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CARIBBEAN SHORT-SEA TRANSPORT:
ITS ROLE, CHALLENGES AND OPPORTUNITIES */

*/ Preliminary version, distributed for comments and suggestions.

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SUMMARY

Correct decisions with respect to the international commercial activities of the totally maritime nations of the Caribbean require an understanding of the fundamental role short-sea transport plays in those activities. To provide a basis for a better understanding of such role, this document presents an analysis of Caribbean short-sea transport services, related trade flows and ports as well as the problems faced by short-sea operators and the countries they serve and suggests possible solutions to their problems.

Short-sea transport encompasses those services between Caribbean countries and their counterparts on the east and Gulf coasts of North America, the east coast of Central America, the north and east coasts of South America, and the east coast of Mexico. The importance of these services can be seen from tables 6-10 in Annex II, which highlight that approximately 50 percent of all Caribbean imports and exports are transported by short-sea vessels. Further, the Caribbean countries have a fundamental reliance on maritime transport, as their ratios of exports and imports to their total gross domestic product are 72.4 percent and 68.2 percent, respectively, while those for all Latin American countries are 11.6 percent and 11.1 percent.

While 50 percent of all Caribbean imports and exports are concentrated in short-sea trade, 80 to 85 percent of those cargoes are transported between Caribbean countries and North America. Even though the North American end of Caribbean short-sea trade flows is concentrated, the Caribbean end is quite dispersed. This concentration-dispersion dichotomy has an important impact on short-sea vessel operators. Due to the impact this dichotomy has on Caribbean trade and transport, as well as the unbalanced and seasonal nature of trade flows, further study should be directed towards developing a greater understanding of the interaction of these factors on the demand for short-sea services. For instance, such studies might determine that the dichotomy could be utilised by Caribbean countries which have similar trade origins and destinations, and are not too geographically dispersed, to establish trading units. These trading units could form the basis of joint short-sea services, either with existing carriers or independently.

From a survey of 76 Caribbean short-sea vessels, which are considered to be about 95 percent of all transport capacity, it was determined that such vessels are quite similar; that is, they all transport unitised cargoes, are either roll/on-roll/off or cellular container vessels, and have a deadweight of approximately 2 000 tons.

Of these vessels, about 80 percent offer services which range from daily to every 10 days, while over 50 percent offer a weekly frequency.

Due to their reliance on maritime transport services, and especially those of a short-sea nature, Caribbean countries during the early 1970s began constructing port facilities for the handling and storage of containers. These countries usually have only one port providing services for container vessels. As a result, any interruption of work flows, whether due to a labour dispute or for the repair of necessary equipment, has an immediate and important impact on the economy of the country it serves.

Of the many challenges facing Caribbean short-sea vessel operators and the countries they serve, some of the more pressing are related to the excess of short-sea transport capacity, cargo flow imbalances, the efficiency and cost of port services, and becoming operators of modern short-sea transport technologies. Traditionally, outside the Caribbean two means have been utilised to resolve an excess of transport capacity, i.e., conferences and domestic legislation. The Conference of Inter-island Shipowners and Operators (CISO) of the Philippines and the Japan Federation of Coastal Shipping Associations (JFCSA) both have measures which are effective in controlling the number of vessels placed in service. Even though both CISO and the JFCSA function in national settings, the methods by which tonnage projections are prepared, excess vessels are laid up, sold and scrapped, and violations of operating agreements are controlled appear applicable to the Caribbean short-sea transport environment.

Almost all Caribbean short-sea vessel operators highlighted what they consider to be excessive port charges. From a comparison of port charges at union and nonunion facilities in Florida, USA, with those of certain Caribbean countries, it was found that the costs of services at union facilities are quite similar to those in the Caribbean. Nonetheless, Caribbean countries might wish to consider the formulation of other bases for such comparisons. For instance, a comparison might be made of Caribbean port workers compensation with that for workers performing similar tasks outside the port. Other areas Caribbean countries might wish to evaluate would be the organisational structure of ports, and the cost of and need for pilots when vessels enter and leave ports.

The short-sea trade flows of Caribbean countries are not only unbalanced but also subject to wide seasonal variations. The relocation of empty containers to North American ports was estimated to cost the Caribbean countries approximately US\$ 14 million per year.

In response to seasonal demand variations, short-sea vessel operators either lay up or charter out excess vessels, or return those which are on charter. For Caribbean importers and exporters that require a frequent short-sea service throughout the year, the seasonal reduction in transport capacity creates numerous problems.

To assist Caribbean countries identify, evaluate and utilise new short-sea transport technologies, five tug-and-barge systems, two sail-assisted systems and one self-propelled vessel were presented and evaluated. With the high cost of petroleum energy products for short-sea vessels, sail-assisted systems have distinct advantages. However, as tugs and barges are an energy efficient system with inherent flexibility as regards cargoes carried, port facilities and water depths required, and methods of acquisition and operation, they would appear suited to Caribbean short-sea needs.

Whether the short-sea transport systems selected by Caribbean countries is self-propelled, towed, pushed or sail-assisted, it should (1) have roll/on-roll/off or cellular container capacity, (2) be appropriately dimensioned to operate profitably throughout the year, taking into account the nature of trade flows, (3) be energy efficient, and (4) be able to load and discharge containers independent of existing port facilities, and to operate in water depths of no more than 4.3 metres (14 feet). The towed tug-and-barge system appears to satisfy all of the above requirements and might merit further investigation by Caribbean countries. For example, those countries might jointly purchase or charter tugs, with needed barges acquired individually by each. There are computer programmes which might be used to determine the relative merits of tug-and-barge as well as other short-sea transport systems in relation to trade-flow volumes, port facilities and required service frequencies.

