ANALYSIS OF POTENTIAL CONTAINER TRAFFIC IN THE PORT OF VANCOUVER

by

GORDON STANWAY REES

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Department of **Commerce and Business Administration**

The University of British Columbia
Vancouver 8, Canada

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ABSTRACT

The primary purpose of the thesis is to evaluate the need for a container handling facility in the Port of Vancouver.

During the late 1960's, the shipping industry has been urging construction of a container berth to protect its position against losing traffic to nearby ports which already have container facilities in operation. The National Harbours Board, on the other hand, has been reluctant to commit funds to a long-term project for construction and operating of a facility when the need for a facility is still poorly defined. The majority of claims by either the shipping industry or the port authority have been based on observation and in no instance has an in-depth study been presented covering all aspects that would support the contentions of either side.

The study reviews the history of containerization in world trade and describes the developments in containerization at major seaports. Criteria for port planning are discussed, followed by a review of containerization taking place in Canadian ports.

Recent studies undertaken to forecast potential containerizable cargo were examined to determine the significance of containerization in the intermodal systems and to highlight developments in world trade, fleet expansion, and in port planning.

The studies also provided a framework in which to develop the method for determining the potential container traffic in Vancouver. The method, described herein as a Container Calculation Model, determines the potential containerizable tonnage and number of containerloads in major trade routes serving Vancouver. Input data for all import-export commodities

on a route-by-route basis were obtained from the National Harbours Board. Each commodity was classified by its suitability to containerization by using both economic and physical criteria.

Results of the Container Calculation Model showed the maximum number of loaded containers which would have been handled in the Port of Vancouver during 1967 would have been 87,700 20-foot containers. This includes both inbound and outbound traffic for all classes of containerization. In terms of total potential tonnage, the port would have handled 785,000 tons import, and 381,000 tons export in containers. Total import tons amounted to 1,969,000 tons of which 39.9 per cent was potentially containerizable. Only 3.5 per cent of 12,130,000 tons outbound was suitable for containerization.

In the study, only 'Prime' commodities are used as the basis of evaluation of a container facility. During 1967, 43,100 units would have been handled on thirteen major trade routes. Japan, Europe, and Southeast Asia account for the majority of traffic. In terms of containerloads, the overall imbalance is almost 5:1 in favour of inbound traffic. On the Orient route, the imbalance is 10:1.

Results of the computer analysis for potential containerized cargo was compared with the volume of actual container traffic during 1967, 1968 and early 1969. In 1967, only about two per cent of the potential was being realized.

In terms of both container tonnage and number of containerloads, the study concluded that there is a definite potential for increased container traffic in the Port of Vancouver 'Prime' container traffic is sufficient to consider one container berth, served by one container crane, and thirty acres of backup area. One container berth would be sufficient to handle port requirements up until at least the mid 1970's.

ACKNOWLEDGMENTS

The author wishes to express his sincere appreciation to the following who assisted in the study: to Capt. O.B. Johnston and his staff of the National Harbours Board, Vancouver, who assisted with data collection; to Mr. F. Culbert of Swan Wooster Engineering Limited for assisting with preparation of the flow chart; and to Miss Carol Bird and Mrs. Ann Floyd of the University of British Columbia Computing Center for their able assistance in implementing the computer programme and obtaining the computer output.

A special note of appreciation to Dr. T. D. Heaver of the Faculty of Commerce and Business Administration whose guidance and foresight brought the study to completion.

As a recipient of a Department of Transport Research Grant, the author is indeed indebted to the Department of Transport, Ottawa, for making funds available to carry out the study of containerization in the Port of Vancouver.

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CHAPTER I

INTRODUCTION

For the past two years a difference of opinion has existed regarding the need for a sophisticated container handling facility and backup area in the Port of Vancouver. The shipping industry has been urging construction of a berth to protect its position against losing traffic to competitive ports. The National Harbours Board, on the other hand, which must provide the capital, has been reluctant to commit funds to a long-term project for construction and operation of the facility when the need for the facility is still poorly defined. The majority of claims made by either the shipping industry or the port authority have been based on limited observation, and in no instance has an indepth study been présented covering all aspects that would support the contentions of either side.

I. THE OBJECTIVE OF THE STUDY

The primary purpose of the thesis is to evaluate the need for a container handling facility in the Port of Vancouver. And secondly, if there is a need, to recommend a plan for the orderly development of container berths and backup area to service import/export traffic in the Western Canadian gateway. The study is based on the existing traffic of deepsea general cargo.

In order to evaluate the need for a container berth in Vancouver, it was prerequisite to develop a method of determining the susceptibility of the present general cargo traffic to containerization. An appropriate method of analyzing the volume of present and potentially containerizable cargo was determined by reference to a number of recent studies undertaken in major seaports. From these reports, it was possible to formulate a Container Calculation Model which required the use of a computer. Monthly commodity flow statistics for 1967, collected and made available by the National Harbours Board, provided the basis of input data.

II. IMPORTANCE OF THE STUDY

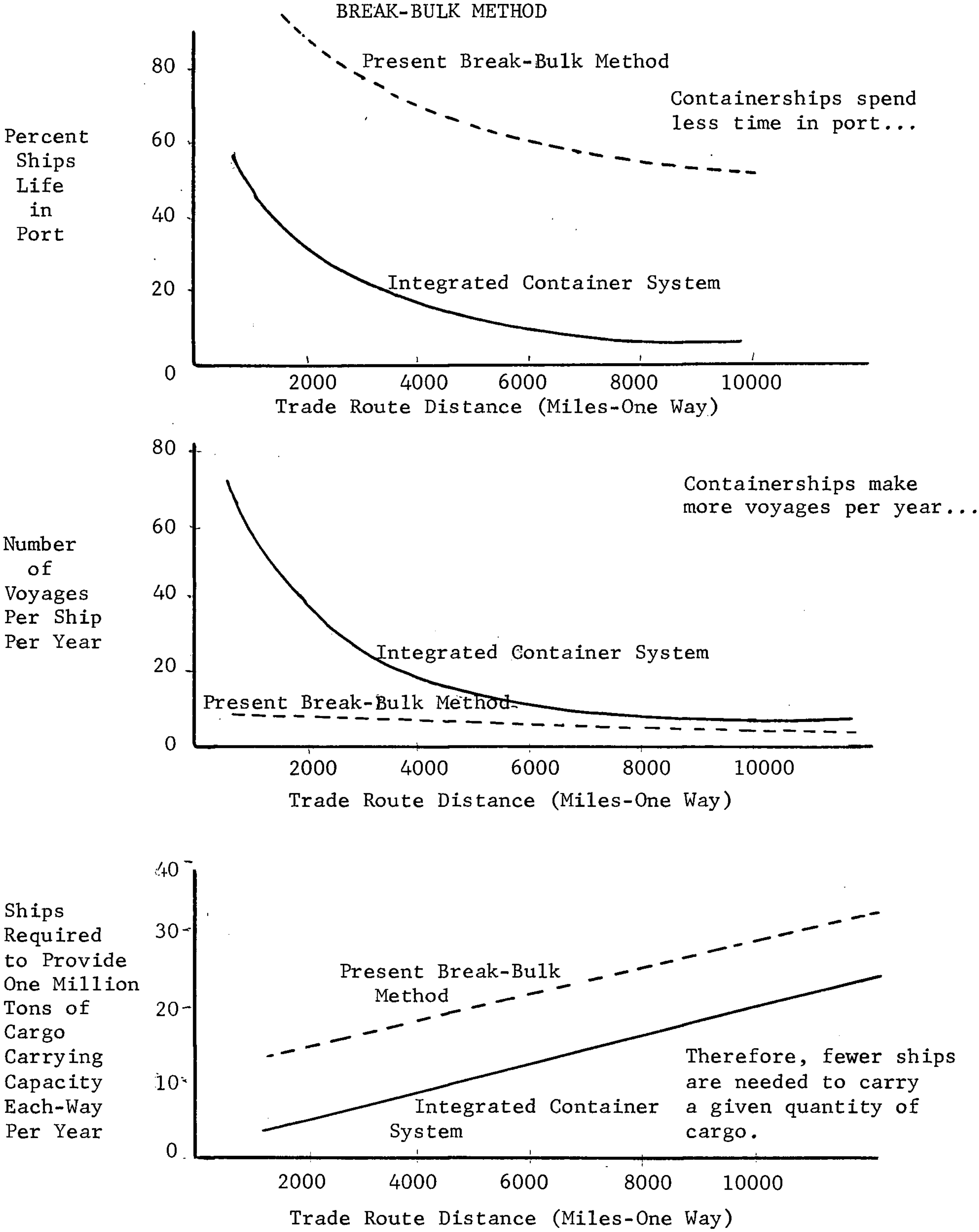
Emphasis on ship turnaround is one of the main preoccupations of ship owners in all maritime countries. Container-ships spend less time in port, thus enabling each vessel to make more voyages per year, which in turn, means that fewer ships in a fleet are needed to carry a given quantity of cargo. Figure 1 on page 3 illustrates this broad concept.

Expansion of container fleets and development of container ports have taken place at a startling rate since 1965. Growth has been most rapid on high-density shipping routes, for example, such as in international service between London, New York and Rotterdam. Or where there is a balanced two-way flow in a closed distribution system such as the oceanic service between California and Hawaii; and in coastal shipment between Vancouver and the Yukon, Seattle, and Alaska.

In Vancouver, the decision to begin construction of the first of five container berths, announced by the Minister of Transport on October 16, 1967, has raised a number of questions as to whether or not there is

FIGURE 1

AN ILLUSTRATION TO SHOW HOW VESSELS IN AN INTEGRATED CONTAINER SYSTEM ARE MORE EFFICIENT THAN VESSELS USED IN THE PRESENT BREAK-BULK METHOD



Source: McKinsey and Consultants, Containerization: The Key to Low-Cost Transport, (London: British Transport Docks Board, June, 1967) Exhibit II to IV, p. 14.

justification and need for the proposed investment of fifteen million dollars. Many local authorities are doubtful whether there has been sufficient analysis of potential future container flows in the Port. Although it is somewhat axiomatic to suggest that politics will play a major part in the final decision to introduce a single-use container facility in Vancouver, there still exists a real need for a feasibility study to determine to what extent, and when development, if desireable, should take place. It is hoped that the present study will contribute to the research required to formulate an overall plan of container berth development in the Port of Vancouver.

III. SCOPE OF THE STUDY

Included in the study is the formulation of a Container Calculation Model for determining the volume of potentially containerizable cargo inbound/outbound through the Port of Vancouver on a commodity-by-commodity, route-by-route basis.

The Container Calculation Model was applied to National Harbours Board commodity flow statistics for 1967 to determine the maximum potential containerizable tonnage and number of containerloads which moved through Vancouver in that year. The following factors had to be taken into account to determine potential container traffic:

(i) product attributes, such as value, odor, density, and susceptibility to damage and pilferage, that effect each commodity's suitability for containerization;

(ii) characteristics of each trade route such as shipping conferences, world trading zones, and the prevalence of major container ports;

(iii) current practice of handling high-volume containerizable commodities that are presently shipped in an efficient manner in specialized vessels;

(iv) port facilities such as mobile cranes, storage areas;

(v) the frequency of calls by container vessels operated by liner companies serving the port on a regular basis;

(vi) inducement to shippers and consignees to specify that goods be carried in containers.

The tonnage of containerizable freight on a route-by-route basis obtained by analyzing the cargo flow statistics were converted into containerload figures by applying appropriate cargo stowage factors for each commodity grouping. The results of the Container Calculation Model were then interpreted to determine future port requirements up to 1985. Vessel capacity, days of berth occupancy per year, and turnaround time measured in days were used as supplementary factors in determining container berth requirements. A comparison was made between the potential container traffic and the actual container traffic handled in the Port of Vancouver during 1967, 1968, and early 1969.

Interviews were conducted with management personnel of liner companies serving Vancouver in order to estimate growth of container traffic. Most of the inbound traffic is from the Orient, United Kingdom, and Europe. In all cases, traffic continues to increase slowly. During the first-half of 1968, about eighty containers per month were being discharged, and hardly more than a dozen outbound. By early 1969 total container traffic had increased to nearly 150 per month. Traffic is expected to increase as more liner companies serving the Pacific Northwest convert more of their vessels to adopt container capacity.

This study assumes that the decision to proceed with construction of a container facility must be based on financial analysis. Revenues generated by the facility must be sufficient to guarantee a sufficient cash flow to cover both capital and operating costs. Return on investment must be sufficient to compete fairly in ranking for Treasury Board funds amongst any projects to be undertaken by National Harbours Board anywhere in Canadian harbours.

IV. ORGANIZATION OF THE THESIS

While it is the stated intention of the thesis to evaluate the potential of the Port of Vancouver as a container terminal, it was first necessary to derive a methodology to determine the containerizable tonnage that might have been handled by the facility in 1967. To assist this analysis and subsequent assessment it was desireable to examine world-wide developments in containerization.

Chapter II outlines a history of containerization in international trade. The chapter, written in two parts, first explains container fleet expansion from intercoastal traffic in North American to near-overcapacity on the North Atlantic by 1967. Secondly, the chapter briefly traces the proliferation of container services from the Atlantic to closed systems operating from the West Coast and eventually to consideration of container shipments by steamship conferences on the Pacific.

Chapter III describes developments in containerization at major deepsea ports. Criteria for port planning are discussed in the first part, followed by a review of containerization in the Canadian ports of Halifax, Quebec City, Montreal, and Vancouver.

Chapter IV is a review of recently completed studies on various aspects of containerization that emphasize the growth of container ports, fleets and traffic in general. The review is intended to illustrate the significance of the container concept in the through-movement system; to highlight developments in world trade, fleet expansion and in port planning. In addition, the chapter brings together some of the techniques employed in previous studies that are helpful in designing a methodology (explained in later chapters) that is applicable to the specific trade characteristics of the Port. The chapter also contains a brief review of cargo forecasting as a useful tool in projection of future general cargo flows.

In Chapter V, a methodology is derived for analysis of 1967 traffic statistics for the Port of Vancouver that seeks to determine the maximum number of containerloads that could have been filled under optimum conditions.

The results of the analysis of existing traffic flow is presented in Chapter VI. Interpretation of results is made in terms of number of berths and backup area requirements. Recommendations for development of container facility conclude the study.

V. LIMITATIONS OF THE STUDY

Many of the limitations of the study are attributable to the form of basic input data, and were thus uncontrollable factors. No other source of data was available that would have provided a complete breakdown of all tonnage by commodity on a route-by-route basis.

1. The National Harbours Board cargo flow statistics used in the present study pertain only to the inner port of the Vancouver waterfront or Burrard Inlet. Traffic through the Port of New Westminster, which is also a major West Coast terminal for general cargo, is not included in the study. Container traffic to ports on Vancouver Island and the north coast of British Columbia was not considered.
2. Coastal traffic transported on containerships of the White Pass and Yukon Corporation are handled at a specialized facility in North Vancouver. These containers are not considered in the study under the definition of "deepsea" traffic.
3. National Harbours Board cargo flow statistics have an inherent overestimate of actual tonnage. Statistics calculated on the basis of measurement tons overestimate actual tonnages of commodities that have a density factor less than 50 pounds per cubic foot (2,000 pounds per 40 cubic feet). Ship manifests, from which data is derived, often do not show both weight tons and cubic measurement since only one or the other is required to determine shipping charges.

When only volume is shown on the ship manifest, tonnage is calculated on the basis of measurement tons. For example, measurement tonnage for 200 cubic feet of textiles would be entered in National Harbours Board statistics as equal to five tons, whereas actual tonnage for the same shipment would be three tons based on a density factor of 30 pounds per cubic foot.

4. Density factors, used to calculate number of containerloads, vary widely for certain commodity groupings. A single density factor was determined for all containerizable commodities. For example, calculations for "Personal & Household Products" were based on 28 pounds per cubic foot, whereas the commodity grouping has density range from 20 to 45 pounds per cubic foot.

5. The study estimates the number of containerloads that would have been used to move the Vancouver cargo under optimum conditions. The actual number of containerloads that in fact were moved in 1967 was substantially less due to the following factors:

   i) lack of container port facilities

   ii) lack of container vessels

   iii) lack of a sufficient rate incentive to induce shippers to use containers even if and when they were available

   iv) obstacles imposed by dock labour, customs regulations, documentation, and insurance requirements.

6. Container tons and containerload calculations in the summary are shown as totals for all commodities on a route-by-route basis. The printout does not show calculations for the tonnage

of specific commodities on each route.

7. Vancouver is the only port identified on any of the trade routes, which are otherwise defined by countries. N.H.B. cargo flow statistics do not show final destinations or origins of commodities beyond the port of entry or disembarkation.

8. Attempts to determine the actual number of containerloads during 1967 and 1968 were met with frustration since no central source could be identified that documents all container movements within the Port of Vancouver. Ship manifests and custom manifests require only the listing of commodities and do not necessarily state that goods are often in fact carried in containers. Time did not permit an analysis of all the manifests describing general cargo handled during 1967.

CHAPTER II

HISTORY OF CONTAINERIZATION IN INTERNATIONAL TRADE

Containers of various shapes and sizes have been used in consolidation of cargo for many years, but the intermodal transfer of containers in international trade has really only come about during the last four years. The impact containerization is having on various aspects of physical distribution is already overwhelming. Shipping routes across the Atlantic, through Panama, and the St. Lawrence Seaway for example, are undergoing significant adjustment in order that fleet owners can retain their share of the trade.[1] Containers are changing the entire transportation industry. Containers are bringing about rationalization of facilities, and at long last the integration of sea-land-air services.

The first mention of van-type containers as they are known today appears to have been an advertisement in the April 11, 1911, issue of the National Geographic Magazine. The picture was of a large container, measuring 18 feet long, eight feet high, and eight feet wide, being lifted aboard a vessel by the ship's boom.[2]

There is substantial evidence the concept was progressing nicely

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[1]Controlling depth to passage of vessels through the Suez Canal is 36 feet, whereas in the Panama Canal, the controlling depth is 42 feet. Panama Canal limits vessel length to 1,000 feet and a maximum of 110 feet wide.

[2]John Immer, Container Services of the North Atlantic, (Washington, D.C.: Work Savings International, 1967), p. 3.

in acceptance by shippers and carriers when, in 1931, the Interstate Commerce Commission (I.C.C.) undertook a general investigation into the rates and charges, rules, regulations, and practices of railroads connected with the use of container cars. I.C.C. ruled that the economies of container transport could not be passed on to the customer.[3] Immer notes that by early 1932, several years of progress in containerization was almost completely wiped out.

Not until the 1950's did the cost-profit squeeze encourage revitalization of the container concept and begin the break-down of the highly compartmentalized transportation industry that in itself was an obstacle to the intermodal transfer of shipments. Steamship companies were concerned only with water transport. Railroads usually limited their services to their own systems, and to those of a few connecting carriers.

Containerization developed first on coastal routes of North America and Australia, and slightly later between ports in the United Kingdom and Europe. Not long after the start in intercoastal trade, service was extended from United States ports to Puerto Rico, Hawaii and Alaska.

There is little disagreement that the impetus to containerization in world shipping stems from American companies serving high-density routes. American steamship lines may still be the leaders in container technology because of the early efforts of the Federal Maritime Administration and by

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[3] Ibid., p. 3. Decision No. 21723, dated April 14, 1931. Effects of this decision are noted in "Preliminary Draft of a Report on National Transportation Policy" prepared for the United States Senate Committee on Interstate and Foreign Commerce, February 2, 1961, p. 654.

pressure exerted by the United States Military Transport Service which is probably the biggest shipper of cargo in American liners and an early convert to the use of containers in off-shore cargo movement. By not being subjected to similar demands by influential shippers, it is not surprising that European lines were slower to react to containerization, at least initially.

