	________
3rd	________	3rd	________

4. Do you think the nature of the general cargo items listed in question 3 is a major determinant of the division of the total general cargo volumes through your port by vessel types? Why? (*Please answer here and/or on overflow sheet at end of questionnaire, if needed.*)

   Yes _____
   No _____

   ____

   ____

5. This question and question 6 are required, not because this data is not available from other sources, but so that this data can be assured of being *directly* comparable with that in questions 7 and 8 on this and the other questionnaires in this study.

   Please indicate your port's 1971 general cargo volume in actual or estimated long-tons or, if necessary, in an estimated percentage of total general cargo volume, for each of the following general cargo vessel types.

Please Circle Appropriate Choice			1971 Long-Ton Volume	Estimated % of 1971 Gen. Cargo Volume
Actual	Estimate	Containership	_____	_____%
Actual	Estimate	Conventional ships	_____	_____%
Actual	Estimate	Others, please specify ________________ . .	_____	_____%
Actual	Estimate	Total general cargo vessel volume in long-tons . . . . *(Please attempt to answer even if only percentage estimates are able to be given for other items.)*	_____	100 %

6. Please indicate your port's 1972 actual or estimated, or percentage estimate volumes as above, for:

Please Circle Appropriate Choice			1972 Long-Ton Volume	Estimated % of 1972 Gen. Cargo Volume
Actual	Estimate	Containership	______	______%
Actual	Estimate	Conventional ships	______	______%
Actual	Estimate	Others, please specify ______________________ . .	______	______%
Actual	Estimate	Total general cargo volume in long-tons (*Please attempt to answer even if only percentage estimates were able to be given for other items.*) . .	______	100 %

7. This question is designed to enable us to compare as precisely as *practicable* the trend of the relative volumes of bargeships versus containerships and conventional ships by coastline (East vs. Gulf vs. West).

What are your estimated 1973 long-ton or percentage estimate volumes as in question 5 above, for:

	1973 Long-Ton Volume	Estimated % of 1973 Gen. Cargo Volume
Containerships	______	______%
Conventional ships	______	______%
Other, please specify ____ . . .	______	______%
Total general cargo volume in long-tons (*Please attempt to answer even if only percentage estimates were able to be given for other items.*) . .	______	______%

8. What do you estimate will be the percentage share of the total general cargo volume of your port of each of the following vessel types five (5) years from now?

Bargeships (anchored at your port)	______%
Bargeship barges (towed to or from another seaport)	______%
Containerships	______%
Conventional ships	______%
Others, please specify ____ . . .	______%

9. What annual volumes do you expect to initially receive in bargeship (anchored at your port) and/or bargeship barge (towed from another seaport) traffic?

	Estimated Initial Annual Volume in Long-Tons	Estimated % of Annual Total Gen. Cargo Volume
Bargeships	____________	______%
Bargeship barges	____________	______%

10. How many inland bargelines serve your port? . . . . ______ Bargelines

11. This question is designed to enable us to estimate the percentage of bargeship cargoes which will flow directly inland without requiring intermediate handling in the seaport area, by coastline.

What percentage of your bargeship (anchored at your port) cargoes and bargeship barge (towed to or from another seaport) cargoes do you *estimate* will be moved directly to or from U.S. inland destinations via barge, rather than requiring transfer to rail or truck lines?

______% Bargeship cargoes

______% Bargeship barge cargoes

12. Excluding replacements required by the wearing out of old facilities, what have been the recent total capital investments from all sources (i.e., your port, federal, state, and local governments, private corporations, and any other significant sources) in the following vessel system facilities at your port: berths, handling equipment including cranes, surfacing and storage areas, and stuffing stations? Investments made as far back as ten (10) years, if known, should be included in totals. Otherwise include earliest known investments and identify year of first investment. Also include investments for projects that are in process now, *where funds are committed.* *(Note that bargeship and bargeship barge facilities are separated.)*

	Total Capital Investment to Date	Year of First Investment in Total
Overall facilities for all vessel systems	$ ____________	19_____
Containership facilities	$ ____________	19_____
Bargeship facilities	$ ____________	19_____
Bargeship barge working facilities	$ ____________	19_____
Conventional ship facilities	$ ____________	19_____
Other general cargo ship facilities . . . . (Please specify type ship(s)) ________________ ______________________________	$ ____________	19_____

13. Excluding replacements required by the wearing out or flooding of old facilities, do the same sources as in question 12 plan to make any major capital investments in the near future (within 5 years) in the same facilities as those in question 12, for any of the following general cargo vessel systems at your port? If so, when?

	Total Capital Investment Planned	Time Period
Overall facilities for all vessel systems	$ ____________	19___ to 19___
Containership facilities	$ ____________	19___ to 19___
Bargeship facilities	$ ____________	19___ to 19___
Bargeship barge working facilities	$ ____________	19___ to 19___
Conventional ship facilities	$ ____________	19___ to 19___
Other general cargo ship facilities . . . . (Please specify type ship(s)) ______________________ ______________________________	$ ____________	19___ to 19___

14. How do you assess the impact of each of the following on the flow of bargeship (anchored at your port) and/or bargeship barge (towed to or from another seaport) cargoes through your port? *Use checks (✓) to indicate answers. If the impact is the same for both types of cargo use one check in that row. If different responses are desired for impacts on bargeships and bargeship barges, use one check for each in that row with a "B" next to the bargeship check and a "BB" next to the bargeship barge check. See illustrative example (*) in first row below.*

	Extremely Favorable	Favorable	No Effect	Unfavorable	Extremely Unfavorable
*Illustrative example	______	✓ B	✓ BB	______	______
a. Bargeship facilities available	______	______	______	______	______
b. Bargeship barge working facilities available	______	______	______	______	______
c. Inland transport modes serving port . .	______	______	______	______	______
d. Suitability of import cargo flows through port	______	______	______	______	______
e. Suitability of export cargo flows through port	______	______	______	______	______
f. Amount of inland waterways serving port	______	______	______	______	______
g. Interest in bargeship mode by port's shippers	______	______	______	______	______

Question 14--Continued

	Extremely Favorable	Favorable	No Effect	Unfavorable	Extremely Unfavorable
h. Interest in bargeship traffic by port .	______	______	______	______	______
i. Bargeship operator interest in port . .	______	______	______	______	______
j. Cost to construct bargeship and/or bargeship barge working facilities .	______	______	______	______	______
k. Cost to construct containership facilities	______	______	______	______	______
l. Ability of bargeship barges to bypass port and move directly to inland destinations	______	______	______	______	______
m. Others, please specify					
______________________ . .	______	______	______	______	______
______________________ . .	______	______	______	______	______

If changes in any of the above impacts have recently taken place or are soon expected to take place, please indicate here and on overflow sheet, if needed.

____

____

____

15. This question is designed to enable us to verify secondary source reports of bargeships consisting of up to 100% pure barges calling on Gulf Coast ports versus 50% barge-50% container loaded bargeships calling on East and West Coast ports.

What percentage of the total bargeship cargo flowing through your port via bargeships will do so in barges versus in 20- 40-foot van containers not loaded in barges but rather handled by container cranes? *(Your answer to this question should not cause any changes in your answers to questions 5-8 unless you put containerized bargeship cargoes into the containership total there, in which case please check (✓) here ____.)*

______% Bargeship flows

______% Bargeship barge flows

16. This question is designed to indicate which types of bargeship cargo items are flowing through ports with heavy versus light bargeship cargo volumes, in order to analyze and compare such patterns by coastline. What do you think are the major bargeship (anchored at your port) and/or bargeship barge (towed to or from another port) cargo import and export items which will flow through your port, in order of importance by volume?

Bargeship: Import Items	Bargeship: Export Items	Bargeship Barge: Import Items	Bargeship Barge: Export Items
1st ______	1st ______	1st ______	1st ______
2nd ______	2nd ______	2nd ______	2nd ______
3rd ______	3rd ______	3rd ______	3rd ______

17. What are the major containership cargo import and export items flowing through your port, in order of importance by volume?

Import Items	Export Items
1st ________	1st ________
2nd ________	2nd ________
3rd ________	3rd ________

18. What are the major conventional ship cargo import and export items flowing through your port, in order of importance by volume?

Import Items	Export Items
1st ________	1st ________
2nd ________	2nd ________
3rd ________	3rd ________

NOTE OVERFLOW SHEET ATTACHED

Thank you for your cooperation.

SEAPORT QUESTIONNAIRE IV

SEAPORTS NOT EXPECTING ANY BARGESHIP AND/OR BARGESHIP BARGE TRAFFIC WITHIN THREE (3) YEARS

(Please assume that you received this questionnaire prior to 1973 spring flooding while answering all questions.)

1. What are your port's three (3) major import and export general cargo items handled in terms of volume?

Import Items		Export Items	
1st	____________	1st	____________
2nd	____________	2nd	____________
3rd	____________	3rd	____________

2. Do you think the nature of the general cargo items listed in question 1 is a major determinant of the division of the total general cargo volumes through your port by vessel types? Why? *(Please answer here and/or on overflow sheet at end of questionnaire, if needed.)* Yes _____ No _____

3. This question and question 4 are required, not because this data is not available from other sources, but so that this data can be assured of being *directly* comparable with that in questions 5 and 6 on this and the other questionnaires in this study.

   Please indicate your port's 1971 general cargo volume in actual or estimated long-tons or, if necessary, in an estimated percentage of total general cargo volume, for each of the following general cargo vessel types.

Please Circle Appropriate Choice			1971 Long-Ton Volume	Estimated % of 1971 Gen. Cargo Volume
Actual	Estimate	Containerships	_____	_____ %
Actual	Estimate	Conventional ships	_____	_____ %
Actual	Estimate	Others, please specify ____________________ . .	_____	_____ %
Actual	Estimate	Total general cargo vessel volume in long-tons . . . . *(Please attempt to answer even if only percentage estimates are able to be given for other items.)*	_____	100 %

4. Please indicate your port's 1972 actual or estimated, or percentage estimate volumes as above, for:

Please Circle Appropriate Choice			1972 Long-Ton Volume	Estimated % of 1972 Gen. Cargo Volume
Actual	Estimate	Containerships	_____	_____ %
Actual	Estimate	Conventional ships	_____	_____ %
Actual	Estimate	Others, please specify ____________________ . .	_____	_____ %
Actual	Estimate	Total general cargo volume in long-tons . . . . *(Please attempt to answer even if only percentage estimates were able to be given for other items.)*	_____	100 %

5. This question is designed to enable us to compare as precisely as *practicable* the trend of relative volume of bargeships versus containerships and conventional ships by coastline (East vs. Gulf vs. West).

What are your estimated 1973 long-ton or percentage estimate volumes as in question 3 above, for:

	1973 Long-Ton Volume	Estimated % of 1973 Gen. Cargo Volume
Containerships	______	______%
Conventional ships	______	______%
Other, please specify ________________________________ . . .	______	______%
Total general cargo volume in long-tons (*Please attempt to answer even if only percentage estimates were able to be given for other items.*) . .	______	100 %

6. What do you estimate will be the percentage share of the total general cargo volume of your port of each of the following vessel types five (5) years from now?

Bargeships (anchored at your port)	______%
Bargeship barges (towed to or from another seaport)	______%
Containerships	______%
Conventional ships	______%
Others, please specify ____ . . .	______%

7. How many inland bargelines serve your port? . . . . ______ Bargelines

8. Excluding replacements required by the wearing out of old facilities, what have been the recent total capital investments from all sources (i.e., your port, federal, state, and local governments, private corporations, and any other significant sources) in the following vessel system facilities additions at your port: berths, handling equipment including cranes, surfacing and storage areas, and stuffing stations)? Investments made as far back as ten (10) years, if known, should be included in totals. Otherwise include earliest known investments and identify year of first investment. Also include investments for projects that are in process now, *where funds are committed.* (*Note that bargeship and bargeship barge facilities are separated.*)

	Total Capital Investment to Date	Year of First Investment in Total
Overall facilities for all vessel systems	$____________	19______
Containership facilities	$____________	19______
Bargeship facilities	$____________	19______
Bargeship barge working facilities	$____________	19______
Conventional ship facilities	$____________	19______
Other general cargo ship facilities . . . . (Please specify type ship(s) ________________ ________________________________)	$____________	19______

9. Excluding replacements required by the wearing out or flooding of old facilities, do the same sources as in question 8 plan to make any major capital investments in the near future (within 5 years) in the same facilities as those in question 8, for any of the following general cargo vessel systems at your port? If so, when?

	Total Capital Investment Planned	Time Period
Overall facilities for all vessel systems	$ ______	19__ to 19__
Containership facilities	$ ______	19__ to 19__
Bargeship facilities	$ ______	19__ to 19__
Bargeship barge working facilities	$ ______	19__ to 19__
Conventional ship facilities	$ ______	19__ to 19__
Other general cargo ship facilities . . . . (Please specify type ship(s))______	$ ______	19__ to 19__

______

10. How do you assess the impact of each of the following on the flow of bargeship (anchored at your port) and/or bargeship barge (towed to or from another seaport) cargoes through your port? *Use checks (✓) to indicate answers. If the impact is the same for both types of cargo, use one check in that row. If different responses are desired for impacts on bargeships and bargeship barges, use one check for each in that row with a "B" next to the bargeship check and a "BB" next to the bargeship barge check. See illustrative example (*) in first row below.*

	Extremely Favorable	Favorable	No Effect	Unfavorable	Extremely Unfavorable
*Illustrative example	✓ B		✓ BB		
a. Bargeship facilities available					
b. Bargeship barge working facilities available					
c. Inland transport modes serving port . .					
d. Suitability of import cargo flows through port					
e. Suitability of export cargo flows through port					
f. Amount of inland waterways serving port					
g. Interest in bargeship mode by port's shippers					
h. Interest in bargeship traffic by port .					
i. Bargeship operator interest in port . .					
j. Cost to construct bargeship and/or bargeship barge working facilities .					
k. Cost to construct containership facilities					
l. Ability of bargeship barges to bypass port and move directly to inland destinations					
m. Others, please specify					
______ . . .					
______ . . .					

If changes in any of the above impacts have recently taken place or are soon expected to take place, please indicate here and on overflow sheet at end of questionnaire, if needed.

______

______

______

11. What are the major containership cargo import and export items flowing through your port, in order of importance by volume?

	Import Items		Export Items
1st	________	1st	________
2nd	________	2nd	________
3rd	________	3rd	________

12. What are the major conventional ship cargo import and export items flowing through your port, in order of importance by volume?

	Import Items		Export Items
1st	________	1st	________
2nd	________	2nd	________
3rd	________	3rd	________

13. What do you estimate to be the probabilities of your port receiving bargeship and/or bargeship barge traffic in the next three (3) years? *(For example, if you estimate that the probabilities are 90% against one of the traffic types, you would enter 90% against and 10% for.)*

	Probability of Receiving For	Probability of Receiving Against
Bargeship (anchored at your port)	____%	____%
Bargeship barge (towed to or from another seaport)	____%	____%

14. Does your port desire bargeship or bargeship barge traffic? Why? (Please answer here and on overflow sheet, if necessary.)

Yes ____

No ____

____

____

____

____

____

NOTE OVERFLOW SHEET ATTACHED

Thank you for your cooperation.

APPENDIX B

U.S. INLAND PORT AUTHORITIES AND TERMINAL COMPANIES ADDRESSES LISTS, PRELIMINARY AND COVER LETTERS, AND QUESTIONNAIRE SET

APPENDIX B

U.S. INLAND PORT AUTHORITIES' ADDRESSES

*Mr. Edward Langlois
General Manager
Maine Port Authority
Maine State Pier
Portland, Maine 04111

*Mr. Elmer Savage, Chairman
Searsport Port Committee
P.O. Box 51
Searsport, Maine 04974

*Mr. Peter G. Collins, Chairman
Fall River Port Authority
State Pier, Water Street
Fall River, Massachusetts 02721

*Mr. Frank W. Dunham, Jr.
General Manager
Albany Port District Commission
Port of Albany
Administration Building
Albany, New York 12202

Mr. Sherwood L. Hamilton
Executive Director
Port of Oswego Authority
Oswego, New York 13126

Mr. Arthur J. Fallon
Executive Director
Niagara Frontier Trans. Author.
1600 Statler Hilton Hotel
Niagara Square
Buffalo, New York 14202

*Mr. A. Dickinson Smith
Executive Director
New Hampshire State Port Authority
555 Market Street
Portsmouth, New Hampshire 03801

*Mr. Thomas C. O'Rourke
Port Director
City of Providence
Department of Public Works
Municipal Wharf
Providence, Rhode Island 02905

*Mr. Roy H. Linden
Deputy Commissioner of Transportation
Commissioners of Steamship Terminals
Bureau of Waterways, State Pier
New London, Connecticut 06320

Mr. P. J. McGinnis
Port Director
Bridge Plaza
Ogdensburg, New York 13669

Mr. William A. Carr, Port Director
Rochester-Monroe County Port Authority
P.O. Box 4755
Rochester, New York 14612

*Mr. Robert L. Pettegrew, Director
Port Commerce and Administration
South Jersey Port Corporation
2400 Broadway
Camden, New Jersey 08104

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*Minor seaport/functional inland port.