For those Caribbean countries with minimal trade volumes and locational disadvantages, there is a very real risk of being caught in a trade-transport vacuum; that is, without sufficient cargoes to induce operators to make more than occasional calls at their ports, this may, in the absence of government initiatives, lead to a reduction in the level of economic activity. To avoid this situation governments might give consideration to the establishment of appropriately dimensioned inter-island feeder services between their countries and major Caribbean ports, possibly through the employment of sail-assisted vessels such as the Na Mataisau found at part III. D. of this document.

PREFACE

As part of a continuing activity of the United Nations Economic Commission for Latin America and the Caribbean (ECLAC) to assist countries of this region in their efforts to identify, evaluate and utilise new transport technologies, in 1979 a survey was conducted of inter-island transport systems employed in Hawaii, United States of America, USA, and the results were presented in a document entitled Survey of Hawaiian inter-island maritime transport systems in the light of their significance for Caribbean inter-island transport (E/CEPAL/1085). Since that time not only have there been numerous technological and institutional developments with short-sea and inter-island transport systems but also the world has been plunged into a prolonged economic recession which has significantly reduced the demand for maritime transport services. In response to these changes and with the kind assistance of the Maritime International Co-operation Center (MICC) of Japan, information was gathered from short-sea and inter-island carriers, shipowner associations, financial institutions and others in Japan, the Philippines, Trinidad and Tobago and the USA to bring the aforementioned document up-to-date and to include other transport technologies as well as relevant institutional experiences.

During the gathering of information for this document, a large number of persons and organisations made important contributions. In recognition and grateful acknowledgement of that support, the names of those organisations are found at Annex I.

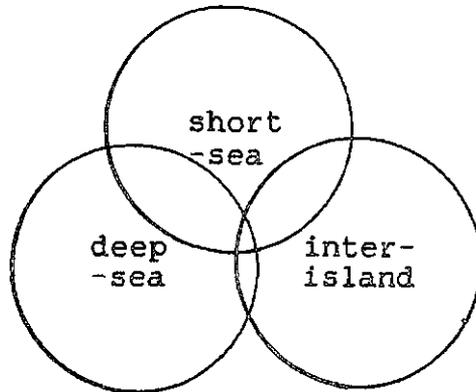
I. Introduction

Since exports, imports and economic growth are clearly interrelated, transport plays an important role in the development processes of all countries. However, when those countries are islands or are isolated and can be reached only by sea, maritime transport assumes functions of such importance that it becomes the fundamental lifeline for not only economic but also social wellbeing of the communities served. Many Caribbean countries seek to take advantage of favourable market access agreements, diversify their limited export bases and carry out economic integration initiatives. In this context, the need for efficient, regular and technologically appropriate short-sea transport cannot be overstated. While there are many factors which should be taken into consideration when evaluating the Caribbean short-sea transport environment, some of the more important are: (a) the scope of short-sea operations, (b) trade patterns and (c) the reliance of Caribbean economies on maritime transport.

A. Scope of Caribbean short-sea maritime transport operations

Due to the geographical spread of Caribbean countries over an ocean area which encompasses 1 870 000 square kilometres (see map at page 6), i.e., with the Bahamas east and southeast of Florida, USA, Belize as part of Central America, an archipelago of islands stretching in a semicircle from Cuba in the north to Trinidad and Tobago in the south and Guyana and Suriname on the northeast coast of South America, one would think that with such diversity there should be very little in common. Indeed, to those familiar with trans-Atlantic and trans-Pacific maritime transport services, the overlapping and variable deep-sea, short-sea, inter-island, coastal and river services of the Caribbean appear quite complex. Nonetheless, with the exception of Haitian coastal fleet and the river and coastal services of Guyana and Suriname, Caribbean maritime transport involves three systems; that is, deep-sea, short-sea and inter-island. Even though each of these transport systems is directed towards different market segments, they do not operate in isolation. For example, deep-sea and short-sea lines which call at two or more Caribbean islands offer inter-island transport services, and deep-sea operators offer direct and indirect or transshipment services between the Caribbean, North America and other continents. Finally, vessels engaged in inter-island transport offer short-sea services between various Caribbean islands, and Guyana and Suriname on the Northeast coast of South America.

As a result of the overlap of deep-sea, short-sea and inter-island transport services, the relation between such services is best visualised with the following diagram:



As can be seen from the above diagram, short-sea operations involve elements of both deep-sea and inter-island transport services. It is necessary, therefore, to carefully define those maritime transport operations which are included within the scope of this study.

For purposes of this study short-sea transport is considered to encompass the ocean carriage of goods and passengers between one or more Caribbean countries 1/ and the east and Gulf coasts of North America, east coast of Central America and Mexico, and the north and east coasts of South America. It should be understood from the outset that this analysis does not encompass domestic cargo movements between continental countries and their island dependencies, e.g., Colombia and San Andrés/Providencia, Honduras and Roatán Island, USA and Puerto Rico, Venezuela and Margarita Island, etc. However, where such domestic cargo movements have an impact on short-sea transport operations, an evaluation of that impact is presented. As most short-sea lines also carry inter-island cargoes between the Caribbean countries served, this definition includes such transport operations. Even though there is also an overlap between the deep-sea and short-sea services, those transport operations which involve cargo movements between the Caribbean and other continents as well as the west coast of North, Central and South America are excluded from this analysis.

B. Trade patterns

1. Historical trade patterns. The foreign trade of Caribbean countries began with the exportation of agricultural products and raw materials to European metropolitan centres. As each country had colonial trade commitments with and relied upon the deep-sea transport services of such centres, there was less need for and consequently less development of short-sea and inter-island transport services. Nonetheless, small amounts of trade were carried between

1/ Included are all Caribbean island nations as well as the continental countries of Belize, Guyana and Suriname.

those countries in sailing schooners. With the outbreak of the Second World War, Caribbean countries found themselves not only cut off from traditional European markets and the means of transport to such markets but also largely without the means to transport their products to available neighbour island markets. In response to the need for greater inter-island maritime transport services, action was taken by colonial governments to organise the schooner owner/operators into the wartime Schooner Owners Association. Under this Association transport services were rationalised, additional vessels were placed in service, and the volume of inter-island trade grew rapidly.