I. CONTAINER FLEET DEVELOPMENT ON THE NORTH ATLANTIC

Since 1966 the predominance of the United States carriers in containerized trade has lessened substantially. Much has changed today with more than twenty steamship companies of many nations offering container service to more than forty ports in Western Europe. In Germany alone, the three ports of Bremen, Hamburg, and Bremerhaven are regularily serviced with containers of 12 steamship lines. Some container traffic is direct from the West Coast of North America.

Pioneers in developing container traffic on the American side include Sea-Land Service, Matson Navigation Company, Grace Line,Erie and St. Lawrence, American Export Isbrandtsen, Moore-McCormack and United States Line. By 1967, more than twelve carriers were engaged in North Atlantic Containerization. Five of these were American flags.

Malcolm McLean, the President of McLean Trucking Company, is credited by Fortune magazine as the one most responsible for laying the

[4]Port of New York Authority, Container Shipping: Full Ahead, (New York: Port of New York Authority, 1967), p.

foundation for the early beginning of containerization of ocean cargo.[5] McLean foresaw the economic advantage that could be obtained "by combining the flexibility of trucks, which can gather freight in relatively small lots anywhere, with the efficiencies of ships, which can carry huge tonnages for long distances at a very low cost per ton-mile." In 1956, operations began with Pan-Atlantic Steamship Company, a subsidiary of McLean Trucking Company. But a year later anti-trust action forced McLean to make a choice between trucks and ships and Pan-Atlantic became the focal point of container expansion. The fleet became Sea-Land Service in 1961.

Sea-Land Service's inaugeration of container services from Elizabeth and Boston in April, 1966, sparked what is often referred to in shipping circles as the "Great International Container Race."[6] Sea-Land first experimented in September, 1962, with containers placed on a special deck structure erected on a T-2 tanker. This was followed by the start of the New York-Puerto Rico and New York-California service via the Panama Canal a year later. In 1964, service was extended to Alaska; and in 1966 seven vessels were put into service between the United States and Vietnam handling some 700,000 tons per year. By May, 1968, Sea-Land launched a new container ship in Portland, Oregon, capable of carrying more than 300 containers.[7]

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[5] Harold B. Meyers, "The Maritime Industry's Expensive New Box," Fortune, LXXVI, (November, 1967), pp. 152-153.

[6] Adrian C. Boehme, "Owner: Containership," (paper read at the Inter-National Cargo Handling Coordination Association, Antwerp, Belgium, May 23, 1967).

[7] C. L. Hiltzheimer, "Sea-Land Concept," (paper read at the American Association of Port Authorities, Vancouver, B.C., September 21, 1967).

While Sea-Land was demonstrating the container's value in domestic maritime service, Grace Line and Matson Navigation Company were introducing all-container service to international routes. However, Grace Line, which did not have the protection of United States cabotage laws that require American ships be used to carry cargo from one domestic port to another, met longshoring problems in Venezuala. After two trips in 1959 the company was forced to terminate the experiment. In 1965 the vessels were sold to Sea-Land.

In a determined bid to reduce American dominance in containerization, ship owners abroad are combining in market-sharing cartels to prepare themselves for the container age. Atlantic Container Line (A.C.L.), registered in Bermuda and representing six companies in four countries (Cunard, French, Holland-American, Swedish American, Swedish Transatlantic and Wallenius Line) began service on the North Atlantic in late 1967. The first four ships (14,000 dwt, 646 feet long, 20 knots) were delivered in September, 1967, with another six due in 1969.[8] Nine major British lines have formed two consortia: Overseas Container Limited (O.C.L.) and Associated Container Transportation Limited (A.C.T.) which have combined a super-consortium for the Australian-United Kingdom trade.

In the United States, where market-sharing arrangements are not taken lightly by anti-trust authorities, shipping lines are being hastened into consolidation and mergers by foreign cartels and by the monopolistic powers of the two or three large American pioneers in container traffic.

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[8] John Schreiner, "Containers are Revolutionizing our Ports," <u>The Financial Post</u>, June 10, 1967, pp. 25-26.

For example, in order to remain competitive, a joint undertaking, announced in 1966, brought Sapphire Steamship Line and Atlantic Express Line together to build three 25-knot containerships capable of carrying 1,200 20-foot containers.[9] The cost of each 749-foot vessel is $19.5 million.

Immer provides a summary of services of twenty container-oriented steamship lines. The list outlines the routes, countries served, frequency of sailings, ship specifications, container specifications, and flag of registry.[10] The majority of companies are members of Integrated Container Service Incorporated (I.T.S.), a van-container equipment-owning pool that deals primarily with ocean, rail, and highway carriers in North America, United Kingdom, and Europe. Per diem rates for 20-foot and 40-foot containers are based on time the equipment is in the system (usually under load). Equipment is obtained from member-carriers and without direct transaction with I.T.S. Cargo containers are also obtained from Container Transport International (C.T.I.) in New York.

While only five of the twenty steamship companies offering container service in conventional ships are under United States flag, ownership of specialized container vessels is exclusively American. As of July, 1967, only three containership services were in operation on the North Atlantic: Container Marine Lines (a division of American Export Isbrandtsen Line), Sea-Land Service, and United States Line.

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[9] New York Times, May 13, 1966.

[10] Immer, Container Services of the North Atlantic: p. 161-164.

II. CONTAINER FLEET DEVELOPMENTS ON THE PACIFIC OCEAN

While competition mounted on the North Atlantic, Matson Navigation Company and an arm of Sea-Land's operation enjoyed a relatively easy time on the Pacific, almost free from foreign container competition. Most of Sea-Land's sailings were intercoastal to the U.S. Atlantic and U.S. Gulf. Matson maintained regular service from the West Coast to Hawaii which it initiated in 1960. When Matson invaded the Far East with inaugeration of container service to Japan in September, 1967, it was the signal for Japan to act quickly if it hoped to carve out a share of the deepsea transportation market from their own shores. Japanese shipowners who had adopted a 'wait and see' attitude toward container fleets, were not anxious to help make their new general cargo vessels obsolete by introducing new container vessels. But by then entry of foreign container vessels into Japanese trade made them come to realize the "container race" had come to the Pacific.

Despite initial reluctance to container fleet development by the Japanese Ministry of Transport, Matson Navigation and two Japanese firms (Showa Kaiun and Nippon Yusen Kaisha) have agreed to share port facilities both in the United States and in Japan. And six Japanese lines with regular transpacific schedules (N.Y.K., Mitsui O.S.K., Kawasaki-Kisen, Japan Line, Yamashita-Shinninon, and Showa Kaiun) have ordered six container ships at a cost of $48 million for delivery in 1968.[11] Star

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[11] Meyers, ibid., "Expensive New Box," p. 154.

Bulk Shipping Company, a Norwegian consortium, is planning a combination bulk-container service monthly between Pacific Northwest ports, Australia, and Japan with the arrival of six 27,000-ton bulk carriers by late 1968.[12] The West Coast service is planned to tie in with Union Pacific Railroad for container movement from the Midwestern United States.

Following initial trails in 1958, Matson Navigation two years later introduced full container ship services between West Coast and Hawaii terminals. By September, 1968, Matson expected to have ready for regular service the first of two containerships to operate between the West Coast and the Far East. The two converted C-3 type freighters, lengthened by 52½-foot midbody sections, will carry 464 of Matson's 24-foot containers.[13] The vessels will be operated until they are replaced by two new 900-container carriers, the first scheduled for delivery in December, 1969, and the second in March, 1970, when the converted vessels will be placed in "feeder" service between Japan, Korea, Taiwan, the Philippines, and Southeast Asia. Part of Matson's fleet replacement programme and Far East expansion included application to the United States Maritime Administration to build two more giant containerships (34,000 dwt, 719 feet long 95-foot beam, 3,200 hp). Each will have capacity to carry 1,016 containers, including 152 refrigerated units.

As of December, 1968, Matson routed only general cargo vessels into Vancouver while all container ships continued to operate only from

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[12] Harbours and Shipping, Vol. L, No. 11, November, 1967, p. 687.

[13] Harbours and Shipping, "Matson Picks Names for Far East Ships," Vol. L, No. 12, December, 1967, p. 762.

California ports.

III. SHIPMENTS BY LINER COMPANIES SERVING VANCOUVER

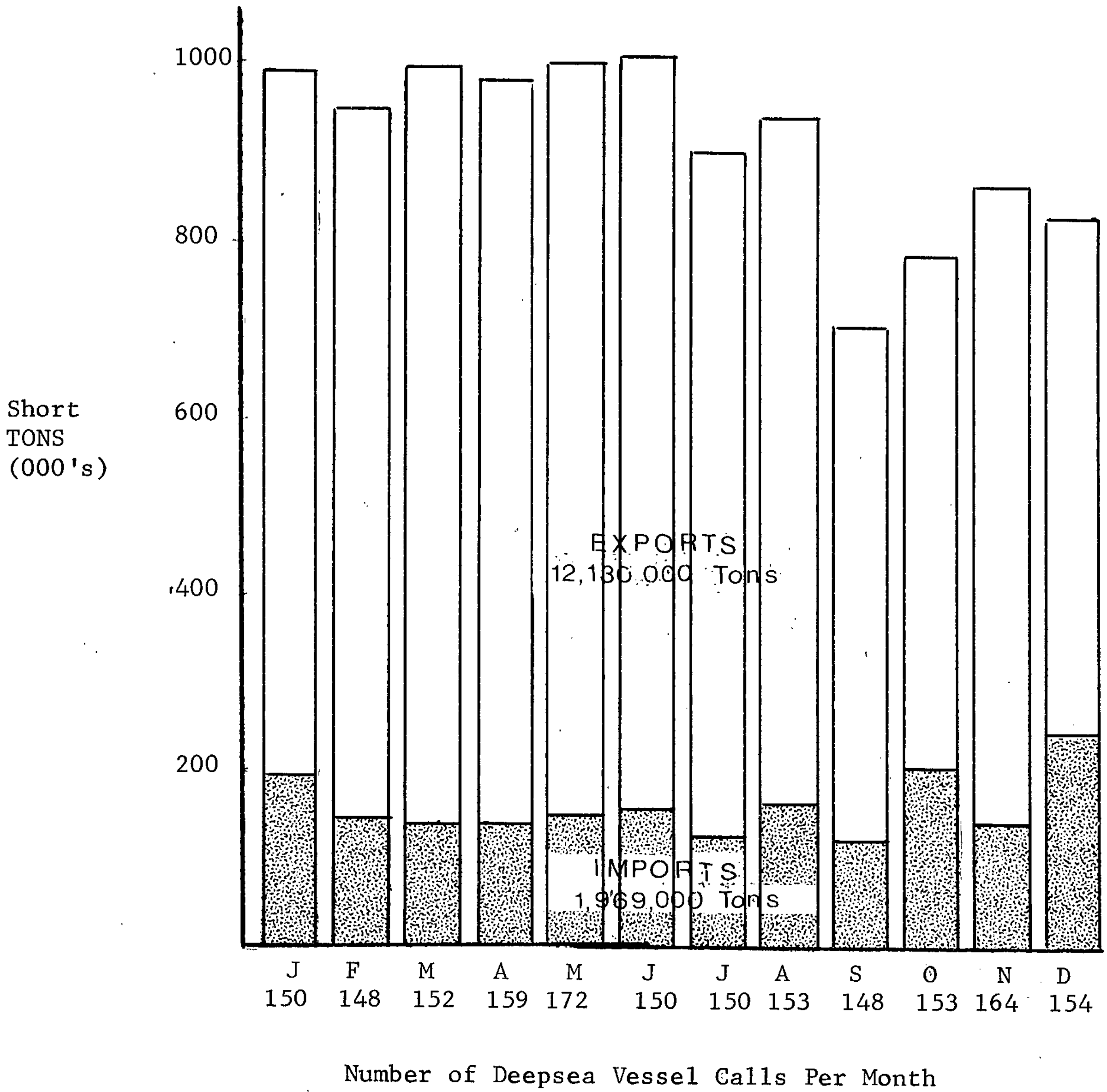
To set the tone for discussion of liner companies serving Vancouver, Figure 2 on page 20 is introduced showing the total flow of deepsea cargo in Vancouver during 1967. The gross imbalance between exports and imports is evident. The number of vessel calls is shown for each month for 1967. In 1966 there were 1,790 vessel calls for an average of 150 calls per month versus 1,853 calls in 1967 for an average of 154 calls per month. Many of these vessels are bulk carriers. Time did not permit a survey of all ship manifests to determine total number of calls by general cargo vessels.

Further study is needed to determine the number of calls of liner vessels serving Vancouver, days in port for turnaround, types of vessels (break-bulk versus container capacity). A measure of berth occupancy at each of the general cargo berths at Centennial, Lapointe, and Ballantyne piers is needed in order to determine future requirements for a container berth. (British Columbia Research Council has computed berth occupancy rates at approximately seventy per cent, but this calculation will not likely have application in future due to construction of new berths, and the tentative plans of the National Harbours Board to lease general cargo facility to private operators).

European and Japanese traffic to Vancouver represents by far the bulk of existing and potential container traffic. Two of the major steamship conferences important in the trade are the European-Western

FIGURE 2

MONTHLY DEEPSEA TONNAGE AND THE CORRESPONDING NUMBER OF VESSEL CALLS PER MONTH - PORT OF VANCOUVER - 1967



Canada Conference and the Japan-West Canada Freight Conference. Table I lists only participating carriers who operate vessels on conference routes on regular schedule and who are known to be committed to containerization at least to some degree.

TABLE I

PARTICIPATING COMPANIES IN MAJOR SHIPPING CONFERENCES SERVING PORT OF VANCOUVER

Europe-Western Canada Steamship Conference	
Anglo Canadian Shipping Company	Holland-American Line
Blue Star Line*	Johnson Line*
East Asiatic Line	North German Lloyd
Furness Line*	Fred Olsen Line
Hamburg-American Line	Royal Mail Line
Canadian Transport Company Limited	

Japan-West Canada Freight Conference	
K Line	Mitsui-O.S.K. Line
Japan Line*	N.Y.K. Line
Showa Line	American Mail Line

*Denotes carriers or their agents interviewed by the author during the course of the present study.

The results of personal interviews with carriers or their shipping agents in Vancouver are summarized in the succeeding section. The intent of the interviews was to determine current operating practices and problems associated with transport of containers on conference routes connecting to Vancouver.

Johnson Line (Shipping Agent: C. Gardner Johnson Limited)

Johnson Line of Stockholm, Sweden, decided in 1967 to completely unitize all cargo taken on board vessels, either in containers or on pallets. As a result, the steamship company is probably the leading proponent of containers in the Vancouver area.

By late 1968, the company was planning to begin service with the first of five Rio de Janeiro-class vessels converted to semi-container ships. Mid-body sections have been added and 25-ton cranes installed on deck. Before conversion, vessels operated by carrying containers on deck and in number three hold. Now each ship will have one hold with its own crane to carry 150 containers.[14]

The fleet operates on a monthly schedule with Vancouver and New Westminster being the northward terminal on sailings from Northern Europe and Scandinavia via Los Angeles, San Francisco, Portland, and Seattle. Reduction in sailing time on the West Coast turnaround as a result of unitization is in the order of four days.

Company-owned containers are 20 feet long, with a weight limit of

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[14] Charles M. Defieux, "Container Service Opens Up," Vancouver Sun (Vancouver: June 22, 1968), p. 8.

18 tons. Eight-foot containers are used sparingly and are gradually being replaced.

The company permits removal of its containers from the dock area, although most of the movement is pier-to-pier since the company will undertake to stock containers at its own expense where suitable goods are available in sufficient quantity to make up a containerload. No demurrage is charged provided containers are returned within a reasonable time. Payload in 20-foot units varys in weight from three to 18 tons. The average is closer to six or eight tons.[15]

Generally, C. Gardner Johnson Limited reported, the average difference between inbound and outbound containers is 5:1 in favour of imports. By early 1969 the difference between full inbound and outbound containers had increased greatly. The "Montevideo" discharged 101 containers in February, 1969, close to a port record, whereas a year earlier vessels like the "Brazilia" were bringing in fifteen containers and loading only five full units.

Japan Line (Subagent: Westward Shipping Company Limited, Vancouver)

Japan Line is fully committed to full container vessels on service between California and Japan. Only semi-container vessels are planned for the Pacific Northwest. When the new vessels will be in service was not disclosed. Presently, Vancouver is the first port of call on inbound general cargo ships from Japan which sail as far south as the Columbia

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[15] Dale Spink, private interview and dock tour, Vancouver, B.C., May, 1968.

River ports. Outbound service to Japan is scheduled ten days later on the return voyage. Australian service is competitive outbound only.

The Company is anxious to serve Eastern Canadian markets through Vancouver since it does not offer direct liner service to either Montreal or Toronto. As a result of experience gained by three separate ten-container shipments from Yokahama to Toronto and Montreal via Vancouver, Japan Line expects to offer container service on overland routes to consignees east of the Saskatchewan-Manitoba border.[16] Part of the service the company intends to sell at competitive rates is regular year around delivery by rail from Vancouver. At present, many potential customers import annual supplies of materials from Japan only during the open season of the St. Lawrence Seaway.

American Mail Line (Shipping Agent: Transpacific Steamship Limited)

American Mail Line is currently discharging about sixty containers per vessel in Seattle as opposed to only two or three containers unloaded in Vancouver. The company noted that rail rates from Seattle to Montreal and Toronto are comparable to freight rates to Eastern Canada from Vancouver. Consequently, the line has built up substantial volume of Canadian traffic through Seattle, including liquor imports of the British Columbia government.

The company currently has three sailings per month between Vancouver, Japan, Korea, and Hong Kong. Three semi-container vessels are expected in

[16]Overland Common Point rate is a commodity rate, agreed to by the railroads and airlines, applicable to Japanese traffic destined for consignees at points east of the Saskatchewan-Manitoba border. The rate is an inducement to shippers to ship via the Port of Vancouver.

service by late 1968, with five new 605-foot long vessels to be built later. Vessels are now equipped with eight-ton cranes. Heavier lifts must be unloaded with shore or floating cranes.

In Vancouver, most 20-foot containers are presently loaded empty for return to Japan. Other than a reduction in wharfage, shippers receive no preferential freight reduction through the use of containers.

Blue Star Line (Shipping Agent: Canadian Blue Star Line Limited)

Blue Star Line is fully committed to palletization but not necessarily to containerization. Containers are discharged in Los Angeles and San Francisco, but by mid-1968 all Vancouver traffic was being palletized. Three vessels in the fleet operate a monthly service into Vancouver. None of the Blue Star vessels on either the Atlantic or the Pacific are full-container ships although the company is a participating member in the O.C.L. consortium which will begin service between Tilbury and Australia in 1969.

As a result of unitization, faster turn around has been possible and so accelerated the ships' schedule. On the United Kingdom-Pacific Coast service, four voyages a year instead of the previous three are now possible.[17] Sailing time for the round trip was reduced from 102 to 85 days, but has since been rescheduled on a 92-day circuit. Expressed another way, three ships are doing now what four did formerly--a perfect example that can be explicitly quantified following the theory depicted in Figure 1 on page 3.

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[17]Captain N. Smith, private interview, Vancouver, B.C., May, 1968.

For the company's outbound traffic, expendible pallets are provided to shippers at cost. Pallets then become the property of the consignee upon delivery. Consignees qualify for a 30 per cent rebate on wharfage as an inducement to ship on pallets. Goods received for export that are not unitized are placed on pallets at the company's expense at either Centennial, Ballantyne or Lapointe Piers.

IV. SUMMARY OF CONTAINER DEVELOPMENT IN THE PORT OF VANCOUVER

The historical summary of containerization illustrates the impact containers are having on world shipping. Many seaports, like Vancouver, are caught up in the dilemma of deciding whether or not it is prudent to proceed with the expenditure of several millions of dollars just to maintain a share of general cargo traffic that in future will require handling by specialized facility. By 1969, burgeoning expansion of container fleets on major trade routes had not resulted in more that a modest increase in container flow in Western Canada. In other regions, the demand for container facility is so strong that ports can no longer afford not to offer the service.