Mr. Joseph G. Rosenthal
Port General Manager
Port Commission
The City of Erie
Room 507, Municipal Building
Erie, Pennsylvania 16501

*Director, Port of Richmond
c/o Mr. John Hunter
Virginia Port Authority
1600 Maritime Tower
Norfolk, Virginia 23510

Mr. George J. King
Port Manager, P.O. Box 267
Port Kennedy Station
Cape Kennedy, Florida 32920

Mr. Joel Wilcox, Port Director
Mañatee County Port Authority
P.O. Box 1180
Bradenton, Florida 33505

*Mr. E. Harris Mercer, Chairman
Panama City Port Authority
P.O. Box 388
Panama City, Florida 32401

Director
Port of Guntersville Terminal
P.O. Box 547
Guntersville, Alabama 35976

Mayor R. Gardner, Exec. Dir.
Port of Hickman
P.O. Box 166
Hickman, Kentucky 42050

Port Director
Huron Joint Port Authority
City Hall
Huron, Ohio 44839

Mr. J. W. Laczko
Port Director
418 High Street
Fairport Harbor, Ohio 44077

Mr. William Farkas, Port Director
Port Authority of Allegheny County
100 Fifth Avenue
Pittsburgh, Pennsylvania 15222

Ms. Doris A. Dawson, Port Director
Board of Harbor Commissioners
P.O. Box 1191
Wilmington, Delaware 19899

*Mr. Weldon B. Lewis, Administrator
Fort Pierce Port Authority
P.O. Box 700
Fort Pierce, Florida 33450

Mr. Raymond B. Bunton
Port Director
Putnam County Port Authority
P.O. Box 1305
Palatka, Florida 32077

Mr. Tom S. Coldewy, Chairman
Port of St. Joe Authority
P.O. Box 280
Port St. Joe, Florida 32456

*Col. Richard V. Hale,
Port Director, Port of Pensacola
Pensacola, Florida 32502

Mr. J. E. Jaudon, Port Director
Port of Palm Beach District
P.O. Box 9935
Riviera Beach, Florida 33404

Mr. Clark Kittrell
Memphis and Shelby County
Port Commission
P.O. Box 6072
Memphis, Tennessee 38106

Mr. Alex Chamberlain, Chairman
Louisville and Jefferson County
Riverport Authority
Standiford Field, P.O. Box 21297
Louisville, Kentucky 40221

Mr. Howard F. Hansen, Chairman
Lorain Port Author., Broadway Bldg.
Lorain, Ohio 44052

Mr. James V. Anthony, Chairman
Conneaut Port Authority
P.O. Box 218
Conneaut, Ohio 44030

Mr. Kenneth W. Wisenbaugh
Transportation Department
Cincinnati Chamber of Commerce
Suite 55, 309 Vine Street
Cincinnati, Ohio 45202

Mr. Joseph L. Smith, Harbormaster
210 State Street
Charlevoix, Michigan 49720

Mr. R. F. Giles, Vice President
Chamber of Commerce
3 East 8th Street
Holland, Michigan 49423

Mr. George M. Harvey
121 South 11th Street
Escanaba, Michigan 48929

Mr. Claude Ver Duin
1 Washington Avenue
Grand Haven, Michigan 49417

Mr. George Johnson
Chief of Police
City Hall
Marquette, Michigan 49855

Mr. John E. Willett, Harbormaster
78 Maple Street
Manistee, Michigan

Mr. Paul Sandmann, Port Director
Port of Harbor Beach
131 State Street
Harbor Beach, Michigan

Port Director
1111 Fourth Street
Muskegon, Michigan 49443

Mr. Jack P. Fitzgerald, Port Dir.
Port of Indiana, P.O. Box 189
Portage, Indiana 46368

Mr. Richard L. Schultz, Exec. Dir.
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Authority, 101 Erieside Avenue
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Mr. John A. McWilliam, Exec. Dir.
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241 Superior Street
Toledo, Ohio 43604

Mr. James McGowan
Director of Port and Industrial
Development
902 N. Madison
Bay City, Michigan 48706

Mr. Jack Doyle, Port Director
City Hall
Cheboygan, Michigan 49721

Mr. Kenneth Birdsey, Harbormaster
712 Harbor Street
Oscoda, Michigan 48750

Mr. Max M. McCray, Exec. Director
Monroe Port Commission
Monroe, Michigan 48161

Port Director
Detroit-Wayne County Port Commission
Veterans Memorial Building
151 West Jefferson Avenue
Detroit, Michigan 48226

Mr. R. C. Premby, Harbormaster
1207 E. Broad Street
St. Joseph, Michigan 49085

Port Director
325 Court Street
Sault Ste. Marie, Michigan 49783

Mr. E. T. Ash, Director
Transportation Division
Southern Securities Building
Evansville, Indiana 47708

Mr. Robert W. Barclay
Port Director
Brown County Board of Harbor Com.
Courthouse Annex
Green Bay, Wisconsin 54301

Mr. A. M. Houston, Port Director
1126 Fairmont Lane
Manitowoc, Wisconsin 54220

Port Director
Sturgeon Bay Harbor Commission
City of Sturgeon Bay
Sturgeon Bay, Wisconsin 54235

Mr. George Nelson, Harbor Chairman
Room 209, Municipal Building
625 52nd Street
Kenosha, Wisconsin 53140

Mr. John Seefeldt
Municipal Port Director
Board of Harbor Commissioners
606 City Hall
Milwaukee, Wisconsin 53202

Mr. Jamie Cannon
City Planning Director
City Hall
East St. Louis, Illinois 62201

Maxim M. Cohen, General Manager
Chicago Regional Port
District Lake Calumet Harbor
Chicago, Illinois 60633

Mr. J. C. Stump, Director
Port of Shawneetown
212 Lincoln Boulevard, East
Shawneetown, Illinois 62984

Mr. Joseph L. Rayniak
Chairman of the Board
Waukegan Port District
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Waukegan, Illinois 60085

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Port of Vicksburg, P.O. Box 1074
Vicksburg, Mississippi 39180

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Port Director
City Hall
P.O. Box 87
Two Rivers, Wisconsin 54241

Mayor R. W. Hansen
City Hall
Ashland, Wisconsin 54806

Mr. E. B. Rognerud, Port Director
Port of Racine
20 McKinley Avenue
Racine, Wisconsin 54304

Mr. Manning W. Kilton
Harbormaster
City Hall
Sheboygan, Wisconsin 53081

Mr. Leroy F. Miller
Port Director
City Hall
La Crosse, Wisconsin 54601

Mr. William Kennedy, President
Superior Board of Harbor Commissioners
City Hall
Superior, Wisconsin 54880

Captain V. J. Soballe
Port Director
Port of Chicago
Navy Pier
Chicago, Illinois 60611

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Tri-Cities Regional Port Authority
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Charles E. Dillerud
Director of Planning
Winona Port Authority
City Building
Winona, Minnesota 55987

Mr. Anlo Myers
Burlington Docks Commission
City Hall
Fourth and Washington Streets
Burlington, Iowa 52601

Chief Executive
Chamber of Commerce
Pioneer Building
510 Francis Street
St. Joseph, Missouri 64501

Mr. Buck Shell
Port of Fort Smith
200 Naval Road
Port Smith, Arkansas 72901

Mr. Walter E. Hicks, Port Dir.
Port of Camden
P.O. Box 583
Camden, Arkansas 71701

Mr. Robert Keenan
Keenan's Port of Dardanelle
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Seaway Port Authority of Duluth
P.O. Box 310
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Port Authority of City of St. Paul
Minnesota Building
4th and Cedar Streets
St. Paul, Minnesota 55101

Chairman
Board of Dock Commissioners
Dubuque, Iowa 52001

Director
Caruthersville River Terminal Com.
Caruthersville, Missouri 63830

Mr. E. T. Horner, Jr., Director
Port of Helena, P.O. Box 550
Helena, Arkansas 72342

Mr. Ross Mauney, Exec. Director
Little Rock Port Authority
P.O. Box 2300, Lindsay Road
Little Rock, Arkansas 72203

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Beaumont, Texas 77704

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Nueces County Navigation Dist.
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Calhoun County Navigation Dist.
P.O. Box 107
Port Lavaca, Texas 77979

*Mr. Harvey B. Hart, Manager
Port of Longview
Longview, Washington 98632

*Mr. T. J. Glenn, General Manager
Port of Bellingham
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Omaha Dock Board
701 Abbott Drive
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Mr. Harley W. Ladd, Port Director
Tulsa Port of Catoosa
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P.O. Box 516
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P.O. Box 615
Freeport, Texas 77541

Director
Matagorda County Navigation Dist. #2
P.O. Box 1426
Bay City, Texas 77414

*Mr. W. C. McConnell, General Manager
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Port Director
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Mr. Frank Buhler
Victoria County Navigation District
South Texas Savings Building
Victoria, Texas 77901

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Commercial Dock
Port of Anacortes
Anacortes, Washington 98221

*Manager, Port of Everett
Pier One
P.O. Box 538
Everett, Washington 98206

*Mr. Gene W. Sibold, Manager
Port of Olympia, P.O. Box 827
Olympia, Washington 98501

*Mr. E. W. Clocksin, Manager
Port of Grays Harbor
P.O. Box 660
Aberdeen, Washington 98520

*Mr. James L. Bean, Manager
Port of Willapa Harbor
Raymond, Washington 98577

*Mr. Thomas C. Neal, Manager
Port of Port Angeles
P.O. Box 791
Port Angeles, Washington 98362

*Mr. Richard Anderson, Director
Port of Stockton, P.O. Box 2089
Stockton, California 95201

*Port Director
Port of Redwood City
775 Harbor Boulevard
Redwood City, California 94063

*Mr. Thomas R. Eddy, Port Director
City of Richmond Port Commission
City Hall
Richmond, California 94804

Director, Decatur State Docks
R #1, Decatur, Alabama 35601

*Mr. John A. Stubbs, General Mgr.
Brunswick Port Authority
Brunswick, Georgia 31520

Col. Reubin Wheelis, Director →
Alabama State Docks Department
P.O. Box 1588
Mobile, Alabama

Ports of: *Mobile, Huntsville, Jackson, Claiborne, Tuscaloosa-Northport, Demopolis, Columbia, Montgomery, Cordova, Phenix City, Florence, and Bridgeport.

Mr. Joseph L. Stanton →
Port Administrator
Maryland Port Administration
19 South Charles Street
Baltimore, Maryland 21201

Ports of: Annapolis and Cambridge

*Mr. K. M. Engebretsen, Director
Port of Vancouver, P.O. Box 1180
Vancouver, Washington 98660

Mr. Richard M. White, General Mgr.
Port of Walla Walla, P.O. Box 1077
Walla Walla, Washington 99362

Mr. H. W. Parkinson, Port Manager
Port of Pasco, P.O. Box 769
Pasco, Washington 99301

*Mr. C. E. Hodges, General Manager
The Port of Astoria
Astoria, Oregon 97103

*Mr. Melvin Shore, Port Director
Port of Sacramento, World Trade Center
West Sacramento, California 95691

*Mr. Robert J. Herrington, Mgr.-Engineer
Port of Coos Bay Commission
P.O. Box 787
Coos Bay, Oregon 97420

Mr. Leslie M. Westfall, Sec.-Surveyor
State Board of Harbor Com. for
Humboldt Bay, P.O. Box 372
Eureka, California 95501

Mr. Warren T. Lawrence, Mgr. Dock 1
Board of Harbor Commissioners for
Oxnard Harbor District
Port Hueneme, California 93041

Director, Port Osborne
P.O. Box 10727
Birmingham, Alabama 35202

U.S. INLAND WATERWAY TERMINAL COMPANIES ADDRESSES

President
Aurora Terminal Co., Inc.
Box 176
Aurora, Indiana 47001

President
P.C. Pfeiffer Company, Inc.
130 Wall St., P.O. Box 3248
Beaumont, Texas 77704

President
Monongahela River Terminals Corp.
6600 Grant Avenue
Cleveland, Ohio
Re: Bunola Terminal

President
Amherst Industries, Inc.
Port Amherst
Charleston, West Virginia 25306

Mr. J. B. Wimberley, President
Texas City Terminal Railway Co.
Texas City, Texas 77591

President
Allied Chemical Company
Hopewell, Virginia 23860
Re: Hopewell Terminal

President
North Pier Terminal Company
Transit Dock #1
Butler Drive, Lake Calumet Harbor
Chicago, Illinois 60633

President
River Transportation Company
5297 River Road
Cincinnati, Ohio 45233

President
Northern Waterway Terminals Corp.
Second Street & River
P.O. Box 361
Clinton, Iowa 52732

Director
Matagorda County Navigation
District No. 2, P.O. Box 1426
Bay City, Texas 77414

President
Delta Concrete Company
41st and Noble Streets
Bellaire, Ohio

President
Union Concrete Pipe Company
Ceredo, West Virginia

Director
Chattanooga River Terminal
Division of SMC Corporation
19th Street at the River
P.O. Box 6216
Chattanooga, Tennessee 37401

Mr. Irv Jensen, Port Director
South Haven Terminal Company
Box 409, South Haven, Michigan 49090

President
Tennessee River Terminals, Division of
Chattanooga Warehouse & Cold Storage Co.
530 Manufacturers Road
Chattanooga, Tennessee 37405

Director
Cincinnati River Terminal
1707 Eastern Avenue
Cincinnati, Ohio 45202

President
Valley Terminal Company
Front and Carr Streets
Cincinnati, Ohio 45203

Director
Tri-State Marine Terminal
Riverside Drive
Coal Grove, Ohio 45638

Director
Standard Terminals, Inc.
One Fifth Street
New Kensington, Pennsylvania 15068
Re: New Kensington Terminal

President
Cooper Terminal Company, Inc.
P.O. Box 1676
East St. Louis, Illinois 62206

President
S. H. Bell Company
103 Brilliant Avenue
P.O. Box 7830
Pittsburgh, Pennsylvania 15215
Re: East Liverpool Terminal
Braddock Terminal

Director
General Materials Terminals
P.O. Box 86
New Brighton, Pennsylvania 15066
Re: Fallston Terminal
Conway Terminal

President
M. T. Epling Company
Gallipolis, Ohio 45631

President
Ward Construction Company
P.O. Box 8038
Huntington, West Virginia 25705

President
Illinois River Terminal Company
315 McDonough Street
Joliet, Illinois 60234

Mr. K. C. Kohl, Manager
Knoxville River Terminal Corp.
1300 American National Bank Bldg.
Chattanooga, Tennessee 37402
Re: Knoxville Terminal

President
Inland Rivers Terminal Company
Foot of Lindsey Road
P.O. Box 6004
Little Rock, Arkansas 72206

President
Dubuque Tank Terminal Company
American Trust Building
Dubuque, Iowa 52001

President
Mead Johnson Termian Corporation
1830 West Ohio Street
P.O. Box 597
Evansville, Indiana 47701

President
The Buncher Company
2515 Preble Avenue
Pittsburgh, Pennsylvania 15233
Re: Leetsdale Terminal

President, Dravo Corporation
Keystone Division
One Oliver Plaza
Pittsburgh, Pennsylvania 15222
Re: Neville Island Terminal
Rochester Terminal
Riverton Terminal

President
Tom Hicks Transfer Company
Peters Road, P.O. Box 283
Harvey, Louisiana 70058

Director
Jeffersonville River Terminal
Jeffersonville, Indiana 47130

Mr. Rodney C. LaMonthe, Port Director
Mid-West Terminal Warehouse Company
5750 East Front Street
P.O. Box 11
Kansas City, Missouri 64141

President
R. J. K. Enterprises, Inc.
4110 Dane Avenue
Cincinnati, Ohio 45223
Re: Lawrenceburg Terminal

Director
Port of Louisville Terminal, Inc.
P.O. Box 1020
333 River Road
Louisville, Kentucky 40201

President
McKees Rocks Industrial Enterprises, Inc.
Nichol Avenue
McKees Rocks, Pennsylvania 15136

Director
Kingston River Terminal, Inc.
P.O. Box 62
Mapleton, Illinois 61547

Director
Memphis River Terminal, Inc.
P.O. Box 25
Foot of Keel Street
Memphis, Tennessee 38101