2. Trade patterns since the Second World War. In the decade following the Second World War, Caribbean prewar export trade patterns were largely reestablished. As European productive capacity was largely in ruins at the end of the Second World War, Caribbean countries turned to North America as a source of manufactured goods and services. At the same time Caribbean countries began to trade more actively with Mexico and those of Central and South America. While this trend was lessened somewhat once European countries had reestablished their industries, it should be understood that the important position of short-sea trades in the economic activities of Caribbean countries remains. Concurrently with the growth in trade flows between Caribbean countries and North, Central and South America, the establishment of regional economic organisations such as the Caribbean Community (CARICOM) and the Organisation of Eastern Caribbean States (OECS) created bases for continued development of inter-island trade. In response to this situation, numerous short-sea shipping lines have been established to service the trade flows between Caribbean countries and North, Central and South America. To enhance load factors and earnings, these lines have come to offer not only short-sea services between various Caribbean islands and North, Central and South America but also inter-island services between the islands served.

Since 1980 the Caribbean countries have increasingly begun to view North America as a market for their exports and Europe as a source of manufactured goods. The reason for this is that the increasing strength of the US dollar in relation to European currencies has made US manufactured goods expensive in comparison with those of Europe. In other words, at present Caribbean countries seek to earn US dollars by exporting their products to that country and are comparing prices of European and North American manufactured goods in order to purchase the least expensive. For instance, the Government of Barbados is encouraging importers to purchase their goods in Europe to take advantage of the weaker currencies ^{2/}. The effect of this policy has been to shift the relative shares of Caribbean imports from

^{2/} The Economist Intelligence Unit, Quarterly Economic Review of

North America to Europe, rather than the introduction of a new source.

C. Caribbean economies and their reliance on maritime transport

With limited exceptions such as the Dominican Republic, Guyana, Jamaica, Suriname and Trinidad and Tobago, with exploitable bauxite deposits in the first four and petroleum in the latter, the majority of Caribbean countries lack natural resources for establishment of major industries. As can be seen from the trade structure of selected Caribbean countries included in table 1 of Annex II, approximately 50 percent of the value of all imports represents manufactured goods, 25 percent involves energy requirements and 18 percent is related to food. With regard to exports of those countries (see table 2 of Annex II), they largely encompass agricultural products such as sugar, coffee and cocoa, clothing and electrical appliances which are assembled locally for North American markets, bauxite, and petroleum and its derivatives. This narrow range of exports, the need to import most manufactured goods and small national markets have created a pressing need for commercial exchanges with other countries.

The fundamental reliance of Caribbean countries on maritime transport services can be seen not only from the nature, tonnages and direction of their trade flows but also from the ratio of imports and exports to gross domestic product (GDP) for those countries. For example, as can be seen from table 3 of Annex II, during 1980 the total Caribbean GDP was US\$ 20 882 million, with imports amounting to US\$ 15 114 million or 72.4 percent and exports US\$ 14 248 million or 68.2 percent of GDP. By way of comparison, the total GDP of all Latin American countries during 1980 was US\$ 784 650 million (see table 4 of Annex II), with imports representing US\$ 91 408 million or 11.6 percent and exports US\$ 86 807 million or 11.1 percent. It should be noted that the ratios for Latin American countries are substantially less than those for the Caribbean, thereby indicating a lesser reliance on foreign markets and, hence, on maritime transport services. For major industrialised nations with large domestic markets, these ratios are even more reduced. For example, during 1980 the USA had a GDP of US\$ 2 599 000 million ^{3/}, with imports amounting to US\$ 256 959 million or 9.9 percent and exports US\$ 220 781 million or 8.5 percent of GDP ^{4/}.

2/ (Cont.) West Indies, Belize, Bahamas, Bermuda, Guyana, No. 4 1984, pp. 9 and 29.

3/ United Nations, Monthly Bulletin of Statistics, February 1984, p. XXXVIII.

4/ International Monetary Fund, Direction of Trade Statistics, Yearbook 1984, p. 3.

As a result of their limited natural resources and the need to import a wide range of manufactured goods and food, the growth of Caribbean economies is strongly conditioned by events outside the sub-region. Indeed, the purchasing patterns of major trade partners, relative strengths of national currencies, levels of investment in new plant and equipment, interest rates, market access agreements, protection measures and many other factors determine both the volume and direction of Caribbean trade flows and, hence, the demand for maritime transport services.

THE CARIBBEAN



II. Caribbean short-sea transport

While many aspects of the Caribbean maritime transport environment should be given careful study when evaluating short-sea transport systems, some of the more important for this analysis are (a) vessels -types, sizes and ownership, capacities and frequencies, and operations; (b) cargoes -sources and volumes, seasonality and passengers; (c) port facilities; and (d) relation between short-sea, deep-sea and inter-island services.

A. Vessels

1. Types of vessels. Due to the openness of Caribbean economies and the geographical proximity of those countries to markets in North, Central and South America as well as to major trade routes utilising the Panama Canal, their liner short-sea trades are served by at least 30 shipping lines (see table 5 of Annex II). While not readily apparent, all vessels operating in non-bulk Caribbean short-sea trades have one aspect in common; that is, they transport unitised cargoes. The principal cargo grouping units are chassis and ISO standard 20 and 40 foot containers 5/. As vessel owners engaged in this trade indicated, short-sea vessels transport food and department store items to Caribbean countries, all of which are amenable to unitisation.