Following the announcement by the Minister of Transport in October, 1967, that Vancouver would have a new container terminal accommodating five deepsea ships, little evidence was presented that would clarify the need for the first berth. By mid-1968, National Harbours Board and the Port of Vancouver Development Committee, representing the interests of private industry, had not been able to come to any decision regarding the need for a sophisticated facility. Further meetings were planned in Vancouver in October, 1968, to discuss a definite commitment on the purchase and siting of a container crane. After the dispute was brought into the open, H. A. Mann, chairman of National Harbours Board, announced that provision of a container crane for Centennial Pier was under consideration provided funds were available.[18] It was later resolved that a temporary crane would be built on an extension of Centennial Pier to serve the port until a permanent site was selected and prepared. The crane would then be dismantled and moved to a new site either at Roberts Bank or to the North shore of Burrard Inlet. The interim site would then become a general cargo pier.

The following chapter starts with a discussion of the theory of port planning and then turns to a review of developments in containerization in major deepsea ports. Berths, cranes, and backup area must be planned well in advance in order to accommodate all the container fleet developments taking place on the North Atlantic and Pacific Oceans.

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[18] Norman Hacking, "Harbour 'Confrontation' Big Flop," Vancouver Province, October 30, 1968, pp. 17-18.

CHAPTER III

SEAPORTS: THE ESSENTIAL LINK

Chapter III is intended to provide a brief review of developments in containerization in major deepsea ports. This analysis assists in evaluating future equipment requirements for the Port of Vancouver.

Seaports are the essential link in the transportation chain between ocean and inland carriers. Containerization, as it is known today, began with ocean carriers. Later, with involvement of the ports, railroads and truckers were awakened to the need for cooperation in integration and coordination of the intermodal transfer of containerized goods.

To plan orderly port development, port managers must know the requirements of the ocean carriers to avoid having to speculate on the type and size of vessels that must be accommodated in the future. Whereas it takes at least a year and a half to build a container port, it requires as little as nine months to adapt a conventional liner so that it is semi-containerized.

I. CRITERIA FOR PLANNING A CONTAINER PORT

In planning for containerization, Walter Hedden, former Director of Port Development for the Port of New York Authority, composed a list of elements to consider before proceeding with container facilities.[1]

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[1]Walter P. Hedden, Mission: Port Development, (Washington: The American Association of Port Authorities, 1967), p. 17.

Four of these are restated below as they apply to the Port of Vancouver:

1. Sufficient flat paved area must be available for open storage of containers, dockside movement, rail connections to mainline, and a consolidation warehouse for cargo.
2. If a container capability seems likely and ships are not self-equipped with cranes of design and lifting power to accomplish transfer unaided by land equipment, consider the possibility of a moveable crane installation.
3. Avoid a financial commitment to provide a fixed-crane installation unless the return is clearly indicated in guaranteed rental income. Backup area and certain types of container cranes are often suitable to handling timer, iron, pipe and steel shapes, and road building equipment. Such items are highly unlikely to be containerized, but the terminal area facilities are compatible with handling more than just cargo containers.
4. Duplication of a container terminal because it is working well in some other port does not imply successful operation under local conditions.

Once the decision has been made to proceed with a container development, many of the details of number of berths, length of quay, size of backup area, size and type of cargo sheds to handle the estimated volume of traffic must be assembled. In the research and planning investigation leading up to the present development of Tilbury Docks, certain basic ideas were evolved concerning the layout of berths designed for high throughput. Briefly, these are as follows:

1. A berth should be conceived in depth and not linearly. (Description of berths in terms of their length are inadequate. A better description is, for example, a berth 800 feet long with two acres per 100 feet run).
2. The land directly behind the berth must be used exclusively for the cargo loaded and discharged at the berth. The area must not be intersected by roads or railways. Through roads must be at the rear of the berth plots.
3. The dock layout must, as far as possible, give flexibility as to the length of individual berths within the total quay length available.
4. All berths must have ready access to all support and backup facilities.

The Tilbury development allows 2.25 acres per 100-foot run of quay, which is comparable, for example, to Baltimore, while Port of New York and Norfolk are both approximately two acres per 100 feet. In most cases, port authorities in the United States allowed 10 to 15 acres per berth, depending upon the total number of berths required. Slightly less acreage is required per unit when the number of berths is large.

II. SEATTLE DEVELOPS AS MAJOR CONTAINER PORT

Seattle, only one hundred and fifty miles south of Vancouver, is now establishing itself as the leading general cargo seaport in the Pacific Northwest. More than three railroads and an extensive highway network connect the port with inland consolidation points, while numerous feeder routes link American carriers to distribution centres in Calgary via

Spokane; Winnipeg via Fargo and Minneapolis; Fort William from Duluth; and most of southern Ontario from the important Chicago railhead.

Two container cranes have been built privately by Sea-Land Services.[2] Another two cranes have just been erected by the Seattle Port Commission to be leased by Matson Line and by the Japanese Trans-Pacific Line which plans to have container ships operating by 1969.

In addition, another berth is under construction on Seattle's Harbour Island which will provide a backup area of 54 acres for container storage and new cranes.

III. CONTAINERIZATION IN CANADIAN SEAPORTS

Containerization in Canadian deepsea ports, with the exception of White Pass & Yukon Corporation's double-berth layout in Vancouver, has lagged well behind developments elsewhere in international shipping. The following summary describes the events taking place in Canadian ports up to the end of 1968.

Montreal

Montreal will be the first Canadian port to begin operation of container facility. Before the end of 1968, Manchester Liners Limited will have three cellular containerships carrying trade between Canada and the United Kingdom. The National Harbours Board put up 13 acres for lease,

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[2] Norman Hacking, "Take a Look at Seattle, NHB," Vancouver Province, November 13, 1968, pp. 27-28.

and Furness Withy & Company Limited, Canadian agents for Manchester Lines, built the terminal at shed area 68 in Montreal's East End.[3] To back up their investment, Manchester Lines has selected Canadian National Railway to provide a land link with CNR's new Toronto express terminal. The railroad will establish a distribution system for the traffic to consignees in southwestern Ontario and will be able to handle container shipments through to Detroit and Chicago.

Federal Commerce & Navigation Limited of Montreal has also introduced two combination bulk-containerships on the Eastern Canada-Northern Europe trade route. Another berth may also be built in Montreal harbour for general use.

Even without the container facility complete during 1967, Montreal handled 54,987 tons in import containers, and 21,748 tons containerized exports.[4]

Halifax

Halifax, as a year-round ice-free port, has been recommended as the best Atlantic Coast port for proposed container development in a study prepared by Kates, Peat, Marwich and Company. The report, which is not available to the writer, is known to be based on the need for unit train service to Central Canada. Canadian National Railways has been approached

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[3] Christy McCormick, "The Container: A Tin Box that will Revolutionise Montreal's Waterfront," The Gazette (Montreal: April 29, 1968), p. 11.

[4] P. D. Williams, personal letter, National Harbours Board (Ottawa: May 17, 1968).

to provide the service. The National Harbours Board is expected to call for tenders soon for the construction of two large piers at a probable cost of about $7.4 million. Construction is expected to be completed by 1970. About $800,000 has already been spent by National Harbours Board for fill and for acquisition of about 19 acres of backup land.

Quebec City

Quebec City has advantages over both Montreal and Halifax as a container port. It is closer to the industrial hinterland than the Atlantic Coast ports, and is easier kept free of ice than ports further up the St. Lawrence River. Port development slated for 1968 includes the construction of a container port in the Beauport area. The facility is to be built by Societe d'Arrimage des Battures de Beauport. The company will invest about one million dollars towards completion of 1,400 feet of new piers and installation of equipment. Although Sabb Incorporated of Quebec City admits to not having any firm commitments from container ship operators, a truck-mounted mobile crane and a gantry crane to serve two piers reserved exclusively for container ships has already been purchased. Land and buildings are leased from National Harbours Board. Total cost, by the time the project is complete in two to three years, is estimated at about three million dollars.

Latest company to announce entry into the field on the North Atlantic is CP Ships. The company will charter two containerships to begin operation in 1969. The service will be year-round between Quebec City, London and Rotterdam. By 1970, it will have three vessels in service that are being built in England to its own specifications.[5]

To complete the Canadian portion of the service, CP Rail and CP Express will spend approximately five million dollars to purchase rail container cars and to install terminal handling facilities and trackage at Quebec City.

Developments in containerization in Montreal, Halifax and Quebec City could have a significant influence on the Port of Vancouver, particularly in view of the much-discussed "land-bridge" that requires high-speed unit trains running regularly between container ports on both the Atlantic and Pacific Coasts. The "land-bridge" concept is discussed briefly on page 38.

Vancouver

The Port of Vancouver, as the principal bulk cargo port and the West Coast terminal of two transcontinental railroads and British Columbia Government owned and operated Pacific Great Eastern Railroad, has a continued flow of commerce virtually assured through expanding shipment of bulk mine, forest, agriculture, and fisheries products extracted from natural resources of the port's vast hinterland. Negotiation for the sale of 8,000,000 tons of coal from Crow's Nest Pass to Japanese interests in January, 1968, is only one example of the continuing growth of exports of bulk commodities through the ports on the Lower Mainland.

Future expansion of shipment of manufactured goods and general

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[5] Canadian Pacific Press Summary, "CP Ships to Begin Containership Operation," (Montreal: Company Press Release, Vol. 24, No. 28, July 12, 1968), p. 8.

cargo is less obvious, but no less significant to agencies and enterprise concerned with handling consolidated traffic in international trade. The imbalance of general cargo trade is weighted heavily in favour of imports. Table II shows the upward trend of deepsea imports/exports of general cargo (including logs and lumber) in the Port of Vancouver between 1961 and 1967.

TABLE II

TOTAL DEEPSEA GENERAL CARGO 1961-1967

PORT OF VANCOUVER

Year	Total Inward General Cargo	Total Outward General Cargo	Exports of Logs and Lumber[1]
1967	1,191,236	2,096,746	1,314,412
1966	1,096,888	1,627,114	1,412,946
1965	1,074,299	1,813,246	1,551,953
1964	869,144	2,144,799	1,381,886
1963	648,773	1,843,625	1,207,837
1962	739,231	1,424,954	931,639
1961	725,261	1,397,918	874,165

Source: National Harbours Board, Port of Vancouver

[1]N.H.B. general cargo statistics include logs and lumber. During the last seven years, logs and lumber have accounted for between sixty and eighty percent of total deepsea exports of general cargo. Excluding logs and lumber, the balance of general cargo imports is about five times the tons of exports.

Table III on page 36 breaks down the total port traffic into bulk cargo and general cargo, and singles out the general cargo traffic handled

TABLE III

TOTAL DEEPSEA CARGO DISTRIBUTION

BY BULK AND GENERAL CARGO FACILITIES

IN PORT OF VANCOUVER, 1965-1967

		Inward Cargo Tons	Outward Cargo Tons
TOTAL CARGO			
(all facilities)	1967	1,969,000	12,130,000
	1966	1,870,000	10,703,000
	1965	1,816,000	9,487,000
BULK CARGO			
(Total harbour)	1967	781,000	9,057,000
	1966	773,000	9,076,000
	1965	741,000	7,674,000
GENERAL CARGO (including logs and lumber)			
(total harbour)	1967	1,191,000	2,097,000
	1966	1,097,000	1,627,000
	1965	1,074,000	1,813,000
(N.H.B. facilities)[1]	1967	844,000	375,000
	1966	811,000	300,000
	1965	727,000	349,000
(other)[2]	1967	347,000	1,722,000
	1966	286,000	1,327,000
	1965	347,000	1,464,000

Source: National Harbours Board, Port of Vancouver.

[1] N.H.B. administers Centennial, Lapointe, and Ballantyne Piers on Burrard Inlet.

[2] Primarily Vancouver Wharves and Lynn Terminals, both located on the North Vancouver side of Burrard Inlet.

at National Harbours Board port facilities for the years 1965 to 1967.

Vancouver is now faced with the decision of maintaining regular and frequent liner service by providing proper berthing facilities or face losing a portion of its trade to neighbouring ports.

Many liner vessels that call regularly in Vancouver are now refitted with tackle to lift containers weighing up to ten tons, while a few will take a maximum of 25 tons. A floating crane hired by shipping agents from Burrard Dry Dock Limited in North Vancouver is often employed to discharge and load most of the 10-foot and 20-foot containers that are handled in the Port. A new heavy-lift 300-ton shore crane at Centennial Pier is not intended to handle containers, although it is sometimes used when vessels are not equipped with cranes designed for lifting containers, or when the floating crane cannot be brought across the inner harbour soon enough to ensure a quick turnaround of the cargo liner.

Container traffic in Vancouver continues to increase slowly. During May, 1968, nearly sixty units were handled inbound, whereas the outbound traffic was averaging about half a dozen or so containers per month, except for shipment of cases of canned salmon and fresh fruit from the Okanagan in season. By early 1969, nearly 150 containers were being handled inbound per month.

At this rate, on an annual basis, this would result in less than 2,000 containers inbound and about 200 outbound. Assuming some 10 tons per 20-foot container (container traffic to Vancouver has a high propensity to "cube out" due to low density "balloon" commodities from the Orient), only about 20,000 tons of containerized cargo would be actually handled both ways in 1967.

Although it is difficult to determine the actual tonnage of inbound traffic moving via Seattle, the following account which appeared in Traffic Management is indicative of at least a marginal flow of Canadian imports/exports through American ports.[6] Nearly a quarter million pounds of canned pineapple was shipped in round-trip container service from Hawaii by Matson Navigation Company to Seattle, and then via Northern Pacific Railway to Winnipeg, Six 24-foot containers were unloaded in Winnipeg for direct haul to consignees. Empty containers were returned to the train, delivered to Husky Briquette Company in North Dakota, then back again on the train to dockside and loaded aboard a Matson vessel for delivery to Hawaii. The shipment both ways takes place under a newly established single-factor through-rate set up by North Pacific ports.

Another fruit shipment reported by Canadian Transportation and Distribution Management described the handling of fruit in containers direct from the Okanagan to Seattle, and then via Matson Line to Hawaii.[7] In previous years, the shipment had been sent air cargo or via the Port of Vancouver.

Land Bridge Concept

The "land-bridge" is not a consideration of the present study. However, the author wishes to stress the view that the hopes of generating traffic through Vancouver, as a result of cargo moving across Canada

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[6] Traffic Management, Vol. 6, No. 11, November 1967, p. 92.

[7] Miles Overend, "Tests Prove Containers Fruitful," Canadian Transportation and Distribution Management, January, 1969, pp. 28-29.

between Europe and the Orient, should not be the basis for a decision on whether or not a container facility is a financially viable investment at present or within at least the next 10 years. Transcontinental traffic will become a fact only if shipments across Canada are less costly than the all-sea voyage from Europe to Japan via the Panama Canal.

In initial experiments, United Cargo Corporation has cut time from 30 or 40 days to 16 or 18 days by shipping containers from Yokahama to Seattle, then by rail to New York, and on to Rotterdam for distribution in Europe.[8] Reduction in time has not necessarily resulted in a decrease in total costs.

Ocean carriers are reluctant to give up traffic to railroads. Robert Tingley, Systems Manager of container development at CNR in Montreal, concedes it will take at least three years, while D. Francis, assistant to the general manager of CP Express in Toronto, predicts it will be eight to ten years before unit trains will run a regular land bridge.[9] Hollis Farewell, Freight Manager of the Port of Seattle, is far from optimistic about the immediate future of the scheme.[10] He says "...the service would require a joining together of transpacific and transatlantic steamship companies along with transcontinental railroads and this has not yet taken place."

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[8] Railway Age, "What's Ahead for Far Eastern Trade," July 31, 1967, p. 42.

[9] Canadian Pacific Press Summary, "World May Pay Millions to Transform Canada into a Bridge to Japan," (Montreal: Company Press Release, Vol. 24, No. 29), p. 11.

[10] Hollis Farewell, personal letter, Port of Seattle, (Seattle: April 11, 1968).

The multitude of possibilities for a land-bridge linking Europe to Japan are illustrated in Figure 3. Canadian railroads may have direct, coast-to-coast mainline, "but few if any [U.S.]railroads are likely to agree with the British Columbia Journal of Commerce that Canada will be the first to achieve land-bridge traffic."[11] One of the first developments was reported later by Traffic World when Northern Pacific Railway Company announced it had finalized arrangements for transcontinental service between Seattle, Portland and the east coast ports of Portsmouth, Norfolk, and Baltimore.[12]

The announcement was made after completion of a comprehensive report produced by International Storage and Distributing Company for the Great Northern, Northern Pacific, and Burlington Railroads. However, it would appear that the decision was reached independent of the report which did not single out land-bridge traffic as a source on which to base future plans.[13]

The report surveyed facilities in nine seaports in the Pacific Northwest that provide for containerizable cargo. The following factors were considered: accessibility to mainline rail service; capability to make direct transfer to rail systems, using 89.5-foot railcars for container traffic; proximity to principal highways for truck distribution of local

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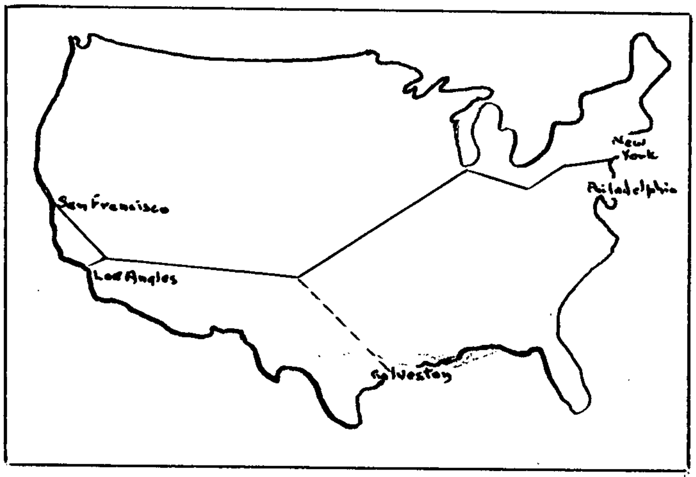
[11] Canadian Pacific Press Summary. "Where are we--Who's Interested?" (Montreal: reprinted from Traffic World, Vol. 24, No. 40, October 4, 1968).

[12] Ibid., Vol. 24, No. 29, (July 19, 1968), p. 12.

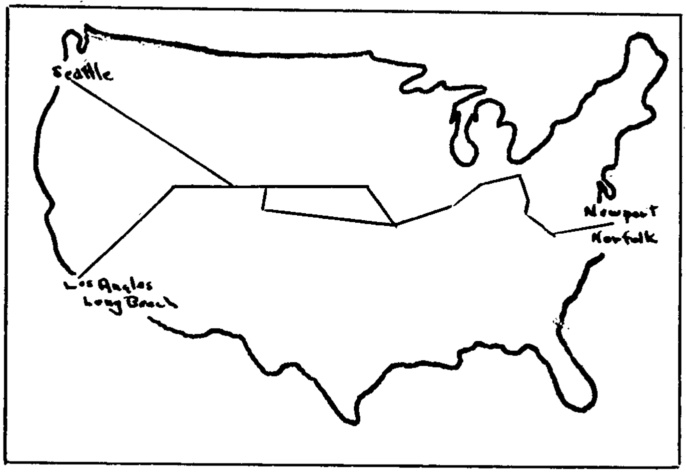
[13] International Storage and Distributing Company, "Containerization and Opportunities for Northern Line Railroads," (Unpublished report, August, 1967), p. 2-4.