Mr. G. M. Kirchoff, President
Northern Waterways Terminals Corp.
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Minneapolis, Minnesota 55404

Mr. Ollie Minton, President
Central-Cumberland Corporation
P.O. Box 747
Nashville, Tennessee 37202

Director
Ozburn-Hessey Storage Co. Terminal
100 First Avenue, North
P.O. Box 7154
Nashville, Tennessee 37210

Director
Jones & Kerby North Little Rock
Port, Inc.
6500 England Highway
North Little Rock, Arkansas 72114

President
Central Illinois Dock Company
P.O. Box 638
Pekin, Illinois

Director
Peoria Barge Terminal, Inc.
Foot of Main Street
Peoria, Illinois 61602

President
McGovney Ready Mix, Inc.
55 River Avenue
Portsmouth, Ohio 45662

Director
Madison River Terminal, Inc.
Box 253
Madison, Indiana 47250

President
Pittsburgh Des Moines Steel Co.
East Canal Road
Marseilles, Illinois 61341

Director
Mid-South Terminals Corporation
1145 Channel Avenue
Memphis, Tennessee 38106

Mr. R. E. Pulford, Port Director
Willbros Terminal Company, Inc.
RFD #5, Port 50
Muskogee, Oklahoma 74401

Director
Nashville Cumberland River Terminal
402 Driftwood Street
P.O. Box 7363
Nashville, Tennessee 37210

Director
Steinhart Terminal
Operated by Sioux City &
New Orleans Terminal Corporation
Foot of Central Avenue
Nebraska City, Nebraska 68410

Director
Omaha Terminal
Operated by Sioux City &
New Orleans Terminal Corporation
701 Abbott Drive
Omaha, Nebraska 68102

Director
Owensboro River-Rail Terminal Division
Owensboro River Sand & Gravel Co., Inc.
P.O. Box 1538
Owensboro, Kentucky

President
Turner Equipment Rental, Inc.
12 Southern Pines Drive
Pine Bluff, Arkansas 71601

President
Quincy Terminal Company
Front & Harrison Streets
Quincy, Illinois 62301

President
M.V.B.L. Terminal Company
Foot of Rutger Street
St. Louis, Missouri 63104

Director
Northern Waterway Terminals Corp.
1033 Childs Road
St. Paul, Minnesota 55106

President
Penn Builders Supply Company
151 West Fourth Avenue
Tarentum, Pennsylvania 15084

President
River Transportation Company
Port of Vicksburg
P.O. Box 1148
Vicksburg, Mississippi 39180

President
Dillner Storage Company
Jones St. & Monongahela River
West Elizabeth, Pennsylvania 15088

President
The Standard Slag Company
Center Street and Hayport Road
Wheelersburg, Ohio 45694

Mr. Gresham Hougland
c/o Crounse Corporation
Paducah, Kentucky 42001

Mr. W. E. Palmer
Big Soo Terminal, Box 209
Sioux City, Iowa

Director
Rock Island River Terminal
Seventh Avenue & Mill Street
Rock Island, Illinois 61201

Mr. Allan P. Bebee, President
St. Louis Terminals Corporation
One North Market Street
St. Louis, Missouri 63102

President
Tennessee Valley Sand & Gravel Co.
P.O. Box 520
Sheffield, Alabama 35660

President
Central Industries, Inc.
P.O. Box 861
Vicksburg, Mississippi 39180

President
Vidalia Dock and Storage Co., Inc.
P.O. Box 891
Vidalia, Louisiana 71373

President
Tom Hicks Transfer Company
Highway No. 378, P.O. Box 98
Westlake, Louisiana 40669

President
Standard Sand & Gravel Company
34th and Market Streets
Wheeling, West Virginia 26003

President
North Star Coal Company
1202 Benedum Trees Building
Pittsburgh, Pennsylvania 15222
Re: Aliquippa Terminal
Monaca Terminal

MICHIGAN STATE UNIVERSITY EAST LANSING · MICHIGAN 48823

GRADUATE SCHOOL OF BUSINESS ADMINISTRATION
DEPARTMENT OF MARKETING AND TRANSPORTATION ADMINISTRATION · EPPLEY CENTER

In a few days you will be receiving a set of questionnaires. This letter is intended to notify you in advance that you should not be overly concerned about the size or weight of the envelope they arrive in, since you will only be asked to answer one of the four questionnaires inside--the one appropriate for your port or terminal.

The purpose of the questionnaire will be explained in the letter which will accompany it. Thank you for your time and consideration.

Sincerely yours,

K. M. Bertram

MICHIGAN STATE UNIVERSITY EAST LANSING · MICHIGAN 48823

GRADUATE SCHOOL OF BUSINESS ADMINISTRATION
DEPARTMENT OF MARKETING AND TRANSPORTATION ADMINISTRATION · EPPLEY CENTER

I am writing my Ph.D. dissertation at Michigan State on the subject of "An Analysis of Bargeship Systems: With Emphasis on Their Impact on U.S. Seaports and Inland Ports." Regarding the enclosed questionnaires, please note that you are only being asked to answer one of the four--the one whose title appropriately describes your port's relationship (or lack thereof) with LASH/SEABEE barges.

Previous communications during the construction of the questionnaires and development of port listings have secured the solid interest, support, and inputs of the cited individuals in the U.S. Department of Transportation (Dr. John Hazard, Assistant Secretary for International Policy), the Office of Ports and Intermodal Systems (Mr. Armour C. Armstrong, Chief) in the U.S. Maritime Administration, the Association of American Port Authorities (Mr. Paul A. Amundsen, Executive Director), and the St. Louis Terminals Corporation (Mr. Allan P. Bebee, President). Your support, however, is even more critical to the achievement of the goals set forth for this project.

Since you will be sent a copy of the survey's results, which will give each inland port's relative position concerning the new forms of international cargo traffic measured here, you will gain an increased knowledge of your port's competitive position by answering and returning your questionnaire. On a broader scale, the information you provide will contribute to the important public knowledge "pool" of how these new international shipping systems are affecting, not affecting and/or expected to affect the nation's inland ports. In this respect, please ignore the use of the word *terminal* in parentheses after the word *port* throughout the questionnaire. It's function is to enable the gathering of data from terminals in those situations where no established inland port authority exists. Finally, it is emphasized that this survey is not a sample, but is attempting a 100 percent return of all questionnaires sent to ports (or terminals) which are either geographically located inland, or functionally performing as an inland port (see first question on your questionnaire).

If you have any questions, please call me collect at work (517-355-4460) or home (517-353-7106). Your help and cooperation in this project will be very deeply appreciated. A stamped, self-addressed envelope is enclosed for your convenience.

Sincerely yours,

K. M. Bertram

MICHIGAN STATE UNIVERSITY EAST LANSING · MICHIGAN 48823

GRADUATE SCHOOL OF BUSINESS ADMINISTRATION

DEPARTMENT OF MARKETING AND TRANSPORTATION ADMINISTRATION · EPPLEY CENTER

I am writing my Ph.D. dissertation here at Michigan State on the subject of "An Analysis of Bargeship Systems: With Emphasis on Their Impact on U.S. Seaports and Inland Ports." You are being contacted at the advice of Mr. Allan Bebee, President of the St. Louis Terminals Corp., who, in the process of providing much help and cooperation in this project, has suggested contacting the major terminal operators at those inland ports which do not have record-keeping public port authorities. Mr. Bebee's help has also been supplemented by that of Dr. John Hazard, Assistant Secretary for International Policy at the U.S. Department of Transportation. Please see enclosed photostat.

Regarding the enclosed questionnaires, please note that you are only being asked to answer one of the four--the one whose title appropriately describes your firm's relationship (or lack thereof) with LASH/SEABEE barges. In addition, you are assured that your reply will be treated as strictly confidential, with only the overall totals of each inland port (i.e., the combined totals of all terminal operators at that port) being published or released in any form. Finally, whenever you see the words "your port (terminal)" on your questionnaire, the word "terminal" applies for you (i.e., except in the first two questions, do not try to give an estimate for your entire port, but rather just your own operations.)

Not only is your answering and returning of the appropriate questionnaire critical to the success of my doctoral dissertation, but the information that you provide will add to the important public "pool of knowledge" of the present and anticipated effects of new shipping systems on the inland ports of the United States. Finally, if you would like a summary copy of the questionnaires' results by inland port, simply check (✓) the box at the bottom of this page and return it with your questionnaire, and I will be happy to send you one.

Should you have any questions please call me collect at work (517-355-4460) or at home (517-353-7106). Your help and cooperation on this project will be very deeply appreciated. A self-addressed, stamped envelope is enclosed for your convenience.

Sincerely yours,

K. M. Bertram

☐ I would like a summary copy of the survey results.

Name of Inland Port ______

Name of Terminal Company ______
(if appropriate)

INLAND PORT (TERMINAL)* QUESTIONNAIRE I

INLAND PORTS (TERMINALS) WITH LASH/SEABEE BARGE TRAFFIC

(Please assume that you received this questionnaire prior to 1973 spring flooding while answering all questions.)

1. In which of the following categories would you place your (terminal's) port? *(Please check (✓) appropriate one)*:

   Geographic Inland Port--located on an inland waterway or one of the Great Lakes, whose St. Lawrence Seaway cannot accommodate full-sized (30 ft. draft) containerships and/or bargeships (LASH/SEABEE) . . . . ______

   Functional Inland Port--located on the U.S. East, West or Gulf Coast, but not presently functionally capable of handling full-sized containerships and/or bargeships (LASH/SEABEE) in terms of depth (30 ft.) or volume . . . . ______

2. Which of the following do you classify your (terminal's) port as? *(Please check (✓) proper choice.)* Terminal operators *please be sure to count competitor's terminals in determining total terminals for your port.*

   Regional Port: (1) At least 10 terminals or terminal activities, including at least one for public use, all located within a waterfront area identified within an urban area with 50,000 people or more; and (2) served by at least five U.S. and/or interstate highways . . . . ______

   Sub-Regional Port: (1) At least three terminals or terminal activities, located within a limited waterfront distance; (2) place identity, by reason of association with a nearby town or city; and (3) served by a railroad and at least one major highway, U.S. or interstate . . . . ______

   Non-Port Terminal: Land-water transfer facilities (terminals) located at waterside in rural areas having place identity but not otherwise identifiable as a regional or sub-regional port . . . . ______

3. When did your port (terminal) start having LASH/SEABEE barge traffic? (Include "early," "mid-," or "late" with calendar year.) . . . . ______19______

4. How many full LASH/SEABEE barges are loaded with cargo at your port (terminal) per month on the average? Unloaded? *(Note: If 100 barges are 1/2 filled, your answer would be 50.)* (SEABEE barges count double.)

   Barges loaded ______

   Barges unloaded ______

5. What are the three (3) major cargo items handled at your port (terminal) in order of importance by volume? Also please indicate whether each item is an import, export, and/or domestic item and its estimated percentage of your total volume.

	Cargo Items	*Please circle appropriate choice(s)*	Estimated Percentage of Port (Terminal) Volume
1st	______	Import Export Domestic	____%
2nd	______	Import Export Domestic	____%
3rd	______	Import Export Domestic	____%

______

*Where public port authorities do not exist, inland terminal operators are asked to answer for their terminal, except in questions #1 and #2, where they are asked to answer for the port as a whole.

	Import Items	Export Items
6. What are the three (3) major LASH/SEABEE barge import and export cargo items handled by your port (terminal), in order of importance by volume?	1. ______ 2. ______ 3. ______	1. ______ 2. ______ 3. ______

7. How many railroads, trucklines and bargelines serve your port (terminal)?

Railroads	Trucklines	Bargelines

8. Please indicate your port's (terminal's) 1971 volume in actual or estimated long-tons or, if necessary, in a percentage of total volume, for each of the following traffic types. *Please insure that items (a), (b), and (c) below add up to (equal) your conventional barges' total figure.)*

Please circle appropriate choice		Traffic Type	1971 Long-Ton Volume	Estimated % of 1971 Total Volume
Actual	Estimate	Conventional barges--total	______	____ %
		Breakdown:		
Actual	Estimate	a. Domestic cargo	______	____ %
Actual	Estimate	b. International cargo not in 20-40 ft. containers .	______	____ %
Actual	Estimate	c. International cargo in 20-40 ft. containers . . .	______	____ %
Actual	Estimate	LASH/SEABEE barges	______	____ %
Actual	Estimate	"Mini-containerships"	______	____ %
Actual	Estimate	Others, please specify ____________________ . .	______	____ %
Actual	Estimate	Total volume of above in long-tons (Please attempt to answer even if only percentage estimates were able to be given above.)	______	100 %

9. What was your port's (terminal's) 1972 volume for each of the following, as above:

Please circle appropriate choice		Traffic Type	1972 Long-Ton Volume	Estimated % of 1972 Total Volume
Actual	Estimate	Conventional barges--total	______	____ %
		Breakdown:		
Actual	Estimate	a. Domestic cargo	______	____ %
Actual	Estimate	b. International cargo not in 20-40 ft. containers .	______	____ %
Actual	Estimate	c. International cargo in 20-40 ft. containers . . .	______	____ %
Actual	Estimate	LASH/SEABEE barges	______	____ %
Actual	Estimate	"Mini-containerships"	______	____ %
Actual	Estimate	Others, please specify ____________________ . .	______	____ %
Actual	Estimate	Total volume of above in long-tons (Please attempt to answer even if only percentage estimates were able to be given above.)	______	100 %

10. What do you estimate will be your port's (terminal's) 1973 volume for each of the following, as above:

Traffic Type	1973 Long-Ton Volume	Estimated % of 1973 Total Volume
Conventional barges--total	______	____ %
Breakdown: a. Domestic cargo	______	____ %
b. International cargo not in 20-40 ft. containers	______	____ %
c. International cargo in 20-40 ft. containers	______	____ %
LASH/SEABEE barges	______	____ %
"Mini-containerships"	______	____ %
Others, please specify ________________________________ . .	______	____ %
Total volume of above in long-tons (Please attempt to answer even if only percentage estimates were able to be given above.)	______	100 %

11. What do you estimate the percentage share of each of the following will be of your port's (terminal's) total volume five (5) years from now? *(Please insure that your percentages for items (a), (b), and (c) add up to your total conventional barges percentage.)*

Conventional barges, total		____ %
Breakdown: a. Domestic cargo	____ %	
b. International cargo not in 20-40 ft. containers	____ %	
c. International cargo in 20-40 ft. containers	____ %	
LASH/SEABEE barges		____ %
"Mini-containerships"		____ %
Others, please specify ______________________________ . .		____ %
Total		100 %

12. Please indicate the percentage of your port's (terminal's) current total cargo traffic that you consider shippable via 20- to 40-ft. containers and/or LASH/SEABEE barges. *Note: Please be sure to give the total percentage for each, though many items could be shipped using either; i.e., though there is an overlap.)*

20- to 40 ft. containers ____ %

LASH/SEABEE barges ____ %

13. Has your port (terminal) or any other corporation or federal, state, or local government or agency made any investments since 1970 which were specifically intended to increase your LASH/SEABEE barge traffic? *Note: Please include investments where construction is in process and funds are committed in this total.*

Yes ______

No ______

If so, for what total dollar amount? . . . . $__________

Who invested in what specific items? ______________________________

____

____

14. Do any of the sources listed in question 13 intend to make any investments in the near future (within 3 years) which will be specifically intended to increase your LASH/SEABEE barge traffic?

Yes ______

No ______

If so, for what total dollar amount? . . . . $__________

Who will invest in what specific items? ______________________________

____

____

15. Is your port (terminal) doing anything else besides the investments in questions 13 and 14 in order to increase your LASH/SEABEE barge traffic?

Yes ______

No ______

If so, what? ____

____

____

16. How many waterway miles is your port (terminal) from the nearest seaport on the East, West, or Gulf Coast (whichever applies in your case)?

____
Waterway Miles

17. How do you assess the past (indicate with a "P"), current (indicate with a "C"), and future (indicate with an "F"), impacts of each of the following on the flow of LASH/SEABEE barge traffic through your port (terminal)? (PAST = USED TO AFFECT; CURRENT = DOES AFFECT; FUTURE = WILL AFFECT.)
Please note: If past, current, and future effects for any of them are identical simply use a check (✓) to indicate all three (see illustrative examples (*) in first two rows).