While most of the short-sea vessels were originally designed either as roll-on/roll-off (RO-RO) vessels 6/ or cellular container ships 7/, one line indicated that it was removing cell guides from

5/ The International Organization for Standardization's Technical Committee 104 (ISO/TC 104) published in 1970 ISO Recommendation R 688 and three years later that Recommendation was again published as an International Standard for freight containers. While ISO 688 encompasses three series of containers, Series 1 includes containers of 2 438mm x 2 438 (8 feet x 8 feet) uniform cross-section, of nominal lengths from 1 500mm to 12 000mm (5 feet to 40 feet). Also included in Series 1 are 2 438mm x 2 591mm high (8 feet x 8 feet 6 inches) containers of 6 000mm, 9 000mm and 12 000mm (20, 30 and 40 feet) lengths. The ratings of the containers from 1 500mm to 12 000mm long are from 5 to 40 tons.

6/ The roll-on/roll-off (RO-RO) transport system consists of chassis, upon which are placed containers and other unitised cargoes, that are pulled by tractors onto vessels specially equipped with one or more external ramps to the dock and various internal ramps or elevators for cargo movements within such vessels.

7/ A cellular container ship is a vessel whose cargo holds are fitted with guides to facilitate the loading, discharge and stowage of

cargo holds to facilitate the handling of flat-rack containers which often carry oversize cargoes. Approximately one-fourth of the short-sea vessels providing lift-on/lift-off (LO-LO) ^{8/} container services have cranes for loading and discharge of such units. The reason for this is that as Caribbean trade patterns change rapidly, many short-sea vessel operators prefer to have their own container handling cranes so that ports without such equipment can be served without difficulty. Such equipment also permits short-sea operators to avoid the extra expense of renting port cranes or to utilise vessel and port cranes simultaneously to carry out discharge and loading operations more rapidly. Indeed, the Shipping Corporation of Trinidad and Tobago (SCOTT) has time chartered two vessels which are so equipped even though Port of Spain, Trinidad and Tobago, has two container cranes. On the other hand, short-sea carriers which operate gearless container vessels, i.e., without cranes, are usually well established in a specific trade route and have either placed needed equipment at the ports served or rent such equipment from ports.

Of the 76 short-sea vessels included in this survey (see table 5 of Annex II), 29 or 38.1 percent are cellular container ships, 37 or 48.7 percent are RO-RO vessels and the remaining 10 or 13.2 percent are of a multipurpose design. Most short-sea operators have acquired specific vessel types in response to characteristics and volumes of goods they wish to carry as well as the facilities, possibilities of congestion and cargo handling speeds at the ports served. For instance, while all of the vessels surveyed transport containers, 48 or 63.2 percent of those vessels utilise the LO-LO system for loading and discharge operations. The port facilities and services required for LO-LO vessels are quite different from their RO-RO counterparts. Due to the less than 0.30 metre (one foot) tidal range in the Caribbean, RO-RO vessel operators require only a dock and possibly chassis and fork-lift trucks (FLT's). On the other hand, LO-LO vessels may have their own cranes. For those that are so equipped their

7/ (Cont.) containers. At times these guides are also placed on top of cargo hold hatch covers to eliminate the need for lashing containers. Such vessels may have their own cranes for discharge and loading of containers.

8/ The lift-on/lift-off (LO-LO) transport system consists of individual cargo units, whether ISO standard containers or break-bulk, which are loaded on and discharged from vessels by cranes that employ vertical (lifting and lowering) and horizontal (between dockside and vessel) movements. The LO-LO system may be utilised individually, as in the case of cellular container ships and break-bulk cargo vessels, or in combination with the RO-RO transport system.

requirements are similar to RO-RO vessels, i.e., chassis and FLT's. Where the LO-LO vessel does not have its own cranes, either port authorities or operators or both must place needed craneage at the ports served.

2. Sizes and ownership of vessels. Vessels engaged in Caribbean short-sea trades (see table 5 of Annex II) range from three vessels of 1 172 TEUs ^{9/} each belonging to Navieras de Puerto Rico to the 24 TEU Tropic Gale of Tropical Shipping Company (TSC). Within this range, it is interesting to note that of the 76 short-sea vessels surveyed, 40 or 52.6 percent are between 24 and 240 TEUs and that of these vessels 34 or 44.7 percent are from from 76 to 240 TEUs. On the other hand, 12 vessels or 15.8 percent are in the 299-400 TEUs category, 15 vessels or 19.7 percent are between 500 and 564 TEUs, and the remaining 9 vessels or 11.8 percent have capacities from 670 to 1 172 TEUs. With regard to ownership of short-sea vessels, it was determined that of the 76 vessels 25 or 32.9 percent were chartered.

With reference to appropriate vessel sizes for the trade between the East coast of the USA and Trinidad and Tobago, one operator indicated that the 450 TEU vessels it currently has on charter are three to four times larger than needed by the trade. If such smaller vessels are chartered, they should have capacities between 112 and 150 TEUs which falls within the range of most popular vessel sizes for Caribbean short-sea transport. Nonetheless, another operator of vessels in this range indicated that such extra capacity permits the carriage of additional cargoes, should they be presented, and avoids "restowes", i.e., temporarily placing containers on the dock so that others may be removed from the holds for final discharge. As charges, dues and terminal expenses at Caribbean ports are considered excessive, this operator believes it less costly to utilise vessels with a certain amount of extra capacity than to pay for "restowes".