FIGURE 3

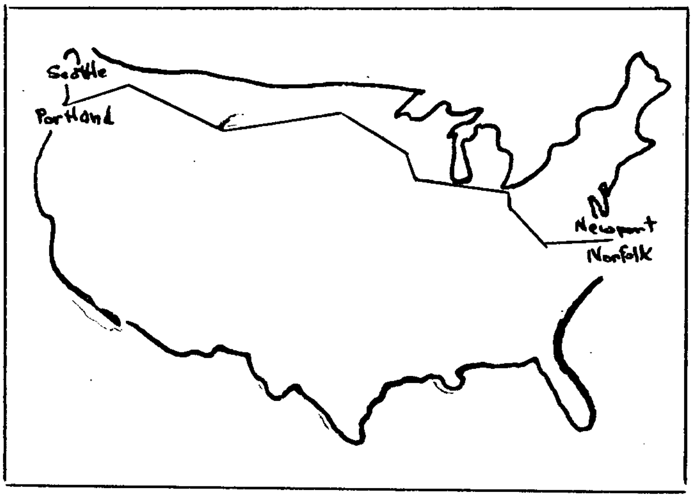
MAPS OF NORTH AMERICA LAND-BRIDGE PROPOSALS



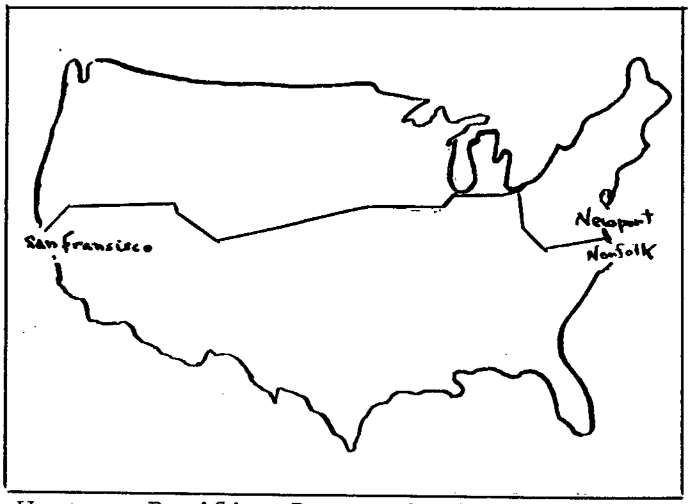
Santa fe, Penn Central....



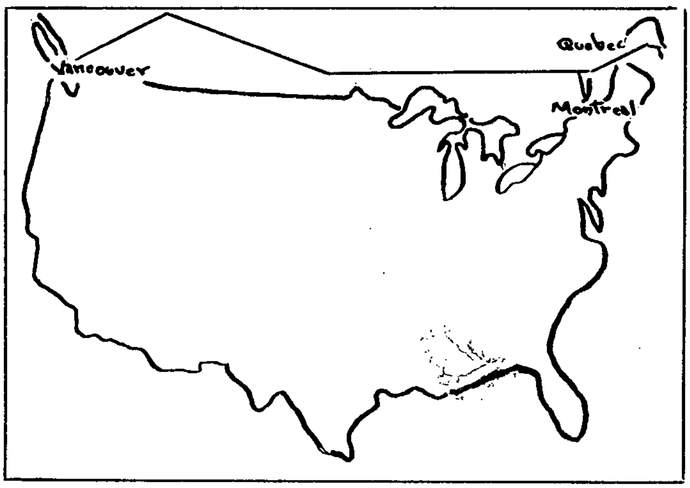
Union Pacific, Norfolk & Western....



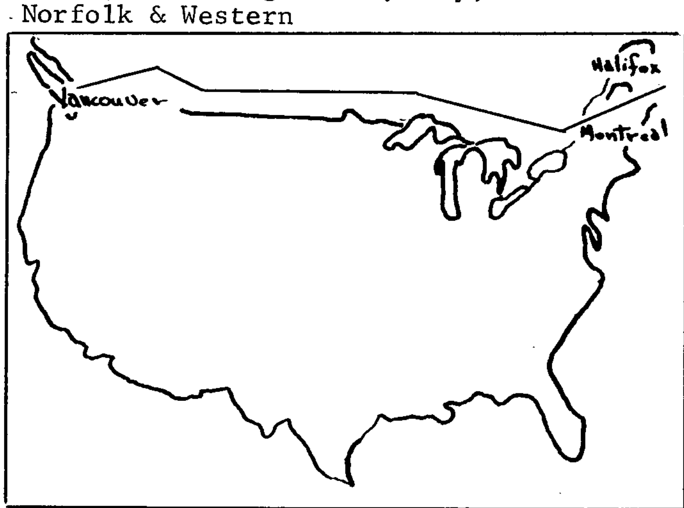
Northern Pacific, Chicago, Burlington & Quincy, and Norfolk & Western



Western Pacific, Denver & Rio Grande, Chicago, Burlington & Quincy, and Norfolk & Western



Canadian National....



Canadian Pacific....

Source: Canadian Pacific Press Summary, "Where Are We--Who's Interested," Montreal (reprint from Traffic World (Montreal: Company Press Release) Vol. 24, No. 40, October 4, 1968), p. 6.

traffic; location with respect to local high-density consumption markets; port services for ocean vessels; availability of land; and plans for expanded containership operations.[14]

In conclusion of the chapter, it is important to note the requirements of planning for container ports. And it is necessary to evaluate the development of container facilities in both Eastern Canada and on the West Coast without taking into account the possibility of future container traffic that might be generated by the "land-bridge" concept.

The following chapter reviews several studies relating to container port developments on the North Atlantic trade and Eastern Canadian ports, as well as studies that are concerned with an analysis of container traffic in the Port of Vancouver.

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[14] Ibid., p. 77.

CHAPTER IV

REVIEW OF PREVIOUS STUDIES INVOLVING ESTIMATES OF CONTAINERIZABLE CARGO

The first section of the chapter deals with cargo forecasting and the application of this tool to projecting future flows of containerizable cargo. The second section in this chapter reviews a number of studies concerning traffic on the North Atlantic and their relevance to containerized cargo inbound/outbound from Canadian ports. A number of reports of considerable importance deal specifically with Vancouver traffic. However, of greater significance to the present study, is the method of analysing the container potential of existing traffic, particularly studies undertaken by the Port of New York Authority, and the Canadian Department of Trade and Commerce prepared in conjunction with the Canadian Shippers' Council.

I. CARGO FORECASTING IN PORT PLANNING

Determination of future cargo flows by forecasting is an essential economic tool in all aspects of port planning. Cargo forecasting is expected to provide an estimate of cargo composition and volumes between specific ports on the trade route over a number of years in the future. Projection, generally, should not exceed ten years, although several studies have been undertaken based on a twenty-five year forecast; for example, the study of Columbia River improvements and their effect on the Pacific Northwest ports.[1] The longer the period, the greater are the changes that are likely to occur in the trade pattern, and the more likely speculation will temper the long-term forecast.

According to Delrich, the end-product of a cargo forecast should enable the company or port to: (1) determine the basic characteristics of a fleet in terms of shipping space requirements on each trade route; (2) estimate shipping weight in tons; (3) provide clues as to changes in packaging form which will have an effect upon the space requirements of commodity group or individual commodities; (4) anticipate trends of cargo volume in the trade allowing for seasonal fluctuations and cyclical variations to aid the fleet planner in programming retirement and construction of a new fleet, (for example, obsolescence of the United States Merchant Marine with planned replacement during periods of low demand); and (5) to determine requirements for special features of the individual ships in the fleet.[2]

"By merely adding forecast values derived from the trends of individual commodities will usually lead to an erroneous result," says Bloch. "Such an additive process does not recognize the possibilities of generation or disappearance of cargo due to changes in market demands or productive

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[1] Ivan Bloch, "Cargo Forecasting," Research Techniques in Maritime Transport, (Washington: Maritime Cargo Transportation Conference of National Research Council, Publication 720, Washington, D.C.: 1959).

[2] Raymond P. Delrich, "Cargo Forecasting," Research Techniques in Maritime Transport (Comments on a paper presented by Ivan Bloch, Maritime Cargo Transportation Conference of National Research Coundil, Publication 720, Washington, D.C.: 1959).

techniques."[3] Ideally, cargo forecasting must combine the use of growth factors and correlations (population growth, gross national product, national income), the examination of the hinterland, and an analysis of trends in specific commodities (for example, long term contracts for raw material such as coal from Crow's Nest Pass to Japan via Roberts Bank).

The majority of studies undertaken in cargo forecasting have been concerned with the present volumes of traffic and from these, researchers have predicted future patterns of trade. An initial examination of historic data on cargo movement inbound/outbound through ports serving a hinterland serves two major purposes:[4]

1. To facilitate some sort of segregation or classification of cargo from which it *may* be possible to develop the correlation with hinterland development.
2. To define the primary boundaries of the hinterland.

Components in forecasting international cargo movements can become extremely complex. Factors of a political and economic nature often influence world trade (common market concepts, balance of payments, hostilities, diplomatic relations) and factors which relate to the manner in which cargo moves within producing and consuming regions (overland freight rates, equipment availability, distribution methods, port and terminal facilities) take on additional significance when forecasting future volumes of international trade. Changes in freight rates and technology are other factors which can obscure the accuracy of long-term

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[3] Ivan Bloch, *op. cit.*

[4] Ibid., Bloch.

projections.

A forecast of bulk cargoes, whose future flows can be estimated from analysis of world-wide supply and demand of particular commodities, is probably more reliable and meaningful than a forecast of general cargo. For example, Clapham has surveyed companies engaged in developing mineral and forest resources in Canada in order to estimate future port requirements.[5] Grain from the Prairie Provinces, pulp and paper from Alberta and the Interior of British Columbia, sulphur from Alberta, potash from Saskatchewan, are major bulk commodities. They comprise over eighty per cent of total export tonnage moving to world markets through Vancouver and possess an enormous potential in future traffic.

The pattern of general cargo trade on particular routes is far less predictable than forecasting bulk commodities, and is likely to vary widely from year to year. Table II on page 35 shows this to be true. However, the long-run trend is definitely upward. Further reference is made to the forecast of future traffic as in Table XIII on page 86.

Toscano was one of the first researchers to apply cargo forecasting specifically to containerization.[6] A mathematical model was developed to determine how many containers to utilize in a trade route and how to allocate these containers among shipments in the trade route in order to maximize profit. To test the algorithm, the Trans-Pacific trade route of

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[5] J. C. Clapham, Informal address to Vancouver Real Estate Board, Vancouver, May 1968.

[6] Cesar F. Toscano, "Allocation of Containers in a Trade Route," Research Techniques in Maritime Transportation, (Washington: Maritime Cargo Transportation Conference of National Research Council, Publication 720, 1959).

American President Lines was chosen with nine ports of call. Data totalled 1,366 different commodities of which only 861 types were physically containerizable. Since the amount of cargo was given either in weight tons or measurement tons, it was necessary to transform the solution into number of containerloads. The number of containers depends on:

1. Internal dimensions of the container (cubic volume), and;
2. Maximum lifting capacity of the ship and/or shore crane, or with weight constraint of the container.

This method of determining number of containerloads is similar to that described by Matson Research Corporation and is also the method employed in Chapter V of the present study.[7]

Whereas the first part of Chapter IV has briefly examined the general aspects of cargo forecasting, the second part is concerned with studies that relate specifically to containerization.

II. PORT STUDIES RELATED TO CONTAINERIZATION OF EXISTING TRAFFIC

The first sub-section of this part summarizes the results of container studies for ports other than Vancouver, whereas the second sub-section examines the findings of three studies that attempted to predict the potential volume of containerizable cargo in the Port of Vancouver.

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[7] Matson Research Corporation, "A Comprehensive Comparison of Trade Route 27 Container Services" (Unpublished report prepared in San Francisco, October, 1965).

Studies Relating to Containers on the North Atlantic

Three studies are examined that have methods or findings applicable to the present study.

North Atlantic Container Experiment, 1966. This experiment, published jointly by government agencies in Britain and the United States, is one of the first of a long series of reports to be produced on the subject of containerization in the 'new era'.[8] Results are presented in the form of a case study of container movement that took place on the North Atlantic between March and May, 1966. A total of seven containers were shipped from the United States to the United Kingdom, and ten containers were shipped from the United Kingdom to the United States. At that time, shippers on the North Atlantic were confronted with many of the same problems that the industry is now experiencing in Vancouver.

On the basis of observations, major problem areas were identified as documentation and coordination of movement, packaging, and customs regulations.

As an integral part of the present study, a proposal was made to various shipping companies on the West Coast to conduct a similar study involving Vancouver traffic. The prime interest of the proposal was to assist in identification of susceptibility of containerized cargo on specific routes. By recording the routing and time schedule of containers to and from inland destinations, container specifications (owner, number,

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[8] North Atlantic Container Experiment, 1966, A Report Prepared by the United States Department of Commerce, Maritime Administration, National Facilitation Committee, and the National Ports Council of Great Britain (London: Taurus Press, 1966), pp. 1-11.

and dimension) and contents, handling methods in the ports, the shipping company and the ship, it was believed that it would be possible to develop information that would be useful in planning for future container traffic.

The author was advised that the shipping companies are not at liberty to reveal the contents of containers shipped on their vessels. Often times, the contents are not even known to the carriers. Also, insufficient time was available to gather information on a significant number of container movements in the port.

The Port of New York Authority. Most sources of literature already acknowledge New York as the world's leading container port since it had an early beginning in berthing container vessels and because it is the hub of the vast megalopolis region of the Atlantic Coast. In May, 1967, the Port of New York Authority published a four-colour brochure summarizing the results of a study which examined in detail the present application of containerization to trade routes connecting with New York.[9] The summary also included a forecast of how containerization of ocean-borne foreign trade will develop by 1975.

The research is of particular interest since it forms the basis for rating the susceptibility of cargo for containerization in Chapter V. Similar criteria were also employed in the study completed in May, 1968, of containerizable Canadian imports/exports by the Canadian Department of Trade and Commerce (see page 52). The New York study also forms the

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[9] The Port of New York Authority, Container Shipping: Full Ahead, A Report prepared under the direction of C.D. Peavey, Acting Chief, Planning and Development Department (New York: Port of New York Authority, May, 1967), pp. 5-34.

framework of a study initiated in June, 1968, by the Canadian Department of Transport which deals specifically with determining the potential tonnage of containerizable traffic in the Port of Vancouver.

By constructing a model of 'Container Susceptibility' for computer programming, the study rated the volume of New York's 1964 trade that could have been moved in containers on a route-by-route, commodity-by-commodity basis.[10] Commodities are classified into four categories, in declining order of suitability for containerization: 'Prime,' 'Suitable,' 'Marginal,' and 'Unsuitable.' The first three categories are summed to give the total potential volume of containerizable cargo.

Accordingly:

> The analysis showed that during 1964, some 10,478,000 long tons or 75 per cent of the Port's total of 13,838,000 long tons of import/exports of general cargo could have moved in containers. More significantly, about 62 per cent of the total was in "Prime" and "Suitable" categories, indicating a very large basic container market.[11]

By taking into account past trends, anticipated economic growth in various trade centers, the future prospects for commodities were forecast for 1975. The projection indicated that 12,750,000 long tons will be moved through the Port of New York in containers by 1975, an increase of 2,272,000 tons or 22 per cent over the 1964 base-year.

National Ports Council of Great Britain. Before the inquiry into major ports of the United Kingdom in 1962, very little was known about the destination and origin of cargo within the country, although a great

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[10] Clayton D. Peavey, personal letter, February 26, 1968.

[11] Port of New York Authority, *op. cit.*, p. 21.

deal was known of flows of cargo on the seaward part of the journey to and from the port.[12] In 1964, Martech Consultants Limited, on behalf of the National Ports Council, were assigned the task of establishing for the whole country the inland destination of foreign imports and the inland origin of overseas exports for all foreign dry cargo trades.[13]

The results of the study showed that London offers the greatest concentration of traffic into and from the United Kingdom (over one-third of Britain's general cargo flows through the Port of London). The study also revealed that the Port serves the largest number of sailings to main world zones. A high degree of concentration of traffic flow within a small radius of the port is regarded as an essential feature in port planning.

"Containerization: The Key to Low-Cost Transport," prepared by McKinsey Consultants Limited who were employed by the British Transport Docks Board, sets forth recommendations for the implementation of a general cargo transportation policy for the United Kingdom.[14] The McKinsey report calls for concentration of container facilities in three or four British ports with unit train service between ports and a limited number of inland depots serving major industrial regions. Rationalization of the British shipping industry is urged in order to capitalize on opportunities presented by containerization.

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[12] Dudley Perkins, "The Port Manager's View of the Importance of Research into Flow of Seaborne Traffic," Transportation Research Forum (Montreal: 1967).

[13] L. N. Laundy, "Tilbury Prepared for Container Age," <u>Foreign Trade</u> Vol. 128, No. 4, (August 19, 1967), p. 7.

[14] McKinsey and Company Incorporated, "Containerization: The Key to Low-Cost Transport," A Report prepared by McKinsey and Company, Incorporated, for the British Transport Docks Board, London, June, 1967.

The following two sub-sections summarize the results of four studies that employed various methods in attempting to estimate potential containerizable cargo in the Port of Vancouver.

Studies Relating to Containerizable Cargo in Canadian Ports

Containerizable Cargo Handled at Canadian Ports. The Department of Trade and Commerce, in conjunction with the Canadian Shipper's Council, released in March 1968, the preliminary estimates of volume of potentially containerizable cargo in Canadian international trade during 1965. The study was initiated as a result of concern which stems from the "possibility that rapidly developing container ports in the United States are attracting an increasing volume of Canadian containerizable cargo..."[15] The report does not attempt to measure the volume of Canadian traffic that is suspected of actually moving through ports in New York and Seattle.

Estimates of containerizable cargo potential have been obtained by employing two concepts as follows:

1. By taking into account only the physical aspect of the commodities, denoted "Physically Containerable," ('Possible,' 'Impossible,' and 'Limited') by the Canadian Shipper's Council.
2. By taking into account economic considerations together with physical qualities, denoted "Economically Containerable" by constructing a model of container suitability (after the Port of New York Authority) and programming it for computer processing.

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[15] Department of Trade and Commerce, "Containerable Cargo Handled at Canadian Ports in International Trade During the Year 1965," Preliminary estimates (Ottawa: Department of Trade and Commerce, Transportation Division, March, 1968), pp. 1-2.

The model determines how much of Canada's 1965 waterborne trade could have moved in containers on a route-by-route basis. Only results applicable to British Columbia bear summarizing in the present study, although the report considers 25 Canadian seaports. North American trade was not included in the research. The results are presented in Tables IV and V, on page 54.

While the study was carried out taking into account two aspects of containerization, namely "Physical Aspect" and "Economic Aspect," conclusions are based on the latter.[16] Table V shows British Columbia, with 1,866,413 tons of containerizable export cargo, of which 1,015,880 tons or 54.4 per cent of the total was handled at the Port of Vancouver. Out of 599,591 tons of containerizable import cargo, Vancouver handled 523,675 tons or 87.3 per cent.

Results of the Canadian Government study are compared with the findings of two other studies on page 61.

Studies Relating Directly to the Port of Vancouver

British Columbia Research Council Studies. The third in the series of reports prepared for the National Harbours Board by the British Columbia Research Council deals specifically with requirements of the berths, sheds, and open storage to service the expected growth in general cargo traffic. As a follow-up to the "Port of Vancouver Trade Study," which indicated that present capacity to handle general cargo would soon be exceeded,

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[16] Ibid., p. iii.

TABLE IV

ECONOMICALLY CONTAINERIZABLE CARGO - 1965

BRITISH COLUMBIA PORTS

(in short tons)

	Total Cargo	Containerizable Cargo	Per Cent Containerizable
Export	11,631,543	1,866,413	16.0
Import	2,459,154	599,591	24.4
Total	14,090,697	2,466,004	

Source: Department of Trade and Commerce, "Containerizable Cargo Handled at Canadian Ports in International Trade During the year 1965," Preliminary Estimates (Ottawa: Department of Trade and Commerce March 1968), Table 23, p. 78.