Items	Extremely Favorable	Favorable	No Effect	Unfavorable	Extremely Unfavorable
*Illustrative example 1		F	C		P
*Illustrative example 2		✓			
a. Type of agricultural[♦] items produced locally					
b. Type of non-agricultural[♦♦] items produced locally					
c. LASH/SEABEE cargo rate structure					
d. LASH/SEABEE cargo damage ratio					
e. Distance of your port from nearest East, West, or Gulf Coast seaport					
f. Port (terminal) promotion efforts for such traffic					
g. LASH/SEABEE operators promotion efforts for such traffic					
h. Bargeline operators promotion efforts for such traffic					
i. Number of railroads serving port (terminal)					
j. Number of trucklines serving port (terminal)					
k. Number of bargelines serving port (terminal)					
l. Type of imported agricultural[♦] items demanded locally					
m. Type of imported non-agricultural[♦♦] items demanded locally					
n. Port (terminal) volume potential					
o. Number of LASH/SEABEE barges available					
p. Others, please specify					
______					
______					

18. Which of the items in question 17 currently most encourage LASH/SEABEE barge traffic at your port (terminal)? Discourage?

Most Encourage	Most Discourage
1. ______	1. ______
2. ______	2. ______
3. ______	3. ______

19. Do you expect LASH/SEABEE barge traffic to increase at your port (terminal) during the next five (5) years? Yes ______ No ______

If yes, by what percent per year, on the average? . . . . ______%

[♦]Agricultural items include crude materials such as cotton, crude foodstuffs, manufactured foodstuffs and beverages for human consumption, semimanufactured items such as lumber and wood-pulp, and finished manufactured items such as smoking tobacco in bulk.

[♦♦]Non-agricultural items also include crude materials, crude foodstuffs, manufactured foodstuffs and beverages, semimanufactures, and finished manufactured goods, except from non-agricultural sources, i.e., petroleum, fishmeal unfit for human consumption, and construction equipment, for example.

20. Are your expectations of future LASH/SEABEE barge traffic at your port (terminal) the result of the actions of any nearby shippers?

Yes _______
No _______

If yes, please list shippers, their potential annual volume and their actions taken (e.g., signed contract with shipline, planning exports, etc.).

	Shipper	Potential Annual Long-Ton Volume	Action Taken
1.	____	____	____
2.	____	____	____
3.	____	____	____

21. What do you estimate to be the maximum annual LASH/SEABEE barge traffic volume in 1978 at your port (terminal)? In 1983?

1978: _______ Long-Tons
1983: _______ Long-Tons

22. How do you rank the barge types listed on the right using 1, 2, 3, or 4 to indicate each's ranking by the degree to which they compete at your port (terminal) with LASH/SEABEE barge traffic? *(Leave blank the barge types whose competition is insignificant.)*

Tanker barges _____
Open hopper barges _____
Covered dry cargo barges _____
Deck barges _____

23. Do LASH/SEABEE barges carry 20- to 40 ft. containers to or from your port (terminal)?

Yes _____ No _____

If yes, how many imported and exported containers per month, on the average?

# Containers/Month	
Import	Export
____	____

24. If conventional barges carry 20- to 40-ft. containers to or from your port (terminal), please indicate the number per month by type of barge and cargo.

	# Containers/Month	
	Import	Export
Hopper barges	____	____
Covered dry cargo barges	____	____
Deck barges	____	____

25. Do you expect LASH/SEABEE barges to have a significant effect on your port's (terminal's) international cargo traffic? If so, describe such effects not already covered in questions 11, 12, 19 and 21 here and on overflow sheet, if needed.

Yes _______
No _______

NOTE OVERFLOW SHEET ATTACHED

Thank you for your cooperation.

Name of Inland Port

Name of Terminal Company
(if appropriate)

INLAND PORT (TERMINAL)* QUESTIONNAIRE II

INLAND PORTS (TERMINALS) IMMEDIATELY EXPECTING (DURING 1973) LASH/SEABEE BARGE TRAFFIC

(Please assume that you received this questionnaire prior to 1973 spring flooding while answering all questions.)

1. In which of the following categories would you place your (terminal's) port? *(Please check (✓) appropriate one):*

   Geographic Inland Port--located on an inland waterway or one of the Great Lakes, whose St. Lawrence Seaway cannot accommodate full-sized (30 ft. draft) containerships and/or bargeships (LASH/SEABEE) . . . . ______

   Functional Inland Port--located on the U.S. East, West or Gulf Coast, but not presently functionally capable of handling full-sized containerships and/or bargeships (LASH/SEABEE) in terms of depth (30 ft.) or volume . . . . ______

2. Which of the following do you classify your (terminal's) port as? *(Please check (✓) proper choice.)* Terminal operators *please be sure to count competitor's terminals in determining total terminals for your port.*

   Regional Port: (1) At least 10 terminals or terminal activities, including at least one for public use, all located within a waterfront area identified within an urban area with 50,000 people or more; and (2) served by at least five U.S. and/or interstate highways . . . . ______

   Sub-Regional Port: (1) At least three terminals or terminal activities, located within a limited waterfront distance; (2) place identity, by reason of association with a nearby town or city; and (3) served by a railroad and at least one major highway, U.S. or interstate . . . . ______

   Non-Port Terminal: Land-water transfer facilities (terminals) located at waterside in rural areas having place identity but not otherwise identifiable as a regional or sub-regional port . . . . ______

3. When during 1973 does your port (terminal) expect to start having LASH/SEABEE barge traffic? (Insert month next to calendar year 1973.) __________ 1973

4. How many full LASH/SEABEE barges do you estimate will be loaded with cargo at your port (terminal) per month on the average? *(Note: If 100 barges are 1/2 filled, your answer would be 50.)* Unloaded? (SEABEE barges count double.)

   Barges loaded ______
   Barges unloaded ______

5. What are the three (3) major cargo items handled at your port (terminal) in order of importance by volume? Also please indicate whether each item is an import, export, and/or domestic item and its estimated percentage of your total volume.

	Cargo Items	*Please circle appropriate choice(s)*	Estimated Percentage of Port (Terminal) Volume
1st	______________________	Import Export Domestic	____%
2nd	______________________	Import Export Domestic	____%
3rd	______________________	Import Export Domestic	____%

---

*Where public port authorities do not exist, inland terminal operators are asked to answer for their terminal, except in questions #1 and #2, where they are asked to answer for the port as a whole.

6. What will be the three major LASH/SEABEE barge import and export cargo items handled by your port (terminal), in order of importance by volume?

Import Items	Export Items
1. ______	1. ______
2. ______	2. ______
3. ______	3. ______

7. How many railroads, trucklines and bargelines serve your port (terminal)?

______ Railroads	______ Trucklines	______ Bargelines

8. Please indicate your port's (terminal's) 1971 volume in actual or estimated long-tons or, if necessary, in a percentage of total volume, for each of the following traffic types. *(Please insure that items (a), (b), and (c) below add up to (equal) your conventional barges' total figure.)*

Please circle appropriate choice	Traffic Type	1971 Long-Ton Volume	Estimated % of 1971 Total Volume
Actual Estimate	Conventional barges--total	______	______ %
	Breakdown:		
Actual Estimate	a. Domestic cargo	______	______ %
Actual Estimate	b. International cargo not in 20-40 ft. containers .	______	______ %
Actual Estimate	c. International cargo in 20-40 ft. containers . . .	______	______ %
Actual Estimate	"Mini-containerships"	______	______ %
Actual Estimate	Others, please specify ______ . .	______	______ %
Actual Estimate	Total volume of above in long-tons (Please attempt to answer even if only percentage estimates were able to be given above.)	______	100 %

9. What was your port's (terminal's) 1972 volume for each of the following, as above:

Please circle appropriate choice	Traffic Type	1972 Long-Ton Volume	Estimated % of 1972 Total Volume
Actual Estimate	Conventional barges--total	______	______ %
	Breakdown:		
Actual Estimate	a. Domestic cargo	______	______ %
Actual Estimate	b. International cargo not in 20-40 ft. containers .	______	______ %
Actual Estimate	c. International cargo in 20-40 ft. containers . . .	______	______ %
Actual Estimate	"Mini-containerships"	______	______ %
Actual Estimate	Others, please specify ______ . .	______	______ %
Actual Estimate	Total volume of above in long-tons (Please attempt to answer even if only percentage estimates were able to be given above.)	______	100 %

10. What do you estimate will be your port's (terminal's) 1973 volume for each of the following, as above:

Traffic Type	1973 Long-Ton Volume	Estimated % of 1973 Total Volume
Conventional barges--total	______	______ %
Breakdown: a. Domestic cargo	______	______ %
b. International cargo not in 20-40 ft. containers.	______	______ %
c. International cargo in 20-40 ft. containers	______	______ %
LASH/SEABEE barges	______	______ %
"Mini-containerships"	______	______ %
Others, please specify ______ . .	______	______ %
Total volume of above in long-tons (Please attempt to answer even if only percentage estimates were able to be given above.)	______	100 %

11. What do you estimate the percentage share of each of the following will be of your port's (terminal's) total volume five (5) years from now? *Please insure that your percentages for items (a), (b), and (c) add up to your total conventional barges percentage.*

Conventional barges, total . . . . ______%

Breakdown:
- a. Domestic cargo . . . . ______%
- b. International cargo not in 20-40 ft. containers . . . . . ______%
- c. International cargo in 20-40 ft. containers . . . . ______%

LASH/SEABEE barges . . . . ______%

"Mini-containerships" . . . . ______%

Others, please specify ______________________________ . . ______%

Total . . . . 100 %

12. Please indicate the percentage of your port's (terminal's) current total cargo traffic that you consider shippable via 20- to 40-ft. containers and/or LASH/SEABEE barges. *Note: Please be sure to give the total percentage for each, though many items could be shipped using either; i.e., though there is an overlap.*

20- to 40 ft. containers ______%

LASH/SEABEE barges ______%

13. Has your port (terminal) or any other corporation or federal, state, or local government or agency made any investments since 1970 which were specifically intended to increase your LASH/SEABEE barge traffic? *Note: Please include investments where construction is in process and funds are committed in this total.*

Yes ______
No ______

If so, for what total dollar amount? . . . . $__________

Who invested in what specific items? ______________________________

____

____

14. Do any of the sources listed in question 13 intend to make any investments in the near future (within 3 years) which will be specifically intended to increase your LASH/SEABEE barge traffic?

Yes ______
No ______

If so, for what total dollar amount? . . . . $__________

Who will invest in what specific items? ______________________________

____

____

15. Is your port (terminal) doing anything else besides the investments in questions 13 and 14 in order to increase your LASH/SEABEE barge traffic?

Yes ______
No ______

If so, what? ______________________________

____

____

16. How many waterway miles is your port (terminal) from the nearest seaport on the East, West, or Gulf Coast (whichever applies in your case)?

______
Waterway Miles

17. How do you assess the past (indicate with a "P"), current (indicate with a "C"), and future (indicate with an "F"), impacts of each of the following on the flow of LASH/SEABEE barge traffic through your port (terminal)? (PAST = USED TO AFFECT; CURRENT = DOES AFFECT; FUTURE = WILL AFFECT.)
Please note: If past, current, and future effects for any of them are identical simply use a check (✓) to indicate all three (see illustrative examples (*) in first two rows).

Items	Extremely Favorable	Favorable	No Effect	Unfavorable	Extremely Unfavorable
*Illustrative example 1		F	C		P
*Illustrative example 2		✓			
a. Type of agricultural♦ items produced locally					
b. Type of non-agricultural♦♦ items produced locally					
c. LASH/SEABEE cargo rate structure					
d. LASH/SEABEE cargo damage ratio					
e. Distance of your port from nearest East, West, or Gulf Coast seaport					
f. Port (terminal) promotion efforts for such traffic					
g. LASH/SEABEE operators promotion efforts for such traffic					
h. Bargeline operators promotion efforts for such traffic					
i. Number of railroads serving port (terminal)					
j. Number of trucklines serving port (terminal)					
k. Number of bargelines serving port (terminal)					
l. Type of imported agricultural♦ items demanded locally					
m. Type of imported non-agricultural♦♦ items demanded locally					
n. Port (terminal) volume potential					
o. Number of LASH/SEABEE barges available					
p. Others, please specify					
____________					
____________					

18. Which of the items in question 17 currently most encourage LASH/SEABEE barge traffic at your port (terminal)? Discourage?

Most Encourage	Most Discourage
1. ____________	1. ____________
2. ____________	2. ____________
3. ____________	3. ____________

19. Do you expect LASH/SEABEE barge traffic to increase at your port (terminal) during the next five (5) years? Yes _____ No _____

If yes, by what percent per year, on the average? . . . . _____%

♦Agricultural items include crude materials such as cotton, crude foodstuffs, manufactured foodstuffs and beverages for human consumption, semimanufactured items such as lumber and wood-pulp, and finished manufactured items such as smoking tobacco in bulk.

♦♦Non-agricultural items also include crude materials, crude foodstuffs, manufactured foodstuffs and beverages, semimanufactures, and finished manufactured goods, except from non-agricultural sources, i.e., petroleum, fishmeal unfit for human consumption, and construction equipment, for example.

20. Are your expectations of future LASH/SEABEE barge traffic at your port (terminal) the result of the actions of any nearby shippers?

Yes ______
No ______

If yes, please list shippers, their potential annual volume and their actions taken (e.g., signed contract with shipline,

	Shipper	Potential Annual Long-Ton Volume	Action Taken
1.	______	______	______
2.	______	______	______
3.	______	______	______

21. What do you estimate to be the maximum LASH/SEABEE barge traffic annual volume in 1978 at your port (terminal)? In 1983?

1978: ______ Long-Tons 1983: ______ Long-Tons

22. How do you rank the barge types listed on the right using 1, 2, 3, or 4 to indicate each's ranking by the degree to which they will compete at your port (terminal) with LASH/SEABEE barge traffic? (*Leave blank the barge types whose competition is insignificant.*)

Tanker barges ______
Open hopper barges ______
Covered dry cargo barges ______
Deck barges ______

23. Do you expect LASH/SEABEE barges to carry 20- to 40-ft. containers to or from your port (terminal)?

Yes ______ No ______

If yes, how many imported and exported containers per month, on the average?

# Containers/Month	
______	______
Import	Export

24. If conventional barges carry 20- to 40-ft. containers to or from your port (terminal), please indicate the number per month by type of barge and cargo.

	# Containers/Month	
	Import	Export
Hopper barges	______	______
Covered dry cargo barges	______	______
Deck barges	______	______

25. What do you estimate will be your port's (terminal's) initial annual LASH/SEABEE barge volume in long-tons?

______ Long-Tons

26. Do you expect LASH/SEABEE barges to have a significant effect on your port's (terminal's) international cargo traffic? If so, describe such effects not already covered in questions 11, 12, 19 and 21 here and on overflow sheet, if needed.

Yes ______
No ______

______
______
______
______

NOTE OVERFLOW SHEET ATTACHED

Thank you for your cooperation.

Name of Inland Port ______

Name of Terminal Company
(if appropriate) ______

INLAND PORT (TERMINAL)* QUESTIONNAIRE III

INLAND PORTS (TERMINALS) EXPECTING TO RECEIVE LASH/SEABEE BARGE TRAFFIC WITHIN THREE (3) YEARS (BUT NOT DURING 1973)

(Please assume that you received this questionnaire prior to 1973 spring flooding while answering all questions.)

1. In which of the following categories would you place your (terminal's) port? *(Please check (✓) appropriate one)*:

   Geographic Inland Port--located on an inland waterway or one of the Great Lakes, whose St. Lawrence Seaway cannot accommodate full-sized (30 ft. draft) containerships and/or bargeships (LASH/SEABEE) . . . . ______

   Functional Inland Port--located on the U.S. East, West or Gulf Coast, but not presently functionally capable of handling full-sized containerships and/or bargeships (LASH/SEABEE) in terms of depth (30 ft.) or volume. . . . . ______

2. Which of the following do you classify your (terminal's) port as? *(Please check (✓) proper choice.)* Terminal operators *please be sure to count competitor's terminals in determining total terminals for your port.*

   Regional Port: (1) At least 10 terminals or terminal activities, including at least one for public use, all located within a waterfront area identified within an urban area with 50,000 people or more; and (2) served by at least five U.S. and/or interstate highways . . . . ______

   Sub-Regional Port: (1) At least three terminals or terminal activities, located within a limited waterfront distance; (2) place identity, by reason of association with a nearby town or city; and (3) served by a railroad and at least one major highway, U.S. or interstate . . . . ______

   Non-Port Terminal: Land-water transfer facilities (terminals) located at waterside in rural areas having place identity but not otherwise identifiable as a regional or sub-regional port . . . . ______

3. When does your port expect to start having LASH/SEABEE barge traffic? (Include "early," "mid-," or "late" with calendar year.) . . . . ______19______

4. How many full LASH/SEABEE barges do you estimate will be loaded with cargo at your port per month on the average? *(Note: If 100 barges are 1/2 filled, your answer would be 50.)* Unloaded? (SEABEE barges count double.)