3. Capacities and frequencies of vessels. It should be understood that neither the number of vessels in a trade nor the size of each in TEUs provides sufficient information to calculate the total Caribbean short-sea transport capacity. The factor missing is frequency or the number of round voyages a vessel makes in a given period. Further, transport capacity in the abstract means little unless related to outbound and backhaul cargo volumes. As cargo volumes and the seasonality of trade flows will be treated in greater depth at parts II. B. and III. B., respectively, it is sufficient

^{9/} The acronym TEU or twenty-foot equivalent unit refers to a Series 1 ISO container (see footnote 7) and is commonly utilised as a base measure for, inter alia, vessel carrying capacity and port productivity.

at this point to indicate that the 76 short-sea vessels surveyed (see table 5 of Annex II) have a total of 26 233 TEUs of cargo carrying space. The average size of short-sea vessel engaged in Caribbean trades is approximately 345 TEUs.

To place this overall short-sea transport capacity in perspective, it is necessary to look at the domestic commercial exchanges between the USA and Puerto Rico. Such exchanges are not typical of those between North, Central and South America and the Caribbean nations included in this study. Nonetheless, they are important for two reasons: first, shipping lines dedicated to this service seek to enhance load factors by transporting cargoes to Puerto Rico which are bound for other Caribbean islands, thereby utilising San Juan and Ponce as transshipment centres with feeder services to final destinations; and second, the size of ships in this trade greatly exceeds those for vessels dedicated to short-sea routes under study. For example, American Caribe Line, Navieras de Puerto Rico and TMT are dedicated almost exclusively to the USA/Puerto Rico trade and utilise 21 vessels with a combined capacity of 14 410 TEUs or 54.9 percent of all Caribbean short-sea transport capacity. By way of comparison, the other Caribbean short-sea trades are served by 55 vessels with a total capacity of 11 823 TEUs or 45.1 percent of the total Caribbean short-sea transport capacity. With regards to average vessel sizes in these two distinct Caribbean short-sea trades, those engaged in the USA/Puerto Rico service would be approximately 686 TEUs, while in the other trades 215 TEUs.

With the exception of Alcoa Steamship Company and Saguenay Shipping Ltd., which offer services every month and 21 days between North America and the Caribbean, respectively, all other short-sea lines provide services which are divided into the following categories: (a) more than weekly - five, four, three and two times per week - five lines or 17.2 percent, (b) weekly, 15 lines or 51.7 percent, (c) every 10 days, three lines or 10.3 percent, and (d) every two weeks, four lines or 13.8 percent. Thus, weekly service predominate in Caribbean short-sea trades.

4. Vessel operations. Due to the current economic recession many Caribbean short-sea vessel operators are reluctant to enlarge the range of ports served, as reduced cargo volumes at most ports do not justify the charter of an additional vessel. It was considered that an increase in the number of ports served, without an additional vessel, could only be achieved through a reduction in service frequency which would result in a loss of extremely hard-won customer satisfaction and, probably, their cargoes. Moreover, as a 125 TEU vessel during November 1984 could be time chartered for US\$ 1 900 per day and used containers rented at US\$ 1 per day, the entry barriers are very low for participation in Caribbean short-sea transport and competition could easily appear.

To avoid this situation and, at the same time, extend the scope of its services, Tropical Shipping Corporation (TSC) has executed joint operating agreements with certain deep-sea carriers and utilises three load centres -West Palm Beach (Florida, USA), St. Thomas and St. Lucia ^{10/}. Each of these centres is a distribution point for cargoes -either distribution to final consignees or for on carriage to another port. The joint operating agreements TSC has executed with deep-sea carriers permits it to market their services within the Caribbean. For example, the agreement with Geest Line permits that line to drop off cargoes, which are bound for islands it does not serve directly, at St. Lucia with TSC vessels transporting such cargoes to any of the other destinations it serves. On the other hand, Geest Line picks up TSC's cargoes off loaded at St. Lucia and carries them on to Dominica, Grenada and St. Vincent and the Grenadines. It should be highlighted that TSC has similar arrangements with other shipping lines which give it access to Canadian (Toronto and Montreal) and European (Felixstowe, Le Havre and Rotterdam) ports.

Other short-sea carriers have sought to increase the scope of their operations through different means. For example, CCT increased the number of ports served when it began calling at the ports vacated by the bankrupt short-sea carrier Pan Atlantic Line. To maintain the service frequency on its former routes, CCT chartered additional tonnage. The enlarged catchment area for cargoes has resulted in outbound load factors from US east and Gulf coast ports of from 90 to 100 percent.

B. Cargoes

1. Sources and volumes of cargoes. The four principal sources of cargoes for Caribbean short-sea lines are: (1) exports of North, Central and South American countries to Caribbean nations, (2) exports of Caribbean countries to those of North, Central and South America and to Asia/Europe via transshipment at North American ports, (3) trans-Atlantic and trans-Pacific cargoes which are transshipped at North American ports for on carriage to Caribbean destinations and (4) inter-island cargo flows.

^{10/} The ports served and frequencies provided from such centres are as follows: (1) West Palm Beach -Freeport and Nassau five times per week and St. Thomas four times per week; (2) St. Thomas -Antigua, Barbados, St. Barthelemy, St. Christopher, St. Lucia, St. Martin, Tortola and Trinidad all once a week, and St. Croix twice weekly; and (3) St. Lucia -a weekly service with Geest Line to Dominica, Grenada and St. Vincent.

The data presented in tables 6-10 of Annex II relate to the years 1977-1980 and do not reflect the impact of the economic recession since the latter date. Nonetheless, as can be seen from table 6, the lack of a resource base in most Caribbean countries, from which a programme of import substitution could be undertaken, has all but precluded a reduction in imports of manufactured goods and food from the peak volumes of 1978-1979. On the other hand, table 8 indicates that between 1978 and 1980 general cargo exports of Caribbean countries decreased 5 284 109 metric tons or 58.7 percent. From table 10 it can be seen that this decrease was caused by a reduction in the exports of non-energy petroleum products and chemicals.