TABLE V

PHYSICALLY CONTAINERIZABLE CARGO - 1965

BRITISH COLUMBIA PORTS

(in short tons)

	Total Cargo	Containerizable Cargo	Per Cent Containerizable
Export	11,634,745	4,993,481	42.9
Import	2,461,707	1,239,718	50.4
Total	14,096,452	6,233,199	

Source: Department of Trade and Commerce, "Containerizable Cargo Handled at Canadian Ports in International Trade during the year 1965," Preliminary Estimates (Ottawa: Department of Trade and Commerce, March 1968), Table 28, p. 82.

Note: The discrepancy in Total Cargo imports/exports shown in Tables IV and V is as recorded in the original study. No explanation is given.

Sheriff was concerned with determining long-term construction requirements.[17]

The conclusions include: (1) Berth occupancy rates of the order of 70 per cent are too high in the interest of good house keeping. (2) The encouragement of palletization and the adoption of improved systems in the transit sheds have the potential to increase capacity to such a level that no further construction of new conventional facilities would be required. (3) Extrapolation of current containerizable cargo tonnages through Vancouver at the annual growth rate of five per cent per year indicates that a single container berth would suffice to 1975 were it not for the unknown potential of Japan-Europe 'land-bridge' traffic being routed through Canada.

The report recommends postponement of a decision on construction of a permanent container facility until future potential is determined. In the meantime, the report states, construction of a temporary container facility on westward extension of Centennial Pier would serve to handle current container transfers in the port. The temporary container berth would then be converted to a conventional berth when a permanent berth is finished.

A computer analysis was carried out on data obtained for each of nearly 150 ships carrying general cargo which called at the three N.H.B. piers (Centennial, Ballantyne, and Lapointe) between October and December, 1965. Each cargo item was coded in order that it could be identified by

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[17] W. J. Sheriff, The Port of Vancouver General Cargo Requirements, A Report Prepared for the National Harbours Board by the British Columbia Research Council, (Vancouver: The British Columbia Research Council, January, 1968), pp. 2-3.

the ship which carried it, and thus by its berth of discharge/loading, and also by its trade route of origin/destination.[18]

The results of the computer analysis of the three month sample were summarized and multiplied by four to obtain annual tonnage for the three piers.

The study showed that in 1965 the total containerizable imports would have amounted to 199,000 tons; and exports to 113,000 tons, as shown by Table VI on page 57. The report states:

> On the basis of total trade volume, the Japan and Europe trade routes easily rank as the first two potential candidates for any extensive containerization. If to their combined import/export total of 215,000 tons of containerizable cargo, a generous allowance of 100% is made for containerizable cargo at C.P.R. pier, Terminal Dock and other general cargo piers, an upper limit of 430,000 tons of containerizable cargo in 1965 is obtained for the Japan and Europe routes. At a 5% rate of growth, this would amount to 700,000 tons per year by 1975 or some 490,000 tons in containers if 70% of it were to be containerized by then. This upper estimate is just about the capacity of a single container berth.

In a previous report, the British Columbia Research Council stated that future bulk commodity flows through Lower Mainland ports are expected to be about two and a half times as great by 1975 as in 1966.[19] General cargo totals, though less spectacular, should nearly double by 1975 and continue increasing through 1985. The average growth rate of exports is expected to be about 3½ per cent per year.[20]

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[18] Ibid., pp. 4-5.

[19] Ibid., pp. 32-34.

[20] British Columbia Research Council, Foreign Trade Study Lower Mainland Ports of British Columbia, a Report prepared for the National Harbours Board by the British Columbia Research Council (Vancouver, December, 1967), pp. 2-15.

TABLE VI

RESULTS OF BRITISH COLUMBIA RESEARCH COUNCIL STUDY OF

CONTAINERIZABLE CARGO BY TRADE ROUTE

Trade Route		General Cargo* Total Tons Wt.	Containerizable Tons Wt	Containerizable % of Total	Percentage of Containerizable Tons Prime	Suitable	Marginal
Japan	IMP	411,000	80,000	19.6	63.3	30.5	6.2
	EXP	24,000	3,500	14.5	94.2	5.1	0.7
Europe	IMP	159,000	73,000	45.8	71.4	24.5	4.1
	EXP	73,000	60,000	82.5	89.7	9.7	0.5
Orient	IMP	16,000	16,000	99.6	73.6	21.6	4.7
	EXP	19,000	13,000	69.7	95.7	3.6	0.6
Australia	IMP	33,000	7,000	21.2	77.2	21.3	1.4
	EXP	10,000	8,000	83.4	62.3	34.6	3.1
Mediterranean	IMP	17,000	14,000	78.0	87.0	11.9	1.1
	EXP	16,000	6,000	38.4	92.3	6.2	1.5
South America	IMP	10,000	10,000	100.0	95.2	4.7	0.1
(East Coast)	EXP	28,000	15,000	54.9	91.1	8.0	0.9
Other (Total)	IMP	-					
	EXP	7,000	7,000	95.1	90.7	7.9	1.4
Total Imports		646,000	199,000	30.9			
Total Exports		177,000	113,000	64.0			

Note: *All tonnages are Oct.-Dec. 1965 quarterly tonnages multiplied by 4 and rounded to nearest 1000.

Source: W. J. Sheriff, The Port of Vancouver General Cargo Requirements, A Report Prepared for the National Harbours Board by the British Columbia Research Council, (Vancouver: The British Columbia Research Council, January 1968), Table 8, p. 33.

Johnston Terminal Report to N.H.B. The views of the foreign freight forwarder are presented in a report submitted to the National Harbours Board by Johnston Terminals Limited.[21] The study is an analysis of present and future containerizable general cargo and recommends a plan for implementing containerization in the Port of Vancouver.

The report concluded that 70,600 containers would have been required, based on National Harbours Board traffic statistics for 1965, if all containerizable traffic had actually been shipped in containers. General cargo was rated into three categories in order of its suitability for containerization. The classifications were: (A) suitable for temperature-controlled containers, (B) suitable for standard containers, and (C) possible for standard containers. On the basis of 20 tons per container, containerizable tonnages were expressed in number of containerloads. A summary of import/export traffic on a route-by-route basis is presented in Table VII, on page 59.

Future container flows on a route-by-route basis is forecast for 1975, at which time, the report estimates 137,500 20-ton containerloads would be moving through the port. By 1985, this volume will have increased to 200,000 containerloads moving in both directions.

Route development should begin with Japanese trade, followed in order by Southeast Asia, Europe, and Australasia. Consideration is given in the outlook to the potential volume of wood pulp that could be shipped in containers.[22] In 1965, a volume of 604,036 tons of pulp was exported from

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[21] Johnston Terminals Limited, "Cargo Containerization and the Port of Vancouver," typed report submitted to the National Harbours Board (Vancouver: Johnston Terminals Limited, February, 1967), p. 10.

[22] *Ibid.*, Johnston Terminals Limited, pp. 13-14.

TABLE VII

RESULTS OF JOHNSTON TERMINAL LIMITED STUDY OF

DISTRIBUTION OF TOTAL CONTAINERIZABLE TRAFFIC

CLASSIFIED BY MAJOR TRADE ROUTES - 1965

(Measured in containerloads of 20 tons each)

Trade Route	Number of Containerloads Import	Export	Total
Japan, Korea, Formosa	9,000	11,000	20,000
Europe	2,900	16,300	19,200
Southeast Asia	7,700	3,000	10,700
Caribbean Gulf, East Coast S. America	1,700	500	2,200
Mexico, Central America, other	1,800	6,200	8,000
Australia, New Zealand	1,800	4,600	6,400
Mediterranean	300	2,100	2,400
Africa	1,000	700	1,700
Total	26,200	44,400	70,600

Note: Data includes tonnage of wood pulp.

Source: Johnston Terminals Limited, Figure A, p. 12.

Vancouver. By 1985, new pulpmills in the interior could bring the output to two million tons per year.

Abrahamson on Containerization. In a more recent study, Abrahamson (1968) used the Dominion Bureau of Statistics Report-Part VI to estimate that 30,000 20-ton containerloads would have passed through the Port of Vancouver had vessels and port facilities been available during 1964 and

1965.[23]

For the study, the world was divided into five major trading areas which affect the port. Each container was assumed to have a capacity of 20 tons. The total tonnage of all commodities on each route was rated into one of three classifications: (1) 'Suitable,' (2) 'Possible,' and (3) 'Impossible.'[24] The balanced-flow tonnage on each route was determined for each area by classifying all cargo under one of the three ratings. For example:

> Commodities loaded at Vancouver for the Japanese trading area totalled 289,191 tons. Unloaded 'Suitable' commodities were 128,570 tons. In an attempt to balance the flow, the 'Possible' unloaded of 15,257 tons is added to the 'Suitable' unloaded to give a total of 143,845 tons [or a total of 7,192 containers bothways]. This represents the maximum tonnage that could flow in each direction to yield a balanced container flow or no empty back haul.[25]

In 1964, total volume of containerizable cargo ('Suitable' and 'Possible') amounted to 680,752 tons or 34,034 containerloads bothways through Vancouver. Comparable results for 1965 are: 660,856 tons or 33,642 containerloads. These estimates are only slightly more than half the number of 20-ton containers determined by the Johnston Terminal Limited study. Both studies judged wood pulp, the single most significant commodity, to be 'Suitable' or 'Possible' for containerization. This may be interpreted as tipping the total potential volume unrealistically in favour of the need for expanded container facilities. Johnston Terminals Limited included the volume of pulp from all British Columbia ports in

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[23] John L. Abrahamson, "Containerization and the Port of Vancouver," (Unpublished graduating essay, The University of British Columbia, 1968), p. 45.

[24] _Ibid_., p. 17.

[25] _Ibid_., p. 31.

order to estimate the affect on container back haul.

Comparison of results obtained by the four independent studies reveal a wide range of results as illustrated in Table VIII.

TABLE VIII

COMPARATIVE RESULTS OF CONTAINERIZABLE CARGO

DETERMINED BY INDEPENDENT STUDIES

*

	Containerizable Cargo-Tons		
	Imports	Exports	Total
British Columbia Research Council (Containerizable-all classes)	199,000	113,000	312,000
Johnston Terminals Limited (Suitable)	372,400	107,630	480,030
Abrahamson (Suitable and Possible-balanced)	-	-	660,856
Department of Trade and Commerce			
(a) Economic containerizable	1,866,413	599,591	2,466,004
(b) Physically containerizable	6,993,481	1,239,718	6,233,199

Variations in results are attributable to a number of factors. The most significant appear to be:

1. Source of primary data. Department of Trade and Commerce and Abrahamson chose the Shipping Report - Part IV prepared by the Dominion Bureau of Statistics. Johnston Terminals Limited used National Harbours Board traffic statistics. British Columbia Research Council sampled ship manifests.

* See loose leaf at the end of the Volume

2. Definition of geographic area. The Department of Trade and Commerce study considers all ports in British Columbia. Johnston Terminals Limited combined New Westminster and Fraser River ports with the inner harbour of the Port of Vancouver. British Columbia Research Council studied only the Port of Vancouver.

3. Classification of containerizable goods. Different criteria were used in all the studies to evaluate the susceptibility of each commodity to containerization. Each study treated large-volume cargoes with marginal suitabilities somewhat differently. Wood pulp, newsprint, lumber, plywood, steel, and automobile parts can have a distorting effect on results. The Department of Trade and Commerce patterned their study after the Port of New York Authority Container Susceptibility model, but modified to account for difference in Canadian traffic. The study is by far the most optimistic, which may be due to the unfamiliarity with local conditions on the West Coast.

The following chapter establishes the method used in determining the number of containerloads which is in itself one of the primary objectives of the present study. A number of features from previous studies have been incorporated in the procedure.

CHAPTER V

METHODOLOGY FOR DETERMINING CONTAINER TRAFFIC

The purpose of this chapter is to outline the method of determining the number of containerloads that would have passed through the Port of Vancouver during 1967 had:

1. proper facility been available, and
2. shipper and/or carriers found it both convenient and profitable to ship one hundred per cent of the potentially containerizable cargo in containers.

Source of Input Data

Input data was obtained from the National Harbours Board in Vancouver. Cargo Traffic Statistics (1967) are recorded monthly by the N.H.B. on a commodity-by-commodity basis for imports/exports for each country of origin and to each country of destination from Vancouver.

Basic input data included five coded items: (1) import/export, (2) month, (3) commodity grouping, (4) route, and (5) weight tons. The density and the product characteristic array for each commodity group are a function of commodity that are defined in a succeeding section of this chapter.

Nearly eight thousand data processing cards were key-punched to record the distribution of 117 commodity groupings on sixty-nine trade routes. The revised N.H.B. Cargo Classification, described on page 65 is included in Appendix A. To this list has been added the density factor of each commodity and its degree of suitability to containerization.

Output from the computer programme was recorded on a monthly basis in order to attempt to account for seasonal variation in general cargo flow. However, the true significance of the variation cannot be quantified due to the randomness of ship arrival and the scattered distribution pattern of cargo arriving at the piers from inland carriers.

The following sub-sections will describe some of the rationale employed in formulating a method of determining the number of containerloads on a route-by-route basis.

Commodity Characteristics

Commodities are rated by the degree of suitability to containerization using the Port of New York Authority guideline entitled "Criteria for evaluating the share and volume of foreign oceanborne general cargo that can be containerized."[1] The Container Susceptibility Model for the Port of New York was derived through a team effort of specialists in cargo handling, port operations and terminal design. To a large degree, the assignments to categories were made on the basis of experience and judgment rather than definite quantitative values that could be assigned to factors such as "low" value, "low" shipping rates, "little" susceptibility to damage and pilferage. A similar procedure was followed for local data although assignment, in many instances of identical cargo, does not necessarily follow the precise allocation due to different means of packaging, and method of handling in specialized vessels when moving in

[1] Peavey, personal letter, February 26, 1968.

large volume in Vancouver compared to a similar commodity in New York.

The Port of New York Authority provided useful criteria for classifying 'Prime,' 'Suitable,' 'Marginal' and 'Unsuitable' cargo.[2] Two additional categories were established for Vancouver traffic by separating 'Unsuitable' cargo into 'Unsuitable-bulk' and 'Unsuitable-general cargo.' For example, unmanufactured wood which is classified by N.H.B. as general cargo is obviously 'Unsuitable' due to restrictions of length and to the widely accepted method on the West Coast of unitizing lumber in packages. The New York study classified all unmanufactured wood as 'Marginal.'

A sixth potentially containerizable class was established for shipment of perishable goods in refrigerated containers. All of these commodities would otherwise have been classified as 'Prime.'

Categories of cargoes are defined as follows:

1. Prime. Commodities of high value with relatively high handling and shipping rates which can be readily packaged in containers, thus reducing their high degree of susceptibility to damage and pilferage. Major physical criteria are size and the relation of weight to cube. Examples: canned meat, apparel, liquors.
2. Suitable. Commodities of moderate value with lower shipping rates than those for prime commodities and only moderate susceptibility to damage and pilferage. Examples: wood shingles, wire products, cotton.
3. Marginal. Commodities physically suitable to containerization but are of low value with low shipping rates and little

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[2] Port of New York Authority, Container Shipping, p. 12.

susceptibility to damage and pilferage. Many marginal commodities would be difficult to containerize because of size and weight. Examples: steel ingots, ore concentrates, veneer and plywood.

4. Reefer. Perishable commodities requiring a controlled temperature with a relatively high shipping rate which can be stored in containers to reduce susceptibility to damage and pilferage. Examples: butter, fresh vegetables, frozen meats.
5. Unsuitable-general cargo. Cargoes classified as general cargo that physically cannot be put in containers or generally are much more efficiently unitized or carried in specialized vessels when moving in large volume. Examples: logs, lumber, plywood.
6. Unsuitable-bulk. Bulk cargoes that physically cannot be put in containers or generally are much more efficiently carried in specialized vessels when moving in large volume. Examples: pulpwood chips, coal, potash, grain.

Suitability Constants for Containerization

Arbitrary assignment of percentage values to the various categories of cargoes (containerizability) required a decision to be made essentially on the basis of subjective evaluation. The classification in this study is adapted from the Port of New York Authority report summarized on page 49 which has been modified to local conditions with the aid of N.H.B. and other officials familiar with Vancouver traffic.

The Department of Trade and Commerce study, as described on page 52 has also made a valuable contribution to the subject using in its report the criteria established by the Port of New York Authority. In many instances, in the present study, it was necessary to modify the ratings adopted by the Department of Trade and Commerce to a more conservative evaluation of containerizable cargo for Vancouver traffic. For example, most of the lumber, veneer, and plywood which Ottawa termed "100 per cent suitable" is already unitized in large packages (two feet high by four feet wide, stacked two or three packages high for loading) and are therefore unlikely to be containerized since these general cargo commodities (Category 5) already move efficiently in specially-designed lumber carriers.

Wood pulp is one of the major general cargo items in Category 5 (unsuitable-general cargo) that could be considered for containerization in the event of empty space on back haul. Providing space is available on the return trip from the West Coast, low value/high bulk cargoes which are not normally containerized may be shipped in containers. Some forms of bulk commodities may be shipped in containers although this is the exception rather than the rule. White Pass and Yukon Corporation carries asbestos to Vancouver from Cassiar in the Yukon. A similar situation may eventually apply to iron and copper ores in British Columbia trade to Japan.

The Johnston Terminals Limited study, which also tends to be more optimistic of future container flows than the present study, served as another local source that was helpful in rating and classifying some commodities.[3] In a study by the British Columbia Research Council, the following commodities were described as not containerizable:[4]

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[3] Johnston Terminals Limited, p. 11.

[4] Sheriff, The Port of Vancouver General Cargo Requirements, p. 32.

Automobiles, Tractors,

Drums and Barrels,

Lumber and lumber products,

Uncrated iron and steel,

Tin plate and skelp in rolls.

In addition, the following commodities were classified under the N.H.B. code as bulk cargo, and as such, were placed on Category 6 (unsuitable-bulk):

Exports: coal, copper in ores, fish oil, fodder and feed, grain and seed, methanol, potash, propane gas, tall oil, tallow, sulphur, fertilizers (bulk nitrate), petroleum products, pulp chips;

Imports: caustic soda, common salt, fuel oil, gasoline and other petroleum products, ores and concentrates (lead and zinc), phosphate rock, raw sugar.

Appendix B describes how the results of previous reports were used in the present study to establish suitability constants for several important commodities.

Commodity Grouping

National Harbours Board commodity statistics are recorded on a monthly basis according to the N.H.B. Cargo Classification. The list of N.H.B. commodity groupings is derived from the Dominion Bureau of Statistics Standard Commodity Classification.

In the present study, the original 174 N.H.B. Cargo Classifications used in the cargo flow data was reduced to 117 groups (Appendix A). Three criteria were established for reclassification. The original intent of reclassification was to reduce the number of data processing cards, and to simplify the research required to determine the density of each of the original 174 commodities.

The three criteria for grouping commodities are as follows:

(1) Commodities must have similar physical product characteristics which determine the suitability to containerization of each commodity.

(2) Commodities must have or be assigned identical density factors.

(3) Commodities must be handled, packaged, and shipped in ocean transport by a similar method.

For example, the N.H.B. Cargo Classification for Fermented Alcoholic Beverages, Distilled Alcoholic Beverages, and Non-Alcoholic Beverages have been classified under the Revised Commodity Code 45 for Beverages. Another example was the reclassification of Cotton, Wool, and Jute under the Revised Commodity Group of "Gunnies" (Revised Commodity Code 61).

In each case, the Revised Commodity Group has the same suitability to containerization, the same density, and is handled, packed or shipped in a similar manner.