   Barges loaded ______

   Barges unloaded ______

5. What are the three (3) major cargo items handled at your port (terminal) in order of importance by volume? Also please indicate whether each item is an import, export, and/or domestic item and its estimated percentage of your total volume.

	Cargo Items	*Please circle appropriate choice(s)*	Estimated Percentage of Port (Terminal) Volume
1st	______	Import Export Domestic	____%
2nd	______	Import Export Domestic	____%
3rd	______	Import Export Domestic	____%

---

*Where public port authorities do not exist, inland terminal operators are asked to answer for their terminal, except in questions #1 and #2, where they are asked to answer for the port as a whole.

	Import Items	Export Items
6. What will be the three major LASH/SEABEE barge import and export cargo items handled by your port (terminal), in order of importance by volume?	1. ______ 2. ______ 3. ______	1. ______ 2. ______ 3. ______

7. How many railroads, trucklines and bargelines serve your port (terminal)?

______	______	______
Railroads	Trucklines	Bargelines

8. Please indicate your port's (terminal's) 1971 volume in actual or estimated long-tons or, if necessary, in a percentage of total volume, for each of the following traffic types. *(Please insure that items (a), (b), and (c) below add up to (equal) your conventional barges' total figure.)*

Please circle appropriate choice		Traffic Type	1971 Long-Ton Volume	Estimated % of 1971 Total Volume
Actual	Estimate	Conventional barges--total	______	______ %
		Breakdown:		
Actual	Estimate	a. Domestic cargo	______	______ %
Actual	Estimate	b. international cargo not in 20-40 ft. containers	______	______ %
Actual	Estimate	c. International cargo in 20-40 ft. containers	______	______ %
Actual	Estimate	"Mini-containerships"	______	______ %
Actual	Estimate	Others, please specify ______	______	______ %
Actual	Estimate	Total volume of above in long-tons (Please attempt to answer even if only percentage estimates were able to be given above.)	______	100 %

9. What was your port's (terminal's) 1972 volume for each of the following, as above:

Please circle appropriate choice		Traffic Type	1972 Long-Ton Volume	Estimated % of 1972 Total Volume
Actual	Estimate	Conventional barges--total	______	______ %
		Breakdown:		
Actual	Estimate	a. Domestic cargo	______	______ %
Actual	Estimate	b. International cargo not in 20-40 ft. containers	______	______ %
Actual	Estimate	c. International cargo in 20-40 ft. containers	______	______ %
Actual	Estimate	"Mini-containerships"	______	______ %
Actual	Estimate	Others, please specify ______	______	______ %
Actual	Estimate	Total volume of above in long-tons (Please attempt to answer even if only percentage estimates were able to be given above.)	______	100 %

10. What do you estimate will be your port's (terminal's) 1973 volume for each of the following, as above:

Traffic Type	1973 Long-Ton Volume	Estimated % of 1973 Total Volume
Conventional barges--total	______	______ %
Breakdown: a. Domestic cargo	______	______ %
b. International cargo not in 20-40 ft. containers	______	______ %
c. International cargo in 20-40 ft. containers	______	______ %
LASH/SEABEE barges	______	______ %
"Mini-containerships"	______	______ %
Others, please specify ______	______	______ %
Total volume of above in long-tons (Please attempt to answer even if only percentage estimates were able to be given above.)	______	100 %

11. What do you estimate the percentage share of each of the following will be of your port's (terminal's) total volume five (5) years from now? *Please insure that your percentages for items (a), (b), and (c) add up to your total conventional barges percentage.*

Conventional barges, total . . . . ____%

Breakdown:
- a. Domestic cargo . . . . ____%
- b. International cargo not in 20-40 ft. containers . . . . . ____%
- c. International cargo in 20-40 ft. containers . . . . ____%

LASH/SEABEE barges . . . . ____%

"Mini-containerships" . . . . ____%

Others, please specify ______________________________ . . ____%

Total . . . . 100 %

12. Please indicate the percentage of your port's (terminal's) current total cargo traffic that you consider shippable via 20- to 40-ft. containers and/or LASH/SEABEE barges. *Note: Please be sure to give the total percentage for each, though many items could be shipped using either; i.e., though there is an overlap.*

20- to 40 ft. containers____%

LASH/SEABEE barges____%

13. Has your port (terminal) or any other corporation or federal, state, or local government or agency made any investments since 1970 which were specifically intended to increase your LASH/SEABEE barge traffic? *Note: Please include investments where construction is in process and funds are committed in this total.*

Yes ______

No ______

If so, for what total dollar amount? . . . . $__________

Who invested in what specific items? ____

____

____

14. Do any of the sources listed in question 13 intend to make any investments in the near future (within 3 years) which will be specifically intended to increase your LASH/SEABEE barge traffic?

Yes ______

No ______

If so, for what total dollar amount? . . . . $__________

Who will invest in what specific items? ____

____

____

15. Is your port (terminal) doing anything else besides the investments in questions 13 and 14 in order to increase your LASH/SEABEE barge traffic?

Yes ______

No ______

If so, what? ____

____

____

16. How many waterway miles is your port (terminal) from the nearest seaport on the East, West, or Gulf Coast (whichever applies in your case)?

____
Waterway Miles

17. How do you assess the past (indicate with a "P"), current (indicate with a "C"), and future (indicate with an "F"), impacts of each of the following on the flow of LASH/SEABEE barge traffic through your port (terminal)? (PAST = USED TO AFFECT; CURRENT = DOES AFFECT; FUTURE = WILL AFFECT.) *Please note: If past, current, and future effects for any of them are identical simply use a check (✓) to indicate all three (see illustrative examples (*) in first two rows).*

Items	Extremely Favorable	Favorable	No Effect	Unfavorable	Extremely Unfavorable
*Illustrative example 1		F	C		P
*Illustrative example 2		✓			
a. Type of agricultural♦ items produced locally					
b. Type of non-agricultural♦♦ items produced locally					
c. LASH/SEABEE cargo rate structure					
d. LASH/SEABEE cargo damage ratio					
e. Distance of your port from nearest East, West, or Gulf Coast seaport					
f. Port (terminal) promotion efforts for such traffic					
g. LASH/SEABEE operators promotion efforts for such traffic					
h. Bargeline operators promotion efforts for such traffic					
i. Number of railroads serving port (terminal)					
j. Number of trucklines serving port (terminal)					
k. Number of bargelines serving port (terminal)					
l. Type of imported agricultural♦ items demanded locally					
m. Type of imported non-agricultural♦♦ items demanded locally					
n. Port (terminal) volume potential					
o. Number of LASH/SEABEE barges available . .					
p. Others, please specify					
______________________ . .					
______________________ . .					

18. Which of the items in question 17 currently most encourage LASH/SEABEE barge traffic at your port (terminal)? Discourage?

Most Encourage	Most Discourage
1. ______________	1. ______________
2. ______________	2. ______________
3. ______________	3. ______________

19. Do you expect LASH/SEABEE barge traffic to increase at your port (terminal) in the future beyond its initial annual rate? Yes ______ No ______

If yes, by what percent per year, on the average? . . . . ______%

♦Agricultural items include crude materials such as cotton, crude foodstuffs, manufactured foodstuffs and beverages for human consumption, semimanufactured items such as lumber and wood-pulp, and finished manufactured items such as smoking tobacco in bulk.

♦♦Non-agricultural items also include crude materials, crude foodstuffs, manufactured foodstuffs and beverages, semimanufactures, and finished manufactured goods, except from non-agricultural sources, i.e., petroleum, fishmeal unfit for human consumption, and construction equipment, for example.

20. Are your expectations of future LASH/SEABEE barge traffic at your port (terminal) the result of the actions of any nearby shippers?

Yes ______

No ______

If yes, please list shippers, their potential annual volume and their actions taken (e.g., signed contract with shipline, planning exports, etc.).

	Shipper	Potential Annual Long-Ton Volume	Action Taken
1.			
2.			
3.			

21. What do you estimate to be the maximum LASH/SEABEE barge traffic annual volume in 1978 at your port (terminal)? In 1983?

1978________ Long-Tons   1983:________ Long-Tons

22. How do you rank the barge types listed on the right using 1, 2, 3, or 4 to indicate each's ranking by the degree to which they will compete at your port (terminal) with LASH/SEABEE barge traffic? (*Leave blank the barge types whose competition is insignificant.*)

Tanker barges ______

Open hopper barges ______

Covered dry cargo barges ______

Deck barges ______

23. Do you expect LASH/SEABEE barges to carry 20- to 40-ft. containers to or from your port (terminal)?

Yes _____ No _____

If yes, how many imported and exported containers per month, on the average?

# Containers/Month	
Import	Export
______	______

24. If conventional barges carry 20- to 40-ft. containers to or from your port (terminal), please indicate the number per month by type of barge and cargo.

	# Containers/Month	
	Import	Export
Hopper barges	______	______
Covered dry cargo barges	______	______
Deck barges	______	______

25. What do you estimate will be your port's (terminal's) initial annual LASH/SEABEE barge volume in long-tons?

________ Long-Tons

26. What in particular causes you to expect bargeship barge traffic within the next three (3) years?

____

____

27. Do you expect LASH/SEABEE barges to have a significant effect on your port's (terminal's) international cargo traffic? If so, describe such effects not already covered in questions 11, 12, 19 and 21 here and on overflow sheet, if needed.

Yes ______

No ______

____

____

____

NOTE OVERFLOW SHEET ATTACHED

Thank you for your cooperation.

Name of Inland Port

Name of Terminal Company
(if appropriate)

INLAND PORT (TERMINAL)* QUESTIONNAIRE IV

INLAND PORTS (TERMINALS) NOT EXPECTING ANY LASH/SEABEE BARGE TRAFFIC WITHIN THREE (3) YEARS

(Please assume that you received this questionnaire prior to 1973 spring flooding while answering all questions.)

1. In which of the following categories would you place your (terminal's) port? *(Please check (✓) appropriate one)*:

   Geographic Inland Port--located on an inland waterway or one of the Great Lakes, whose St. Lawrence Seaway cannot accommodate full-sized (30 ft. draft) containerships and/or bargeships (LASH/SEABEE) . . . . ______

   Functional Inland Port--located on the U.S. East, West or Gulf Coast, but not presently functionally capable of handling full-sized containerships and/or bargeships (LASH/SEABEE) in terms of depth (30 ft.) or volume . . . . ______

2. Which of the following do you classify your (terminal's) port as? *(Please check (✓) proper choice.)* Terminal operators *please be sure to count competitor's terminals in determining total terminals for your port.*

   Regional Port: (1) At least 10 terminals or terminal activities, including at least one for public use, all located within a waterfront area identified within an urban area with 50,000 people or more; and (2) served by at least five U.S. and/or interstate highways . . . . ______

   Sub-Regional Port: (1) At least three terminals or terminal activities, located within a limited waterfront distance; (2) place identify, by reason of association with a nearby town or city; and (3) served by a railroad and at least one major highway, U.S. or interstate . . . . ______

   Non-Port Terminal: Land-water transfer facilities (terminals) located at waterside in rural areas having place identity but not otherwise identifiable as a regional or sub-regional port . . . . ______

3. What are the three (3) major cargo items handled at your port (terminal) in order of importance by volume? Also please indicate whether each item is an import, export, and/or domestic item and its estimated percentage of your total volume.

	Cargo Items	*Please circle appropriate choice(s)*	Estimated Percentage of Port (Terminal) Volume
1st	______	Import Export Domestic	____%
2nd	______	Import Export Domestic	____%
3rd	______	Import Export Domestic	____%

4. How many railroads, trucklines and bargelines serve your port (terminal)?

   ____ Railroads ____ Trucklines ____ Bargelines

*Where public port authorities do not exist, inland terminal operators are asked to answer for their terminal, except in questions #1 and #2, where they are asked to answer for the port as a whole.

5. Please indicate your port's (terminal's) 1971 volume in actual or estimated long-tons or, if necessary, in a percentage of total volume, for each of the following traffic types. *Please insure that items (a), (b), and (c) below add up to (equal) your conventional barges' total figure.)*

Please circle appropriate choice		Traffic Type	1971 Long-Ton Volume	Estimated % of 1971 Total Volume
Actual	Estimate	Conventional barges--total	________	____%
		Breakdown:		
Actual	Estimate	a. Domestic cargo	________	____%
Actual	Estimate	b. International cargo not in 20-40 ft. containers.	________	____%
Actual	Estimate	c. International cargo in 20-40 ft. containers . .	________	____%
Actual	Estimate	"Mini-containerships"	________	____%
Actual	Estimate	Others, please specify ____________________ . .	________	____%
Actual	Estimate	Total volume of above in long-tons (Please attempt to answer even if only percentage estimates were able to be given above.)	________	____%

6. What was your port's (terminal's) 1972 volume for each of the following, as above:

Please circle appropriate choice		Traffic Type	1972 Long-Ton Volume	Estimated % of 1972 Total Volume
Actual	Estimate	Conventional barges--total	________	____%
		Breakdown:		
Actual	Estimate	a. Domestic cargo	________	____%
Actual	Estimate	b. International cargo not in 20-40 ft. containers.	________	____%
Actual	Estimate	c. International cargo in 20-40 ft. containers . .	________	____%
Actual	Estimate	"Mini-containerships"	________	____%
Actual	Estimate	Others, please specify ____________________ . .	________	____%
Actual	Estimate	Total volume of above in long-tons (Please attempt to answer even if only percentage estimates were able to be given above.)	________	____%

7. What do you estimate will be your port's (terminal's) 1973 volume for each of the following, as above:

Traffic Type	1973 Long-Ton Volume	Estimated % of 1973 Total Volume
Conventional barges--total	________	____%
Breakdown: a. Domestic cargo	________	____%
b. International cargo not in 20-40 ft. containers	________	____%
c. International cargo in 20-40 ft. containers	________	____%
"Mini-containerships"	________	____%
Others, please specify ______________________________ . .	________	____%
Total volume of above in long-tons (Please attempt to answer even if only percentage estimates were able to be given above.)	________	____%

8. What do you estimate the percentage share of each of the following will be of your port's (terminal's) total volume five (5) years from now? *Please insure that your percentages for items (a), (b), and (c) add up to your total conventional barges percentage.*

Conventional barges, total		______ %
Breakdown: a. Domestic cargo	____ %	
b. International cargo not in 20-40 ft. containers . . .	____ %	
c. International cargo in 20-40 ft. containers	____ %	
LASH/SEABEE barges		______ %
"Mini-containerships"		______ %
Others, please specify ______________________________ . .		______ %
Total		100 %

9. Please indicate the percentage of your port's (terminal's) current total cargo traffic that you consider shippable via 20- to 40-ft. containers and/or LASH/SEABEE barges. *Note: Please be sure to give the total percentage for each, though many items could be shipped using either; i.e., though there is an overlap.*

20- to 40 ft. containers ______ %

LASH/SEABEE barges ______ %

10. How many waterway miles is your port (terminal) from the nearest seaport on the East, West, or Gulf Coast (whichever applies in your case)?

____
Waterway Miles

11. How do you assess the past (indicate with a "P"), current (indicate with a "C"), and future (indicate with an "F"), impacts of each of the following on the flow of LASH/SEABEE barge traffic through your port (terminal)? (PAST = USED TO AFFECT; CURRENT = DOES AFFECT; FUTURE = WILL AFFECT.) *Please note: If past, current, and future effects for any of them are identical simply use a check (✓) to indicate all three (see illustrative examples (*) in first two rows).*

Items	Extremely Favorable	Favorable	No Effect	Unfavorable	Extremely Unfavorable
*Illustrative example 1		F	C		P
*Illustrative example 2		✓			
a. Type of agricultural[♦] items produced locally					
b. Type of non-agricultural[♦♦] items produced locally					
c. LASH/SEABEE cargo rate structure					
d. LASH/SEABEE cargo damage ratio					
e. Distance of your port from nearest East, West, or Gulf Coast seaport					
f. Port (terminal) promotion efforts for such traffic					
g. LASH/SEABEE operators promotion efforts for such traffic					
h. Bargeline operators promotion efforts for such traffic					
i. Number of railroads serving port (terminal)					
j. Number of trucklines serving port (terminal)					
k. Number of bargelines serving port (terminal)					
l. Type of imported agricultural[♦] items demanded locally					
m. Type of imported non-agricultural[♦♦] items demanded locally					
n. Port (terminal) volume potential					
o. Number of LASH/SEABEE barges available . .					
p. Others, please specify					
______________________________ . .					
______________________________ . .					