With reference to Caribbean general cargo and refrigerated food exports, tables 8 and 9 clearly indicate the pivotal role played by short-sea operators in carrying those goods to markets in North, Central and South America. Specifically, all Caribbean general cargo exports in 1980 amounted to 3 713 612 metric tons, of which 1 839 862 metric tons or 49.5 percent were carried by short-sea vessels to those markets. On the other hand, Caribbean exports of refrigerated foods in that same period amounted to 616 884 metric tons, of which 487 557 metric tons or 79.0 percent were bound for European destinations and 62 526 metric tons or 10.1 percent were carried by short-sea vessels to markets in North, Central and South America.

Just as short-sea transport services play a fundamental role in Caribbean general cargo exports, so also is the case with general cargo and refrigerated food imports. As can be seen from table 6, during 1980 there were 5 775 931 metric tons of general cargo imports, of which 2 802 112 metric tons or 48.6 percent were carried by short-sea vessels from sources in North, Central and South America to Caribbean countries. Table 7 indicates that during 1980 Caribbean countries imported 495 493 metric tons of refrigerated foods, of which 215 188 metric tons or 43.5 percent were carried by short-sea vessels. The Caribbean countries also imported refrigerated foods from European sources amounting to 237 947 metric tons or 48.0 percent of all imports for that year.

While data are unfortunately lacking for cargo volumes imported and exported by Caribbean countries since 1980, an indication of changes in such volumes can be obtained from the tonnages handled by the Port of Miami. The principal North American ports which provide services to short-sea vessels engaged in Caribbean trades are Houston, Miami, New Orleans, Port Everglades and West Palm Beach. At the Port of Miami, for example, 80 percent of all outbound cargoes are destined to Latin American and Caribbean countries. The total tonnages handled at that port since 1980 are as follows:

**CARGO TONNAGES */ HANDLED
AT THE PORT OF MIAMI, FLORIDA (USA), 1980-1983**

YEAR	TONNAGE IN/OUTBOUND	PERCENT CHANGE FROM PREVIOUS YEAR
1980	2 499 170	+ 11.0
1981	2 757 374	+ 10.3
1982	2 665 921	- 3.3
1983	2 305 646	- 13.5

Source: Based upon information provided by the Port of Miami, Florida (USA).

*/ Short tons of 2 000 pounds.

From the information provided in the above table it would appear that there was an increase in trade volumes during the 1980-1981 period. Beginning in 1982 such volumes seem to have fallen off appreciably. As the tonnages handled at the Port of Miami are aggregates which include both inbound and outbound cargoes, it is impossible to determine the exact impact on import and export cargo volumes of Caribbean countries. Nonetheless, from what was indicated earlier regarding tables 6, 8 and 9, the greatest reduction in trade volume was probably borne by Caribbean exports.

2. Seasonality of cargoes. Caribbean short-sea cargo volumes increase during the second half of each year. This is largely the result of purchases by Caribbean importers to build-up inventories in anticipation of the tourist (October to March) season, and for Christmas and New Year holidays. As an indication of the impact such purchases have on the short-sea lines operating out of Miami, Florida, USA, all lines interviewed during November 1984 indicated their vessels were departing that port for various Caribbean countries with load factors ranging from 85 to 100 percent. By way of comparison, Caribbean exports bound for that port on the same date ranged from empty containers to approximately 15 percent load factors and were composed principally of coffee, cocoa, clothing and vegetables.

The export of coffee from Caribbean countries to the USA is governed by quotas. The amounts authorised for each country are granted quarterly beginning 1 January each year. As Caribbean exporters try to take immediate advantage of their individual rights upon receiving an authorisation, the demand for short-sea transport services normally terminates a few days after such dates. Sugar exports from Caribbean countries to the USA not only face a similar quota regime but also the lowest prices in over 15 years 11/ and a

declining demand due to the growing use of high fructose corn syrup as a sweetener 12/. While the Caribbean trade in bananas is not as seasonal as other tropical fruits, about 30 percent of the total trade is transported in the months of April, May and June with the remainder spread equally over the other months 13/. With regard to sea-food exports, those from Roatán Island off the coast of Honduras amount to 1 364-2 273 metric tons (3-5 million pounds) of refrigerated cargo between the months of July and February each year. In response to these seasonal changes in traditional Caribbean exports, short-sea lines seek to place their vessels at appropriate loading ports during those periods.

The seasonal nature of Caribbean exports has been somewhat lessened by market access agreements. As examples, section 807 of the US Customs Code permits Caribbean countries to establish assembly industries and export finished products duty free to the USA. Also the Caribbean Basin Initiative (CBI) of that country permits the duty-free entry of many Caribbean products for 12 years, thereby creating an incentive for manufacturers to establish factories in any of 20 designated Caribbean and Central American countries 14/. During the first 6 months of 1984, a total of US\$ 298 million of goods entered the USA under the duty-free provision of the CBI, of which US\$ 125 million were from the Dominican Republic 15/. In an effort to participate in the trade flows to and from Caribbean countries, the port of New Orleans, Louisiana, USA, has reduced wharfage rates 25 percent for most goods eligible for duty-free entry under the CBI 16/. The Lomé Convention is a renewable five year contract between the European Community and 65 African, Caribbean and Pacific nations which

11/ The Economist Intelligence Unit, Quarterly Economic Review of Jamaica, Belize, Bahamas, Bermuda, No. 1, 1985, p. 10.

12/ The Economist Intelligence Unit, Quarterly Economic Review of Trinidad and Tobago, Guyana, Barbados, Windward and Leeward Islands, No. 1, 1985, p. 11; Fairplay International Shipping Weekly, 6 December 1984, p. 23; and Seatrade, August 1983, pp. 49 and 51.

13/ Fairplay International Shipping Weekly, 17 January 1985, p. 27.