Trade Routes - Origin and Destination

The definition of 69 "trade routes" refers to 69 countries or geographic regions served by deepsea transport to/from which traffic flowed through the Port during 1967. In the final analysis, the origins and destinations were grouped into 14 world trading zones as follows:

1. United Kingdom and European Common Market countries
2. Scandanavia (Finland, Norway, Denmark, Sweden, Iceland)
3. Australasia (Australia, New Zealand, South Pacific Islands)
4. Japan
5. Hong Kong
6. Southeast Asia (Korea, Vietnam, Formosa, Singapore)
7. Africa (East Africa, West Africa)
8. South America (all countries)
9. Iberia (Spain, Portugal)
10. U.S. Atlantic
11. Central America (Mexico, Caribbean, Central America countries)
12. India/Pakistan/Ceylon
13. China and China coast
14. Hawaii

The basic data does not describe the inland origin of exports, nor does it identify the final destination of exports other than by country. The same information is lacking for imports. Vancouver is the only fixed point in the system.

The absence of the specific origin and destination location of goods detracts from the usefulness of the data for determining containerability. Without the prospect of intermodal transfer of containers for delivery to inland terminals, there is less incentive for shippers to choose containers as a means of shipping goods in ocean transport.

<u>Density Factors of Commodity Groupings</u>

The stowage factor of a commodity is the figure which represents the number of cubic feet of cargo space in which a long ton (2240 pounds) of the commodity may be stored.[5] Information on how much space an item of cargo occupies when stowed in a vessel's hold was published in Modern Ship Stowage (1942) which contains a complete list of stowage factors for all usual cargoes. Changing technology and introduction of new products has since altered a number of the stowage factors. In several instances, it was necessary to modify the density to suit local trade. Garoche (1952) lists more recently calculated stowage factors for new products, but even these do not all apply equally well to container traffic in Vancouver.

Stowage factors are of two kinds. One kind measures the actual amount of space occupied by the item in broken stowage as in the hold of the ship. The second kind, as used in the present study, is determined from the actual volume of the commodity as it is packaged for shipment with no allowance for broken stowage caused by the commodity's peculiar shape and/or the use of dunnage to secure cargo in the hold.

Loading a container with one commodity until either the weight or volume constraint binds implies that the container is fully utilized. Therefore, as in the present study, it is assumed that loss of space through use of containers takes place in the vessel *per se* (generally about 85 per cent of cubic capacity of a fully containerized vessel) and not in the individual containers.

The Matson report of containerization on Trade Route 27 grouped commodities into six broad density ranges plus reefers. The study served

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[5] James Vernon Metcalfe, *Principles of Ocean Transportation*, (New York: Simmons-Boardman Publishing Corporation, 1959), p. 71.

as a secondary source for determining cargo density and otherwise provided a means of establishing reasonable guidelines for specific products in the commodity groupings. Table IX on page 73 illustrates the grouping of commodities that have a similar range of density factors.

The present study derived densities from manifests relating to local traffic and from discussions with local manufacturers, shippers, and consignees of large-volume commodities. MacMillan Bloedel Limited provided density factors for forest products; Kelly Douglas Limited were contacted for food stuffs; Canadian Industries Limited provided data for chemicals, fertilizers, and explosives. White Pass & Yukon Corporation provided density factors for crude asbestos and miscellaneous products.

A list of densities obtained from a report produced by the International Air Transport Association was used to supplement other sources.[6] All commodities in the IATA list are considered to be in the 'Prime' category of suitability since they are high density/high value/low bulk commodities that can bear the cost of air transport.

Density factors for all commodities are listed in Appendix A.

Container Specifications

The number of containerloads required for 1967 was determined for both 20-foot and 30-foot containers. Specifications of the two sizes used in the present study are presented in Table X, on page 74, although any number of sizes could have been used, all of which would have had different physical characteristics.

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[6] International Air Transport Association. Report of the Second Meeting, Container Density Incentive Advisory Group (Montreal: March, 1966) Attachment A. Unpublished report. (Confidential).

TABLE IX

THE RANGE OF DENSITY FACTORS FOR COMMODITY GROUPS

Density Group	Commodity
1 (less than 23 lbs/ft.^{3})	Tobacco, Fibers, Tires and Tubes Engines and parts, Spices, Seeds Utensils, Agricultural Machines
2 (23-25 lbs./ft.^{3})	Coffee, Shellfish, Nuts, Wood Material, Textiles/shoes
3 (26-30 lbs./ft.^{3})	Fish and products, Vegetable products, Paper, Paper waste stock
4 (31-37 lbs./ft.^{3})	Synthetic rubber, Newsprint, Beverages, Industrial machine parts
5 (38-45 lbs./ft.^{3})	Coffee , Fruits, Woodpulp, Paints, Paperboard
6 (over 45 lbs./ft.^{3})	Glass, Tools, Tile, Aluminum metal alloy, Oil Seeds
Reefer	Frozen fruits and vegetables

Source: Matson Research Corporation, "A Comprehensive Comparison of Trade Route 27 Container Services" (Unpublished Report prepared in San Francisco, October, 1965), Appendix A, p. A-1.

TABLE X

CONTAINER SPECIFICATIONS

Nominal Container Size Feet	Maximum Useable Volume Cubic Feet	Maximum Payload Weight Pounds	Critical Density lbs./ft.^{3}
20 x 8 x 8	930	41,440	44.5
30 x 8 x 8	1,410	47,000	33.5

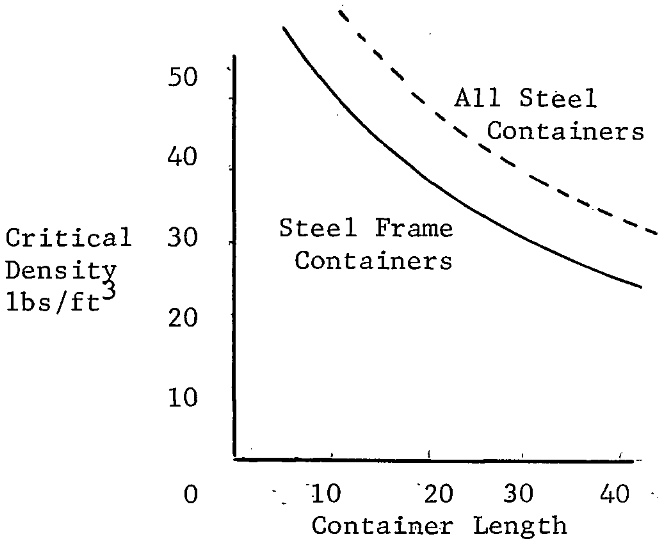
Source: Matson Research Corporation, "A Comprehensive Comparison of Trade Route 27 Container Services" (Unpublished Report prepared in San Francisco, October, 1965), Appendix A, Table 2.

The critical density of a container is defined as the point at which both the maximum payload and maximum useable volume is fully utilized when loaded with a commodity which has a density equal to the critical density. Commodities that have a density less than the critical density will "cube out" before the maximum payload is reached. Similarly, commodities that have a density greater than the critical density will "weigh out" before the maximum useable volume is filled.

Although it would have been sufficient to carry out the calculations for only the 20-foot container, 30-foot containers also considered in the results to illustrate the effect of critical density upon number of containerloads. The longer the container, the less is the critical density since the increase in payload is less than proportionate to the increase in cubic content as illustrated in Figure 4 on page 75. The use of longer containers (30-foot and 40-foot are generally the maximum length) appears

FIGURE 4

RELATIONSHIP OF CRITICAL DENSITY TO CONTAINER SIZE



...Increase in payload is less than proportionate to an increase in cubic content with increase in length...

to be restricted to trade routes characterized by "balloon cargo" since on other routes most commodities would "weigh out" before the additional cubic content could be utilized. The maximum payload of a steel-frame 40-foot container is about 30 tons (critical density about 27 pounds per square foot), whereas an all-steel 20-foot container may take up to 22 tons (critical density about 53 pounds per square foot).[7]

Container Calculation Model

The Flow Chart in Appendix C summarizes the computer analysis designed to calculate the tonnage of containerizable cargo, and in turn,

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[7]American Iron and Steel Institute, Steel Containers: Comprehensive Quick Selection Chart, (New York: October, 1967), Fact Sheet No. 16.

the number of containerloads handled in the port during 1967. A brief explanation of the steps outlined in the Flow Chart is as follows:

Input Data. At the (START), density factors (DC:density of commodity in pounds per cubic foot) and suitability factors (SUIT) for each of the six categories of containerization (J=1,6) were read in for each of 117 commodities. The critical density (CD) for each of the two container sizes was fed in to the programme in a separate array.

Commodity flow data, available on a month-by-month basis (MCODE), as fed in on each data card coded by import/export (IEN: 1 if import; 2 if export), commodity (NC: commodity number), and tonnage (TON) on each of 69 routes (NRN).

Calculation of Number of Containerloads. The number of containerloads (CONT) was determined for each month by import/export (I=1,2), by route (NRN), and suitability (J). The following is an example of a calculation to determine the number of containerloads for import commodities (I=1) that are suitable for each of the four categories of containerizable commodities (J=1,4). A similar calculation was carried out for exports (I=2).

Part (A) of the Container Calculation Model determines containerizable tonnage and number of containerloads for containerizable commodities. Only commodities that are in the four suitable categories (J=1,4) were assigned density factors. Calculations are carried out only for commodities when density factors "do not equal zero" (DC≠0).

When commodity density was "equal to" or "greater than" critical density of the container, DC(NC) $\geq$ CD (I), cubic volume of the commodity tonnage was calculated in order to determine the number of containerloads

(CONT).

$$\text{Number of containerloads} = \frac{\text{tonnage x 2000 pounds per ton}}{\text{commodity density x useable volume of container}}$$

$$\text{CONT} = \frac{\text{TON x 2000}}{\text{DC(NC) x VC (I)}}$$

When density of a commodity was "less than" the critical density of the container, DC < CD(I), the number of containerloads was calculated by dividing useable payload (WC) into tonnage (TON) for each containerizable commodity.

$$\text{Number of containerloads} = \frac{\text{tonnage}}{\text{weight capacity of container}}$$

$$\text{CONT} = \frac{\text{TON}}{\text{WC(I)}}$$

The total monthly tonnage (TONS) was determined simply by sorting and adding separate import and export tonnage (TON) on each data card for each class of suitability (J=1,6) on a route-by-route basis.

The percentage factors listed in Appendix A were then applied to both (TONS) and/or (CONT) in order to apportion the tonnage and number of containerloads into the appropriate degree of suitability for imports/ exports on each route.

A separate set of calculations (DO loop) was planned for each of the two container sizes.

Calculations for Non-Containerizable Commodities. Commodities that were not containerizable (when density factors equal zero, D=0, for 'Unsuitable General Cargo' (J-5) and 'Unsuitable Bulk Cargo' (J=6) did not require a calculation to determine cubic volume or the number of containerloads. Tonnage (TON) for these two classes of commodities was recorded separately in the monthly output tables.

Output Data. Output from the computer analysis was recorded by total tons (TONS) per month by import/export on a route-by-route basis for each of the six classes of suitability (J=1,6).

A similar monthly table was set up for the number of containerloads (CONT) on a route-by-route basis by month for each of the four classes of containerizable commodities (J=1,4).

Partially filled containerloads (CONT) were rounded upward to a whole number at the end of each month in order to minimize the total number of containers on each route that did not utilize either full weight of cubic capacity.

A running total was kept up for the year-end summary (UPDATE YEARLY TABLES) of tonnage and number of containerloads on a route-by-route basis for both imports and exports.

Results of the analysis are presented in Chapter VI immediately following this outline of methodology to determine the number of containerloads handled in the Port of Vancouver during 1967.

CHAPTER VI

RESULTS OF THE CONTAINER CALCULATION MODEL

The first part of this chapter summarizes the results of the Container Calculation Model which was designed to determine the potential container tonnage and number of containerloads for Vancouver in 1967. The second part forecasts container potential to 1985. The third part of the chapter interprets the results of the data for the base year and the forecast of potential container traffic up to 1985, in order to determine container berth requirements for the port. Conclusions are summarized in the final section.

I. RESULTS OF CONTAINER CALCULATION MODEL

Container Tonnage and Number of Containerloads - 1967.

The computer printout revealed that under ideal conditions, for all classes of suitability, the maximum number of loaded containers which would have been handled in the Port of Vancouver during 1967 would have been 87,700 20-foot containers, or 61,300 containers in 30-foot units. This includes both inbound and outbound movements.

In terms of total potential container tonnage, the port would have handled 785,000 tons import, and 385,000 tons export in containers. Total import tons amounted to 1,969,000 tons of which 39.9 per cent was potentially containerizable. Only 3.5 per cent of 12,130,000 tons outbound was suitable for containerization, due to the heavy export volume of bulk cargo.

Average weight of inbound containers on all routes was 10.4 tons based on 480,000 tons occupying 38,300 'Prime' containers. Average weight in outbound containers was 13.5 tons.

The summary of potential tonnage of containerizable cargo by each of four classes of suitability is presented in Table XI. In 1967, total tonnage amounted to 14,099,000 tons. Of this, 3,288,000 tons was general cargo. The study determined that 1,166,000 tons of general cargo was potentially containerizable.

TABLE XI

POTENTIAL TONNAGE CONTAINERIZABLE CARGO

PORT OF VANCOUVER - 1967

Class of Containerization	Import Tons	Export Tons	Total Tons
1. Prime	480,000	150,000	630,000
2. Suitable	115,000	98,000	213,000
3. Marginal	150,000	114,000	264,000
4. Reefer	40,000	19,000	59,000
Total Container Tonnage	785,000	381,000	1,166,000
Total General Cargo*	1,191,000	2,097,000	3,288,000
TOTAL TONNAGE	1,969,000	12,130,000	14,099,000

Note: *Total General Cargo Tons, including logs and lumber obtained from National Harbours Board, Vancouver, are listed previously in Table II, page 35.

The number of containerloads on a route-by-route basis for each of the four classes of suitability is shown in Table XII on page 82. Total number of containerloads are shown for each of thirteen major trading zones, with a residual balance shown for the accumulation of physically containerizable commodities on routes that cannot justify regular service by container vessels. Trade routes are ranked in the order of 'Prime' number of inbound containers. The column on the extreme right gives the sum total of 43,100 'Prime' containerloads on each of the major routes. This is comprised of 35,600 import units, and 7,500 export containers.

In reference to Table XI and XII, the author contends that only 'Prime' containerizable commodities should be considered as the basis for assessing the economic feasibility of a container terminal. 'Prime' commodities have the highest potential for containerization. Although 'Reefer' commodities have a high suitability for containerization, reefers represent less than seven per cent of total number of containerloads.

'Suitable' and 'Marginal' commodities have a low probability of materializing as container traffic and are not included in this analysis of container berth requirements. In 1967, the import/export of 'Marginal' and 'Suitable' commodities totalled 477,000 tons, or 41 per cent of total potential container tonnage. Should these commodities eventually be placed in containers, the need for expanding container facilities will have to take place at an earlier date. Also, the potential of future traffic generated by the land-bridge scheme, as stated on page 38, is not considered relevant to the decision of establishing the first container berth.

TABLE XII

NUMBER OF CONTAINERLOADS (20-FOOT) BY CLASS ON INTERNATIONAL ROUTES

Trade Route (20-Foot Containers)	Prime	Reefers	Suitable	Marginal	Import Total	Prime	Reefer	Suitable	Marg.	Export Total	Grand Total Prime Only
Japan	16200	1100	2200	3900	23400	1600	100	2200	1900	5800	17800
European Common Market	5800	100	2300	3200	11400	2800	700	800	1200	5500	8600
Hong Kong	6800	-	700	400	7900	200	100	300	100	700	7000
Southeast Asia	2900	100	300	300	3600	500	-	1500	500	2500	3400
Australasia	1000	800	100	300	2200	700	-	400	800	1900	1700
Central America	500	-	500	200	1200	700	-	2000	300	3000	1200
South America	500	100	800	100	1500	500	-	2000	600	3100	1000
India/ Pakistan	400	-	400	400	1200	200	-	200	100	500	600
Scandinavia	400	100	100	200	800	100	200	-	100	400	500
Iberia	400	-	100	-	500	-	-	-	-	-	400
U.S.Atlantic	400	-	200	100	700	-	-	-	-	-	400
Africa	200	-	300	100	600	100	-	-	200	300	300
Hawaii	100	-	-	-	100	100	-	-	-	100	200
Route Total	35600	2300	8000	9200	55100	7500	1100	9400	5800	23800	43100
Other	2700	-	600	300	3600	3600	-	400	1200	5200	6300
Grand Total	38300	2300	8600	9500	58700	11100	1100	9800	7000	29000	49400

By taking only 'Prime' commodities as the basis for calculations and decision-making, no more than 38,300 20-foot containers (or 480,000 tons) would have been handled inbound versus only 11,100 containers (or 150,000 tons) outbound from the port. Many commodities in the 'Suitable' and 'Marginal' categories may be considered for containerization only for back haul, and only on certain routes in order to "balance" the two-way flow.

'Marginal' commodities should not be placed in containers simply to fill up empty space on container back-haul if their value cannot justify container shipment, and then, only when space is available on outbound vessels. As stressed previously, many of these large tonnage 'Marginal' and 'Suitable' commodities, such as pulp and newsprint, are already handled in an efficient manner. Further economies would unlikely be achieved by containerization.

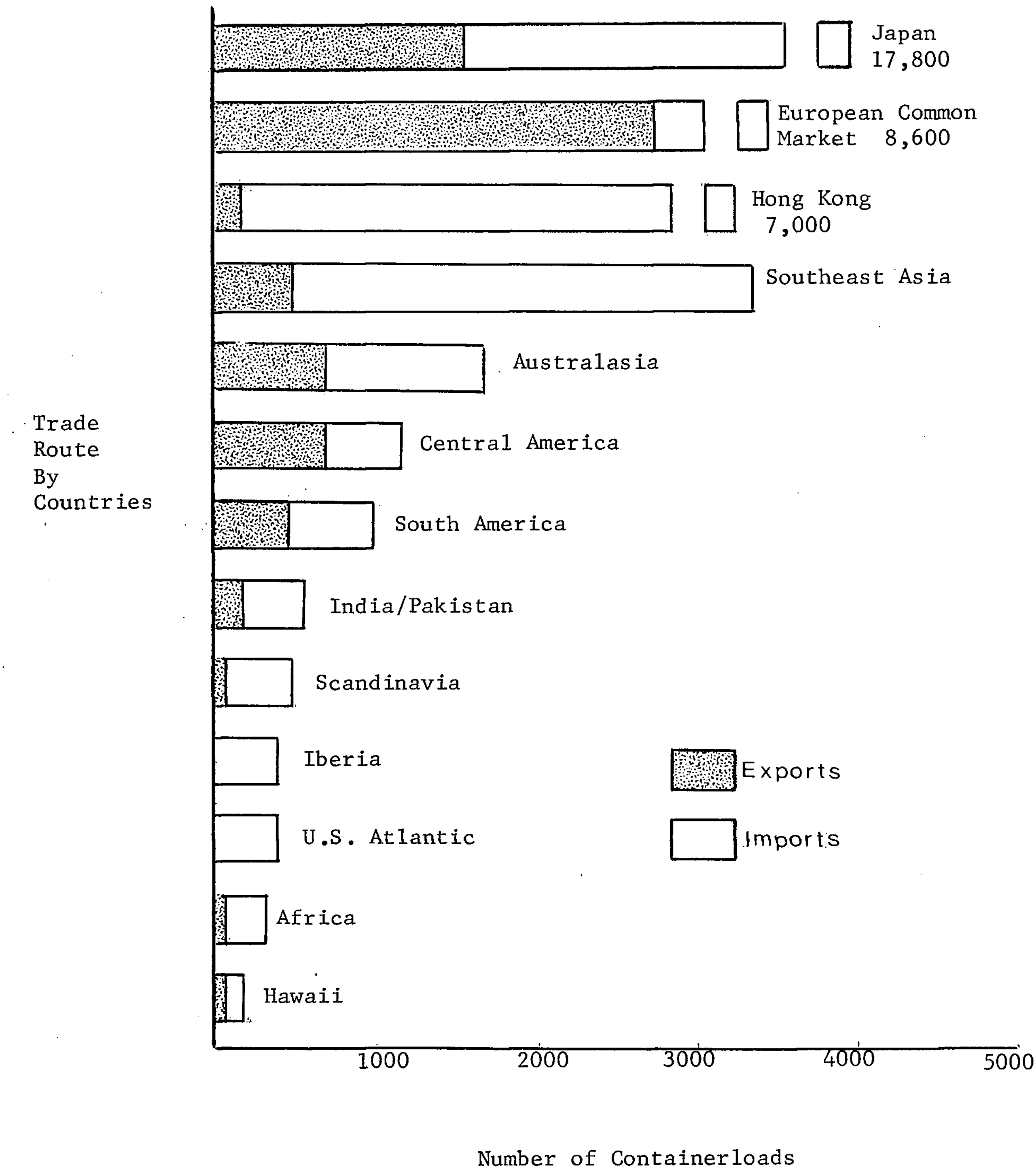
Route Analysis

By eliminating those destinations or originating countries or regions that do not have sufficient number of containerloads to justify utilization of container vessels, the upper limit of containerloads in Vancouver would be reduced from 38,300 containers inbound to 29,500; and from 11,100 containers outbound to 7,700 on the thirteen major trade routes identified in Table XII and shown in Figure 5 on page 84.