[♦]Agricultural items include crude materials such as cotton, crude foodstuffs, manufactured foodstuffs and beverages for human consumption, semimanufactured items such as lumber and wood-pulp, and finished manufactured items such as smoking tobacco in bulk.

[♦♦]Non-agricultural items also include crude materials, crude foodstuffs, manufactured foodstuffs and beverages, semimanufactures, and finished manufactured goods, except from non-agricultural sources, i.e., petroleum, fishmeal unfit for human consumption, and construction equipment, for example.

12. Which of the items in question 11 currently most encourage LASH/SEABEE barge traffic at your port (terminal)? Discourage?

Most Encourage	Most Discourage
1. ______	1. ______
2. ______	2. ______
3. ______	3. ______

13. If conventional barges carry containers to or from your port (terminal), please indicate the number per month by type of barge and cargo.

	# Containers/Month Import	Export
Hopper barges	______	______
Covered dry cargo barges	______	______
Deck barges	______	______

14. What in particular do you think makes it unlikely that your port (terminal) will handle LASH/SEABEE barge cargoes in the next three years?

______

______

______

15. How do you assess the probabilities of your port (terminal) receiving LASH/SEABEE barge cargoes in the next three (3) years?

______ % For

______ % Against

NOTE OVERFLOW SHEET ATTACHED

Thank you for your cooperation.

APPENDIX C

U.S. MINOR SEAPORTS (FUNCTIONAL INLAND PORTS) LIST

APPENDIX C

U.S. MINOR SEAPORTS (FUNCTIONAL INLAND PORTS)

East Coast

Searsport, Maine
Portland, Maine
Portsmouth, New Hampshire
Fall River, Massachusetts
Providence, Rhode Island
New London, Connecticut
Albany, New York
Camden, New Jersey
Annapolis, Maryland
Cambridge, Maryland
Alexandria, Virginia
Richmond, Virgainia
Brunswick, Georgia
Fort Pierce, Florida
Palm Beach, Florida

West Coast

Richmond, California
Sacramento, California
Stockton, California
Port Angeles, California
Coos Bay, Oregon
Astoria, Oregon
Anacortes, Washington
Bellingham, Washington
Vancouver, Washington
Olympia, Washington
Longview, Washington
Everett, Washington
Willapa Harbor, Washington
Grays Harbor, Washington
Walla Walla, Washington

Gulf Coast

Pensacola, Florida
Panama City, Florida
Mobile, Alabama
Bay St. Louis, Mississippi
Pascagoula, Mississippi
Morgan City, Louisiana
Baton Rouge, Louisiana
Freeport, Texas
Orange, Texas
Port Arthur, Texas
Beaumont, Texas
Brownsville, Texas
Port Isabel, Texas
Texas City, Texas
Port Lavaca, Texas

(Addresses can be found in Appendix B, U.S. Inland Port Authorities addresses.)

APPENDIX D

U.S. INLAND WATERWAY LOCATIONS OF DOUBTFUL STATUS LIST, COVER LETTERS, AND "MINI-QUESTIONNAIRES"

APPENDIX D

INLAND WATERWAY LOCATIONS OF DOUBTFUL STATUS
(Includes Chamber of Commerce Zip Code)

Bangor, Maine 04401
Belfast, Maine 04915
Augusta, Maine 04330
Bath, Maine 04530

New Haven, Connecticut 06501
Bridgeport, Connecticut 06603

Atlantic City, New Jersey 08404

Branckenridge, Pennsylvania 15014
Monessen, Pennsylvania 15062
Freeport, Pennsylvania 16229
East Brady, Pennsylvania 16028
Brownsville, Pennsylvania 15417
Glassport, Pennsylvania 15045
McKeesport, Pennsylvania 15134
Clairton, Pennsylvania 15025
Neville Island, Pennsylvania 15225
Kittanning, Pennsylvania 16201

Muscle Shoals, Alabama 35660
Eufaula, Alabama 36027

Clarksville, Tennessee 37040
Covington, Tennessee 38019
Loudon, Tennessee 37774
Perryville, Tennessee
Calhoun, Tennessee 37309
Harriman, Tennessee 37748
Johnsonville, Tennessee
Rockwood, Tennessee 37854

Concord, New Hampshire 03301

Burlington, Vermont 05401

Newport, Rhode Island 02840

Troy, New York 12181
Schenectady, New York 12305
Utica, New York 13503
Plattsburg, New York 12901
Syracuse, New York 13202
Niagara Falls, New York 14302

St. Augustine, Florida 32084
West Palm Beach, Florida 33402
Milton, Florida 32570
Fort Myers, Florida 33902
Charlotte Harbor, Florida 33950
St. Petersburg, Florida 33701
St. Marks, Florida 32355
Carrabelle, Florida 32322
Apalachicola, Florida 32320

Burnside, Kentucky 42519
Maysville, Kentucky 41056
Kenova, Kentucky
Smithland, Kentucky
Carrollton, Kentucky 41008
Bowling Green, Kentucky 42101
Frankfort, Kentucky 40601
Livermore, Kentucky 42352
Beattyville, Kentucky 41311
Rockport, Kentucky 42369
Ashland, Kentucky 41101
Catlettsburg, Kentucky 41129
Calvert City, Kentucky 42029
Covington, Kentucky 41012

Slidell, Mississippi
Biloxi, Mississippi 39533
Greenwood, Mississippi 38930
Rosedale, Mississippi 38769
Jackson, Mississippi 39205

Moundsville, West Virginia 26041
Nitro, West Virginia 25143
Charleston, West Virginia 25301
Point Pleasant, West Virginia 25550
Parkersburg, West Virginia 26105
Morgantown, West Virginia 26505
Ravenswood, West Virginia 26164
Fairmont, West Virginia 26554
Weirton, West Virginia 26062
Huntington, West Virginia 25717
Benwood, West Virginia 26031

Lawrenceburg, Indiana 47025
Terre Haute, Indiana 47808
Mount Vernon, Indiana 47620
Indiana Harbor, Indiana
New Albany, Indiana 47150
Tell City, Indiana 47586
Vincennes, Indiana 47591
Gary, Indiana 46402
Burns Harbor, Indiana

St. Claude, Minnesota 56301
Hastings, Minnesota 55053
Lake City, Minnesota 55041
Red Wing, Minnesota 55066
Wabasha, Minnesota 55981
Dresbach, Minnesota 55930

Benton Harbor, Michigan 49022
Traverse City, Michigan 49684
Petoskey, Michigan 49770

Council Bluffs, Iowa 51501
Lansing, Iowa 52151
Keokuk, Iowa 52632
Fort Madison, Iowa 52761
Davenport, Iowa 52801
Guttenberg, Iowa 52052

Falls City, Nebraska 68355
Plattsmouth, Nebraska 68048

Leavenworth, Kansas 66048
Witchita, Kansas 67201

Sioux Falls, South Dakota 57102
Yankton, South Dakota

Kampsville, Illinois 62053
Spring Valley, Illinois 61362
Morris, Illinois 60450
Henry, Illinois 61537
Ottawa, Illinois 61350
Kingston, Illinois 60145
La Salle, Illinois 61301
Lemont, Illinois 60349
Peru, Illinois 61354
Joppa, Illinois 62953
Havana, Illinois 62644
Oquawka, Illinois 61469
Beardstown, Illinois 62618
Keithsburg, Illinois 61442
Hardin, Illinois 62047
Savanna, Illinois 61074
Grafton, Illinois 62037
Alton, Illinois 62002
Chester, Illinois 62233
Moline, Illinois 61265
Meredosia, Illinois 62665

New Boston, Ohio 45662
Martins Ferry, Ohio 43935
Omal, Ohio
Ironton, Ohio 45638
Ashtabula, Ohio 44004
Marietta, Ohio 45750
Sandusky, Ohio 44870
Fairport Harbor, Ohio 44077
Steubenville, Ohio 43952
Wellsville, Ohio 43968

Appleton, Wisconsin 54911
Genoa, Wisconsin 54632
Cassville, Wisconsin 53806
Prarie de Chien, Wisconsin 53821
De Pere, Wisconsin 54115
Stillwater, Wisconsin

West Memphis, Arkansas 72301
Clarksville, Arkansas 72830
Blytheville, Arkansas 72315
Arkansas City, Arkansas 71630
Fulton, Arkansas 71838
Osceola, Arkansas 72370
Barfield, Arkansas
Van Buren, Arkansas 72956

St. Genevieve, Missouri
Hannibal, Missouri 63401
New Madrid, Missouri 63869
Boonville, Missouri 65233
Palmyra, Missouri 63461
Jefferson City, Missouri 65101
St. Charles, Missouri 63301
Cape Girardeau, Missouri 63701
Herculaneum, Missouri 63048

Port Neches, Texas 77651
Dallas, Texas 75201
Fort Worth, Texas 76102
Sabine Pass, Texas 77655
Port O'Connor, Texas 77982
Baytown, Texas 77520
Liberty, Texas 77575
Port Arkansas, Texas 78373
Sweeney, Texas 77480
Point Comfort, Texas 77978
Seadrift, Texas 77983
Victoria, Texas 77901
Gregory, Texas 78349
Sweetwater, Texas 79556
Austin, Texas 78767
Port Mansfield, Texas 78580
El Paso, Texas 79902

Marysville, California 95901
Santa Barbara, California 93101

Melville, Louisiana 71353
Krotz Springs, Louisiana 70750
Shreveport, Louisiana 71101
Larose, Louisiana 70373
Angola, Louisiana 70712
St. Francisville, Louisiana 70775
Plaquemine, Louisiana 70764
Houma, Louisiana 70360
Lake Providence, Louisiana 71254
Simmesport, Louisiana 71369
Lake Arthur, Louisiana 70549
Lockport, Louisiana 70374
Port Sulphur, Louisiana 70663
Alexandria, Louisiana 71301
Lafayette, Louisiana 70501
Abbeville, Louisiana 70510
New Iberia, Louisiana 70560
Cameron, Louisiana 70631
Thibodeaux, Louisiana 70301
Pilottown, Louisana 70081
Burnside, Louisiana 70734

Boise, Idaho 83702
Lewiston, Idaho 83501

Kennewick, Washington 99336
Wenatchee, Washington 98801
Lewiston, Washington

Salem, Oregon 97308
Albany, Oregon 97321
St. Helens, Oregon 97051
The Dalles, Oregon 97058

MICHIGAN STATE UNIVERSITY EAST LANSING · MICHIGAN 48823

GRADUATE SCHOOL OF BUSINESS ADMINISTRATION
DEPARTMENT OF MARKETING AND TRANSPORTATION ADMINISTRATION · EPPLEY CENTER

I am writing my Ph.D. dissertation here at Michigan State on the subject of "An Analysis of Bargeship Systems: With Emphasis on Their Impact on U.S. Seaports and Inland Ports." Your town, while located on an inland waterway, is not presently considered by my various secondary research sources to have sufficient barge traffic to warrant being defined as an inland port.

However, since my study is covering the entire population of inland ports and I am most interested in whether these ports have or expect bargeship (LASH/SEABEE) barge traffic, your actual status in these respects is important to me. Therefore, the brief questions listed on the next page are asked of you. Please answer them on that sheet and return it in the enclosed, stamped, self-addressed envelope. Thank you for your time and cooperation.

Sincerely yours,

K. M. Bertram

INLAND WATERWAY LOCATIONS QUESTIONNAIRE

1. Approximately how many long-tons and/or bargeloads of waterborne cargo are handled at your location per year?

   Long-tons ________
   Bargeloads ________

2. If your answers to question #1 were not zeros, what are the major barge items handled at your location, in order of importance by volume?

   Item #1 ________________
   Item #2 ________________
   Item #3 ________________

3. If there are any waterborne cargo handling docks at your location, please indicate how many are owned by: (a) a local "port authority," (b) terminal operating companies open to the public and/or (c) firms with their own private cargo handling uses for docks? Otherwise enter zeros where appropriate and/or describe any other relevant situations existing at your location here:____

   ____

   ____

   Cargo Handling Docks

   a.________________
   Port authority owned

   b.________________
   Terminal oper. owned

   c.________________
   Private user owned

4. Are any LASH/SEABEE barges currently being handled at your location?

   Yes ______
   No ______

   If yes, how many bargeloads per year?

   Bargeloads ________

Answer question #5 only if you answered "no" for question #4.

5. Does your location expect to receive any LASH/SEABEE barge traffic within the next 3 years?

   Yes ______
   No ______

Thank you for your cooperation.

APPENDIX E

U.S. INLAND PORT AUTHORITIES AND TERMINAL COMPANIES

FOLLOW-UP LETTERS

MICHIGAN STATE UNIVERSITY EAST LANSING · MICHIGAN 48823

GRADUATE SCHOOL OF BUSINESS ADMINISTRATION
DEPARTMENT OF MARKETING AND TRANSPORTATION ADMINISTRATION · EPPLEY CENTER

Dear

Recently I sent you a set of questionnaires regarding the impact (or lack thereof) of LASH/SEABEE barges on your port (terminal). If yours is already in the mails, thank you for your cooperation and please ignore this reminder. If you have not yet found time to answer the questionnaire appropriate to you, could you please fill one out to the best of your ability? A partially-filled out questionnaire, while not as valuable as one which is complete, is still far more valuable than none at all, so please do not let a lack of available information on some questions stop you from answering those questions you can answer.

If the questionnaire set has either not reached you or been misplaced, please indicate which of the following categories is appropriate to your port (terminal) either on this sheet or to one of the secretaries at AC 517-355-4460 (please be sure to mention my name), and I will be happy to mail it to you:

I. Inland Ports (Terminals) with LASH/SEABEE Barge Traffic

II. Inland Ports (Terminals) Immediately Expecting (During 1973) LASH/SEABEE Barge Traffic

III. Inland Ports (Terminals) Expecting LASH/SEABEE Barge Traffic Within Three (3) Years But <u>NOT</u> During 1973

IV. Inland Ports (Terminals) <u>NOT</u> Expecting LASH/SEABEE Barge Traffic Within Three (3) Years.

Please remember also that by filling out a questionnaire, you will not only be increasing the public knowledge of how LASH/SEABEE barges have affected which inland ports, but also your own--as you will get a summary copy of my results. Thank you for your time and consideration.

Sincerely yours,

K. M. Bertram

MICHIGAN STATE UNIVERSITY EAST LANSING · MICHIGAN 48823

GRADUATE SCHOOL OF BUSINESS ADMINISTRATION
DEPARTMENT OF MARKETING AND TRANSPORTATION ADMINISTRATION · EPPLEY CENTER

Dear

A few weeks ago I sent you a set of questionnaires regarding your port or terminal's relationship (or lack thereof) to LASH/SEABEE barge traffic. If you have already responded to my survey, please accept my thanks and ignore this reminder.

If you were away or too busy to fill out the one (1) of four (4) questionnaires appropriate to your port or terminal, may I ask that you please do so as soon as possible so that I can include your information in my results. If you no longer have access to the questionnaires, could you please forward a brief letter indicating your port or terminal's: (1) Approximate annual volume (with LASH/SEABEE portion thereof indicated, (2) Investments to specifically promote LASH/SEABEE traffic, (3) Expectations regarding international traffic as affected by LASH/SEABEE barges, and (4) Reasons why you have, expect, or don't expect LASH/SEABEE barge traffic?

Thank you for your time and consideration.

Sincerely yours,

K. M. Bertram

BIBLIOGRAPHY

BIBLIOGRAPHY

Books

American Waterway Operators, Inc., The. Big Load Afloat. Washington D.C.: The American Waterway Operators, Inc., 1965.

Erdos, Paul L., and Arthur J. Morgan. Professional Mail Surveys. New York: McGraw-Hill, 1970.

Howe, Charles W., Joseph L. Carroll, Arthur P. Hunter, Stephen J. Ramsey, Nancy L. Schwartz, Eugene Silberberg, and Robert M. Steinberg. Inland Waterway Transportation Studies in Public and Private Management and Investment Decisions. Washington, D.C: Resources for the Future, Inc., 1969.

Mossman, Frank, and Newton Morton. Logistics of Distribution Systems. Boston: Allyn and Bacon, Inc., 1965.

Tabak, Herman D. Cargo Containers, Their Stowage, Handling and Movement. Cambridge, Md.: Cornell Maritime Press, 1970.

Periodical Articles

"A Railroad That May Run a Barge Business." Business Week, November 18, 1972, pp. 86-90.

Aadland, Tom. "The Total Transportation Concept." ICHCA Journal, December, 1969, pp. 6-7.

"Acadia Forest. A 10 Million Dollar Guinea Pig." Containerization International, July, 1970. (Reprint.)

"All But Two Ports Ratifying Three Year Pact Including 32.5% Raise for ILA Workers." Traffic World, March 13, 1972, p. 2.