14/ Port of Houston, November 1984, pp. 16-18; and Business America, 20 August 1983, p. 31.

15/ The Economist Intelligence Unit, Quarterly Economic Review of Cuba, Dominican Republic, Haiti Puerto Rico, No. 4, 1984, p. 21.

16/ Port Record, February 1985, p. 21.

provides such countries with not only almost totally free access to Community markets for their exports ^{17/} but also a wide range of development assistance programmes. Finally, the United Kingdom under its Commonwealth arrangements permits former Caribbean colonies access to its internal market under favourable terms.

3. Passengers and cargo. The West Indies Shipping Corporation (WISCO) is a multinational subregional carrier ^{18/} which began operations in 1961 with a donation from the Government of Canada of two general cargo/passenger vessels -the Federal Maple and Federal Palm. These vessels assisted WISCO to initiate a cargo/passenger service between owner countries. After their disposal, WISCO ceased transporting passengers. Today, WISCO's operations are dedicated to the transport of general cargo and containers with four cellular vessels (see table 5 of Annex II) which have their own cargo handling cranes. Two of these vessels have space for 3 600 tons of general cargo. Even though the commercial focus of WISCO is limited to general cargo and containers, interest has been expressed in evaluating cargo/passenger operations, possibly with an appropriately dimensioned RO-RO vessel.

Numerous persons have indicated that the Scandinavian RO-RO passenger ferry concept should be applicable to the Caribbean ^{19/}. Nonetheless, generalisations with regard to the applicability of such ferries to Caribbean passenger movements can be misleading. The fundamental reason for this is the enormous difference in types of vessels and facilities needed for passenger movements between the American Continent and Caribbean islands, which principally involve tourists on cruises or round-trip voyages, and those for Caribbean nationals wishing to move from one island to another. These two Caribbean ocean passenger sectors have their own particular supply and demand factors, as well as service requirements, which must be carefully distinguished in any evaluation that seeks to determine the

17/ The Courier, January-February 1985, No. 89, published by ACP - EEC; see also The Economist Intelligence Unit, Quarterly Economic Review of West Indies, Belize, Bahamas, Bermuda, Guyana, No. 4 1984, pp. 15-16.

18/ Ownership of WISCO is as follows: Trinidad and Tobago -40 percent, Jamaica -30 percent, Barbados -10 percent, Guyana -10 percent, and 10 percent divided equally among Antigua and Barbuda, Belize, Dominica, Grenada, Montserrat, St. Christopher and Nevis, St. Lucia and St. Vincent and the Grenadines.

19/ Fairplay International Shipping Weekly, 13 September 1984, pp. 4 and 34.

feasibility of establishing an inter-island RO-RO cargo/passenger operation. For example, in the last five years the number of passenger vessels which offer cruise or round-trip voyages between Florida (USA) ports and various Caribbean islands has increased enormously 20/, while a formal sector for inter-island passenger movements remains notably absent.

The operation of a RO-RO ferry entails the mixing of cargoes, such as those in containers or on chassis, with passengers. It should be highlighted that the latter are considered a delicate cargo by passenger ship operators and can tolerate little or no delay. On the other hand, containers and trailers normally tolerate delays of 24-48 hours and even longer without difficulty. This difference in delay tolerance creates a basis for never-ending conflicts between the "cargoes". As most RO-RO terminals lack Customs and immigration facilities for rapid processing of passengers and their baggage, delays would be unavoidable.

RO-RO vessel which have a limited number of economy accommodations, e.g., up to 13, for inter-island passenger movements can provide carriers with another source of revenue and Caribbean nationals with a less expensive means for moving between islands. In certain jurisdictions if this number of passengers is exceeded a medical doctor must be aboard the vessel. Due to the convenience which results from the rapidity of air travel in comparison with an ocean passage, RO-RO vessel operators would probably have to offer certain incentives for persons to utilise their vessels. In this sense, inter-island RO-RO vessel operators might offer an itinerary that is unavailable to the air traveler, a low passage cost which includes food or permit a large amount of baggage or cargo to accompany passengers.

C. Port facilities

For Caribbean countries which rely so completely on maritime transport services for commercial exchanges, their ports assume a position of equal if not greater importance. The reason for this is that there are alternative means to transport goods to a Caribbean island, i.e., utilise the services of any one of numerous short-sea shipping lines, charter a vessel or purchase needed goods in Asia or Europe and have them transported to the Caribbean by an appropriate deep-sea carrier. On the other hand, if the only port of an island nation has a labour dispute or excessive charges, the shippers, carriers and consignees have no alternative but to wait until the

20/ Fairplay International Shipping Weekly, 18 April 1985, p. 14; Seatrade, April 1985, pp. 17 and 53, and February 1985, pp. 29-33.

dispute is resolved and pay the charges.

For Caribbean countries the predominance of markets for and sources of goods in North America and Europe as well as the almost total reliance on the shipping services of those regions, have had a fundamental impact on their investments in port infrastructures and on the types of services offered. As will be recalled, the transport of containers began in 1956 when Malcolm McLean modified a T-2 tanker named the "S.S. Maxton" to transport 58 truck trailers (without chassis) in a coastwise service between Newark, New Jersey, and Houston, Texas, USA 21/. This new transport technology demonstrated many benefits such as a reduction in port labour requirements, an increase in vessel productivity and a reduction in cargo damage and pilferage, thereby benefiting not only carriers but also shippers and consignees. As a consequence of these benefits, in 1958 the coastwise transport of containers was extended to the Caribbean, eight years before containers were to be carried on the North Atlantic between Europe and the USA 22/.