The trade route to Japan alone would have had 42 per cent of potential 'Prime' inbound container traffic and 21 per cent outbound traffic, comprised of 16,200 containers inbound and 1,600 outbound. The addition of countries in Southeast Asia (Hong Kong, Korea, Vietnam,

POTENTIAL CONTAINERLOADS (20-FOOT) OF PRIME COMMODITIES

PORT OF VANCOUVER - 1967



Thailand, Formosa, and Philippines) would have brought the total Orient traffic to 28,200 containers, or nearly 70 per cent of total inbound containers. The imbalance of inbound containers would be in the order of 10:1 based on 25,900 inbound and only 2,300 outbound from Vancouver.

The European Common Market countries, with the addition of the United Kingdom, make the North Atlantic the second most important route serving the West Coast trade. Of the total 5,800 containers inbound, 3,100 would have been loaded in Britain. The Scandinavian countries add another 400 inbound. The German, French, Dutch, and Italian ports loaded another 3,500 containers to Vancouver. Outbound, a total of 2,800 'Prime' containerloads were shipped to the United Kingdom, Scandinavia, and Common Market countries. The balance of traffic might be expected to be about 2:1 in favour of inbound containers.

Australasia is the third most important trading region based on container flow. A total of 1,000 containers inbound and 700 outbound comes much closer to balanced two-way trade. Australia is active in more than ninety per cent of Australasia traffic, with New Zealand accounting for most of the small remaining South Pacific container traffic.

Central America (Mexico and West Indies) and South America (Brazil, Chile, and Argentina) together account for a total of 2,100 containers, with nearly a perfect directional balance in container trade.

India/Pakistan, Spain/Portugal, Africa, and Hawaii together would have added only 1,300 containers moving in both directions from Vancouver.

The addition of China and China coast as a fourteenth trade route would bring in another 2,100 containers, but only a mere eight containers would be added to the total outbound, thus compounding the already severe imbalance in traffic from the Orient.

II. FORECAST OF POTENTIAL CONTAINER TONNAGE

The growth of general cargo traffic in the Port of Vancouver is forecast by Sheriff to increase at the rate of five per cent per annum for imports, and at 3.5 per cent for exports.[1,2]

Table XIII illustrates the projected growth in 'Prime' container traffic from the base year in 1967, as shown in Table XI on page 80, to potential traffic resulting by 1985.

TABLE XIII

FORECAST OF POTENTIAL 'PRIME' CONTAINER TRAFFIC - TONS

PORT OF VANCOUVER

Directional	Rate of Growth %	Year 1967	Year 1975	Year 1985
Imports	5.0	480,000	700,000	1,580,000
Exports	3.5	150,000	200,000	310,000
Total		630,000	900,000	1,890,000

[1] Sheriff, <u>The Port of Vancouver General Cargo Requirements</u>, pp. 2-3.

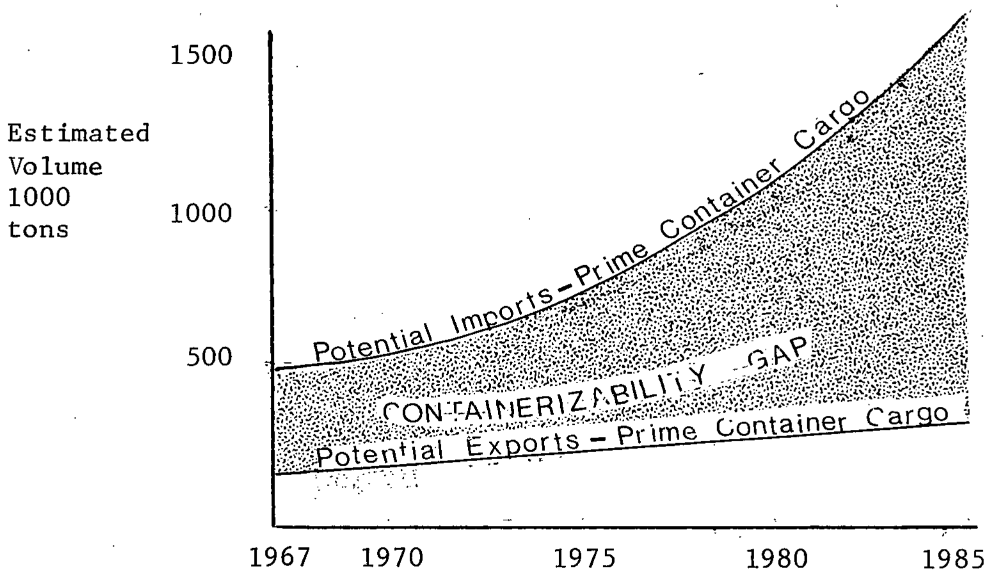
[2] British Columbia Research Council, <u>Foreign Trade Study Lower Mainland Ports of British Columbia</u>, pp. 2-15.

As shown in Table XIII, by 1975 the import potential is expected to increase from 480,000 tons to 700,000 tons; while export potential increased from 150,000 to 200,000 tons. By 1985, the total import/export potential will more than double from the present 630,000 tons to 1,890,000 tons. Figure 6 illustrates the widening 'Containerizability Gap' between total imports and total exports due to the forecast of greater growth of containerizable imports than the growth of exports which are predominantly bulk cargoes.

FIGURE 6

GROWTH OF 'PRIME' CONTAINERIZABLE CARGO - TONS

PORT OF VANCOUVER



III. DETERMINATION OF BERTH REQUIREMENTS

The purpose of this section is to investigate the need for one or more container berths in the Port of Vancouver based on actual and potential container traffic of 'Prime' commodities.

Berth requirements are a function of number of vessel calls per year, vessel capacity to carry containers, and the number of days required to discharge and load containers. Another major factor is the rate of growth at which commodities that are suitable for containerization are actually in fact shipped in containers.

Two criteria are employed in determining the number of container berths: tonnage and containerloads. The first method is the crudest measure because it ignores density characteristics of each commodity and because it does not give a precise measurement of number of containerloads. The second method, which is more realistic, measures the number of containerloads based on cubic and weight factors for each commodity.

Berth Requirements Based on Tonnage Forecast

Total potential of 'Prime' imports and exports of containerizable general cargo in Port of Vancouver during 1967 was 630,000 tons. 'Prime' imports alone totalled 480,000 tons. By 1975, total potential will increase to 900,000 tons, of which 700,000 tons will be imports. Nearly two million tons of 'Prime' containerizable cargo will be handled in the Port by 1985.

Assuming a capacity of one million tons per berth, one container berth will be more than sufficient to handle port requirements up to 1975. Planning for a second berth should be undertaken early in the 1980's. This rule-of-thumb measurement is illustrated in Figure 7.

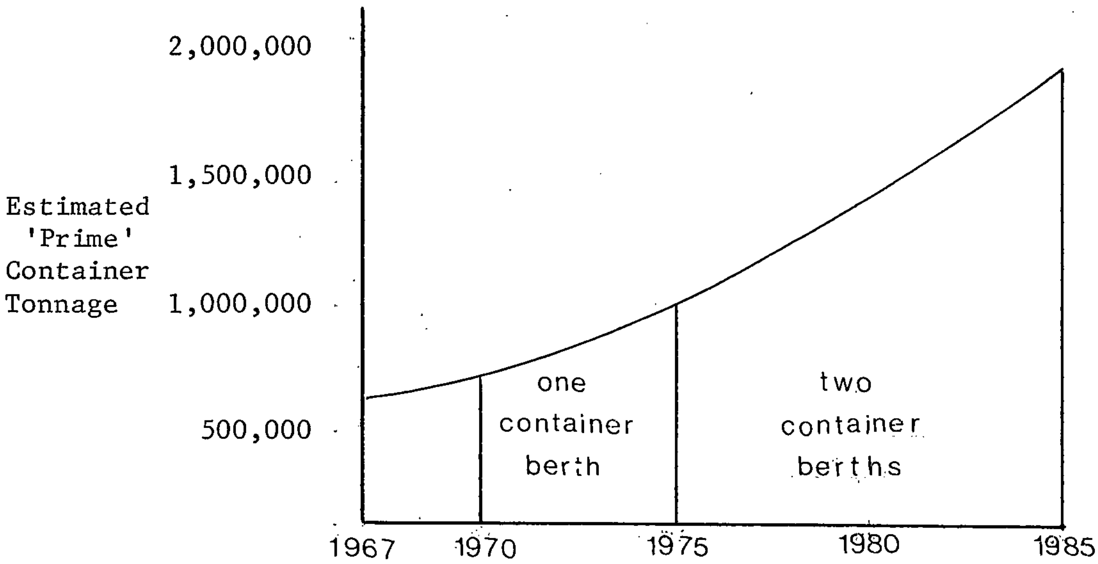
Berth Requirements Based on Number of Containerloads

In terms of potential numbers of containerloads as the basis for

FIGURE 7

CONTAINER BERTH REQUIREMENTS BASED ON

ONE MILLION TONS PER BERTH PER YEAR, 1967-1985



evaluation of berth requirements, the potential 38,300 inbound and 11,100 outbound containers in 1967 will increase to 56,300 and 14,400 respectively, by 1975.

The actual and potential containerloads for 1967 are converted into figures illustrating berth utilization in Table XIV. The table assumes various vessel sizes appropriate for West Coast traffic along with an estimated time for turnaround for each vessel size. Levels of berth utilization are shown for actual and potential container traffic estimated for 1967.

Actual container traffic in 1967 amounted to about 80 containers

TABLE XIV

ACTUAL AND POTENTIAL BERTH OCCUPANCY AS A FUNCTION OF

VESSEL CAPACITY AND CALL REQUIREMENTS

ESTIMATED FOR - 1967

PORT OF VANCOUVER

Containerloads per Year ('Prime' commodities only)		1,000 (Actual)		50,000 (Potential)	
Containers Per Vessel	Days in Port	Required Vessel Calls Per Year	Berth Occupancy Days/Year	Required Vessel Calls Per Year	Berth Occ. Dy/Yr.
1000	4	1	4	50	200
500	2	2	4	100	200
200	1	5	5	250	250
100	.5	10	5	500	250
50	.5	20	10	1000	500

per month, or approximately 1,000 actual containerloads handled in the Port of Vancouver during the year. (In 1967, outbound traffic amounted to only a half dozen or so containers per month, as stated on page 37). The potential inbound and outbound containers was approximately 50,000 units.

According to the table, vessels discharging an average of 50 containers in Vancouver would have to make 20 calls per year for a berth occupancy of only 10 days per year, if the annual total of containerloads amounted to 1,000 containers. For the same vessel carrying 50 containers, if the total yearly containerloads reached the full potential of 50,000 containers, berth occupancy would increase to 500 days per year, thereby exceeding berth capacity of a single container berth.

The major problem of forecasting future container terminal requirements depends upon determining the rate at which cargo that has the potential for containerization will actually in fact be containerized.

In addition to the rate of actual containerization, the size of container vessels will also effect the need for increased number of container berths. The larger the vessel, the lower the level of berth utilization. Actual size distribution of vessels calling in Vancouver is likely to vary between 100 and 200 containers per vessel. Most of the vessels will be semi-container vessels. There is less liklihood of full container vessels taking on or discharging partial loads.

Given that vessels will carry between 100 and 200 containers per call, berth occupancy will amount to 250 days per year as shown in Table XIV. Assuming 250 working days per year, one container berth would achieve full utilization if all 'Prime' container traffic were actually containerized in 1967.

By 1970, approximately 10,000 actual containerloads would likely be handled in the port (based on 1967 'Prime' traffic estimated to increase at 50 per cent per annum as a result of induced demand mainly because facilities are available in major ports around the world. The rate of growth of container traffic is likely to decrease to about 20 per cent per annum after the period of initial growth).

Therefore, based on 1967 data, a container berth would actually achieve only 5 days occupancy or 2 per cent utilization. However, with the potential container traffic, berth utilization would increase to 100 days berth occupancy or 40 per cent utilization by 1970.

Since 40 per cent utilization is not an unreasonable volume of traffic to justify operation of a container facility, one container berth would be adequate to handle traffic up to the mid 1970's. A single container crane will be required for each berth. Each berth will be 750 feet long. Fifteen acres of land (two acres per 100 feet of quay) will be required to provide backup for the berth, although it is recommended that thirty acres be set aside in initial planning to provide accommodation for traffic moving over two container berths.

The following section summarizes the merits of basing the decision to proceed with construction of a container facility in the Port of Vancouver.

IV. SUMMARY AND CONCLUSION

It is obvious from the present study that a significant potential volume of container traffic exists in the Port of Vancouver.

However, results of the present study should be viewed in light of several arbitrary decisions made by the author during the search for basic data. The categorization of commodities into one or more of the six containerizable classes is still a highly subjective exercise. Another factor which could substantially alter the results of the present study is the selection of appropriate density factors since the number of containerloads depends on the cubic and weight measurement of each commodity. The analysis of potential container traffic is based on 'Prime' containerizable cargoes.

Methods of estimating container traffic in the present study are deliberately more conservative than those used in the previous studies reviewed herein. Despite these less optimistic views, the study showed that a definite potential exists for container traffic. The author contends that only 'Prime,' and possible 'Reefer,' commodities should be the real basis of the final decision to build a container port. 'Marginal' and 'Suitable' commodities such as pulp, newsprint, and ore concentrates are not considered containerizable during early development of container traffic.

Particular attention must be paid to growth and development of containerization in trade with the Orient. Trade with Japan and Southeast Asia has the highest propensity for containerization and will undoubtedly have the greatest impact on containerization developments on the West Coast.

In conclusion, the results of the analysis indicated a definite potential tonnage of containerizable 'Prime' cargo was available in Vancouver to consider one container berth, served by one container crane and thirty acres of backup area. One container berth would be sufficient to handle port requirements at least up until the mid 1970's.

V. NEED FOR FURTHER STUDY

The present study of containerization in Vancouver does not include an evaluation of financial criteria required to determine the need for a container facility.

1. Having estimated the potential container tonnage and containerloads moving through the port to 1975, there is an urgent need to carry out financial analysis to determine whether or not revenue derived from future traffic will be sufficient to cover operating costs (including depreciation) and recoup the investment in berths, cranes, land, and ancillary equipment.
2. Plans of shipping companies relative to Vancouver will effect the growth rate of container traffic. It is important that their plans be documented so that planning of berth expansion can be scheduled appropriately. Vessel capacity and onboard container handling facility should also be recorded since many liners are already equipped with 25-ton cranes which may perhaps negate the need for an increased number of costly shore-based container cranes.
3. Consideration should be given to determining the amount of additional revenue that would need to be generated by containerized cargo in order to earn a fair rate of return on the port investment. Port operating revenues are generally derived from three sources:

    (i) charges against ships, and occasionally, inland carriers,

(ii) charges against cargo, paid by the owner or agent, and

(iii) rental space within the port limits.

Often, the charges against vessels and cargo are increased substantially to reflect the advantage of berths that enable a quick turnaround. But revised charges for wharfage, dockage, and handling must be kept within reason. Otherwise, shipowners and shipping conferences may reduce service to the port in favour of a nearby port where revised charges are offset by a higher volume of traffic.

4. No attempt has been made to determine the inland origin or destination of containerizable cargo. Due to the inter-modal aspects of containerization, such a study would seem to be most useful in determining the rate at which the potential of container traffic may be realized.

5. The implementation of the land-bridge concept, although not an immediate concern, should be considered as a future possibility. Any decision to build a container berth in Vancouver should be based on existing traffic, rather than on the remote possibility of diverted traffic across North America.

6. Concern by the local shipping industry over the possibility of loosing Canadian traffic to the neighbouring Port of Seattle warrants a study to determine the volume that would be shipped through Seattle if a container facility was not available in Vancouver.

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A P P E N D I C E S

APPENDIX A

CARGO CLASSIFICATION AND DENSITY FACTORS

Revised Code No.	Revised Commodity Group	Suitability to Containerization (percent containerization) 1	2	3	4	5	6	Density Factor lbs/ft.^{3}
001	Meat, Fresh, chilled	-	-	-	100	-	-	42
002	Meat, canned, preps.	100	-	-	-	-	-	42
005	Fish, fresh, frozen	-	-	-	100	-	-	42
006	Fish, canned	100	-	-	-	-	-	45
008	Shellfish, frozen	-	-	-	100	-	-	24
011	Butter	-	-	-	100	-	-	25
012	Milk powder	100	-	-	-	-	-	20
013	Dairy Produce, nes	-	-	-	100	-	-	27
014	Grain unmilled	-	-	-	-	-	100	-
020	Wheat flour	-	-	-	-	100	-	-
021	Cereals milled	-	100	-	-	-	-	18
022	Fresh fruit	-	-	-	100	-	-	42
025	Fruit, canned, dried	100	-	-	-	-	-	42
029	Nuts	100	-	-	-	-	-	24
030	Potatoes, seed	100	-	-	-	-	-	25
031	Vegetables, fresn nes	-	-	-	100	-	-	30
032	Vegetables-canned	100	-	-	-	-	-	42
034	Raw sugar	-	-	-	-	-	100	-
035	Sugar, refined	100	-	-	-	-	-	25

Source: Revised and Condensed from N.H.B. Cargo Classification.