American Waterway Operators, Inc., The. "AWO's Views on Transportation Regulatory Reform Bills Presented to House and Senate Committees." Weekly Letter, April 29, 1972, p. 305.

________. "DOT Issues Comprehensive Report on Current Transportation Services and Future Needs." Weekly Letter, August 5, 1972, p. 1.

________. "Ground Breaking for Tennessee-Tombigbee Waterway Scheduled for December 12 at Gainesville, Alabama." Weekly Letter, November 4, 1972, p. 4.

________. "ICC Approval of Southern Railways Control of Barge Line Cited by Katy Industries in Its Acquisition Bid." Weekly Letter, November 11, 1972, pp. 2-3.

________. "Senate Committee Orders New Draft of Surface Transportation Act Prepared for Early September Consideration." Weekly Letter, August 19, 1972, pp. 1, 2.

________. "Surface Transportation Act Reintroduced: Retains Rate Filing Provision." Weekly Letter, March 10, 1973, pp. 1-2.

________. "Surface Transportation Bills Die With Congressional Adjournment." Weekly Letter, October 21, 1972, pp. 1, 2.

________. "Title XI Finance Guarantee Bill With AWO Amendment Signed Into Law By President Nixon." Weekly Letter, October 28, 1972, p. 1.

________. "Water Carriers Have Great Potential for Expansion, MARAD Chief Declares." Weekly Letter, May 6, 1972, pp. 7, 8.

"An Important Convert to LASH." Distribution, February, 1972, p. 19.

Archdeacon, Gerald D. "The Container Boom: Is It a Bust?" Modern Railroads, November, 1971, pp. 50-54.

"Barbours Cut Underway." World Ports, February, 1972, p. 13.

"Barge Line Operation by Southern Rail Hit." Journal of Commerce, November 27, 1972, p. 9.

"Battle of the Boxes." Traffic World, September 9, 1967, pp. 58-62.

Becht, J. Edwin. "A Distribution Service That Is Both Obvious and Subtle." Handling and Shipping, March, 1972, p. 13.

"Bentley of FMC Seeks Support for Intermodal Bill, Assails D of J Provision." Traffic World, September 25, 1972, p. 63.

Betz, F. L. "SEABEE--A Systems Approach to Ocean Shipping." Address to West Gulf Regional Convention of Propeller Club of United States, Galveston, Texas, April 2, 1971.

"Bigger Barge Units Coming." Journal of Commerce, January 28, 1971, p. 6.

Bilanow, Alex. "Strong Push on Surface Transport Bill States." Journal of Commerce, September 18, 1972, pp. 1, 22.

Bosworth, Janet. "Waterway to the World." Distribution Worldwide, May, 1971, pp. 29-43.

"British Study Finds Containers Do Cut Loss and Damage." Container News, July, 1969, pp. 48, 58-59.

"Bush Terminal to Handle LASH." Journal of Commerce, January 29, 1971, p. 3A.

Carr, Braxton B. "America's Newest Distribution Opportunities." Handling and Shipping, March, 1972, pp. 87-89.

"Carriers to Exchanging Cost Information." Container News, January, 1971, pp. 36-37.

"Central Gulf Orders Two More LASH Ships." New Orleans Port Record, May, 1972, p. 34.

Chapman, Stanley R. "Maritime Administration Says Railroads Have Obligation To Offer Water-Rail Rates." Traffic World, April 3, 1972, p. 28.

________. "Container Revolution Coming To the Gulf Southern Shipper--Trucker Council Told." Traffic World, June 7, 1969, pp. 37-39.

"Combi Lines First LASH Ship Makes Maiden Voyage to New Orleans." New Orleans Port Record, May, 1972, p. 26.

"Coming Role of Barging in Marine Container Operations." Waterway Economics, III, No. 3. Washington, D.C.: The American Waterways Operations, Inc., April, 1969, 57-63. (In reprint of Vols. II-IV, January, 1970.)

"Common Carrier Capabilities (I): Rail and Water Carriers--Railroads: Continuing the Move to Marketing." Transportation and Distribution Management, March, 1972, pp. 21-24.

"Common Carrier Capabilities (II): Airlines and Trucks--The Trucking Industry: Working Behind the Scenes." Transportation and Distribution Management, April, 1972, pp. 20-24.

"Congress Eyes Simmering Labor Disputes, Docks Reopened in Philadelphia." Traffic World, April 3, 1972, pp. 11-13.

"Container Bet Pays Off." Container News, June, 1972, p. 8.

"Container Growth Forecast." Railway Age, August 11, 1969, p. 30.

"Container Theft at Port of N.Y. Drops Dramatically in 1971." Defense Transportation Journal, May-June, 1972, p. 6.

"Containerization and Central American Ports." Traffic World, September 14, 1968, pp. 70-74.

"Containerization--Stimulus to World Trade." Transportation and Distribution Management, January, 1972, p. 15.

"Containerization Study Completed." Journal of Commerce, July 10, 1972, p. 28.

"Containerization's Problems and Progress." Traffic Management, December, 1970, pp. 53-59.

"Containerized Cargo Loaded for Shipment Abroad." Mobile Register, July 28, 1972, p. 1.

"Containers Widen Their World." Business Week, January 7, 1967, pp. 88-90.

"Cooling the Rate War on the North Atlantic." Business Week, April 29, 1972, pp. 48-52.

Coyle, Joseph S. "Pandora's Boxes." Traffic Management, October, 1968, pp. 41-47.

"Delta Selects Houston Terminal." Defense Transportation Journal, May-June, 1972, p. 7.

"Delta Steamship Lines Select Houston As West Gulf Terminal." Port of Houston Magazine, May, 1972, p. 8.

Dillion, Thomas F. "Containerization--A New Twist on an Old Idea." Purchasing, January 28, 1962, p. 84.

Dixon, James M. "The Ports of North America." Distribution Worldwide, March, 1970, pp. 33-35.

"Dock Strike Picture Cloudy at Many Deep-Sea Ports; Some Gulf Harbors Open." Traffic World, October 18, 1971, p. 78.

"Doctor Lykes--Will Lower Overall Cost of Shipping." Marine Engineering Logs, March, 1972, pp. 50-54.

Douglas, Norman. "How Shippers Are Living With Containerization." Shipping and Shipbuilding Register--Marine Design International, February 27, 1970, pp. 11-12.

Dower, Janet Bosworth. "The Southeast--Fast Growing Distribution Hub." Distribution Worldwide, February, 1972, pp. 29-60.

"Enter the LASH Fleet." Container News, September, 1970, pp. 30-31.

"Expansion in California." Traffic World, September 9, 1967, pp. 65-66.

Felice, Marc. "Barcelona Is LASH-Happy." Container News, April, 1971. (Reprint.)

"Five Stacker Cranes Installed at New San Francisco LASH Terminal." Defense Transportation Journal, May-June, 1972, p. 8.

"Flatback Gains Stature at PC, Reading and CNJ." Modern Railroads, April, 1972, pp. 47-49.

"FMC, ICC Jurisdiction Over LASH Clarified." Traffic World, May 15, 1972, p. 94.

"FMC Proposes Law on Single Factor Rates." Container News, July, 1972, pp. 10, 50-52.

Ford, Nancy. "Marketing Approach Booms Illinois Central." Modern Railroads, February, 1970, pp. 36-38.

"Four Ways LASH Adds to Quality of Transportation." Container News, September, 1970, pp. 32, 97.

Freund, F. G. "The Co-ordination of Cargo Movements Between Road Carriers and Ocean Going Vessels." ICHCA Journal, May, 1965, pp. 24-27.

Frink, Robert. "Dockman Leary of LASH Ships." Newport News Times Herald, January 4, 1972, p.

Goldman, Jerome L. "How LASH Was Born--LASH Inventor Describes This System to ICHCA." ICHCA Journal, April, 1970, pp. 4-11.

"Gulf Outlet Doubles Tonnage Four Times in Last Ten Years." New Orleans Port Record, February, 1972, pp. 24-25.

"Gulf Ports Outlook." World Ports, May, 1972, pp. 11-21, 24-26, 32.

Holubowicz, R. P. "Co-ordination of Cargo Movement Between Rail Carriers and Ocean-Going Vessels." ICHCA Journal, May, 1965, pp. 19-23.

_______. "Port Arrangements Between The Ship and Road Transport and The Ship and Rail Transport." ICHCA Journal, April, 1967, pp. 13-16.

"ICC Lets Railroad Take Over Barge Line." Transport Topics, October 30, 1972, pp. 1, 27.

"ILA and Port Negotiators Deadlocked at Expiration of Pact, 'T-H' Considered." Traffic World, October 4, 1971, pp. 14-15.

"Industry Briefs." Transportation and Distribution Management, June, 1972, p. 9.

_______. Transportation and Distribution Management, September, 1972, p. 10.

"Industry News--Fiberglass Barge." Container News, December, 1971, p. 17.

"Inland Waterways and Economic Growth, The." Waterway Economics, III, No. 2 (January, 1969). Washington, D.C.: The American Waterways Operators, Inc., pp. 50-56. (In reprint of Vols. II-IV, January, 1970.)

"Intermodal Traffic Booming in Ports of North America." Container News, July, 1973, pp. 10-27, 36, 60-61.

"International 'Landbridge' Plans of Sea-Land, Seatrain Authorized by ICC, FMC." Traffic World, January 24, 1972, pp. 40-41.

Johnsen, E. F. "LASH In Operation." ICHCA Journal, April, 1970, pp. 17-20.

Johnsen, Neils W. "LASH System--Revolutionary New Seaborne Transportation." ZOSEN, May, 1969, Uraga Heavy Industries, Ltd., New York, pp. 22-23.

Jones, George M. "U.S.-Canada Cargo Diversion: A Century Old Phenomenon." Container News, September, 1972, pp. 48-54.

Klapper, Charles F. "Inland Waterways: Canals Can Help Port Environment." Dock and Harbour Authority, December, 1971, pp. 335-338.

"Land Bridge--Myth on Method." Railway Age, July 7, 1969, p. 48.

Landing, J. Durel, Jr. "LASH Container Vessels--Their Place in the Modern Distribution System." Statement at Intermodal Transport Seminar, Houston, Texas, May 18, 1972. (Mimeograph.)

"LASH and SEABEE Systems Handicapped by Archaic Shipping Laws." Traffic Management, May, 1971, p. 25.

"LASH Comes to the Pacific." Distribution Worldwide, September, 1971, pp. 46-51.

"LASH Coming to Port of New York." Via Port of New York, December, 1970, pp. 2-3.

"LASH--Containerization . . . Without Dumping the Hogshead or Present Handling Systems." Tobacco International, June 25, 1971. (Reprint.)

"LASH Era and What It Means to Western Truck Operators, The." Go: The Transport Times of the West, February, 1972, pp. 37-42.

"LASH For South America." Container News, September, 1970, p. 70.

"LASH Operations at Los Angeles." World Ports, May, 1972, pp. 22-23.

"LASH Operators Hit ILA Pact, Plans Court Suit; Dickman, of NYSA, Responds." Traffic World, March 13, 1972, p. 70.

"LASH Questions Answered." Shipbuilding and Shipping Record, pp. 31-33.

"LASH Ship Progress--A Working Reality." Shipping World and Ship Builder, January, 1972, pp. 79-82.

"LASH System Adds Flexibility to Port Operations." Via Port of New York, August, 1971, p. 15.

"LASH System Gets Underway." Containerization International, January, 1968, pp. 16-19.

"LASH Systems, Inc." (Advertisement) Container News, July, 1972, p. 27.

"LASH Terminal a World First." World Ports, March, 1972, p. 23.

"Lighters to Broaden Internodal System." Journal of Commerce, January 29, 1971, p. 6A.

"Lykes Bros. Awards $27 Million Barge Contract." Journal of Commerce, April 5, 1971, p. 28.

"Lykes Cargo Vessel Enroute to Europe on Maiden Voyage." Journal of Commerce, October 2, 1972, p. 10.

"Lykes SEABEES May Expand Far East Trade." Chicago Tribune, July 19, 1971.

"Making the System Work Better." Distribution Worldwide, May, 1972, pp. 43-54.

Mann, H. A. "The Port as a Unit in Intermodal Transportation." Dock and Harbour Authority, March, 1972, pp. 456-458.

Mantrop, Stanley. "Intermodal Units Spreading in the Valley." Journal of Commerce, January 28, 1971, p. 5.

_______. "Sea Barge Versus Containership Controversy in Gulf Still Strong." Journal of Commerce, October 4, 1971, p. 19A.

_______. "U.S. Cotton Industry Gets Boost." Journal of Commerce, March 25, 1971, p. 7.

"Many Advantages for Shippers Offered by New Shipping Concept." Journal of Commerce, January 29, 1971, p. 6A.

Marino, John H. "Intermodal Services Hold Key to Intercity Freight Markets." Container News, June, 1972, pp. 16-20.

_______. "Unit Train Service for Domestic Freight Market." Container News, p. 44-48.

"Maritime Industry's Expensive New Box, The." Fortune, November, 1967, pp. 151, 154ff.

Mechling, F. A. "Overnight or Some Day Distribution Service Prompts Many Shippers to 'Think Barge.'" Traffic World, May 8, 1972, pp. 42-43.

Meyers, Harold B. "The Maritime Industry's Expensive New Box." Fortune, November, 1967, pp. 151-154, 190-197.

"Modernization of U.S. Merchant Fleet Includes 49 Ships for Liner Trade." Container News, December, 1971, p. 15.

Moen, Kaare. "The Barge Carriers." ICHCA Journal, November, 1969, p. 18-23.

"More LASH Developments." Containerization International, March, 1972, p. 57.

"More Mechanization in 1972 for Flatback Operations." Modern Railroads, April, 1972, pp. 50-57.

Morison, Robert F. "Intermodal Role Urged for the FMC." Journal of Commerce, September 19, 1972, p. 24.

Morris, J. Fletcher. "Way LASH Makes Economic Sense." ICHCA Journal, August, 1970, pp. 6-10.

Morrissey, James. Re: Intermodal Transportation. Houston Intermodal Transportation Seminar, Houston, Texas, May 18, 1972. (Mimeograph.)

Nagorski, Bohdan. "Port Problems in Developing Countries." Dock and Harbour Authority, May, 1971, pp. 7-16.

"New Hope for Asian Ports." Asian Industry, June, 1971, pp. 39-41.

"New ICC Rail Abandonment Rules Are Set Aside." Journal of Commerce, November 7, 1972, pp. 1, 17.

"New Marine Systems Bring Containers to Inland Ports." Traffic Management, July, 1970, pp. 61-65.

"New Modern Port Complex Construction to Start Soon." Port of Houston Magazine, August, 1970, p. 285.

"New Prudential-Grace Offices in Chicago Seen as Major Shipper Service Improvement." Journal of Commerce, September 19, 1972, p. 24.

"New Ships Expected to Slash Port Time." Journal of Commerce, January 29, 1971, p. 6A.

"Nixon Renews Plea for New Authority Over Transportation Labor Disputes." Traffic World, February 7, 1972, pp. 23-25.

"North Atlantic Pool Lines to Call at Any U.S. Port." Container News, September, 1972, pp. 36, 38, 136.

"Oklahoma Plans Major Program to Attract International Trade." Journal of Commerce, June 3, 1971, p. 28.

"Only 55 Incidents in the Carriage of 330,693 Vans." Container News, January, 1970, p. 10.

Oram, Colonel R. B. "What of the Future for Small Ports?" Dock and Harbour Authority, November, 1971, pp. 297-299.

"Over One Million Containerships, 1975." Container News, February, 1970, p. 20.

Parr, M. E. "New Technology in Maritime Cargo Systems--Introduction." Defense Transportation Journal, July-August, 1972, p. 34-36.

"Peanuts Aren't Peanuts." New Orleans Port Record, March, 1972, p. 32.

Pechousek, Vlastimil. "Container and Their Transport by Water." Doprova [Transportation], 3 Kes 1968, pp. 9-16.

"Philip Bros. Ships Products Overseas in LASH Vessels." Traffic Management, March, 1970, p. 17.

"Policies for Optimizing the Transportation Potential." Waterway Economics, II, No. 6 (June, 1968). Washington, D.C.: The American Waterways Operators, Inc., pp. 36-42. (In reprint Vols. II-IV, January, 1970.)

"Port of Houston Reports Cargo Tonnage Increase." Traffic World, April 10, 1972, p. 73.

"Ports Hope to Stimulate More Inland Traffic." Railway Age, February 26, 1968, pp. 31, 34.

Posthuma, Frans. "Rotterdam-Europoort-Versatility Increases Efficiency." Defense Transportation Journal, May-June, 1972, pp. 50-53.

"Railroads Go All Out to Tie Up with Ports." Container News, April, 1973, pp. 18, 36.

"Railroads in 1980: A DOT Projection." Railway Age, August 28, 1972, p. 52.

"Railroads Meet Demands With Unit Trains and Mini-Bridges." Container News, May, 1973, pp. 14, 20.

"Railways Gambled Millions: Now the Benefits Build Up." International Railway Journal, October, 1970, pp. 35-40.

"Regearing the Ports." Traffic Management, July, 1972, pp. 32-64.

"Review of European Ports." Container News, June, 1972, pp. 22-42.

"Review of North American Ports." Container News, July, 1972, pp. 12-38.

Roberts, Robert. "Interface: Domestic Containerization Inevitable." Modern Railroads, June, 1972, p. 31.

________. "The Intermodal Future--New Growth in Flatback." Modern Railroads, April, 1972, p. 45.

________. "Recession Puts 'Dip' in Flatback Growth." Modern Railroads, November, 1971, pp. 45-48.

Rokeach, Morrey. "72 Passage of Transport Act Possible." Journal of Commerce, August 11, 1972, p. 1, 20.

Salzano, Carlo J. "Prudential-Grace to Sell 'Point-to-Point' Service With Five Barge-Carriers." Traffic World, May 8, 1972, pp. 21-22.

Scott, Michael R. "Inland Waterways Face a Bright Future." Translog, December, 1971-January, 1972, pp. 18-21.

Shaffer, Frank E. "Streamlined PC-Basic 11,000 Mile System." Modern Railroads, August, 1972, pp. 40-41.

"Shippers Decry Lack of Classics." Container News, May, 1972, pp. 77-78.

Simon, Seymour. "U.S. Court Rules: Container Is One Package." Container News, September, 1972, pp. 10, 68-72.

Soules, Thomas. "Present Developments in Centers as Related to the Port Administration." World Ports, March, 1968, pp. 20-24.

"South Atlantic Outlook." World Ports, March, 1972, pp. 12-21.

"Spend, Spend, Spend . . . ." Containerization International, November, 1970, pp. 24-29.

"Subsidy Board Sinks Oversized Crews." Business Week, January 2, 1971, p. 15.

"TAA Favors Legislation." Traffic World, February 7, 1972, p. 25.

Taylor, Ken. "Dangerous Days for Containerization." Fleet Owners, July, 1971, pp. 45-50, 147.

"Terminal Facilities at U.S. and Canadian Ports." Traffic World, September 18, 1972, p. 78.

"Transport Consumer Group Urges Campaign to Enact Labor Reform Legislation." Traffic World, April 24, 1972, p. 26.

"Two LASH Vessels Make Debuts at Port." Via Port of New York, March, 1971, p. 16.

"U.S. Found Leasing Benefit of Container, Barge Ship, Labor, Legislation Cited." Traffic World, October 26, 1970, pp. 77-78.

"U.S. Pacific Northwest Ports-World Traders." Traffic World, September 20, 1971, pp. 30-33.

"U.S. Ports Build for the Future." Container News, April, 1970, p. 42.

Veerhoff, Alfred B. "Motor Carriers Keep Right to Pack Containers." Transport Topics, November 13, 1972, pp. 1, 38.

"Virginia Seaport Reaches for East Coast Container Title." Traffic World, September 14, 1970, pp. 45-46.

"Water Transport Briefs." Traffic World, June 12, 1972, p. 31.

"Waterman Signs for LASH Vessels." Via Port of New York, July, 1971, p. 15.

"Waterway User Charges and Marginal Cost Pricing." Waterway Economics, October, 1967. Washington, D.C.: The American Waterways Operators, Inc., pp. 1-7. (In reprint of Vols. II-IV, January, 1970.)

"Waterways, Moving 16% of Freight for -17% of Freight Bill." Workboat, January, 1971, pp. 17, 31.

Welty, Gus. "TOFC/COFC Hits Its Stride Again." Railway Age, May 29, 1972, pp. 27-31.

"West Coast Dock Labor Peace Upset." Journal of Commerce, November 17, 1972, pp. 1, 17.

"West Coast Ports Tieup Ends as Nixon Signs Back-to-Work Legislation in Peking, China." Traffic World, February 29, 1972, p. 49.

White, J. "Towage of LASH Barges in a River Operation." ICHCA Journal, April, 1970, p. 23.

"World Container Ports." Container News, December, 1971, pp. 18-20.

Wright, Walter B. "The National Water Commission Report: Why Shippers Should Support It." Transportation and Distribution Management, March, 1973, pp. 44-48.

Reports

A. L. Mchling Bargelines, Inc. Map and geographical list of cities and towns showing mileages on inland waterways, Joliet, Ill., n.d.

American Association of Port Authorities. Handbook--1971, 1972, 1973. Washington, D.C.: American Association of Port Authorities, Inc., 1971, 1972, 1973.

_______. Port Practices Rules and Terminal Rates: 1970 Committee VII Report. Washington, D.C.: American Association of Port Authorities, 1971.

American Trucking Association, Inc. American Trucking--Trends 1970-71. Washington, D.C.: American Trucking Associations, Inc., undated.

_______. Containers-Land, Air, and Sea. Monograph. Washington, D.C.: American Trucking Association, Inc., n.d.

American Waterway Operators, Inc., The. "Commercially Navigable Waterways of United States." Compiled from information supplied by U.S. Army Corps of Engineers, Washington, D.C., 1970, table accompanying map.

_______. 1970, 1971 Inland Waterborne Commerce Statistics. Washington, D.C.: The American Waterways Operations, Inc., November, 1971, 1972.

_______. United for Action. Washington, D.C.: The American Waterway Operators, Inc., May, 1972.

_______. Waterside Plant Locations and Expansions--1969, 1970, 1971. Washington, D.C.: The American Waterway Operators, Inc., April, 1970, 1971, 1972.

Association of American Railroads. Yearbook of Railroad Facts. Washington, D.C.: Association of American Railroads, 1972.

Greenville Port Commission. Greenville--Mainstream Profit/Port. Greenville, Miss.: Greenville Port Commission, n.d.

Kaiser Aluminum and Chemcial Corporation. Containerization--An Outlook to 1977. Oakland, Calif.: Kaiser Aluminum and Chemical Corporation, 1968.

Maritime Administration. Bargeship and Shipbarge International Data. New Orleans, La.: U.S. Department of Commerce, February, 1972.

_______. Billion Dollar Boom on the Rivers. Unpublished slide presentation. New Orleans, La.: U.S. Department of Commerce, n.d.

_______. The Impact of Bargeship Systems on Traffic Management in Foreign Trade. Unpublished slide presentation. New Orleans, La.: U.S. Department of Commerce, n.d.

Maryland Department of Transportation. The World Port of Baltimore. Baltimore, Md.: Department of Transportation, August, 1972.

Maryland Port Authority. Ports Ten Year Master Plan Gets Revision. Baltimore, Md.: Maryland Port Administration, n.d.

Massachusetts Port Authority. Massport--Annual Report for 1971. Boston: Massachusetts Port Authority, n.d.

Port Authority of New York and New Jersey, The. Foreign Trade During 1971 at the Port of New York-New Jersey. New York: The Port Authority of New York and New Jersey, 1972.

Regular Common Carrier Conferences of American Trucking Association, Inc., Containerization in International and Domestic Commerce. Washington, D.C.: American Trucking Association, Inc., 1970.

Rockwell F. Clancy Company. Interstate Port Handbook--1971, 1972, 1973. Chicago: Rockwell F. Clancy Co., 1971, 1972, 1973.

Union Barge Line Corporation. Terminal Information. Pittsburgh, Pa., January, 1973.

U.S. Army Corps of Engineers. Waterborne Commerce of the United States: Calendar Year 1971. Parts 1-5. New Orleans: Division Engineer, U.S. Army Engineer District, New Orleans, 1972.

U.S. Department of Commerce. Bureau of Census. Highlights of Exports and Imports: December, 1971. Washington, D.C.: Government Printing Office, 1971.

U.S. Steel Corporation, Containerization--A Maturing Intermodal Concept. Pittsburgh, Pa.: U.S. Steel Corporation, August, 1969.

Virginia Port Authority. Annual Report--Fiscal Year 1970-71. Norfolk, Va.: Virginia Port Authority, undated.

Virginia Port Authority. Economic Forecast of General Cargo to Be Handled by Public Port Facilities on the Port of Hampton Roads. Virginia Port Authority, Va., April, 1972.

Virginia Port Authority. Foreign Trade Annual Report--Virginia Ports 1971. Norfolk: Virginia Port Authority, undated.

Group Research Studies

Manalytics, Inc. The Impact of Containership on the United States Transportation System. Vols. I and II. San Francisco: U.S. Department of Commerce, February, 1972.

Maritime Cargo Transportation Conference. Inland and Maritime Transportation of Unitized Cargo. Washington, D.C.: National Academy of Sciences, 1963.

Matson Research Corporation. The Impact of Containerization on the U.S. Economy: Vols. I and II. San Francisco: Maritime Administration, U.S. Department of Commerce, September, 1970.

Planning Research Corporation. Transoceanic Cargo Study. Vols. I, II and III. Los Angeles, Calif.: U.S. Department of Transportation, March, 1971.

Southern Illinois University. A Study of River Ports and Terminals. Carbondale, Ill.: Southern Illinois University, June, 1968.

United Nations. Unitization of Cargo. New York, 1970.

Dissertation and Thesis Research

Schoell, William Frederick, III. Causes and Effects of the Recent Growth in Barge Transportation: With Emphasis on the Period 1953-1964. University of Arkansas, 1969, in Dissertation Abstracts International, Sec. A, Vol. 30, No. 7, January, 1970, pp. 2699A-2700A.

Schweitzer, Douglas. Containerization. University of Saskatchewan, Saskatoon, Canada, 1969.

Seguin, Vernon C. An Investigation of the Factors Inhibiting the Growth of Containerization in Domestic Surface Freight Shipments. Michigan State University, East Lansing, Michigan, 1971.

Public Documents

Federal Maritime Commission. Cooperative Working Agreement No. 9980. Washington, D.C.: Federal Maritime Commission, July 3, 1972.

U.S. Interstate Commerce Commission. Joint ICC-FMC Statement Regarding LASH Operations ICC Release No. 132-72. Washington, D.C.: U.S. Interstate Commerce Commission, May 12, 1972.

_______. 337 ICC 625, ExParte No. 261--In the Matter of Tariffs Containing Joint Rates and Through Rates for the Transportation of Property Between Points in the United States and Points in Foreign Countries. ICC Reports, Vol. 337. Washington, D.C.: Government Printing Office, September 30, 1970, pp. 625-652.

_______. 347 ICC 246, August 11, 1972, ExParte No. 261, Special Permission No. 70-275, In the Matter of Tariffs Containing Joint Rates for the Transportation of Property Between Points in the United States and Points in Foreign Countries. ICC Reports, Vol. 341. Washington, D.C.: Government Printing Office, pp. 246-256. (Reprint.)

Tariffs

Maryland Port Authority. *Terminal Tariff Number 1.* Baltimore: Maryland Port Authority, February 5, 1971 (with later revisions).

Port of Houston. *Tariff No. 8--Rates, Rules and Regulations.* Houston, Texas: Port of Houston, August 31, 1971 (with later revisions).

Port of Philadelphia. *Marine Terminal Tariff No. 2.* Philadelphia: Port of Philadelphia, May 5, 1969 (with later revisions).

Trunk Line Traffic Bureau. *New York Harbor Traffic--Supplement 63 to Tariff 788.* Chicago: Trunk Line Traffic Bureau, February 10, 1971.

Bibliographies

Current Literature in Traffic and Transportation. Evanston, Ill.: The Transportation Center at Northwestern University, monthly.

MRIS [Maritime Research Information Service] Bulletin. Washington, D.C.: Maritime Administration, U.S. Department of Commerce and National Academy of Sciences, semi-annual.

Ramm, Dorothy V. *A Bibliography on Economics of Containerization.* Evanston, Ill.: The Library of the Transportation Center at Northwestern University, 1968.

________. *Containerization.* Evanston, Ill.: The Library of the Transportation Center at Northwestern University, February, 1970 and May, 1971.

Unpublished Materials

Adams, William A. "Speech to Natchez Rotary Club." Natchez, Mississippi, August 16, 1972. (Mimeograph.)

Association of American Railroads. *Railroad Piggybacking--A Ride to Lower Prices.* Washington, D.C.: Association of American Railroads, undated.

________. *Revenue Per Piggyback Carload vs. Average All Other Cars--1969.* Washington, D.C.: Association of American Railroads, March 4, 1971. (Mimeograph.)

Balsley, Howard L., and Vernon T. Clover. Business Research. Unpublished manuscript, 1973.

Barschodorf, M. Port Director, Greenville Port Commission, Greenville, Miss. Letter, August 9, 1972.

Bebee, Allan P. President, St. Louis Terminals Corporation. Letter, October 9, 1972.

________. Interview (telephone), September 8, 1973.

Boll, B. Owners Representative, Combi Line, New Orleans, La. Letter, May 31, 1973.

Borkowski, John V. Vice President. LASH Systems, Inc., New Orleans, La. Letter, April 6, 1972.

Broadnax, H. M. "Houston--The Focal Point of Future Intermodal Shipping in International Trade." Statement at Houston Intermodal Transport Seminar, May 18, 1972. (Mimeograph.)

________. Director of Trade Development, Port of Houston, Houston, Texas. Letter, June 15, 1972.

Bullock, C. E. Statement at Houston Intermodal Transport Seminar, Houston, Texas, May 18, 1972. (Mimeograph.)

Carlin, B. J. "Sante Fe Stands Ready to Serve." Statement at Houston Intermodal Transport Seminar, Houston, Texas, May 18, 1972.

Cohen, Maxim B. General Manager, Chicago Regional Port District. Chicago, Ill. Letter, August 8, 1973.

French, F. A. "ETMF Freight System Containerization Facilitation Plans." Statement at Houston Intermodal Transport Seminar, Houston, Texas, May 18, 1972. (Mimeograph.)

Gilbert, Jerome. Trade Economist, The Port Authority of New York and New Jersey. Letter, June 29, 1973.

Harrelson. Assistant to the President, Delta Lines, New Orleans, La. Letter, May 31, 1973.

Hazard, John. Assistant Secretary for International Policy, U.S. Department of Transportation, Washington, D.C. Interview, April 15, 1972.

Houston Custom House Brokers Association. "Containers--Know What You Are Ordering And What to Expect." Statement at Houston Intermodal Transport Seminar, Houston, Texas, May 16-18, 1972. (Mimeograph.)

Hunter, John. Director of Research, Virginia Port Authority, Norfolk, Va. Interview (telephone), September 10, 1973.

Johnson, E. F. President, Central Gulf Lines, New Orleans, La. Letter, June 22, 1972.

Lane, M. Statement at Houston Intermodal Transport Seminar, Houston, Texas, May 18, 1972. (Mimeograph.)

Leblanc, Jacques J. "Containerization Today--Seven Danger Signals." Statement at Houston Intermodal Transport Seminar, Houston, Texas, May 18, 1973.

Massey, R. L. Texas Division, Dow Chemical Company, Freeport, Texas. Interview (telephone), August 29, 1973.

McCammon, G. A. "Cooperate, Compete and Prosper." Statement at Intermodal Transport Seminar, Houston, Texas, May 18, 1972. (Mimeograph.)

Morano, J. R. Executive Vice President--Operations, Prudential Grace Lines, New York, N.Y. Letter, June 6, 1973.

Prudential Grace Lines. "Answers to Shippers Questions About LASH." N.d. (Mimeograph.)

________. "LASH at the Port of New York." New York, N.Y., n.d.

Renehan, L. A. Vice President, Waterman Steamship Lines, New Orleans, La. Letter, June 13, 1973.

Selig, O. L. Director of Administration and Finance, Port of Galveston, Galveston, Texas. Interview (telephone), September 5, 1973.

Smith, Clifford J. Statement at Houston Intermodal Transport Seminar, Houston, Texas, May 18, 1972. (Mimeograph.)

Staley, Richard A. Assistant Director, American Trucking Associations, Inc., Washington, D.C. Letter, September 15, 1972 and December 12, 1972.

Stinson, Patrick. Statement at Houston Intermodal Transport Seminar, Houston, Texas, May 18, 1972. (Mimeograph.)

Tierney, D. H. "Promotion of Container and LASH/SEABEE Traffic Railroads Responsibility." Statement at Houston Intermodal Transport Seminar, Houston, Texas, May 18, 1972. (Mimeograph.)