Revised Code No.	Revised Commodity Group	Suitability to Containerization (percent containerization) 1	2	3	4	5	6	Density Factor lbs/ft.^{3}
036	Molasses	-	-	-	-	-	100	-
037	Sugar, syrup, confectionary	100	-	-	-	-	-	40
039	Coffee	100	-	-	-	-	-	35
040	Tea	100	-	-	-	-	-	19
041	Cocoa, Spices Vinegar	100	-	-	-	-	-	23
042	Food, Food Mat, Food prep.	100	-	-	-	-	-	32
043	Secondary Feeds	-	-	-	-	100	-	-
044	Fodder and feed	-	-	-	-	100	-	-
045	Beverages	100	-	-	-	-	-	37
049	Tobacco (mfgd)	100	-	-	-	-	-	27
050	Raw Hides and skins	-	20	-	-	80	-	35
051	Crude animal products	-	75	25	-	-	-	33
052	Seeds for sowing (mustard)	-	-	-	-	-	100	-
055	Rubber & allied gums	-	-	100	-	-	-	34
056	Crude veg. products	60	20	20	-	-	-	30
057	Logs & timbers	-	-	-	-	100	-	-
058	Pulpwood	-	-	-	-	100	-	-
059	Pulp chips	-	-	-	-	100	-	-
060	Crude wood materials	-	-	-	-	100	-	-
061	Wool, Cotton, Jute	-	-	50	-	50	-	26
067	Metal in ores. concentrates	-	-	-	-	-	100	-

Revised Code No.	Revised Commodity Group	Suitability to Containerization (percent containerization) 1	2	3	4	5	6	Density Factor lbs/ft.^{3}
073	Metals,scrap	-	-	-	-	100	-	-
075	Coal	-	-	-	-	-	100	-
077	Crude Oil	-	-	-	-	-	100	-
078	Coal,crude pet. nes	-	-	-	-	100	-	-
079	Asbestos, crude	-	-	40	-	-	60	40
080	Crude non-metallic minerals	-	-	-	-	-	100	-
089	Waste & scrap mats.	-	-	-	-	100	-	-
090	Leather	100	-	-	-	-	-	34
091	Furs, dressed	100	-	-	-	-	-	28
092	Rubber fabricated materials	100	-	-	-	-	-	33
093	Lumber & timber	-	-	-	-	100	-	-
094	Sawmill products, other	-	-	25	-	75	-	35
095	Veneer & plywood	-	-	10	-	90	-	56
096	Wood fabr. mtls.	60	40	-	-	-	-	21
097	Pulp, wood & other	-	-	25	-	-	75	44
099	Newsprint	-	50	50	-	-	-	27
100	Paper, nes	100	-	-	-	-	-	30
101	Building board	-	-	100	-	-	-	37
102	Paperboard, nes	-	-	100	-	-	-	35
103	Textile Fabr. mtls.	100	-	-	-	-	-	31
105	Tallow, indedible	-	-	-	-	-	100	-
106	Fish, marine, animal oils	-	25	75	-	-	-	35

Revised Code No.	Revised Commodity Group	Suitability to Containerization (percent containerization) 1	2	3	4	5	6	Density Factor $lbs/ft.^3$
107	Vegetable & tall oils	-	-	-	-	-	100	-
108	Oils,fats, vaxes,nes	-	25	75	-	-	-	28
109	Chemical elements inorganic	-	-	20	-	80	-	28
112	Potash	-	-	-	-	-	100	-
113	Metalic Salts & Peroysalts	50	25	15	-	10	-	30
114	Calcium carbide	-	-	10	-	90	-	28
115	Inorganic chemicals others	50	25	15	-	10	-	18
116	Hydrocarbons deriv.	-	-	-	-	100	-	-
117	Alcohols & deriv.	-	-	100	-	-	-	15
118	Phenols, ethers, ketones, etc.	-	-	-	-	100	-	-
119	Organic acids Halides	-	-	-	-	100	-	-
120	Nitrogen-Function Compounds, nes	-	-	-	-	100	-	-
121	Inorganic compounds	-	-	-	-	100	-	-
122	Organic Chemicals,nes	-	-	-	-	100	-	-
123	Explosives, fused & caps	100	-	-	-	-	-	45
124	Fertilizers	-	10	-	-	90	-	30
125	Synthetic rubber	50	50	-	-	-	-	35
126	Synthetic resins	50	50	-	-	-	-	37
127	Chemical products,nes	50	25	15	-	10	-	30
128	Gasoline,fuel oil, propane	-	-	-	-	-	100	-

Revised Code No.	Revised Commodity Group	Suitability to Containerization (percent containerization) 1	2	3	4	5	6	Density Factor lbs/ft.^{3}
131	Other petr. products	-	-	-	-	-	100	-
132	Ferro alloys	-	-	-	-	100	-	-
133	Castings & Forgings	-	25	75	-	-	-	45
134	Steel bars,rods,plate	-	-	25	-	75	-	44
136	Structural shapes	-	-	-	-	100	-	-
137	Rail & track mat.	-	-	25	-	75	-	47
138	Pipes & tubes	-	-	25	-	75	-	39
139	Wire	50	40	10	-	-	-	38
140	Iron & steel alloy fab. mat. nes	-	-	-	-	100	-	-
141	Aluminum & copper alloys	50	25	25	-	-	-	33
143	Nickel, zinc alloys	50	20	20	-	10	-	35
146	Metal fabricated basic products	50	20	20	-	10	-	36
147	Stone,brick,clay glass	-	-	-	-	-	100	-
150	Asbestos,cement,concrete	-	-	25	-	75	-	44
154	Fabricated mat'ls.misc.	50	30	20	-	-	-	38
156	Machinery	-	-	25	-	75	-	30
158	Agriculture machinery	-	-	25	-	75	-	23
159	Tractors	20	40	10	-	30	-	35
160	Railway rolling stock	-	-	-	-	100	-	-
161	Road motor vehicles	30	20	20	-	30	-	35
162	Motor vehicle engines accessories	50	20	10	-	20	-	35

Revised Code No.	Revised Commodity Group	Suitability to Containerization (percent containerization) 1	2	3	4	5	6	Density Factor lbs/ft.[3]
163	Aircraft	-	-	-	-	100	-	-
164	Ships, & Marine engines	30	-	-	-	70	-	30
165	Transportation equipment, nes	30	10	10	-	50	-	30
166	Communication equipment	50	15	10	-	25	-	37
167	Other equipment and tools	50	25	15	-	10	-	31
168	Apparel & footwear	100	-	-	-	-	-	21
169	Recreation equipment, toys	100	-	-	-	-	-	29
170	Carpeting	90	-	-	-	10	-	26
171	Kitchen utensils, tableware	100	-	-	-	-	-	21
172	Personal & Household products	50	30	20	-	-	-	28
173	Containers & closures	10	10	30	-	50	-	15
174	Misc. End. products	50	30	20	-	-	-	30

A P P E N D I X   B

PROCEDURE FOR DETERMINING SUITABILITY CONSTANTS

1. LUMBER

NHB Code: 321 Revised Code: 93

Criteria

i) Volume: 1,200,000 tons; 10% of total volume of general cargo,(1966)

ii) Present method of Handling: Unitized in standard length 2' x 4' packages. Even lengths vary from 8' to 32'. Orders generally specify a number of different lengths. Specialized vessels carry large volumes ranging from two to twenty million board feet per sailing.

iii) Trade Route: Export: U.S. Atlantic, United Kingdom, Japan, European Common Market countries, Australia, South Seas.

iv) Value: Low value/high bulk, low rates.

v) Physical characteristics: Physically containerizable, length variation fails to utilize full container. Little susceptibility to damage and pilferage. Surface stain caused by high humidity could not be prevented by containerization.

Ratings

i) Port of New York Authority

(a). export: 100% suitable
(b). import: 20% suitable, 80% marginal

ii) Department of Trade and Commerce

Based on physical aspect only: 5% suitable, 25% marginal, 70% unsuitable.

iii) Johnston Terminals Ltd.: Not containerizable.

iv) B.C. Research Council: Not containerizable

Rees Decision: 100% unsuitable for containerization.

Explanation

British Columbia lumber producers are the world leaders in the shipment of packaged lumber exports. Although Port of New York Authority considers all lumber shipments to be potentially containerizable, it is unlikely that lumber exports from B.C. will ever be shipped in containers. MacMillan Bloedel Ltd. has in service the first bulk lumber carrier on regular schedule to new timber berths in Britain and Europe. Exports from B.C. Coast sawmills totalled 3.5 billion board feet in 1967.

2. WOOD PULP

NHB Code: 335 Revised Code: 97

Criteria

i) Volume: 108,000 tons; approximately 10% of total volume of general cargo (1966).

ii) Present method of Handling: Pulp is bundled, strapped and loaded by special cranes in units not less than 16 tons. Specialized vessels take on 5,000 tons on each of three shipments from Vancouver per month.

iii) Trade Route: Export: London, Rotterdam, Australia; Japan is not a major market but could use up unbalanced container space on back haul.

iv) Value: Moderate value/high bulk, low rates.

v) Physical Characteristics: Physically containerizable. Bales of standard size. No susceptibility to pilferage. Affected by stains, depending on quality. Generally shipped in dry condition in bales. Even when dry it is better to be kept separate from delicate dry commodities. Keep wet pulp away from all goods affected by humidity.

Ratings

i) Port of New York Authority
(a). export: 50% suitable, 50% marginal (incl. newsprint).
(b). import: 25% marginal, 75% unsuitable (incl. pulpwood, paper).

ii) Department of Trade and Commerce
Physical aspect: 25% marginal, 75% unsuitable.

iii) Johnston Terminals Ltd.: 100% possible.

iv) B.C. Research Council: 75% unsuitable.

Rees Decision: 25% marginal, 75% unsuitable.

Explanation:

Wood pulp comprises one of the largest export tonnages of all commodities handled in Port of Vancouver. Pulp could eventually take over the top position with the trend toward reallocation of sawlogs to new pulpmills currently being constructed in the Interior. Most of these new plants will be shipping pulp through the West Coast terminal. Columbia Cellulose Ltd. is shipping strapped bales amounting to 15,000 tons per month.

Shipment of pulp in containers is likely to take place only in back haul, and then, probably only to Japan. The present efficient method of handling precludes any complete shift to containers.

3. RAW HIDES & SKINS

NHB Code: 181 Revised Code: 50

Criteria

i) Volume: 55 tons $<$ 1% of total volume of general cargo.

ii) Present method of Handling: Unitized in bundles, not likely to be containerized. Wet hides may be loaded loose; in brine, in larger shipments.

iii) Trade Route: exports to: Japan, Spain, Germany, Holland.

iv) Value: Medium value/medium bulk

v) Physical Characteristics: Physically containerizable in square bundles. Must be protected from all metal parts of the ship. Affected by rain, fresh water. Give out strong smell and must be stowed in a separate compartment away from all products affected by odors and humidity.

Ratings

i) Port of New York Authority
(a). import: 25% prime, 75% suitable

ii) Department of Trade and Commerce
Physical aspect: 25% prime, 75% unsuitable

iii) Johnston Terminals Ltd.: Possible for standard containers

Rees Decision: 20% suitable, 80% unsuitable.

Explanation:

The odor from raw hides and skins carried in containers would contaminate a container and render it useless for other cargo indefinitely. It is probable that the total tonnage of hides could be considered unsuitable, but the evaluation leaves some allowance for specially packages hides that might possibly be shipped in containers.

4. WHEAT FLOUR

NHB Code: 061 Revised Code: 20

Criteria

i) Volume: 105,000 tons. 1% of total volume of General cargo (1966).

ii) Present Method of Handling: bulk.

iii) Trade Route: exports: Russia, China, Central America.

iv) Value: low value, bulky.

v) Physical Characteristics: Generally travels in bulk, cheapest way possible. Sometimes in bags or barrels which could be containerized. Susceptible to tainting. Requires stowage in cool, dry place.

Ratings

i) Port of New York Authority: 75% suitable, 25% marginal

ii) Department of Trade and Commerce: 100% suitable.

iii) Johnston Terminals Ltd: possible for standard container.

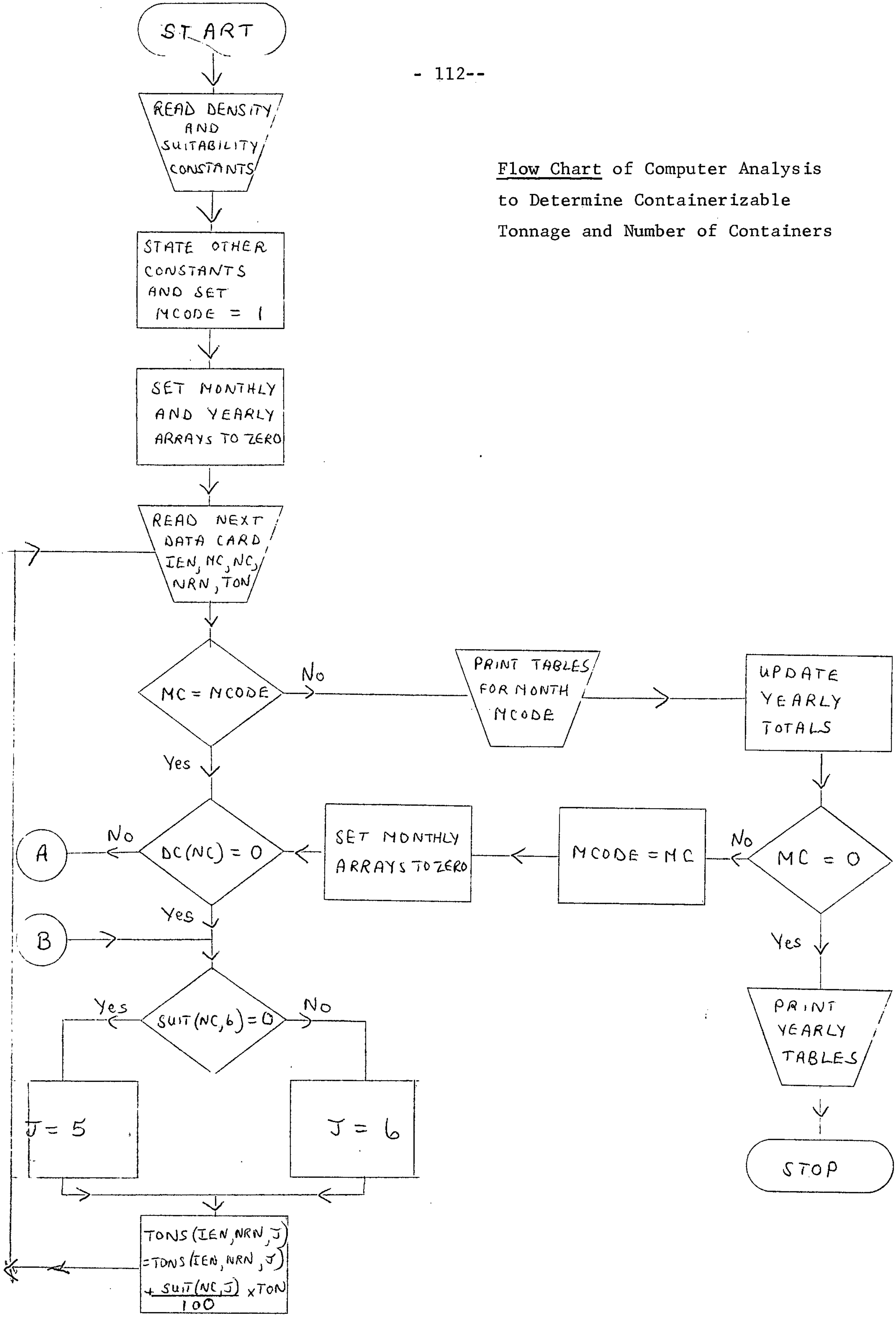
Rees Decision: 100% unsuitable

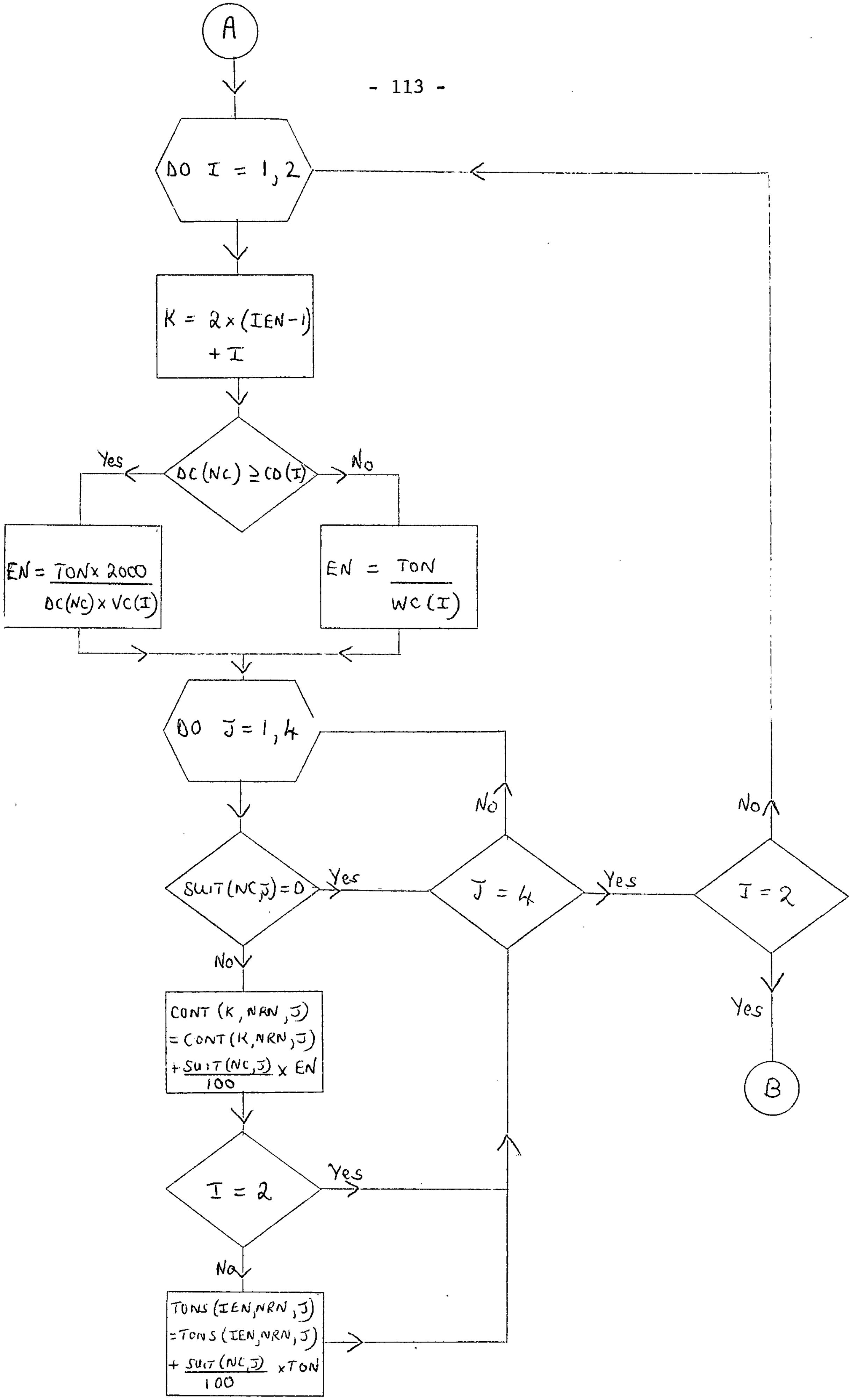
Explanation:

A low value bulk commodity that travels by cheapest means possible, usually in tramp steamer.

A P P E N D I X   C

Flow Chart of Computer Analysis to Determine Containerizable Tonnage and Number of Containers




A
DO I = 1, 2
K = 2 x (IEN-1) + I
DC(NC) ≥ CD(I)
Yes
No
EN = TON x 2000 / DC(NC) x VC(I)
EN = TON / WC(I)
DO J = 1, 4
SUIT(NC,J) = 0
Yes
No
J = 4
Yes
No
I = 2
Yes
No
B
CONT (K, NRN, J) = CONT (K, NRN, J) + SUIT(NC,J)/100 x EN
I = 2
Yes
No
TONS (IEN, NRN, J) = TONS (IEN, NRN, J) + SUIT (NC,J)/100 x TON

Rees

NOTE: p 54 Cda Trade & Commerce Study
indicates EXPORTS 1,866,913 tons
IMPORTS 599,000 tons

But on P 61 these values have been
transposed to read
EXPORTS 600,000 tons
& IMPORTS 1,800,000 tons.

Cf. LOCKHART, JOHN R.
"FACTORS AFFECTING CONTAINERIZED INTERMODAL OCP TRAFFIC MOVEMENT THROUGH THE PORT of VANCOUVER", Unpublished M.B.A. Thesis University of BRITISH COLUMBIA, VANCOUVER, B.C. June 1971. p. 128.

cf. IMMER, JOHN R.
CONTAINER FACILITIES ON THE ATLANTIC 1970. WORK SAVINGS INTERNATIONAL, WASHINGTON, D.C. 1970. (pg ?? 158-159.)