Until the first trans-Atlantic voyage of a container ship in 1966, growth in the use of those units for Caribbean short-sea trades was slow. However, after 1966 many deep-sea and short-sea carriers serving the Caribbean began to transport containers as deck cargo on their breakbulk vessels and, finally, in cellular ships. During the early 1970s many ports of Caribbean countries had begun to make investments in new port infrastructures for loading, discharge, handling and storage of containers. As part of its lending activities to those countries, the Caribbean Development Bank (CDB) between 1970 and 1983 made loans for its category "water transport", which largely involves port infrastructures, amounting to US\$ 50.6 million or 10.9 percent of all loans 23/.

Based upon the initiative of the CDB, other financial institutions such as the Interamerican Development Bank (IDB) 24/ and donors, the infrastructures and container handling equipment available at ports of Caribbean countries are generally considered adequate for current traffic demands. With regard to the principal ports of Caribbean countries, all have sufficient water depth for short-sea vessels. For example, as short-sea vessels which operate out of

21/ Seatrade, August 1983, p. 89.

22/ Transport 2000, December 1984, p. 33 and 78.

23/ Caribbean Development Bank, Annual Report 1983, p. 95.

24/ Interamerican Development Bank, Annual Report 1983, p. 100.

terminals on the Miami River, Miami, Florida, USA, are restricted to a water depth of 4.3 metres (14 feet), such vessels have no difficulty operating in Caribbean ports. Container handling equipment ranges from specialised gantry cranes in the Dominican Republic, Haiti, Jamaica, and Trinidad and Tobago to heavy-lift cranes, FLT's, chassis and RO-RO ramps at the majority of ports. Caribbean ports which do not have specialised container gantry or heavy-lift cranes utilise the ship's own gear to discharge and load units. At those ports containers are usually discharged with vessel cranes directly onto chassis, thereby permitting their movement within the port area and to consignees as well as stuffing and stripping operations.

In order to respond to specific service requirements, certain short-sea carriers have placed their own equipment at ports served. For instance, to support its short-sea service between West Palm Beach, Florida, USA, and numerous Caribbean countries, TSC has purchased and placed 45-ton-capacity container cranes at Barbados, Nassau, the Bahamas, St. Thomas and St. Lucia. Other short-sea carriers have placed FLT's, chassis, truck tractors, etc., at various Caribbean ports to satisfy their own individual needs.

D. Relation between short-sea, deep-sea and inter-island services

1. Short-sea and deep-sea services. The trend towards the use of larger and more capital-intensive cellular container ships and RO-RO vessels in deep-sea transport restricts the possibility of such vessels calling at ports for limited amounts of cargo. As these modern vessels are in useful production only when moving goods toward their destinations, all time spent in port due to, for example, congestion, weather delays, waiting for cargo and the resolution of shore labour problems is non-productive and must be reduced to a minimum. The tendency today is for such ships to call at fewer ports during their voyages 25/. For example, the round-the-world service of Evergreen Line, which commenced in July 1984, calls at 18 ports on the eastbound leg and 17 on the westbound leg 26/. Within the Latin American and Caribbean region Evergreen round-the-world vessels call

25/ Ports and Harbors, September 1984, p. 24; and Fairplay International Shipping Weekly, 22 September 1983, p. 14.

26/ Transport 2000, July/August 1984, p. 9. Eastbound ports of call are Port Kelang, Singapore, Hong Kong, Kaohsiung, Keelung, Pusan, Osaka, Tokyo, Kingston, Charleston, New York, Baltimore, Hamburg, Felixstowe, Rotterdam, Antwerp, Le Havre and Valencia. Westbound ports are the same with the exception that Baltimore and Port Kelang are omitted and Norfolk is added.

only at Kingston, Jamaica. From Kingston, Jamaica, Evergreen operates a weekly short-sea feeder service to Aruba, Costa Rica, Curacao, the Dominican Republic, Panama, Puerto Rico and the USA (Houston) with three 510 TEU B-series vessels -the Evers Better, Breeze and Bridge 27/. Increasing importance must therefore be placed on short-sea and inter-island feeder transport services, not only to supply main-line vessels with cargo but also to deliver cargo to consignees 28/.

In response to the above trend and in recognition of the advantageous geographical proximity of numerous Caribbean countries to important markets in North, Central and South America and to trade flows which utilise the Panama Canal, many of those countries have established or seek to establish container transshipment centres. The establishment of container transshipment centres is viewed as a means to utilise a country's port not only for domestic and transshipment cargoes and, hence, a source of employment and income, but also as a means to ensure the availability of direct deep-sea liner services to overseas trade partners. Whether the availability of direct liner services is an advantage must be evaluated in the light of the economies of scale and possible lower transport costs of large main-line vessels with a limited number of ports of call, the cost of transshipping cargoes at intermediate ports, and the cost and frequency of feeder services. While an appropriate geographical location is a prerequisite for establishment of a transshipment centre, it should be understood that the long-term economic viability of such centres is based upon a dynamic flow of domestic import and export cargoes which attract main-line and round-the-world vessels to a particular port, as transshipment services are subordinate to such flows, and adequate short-sea and inter-island feeder services to the out ports sought to be served 29/.

2. Short-sea and inter-island services. While an overlap between short-sea and inter-island services was shown in the diagram on page 3, it should be understood that this overlap relates only to unitised cargoes -normally containers. The cargoes carried on inter-island vessels are usually different from those carried between the same islands on short-sea vessels in three respects, i.e., types, volumes and shipping units.

27/ Fairplay International Shipping Weekly, 11 April 1985, p. 9, and 20/27 December 1984, p. 6; and Transport 2000, February 1985, p. 18;

28/ Fairplay International Shipping Weekly, 30 June 1983, pp. 10-11.

29/ ECLAC, Guidelines for the evaluation of transshipment opportunities: The case of St. Lucia (E/CEPAL/G.1273), 4 January 1984.

Inter-island cargo movements may be characterized in general terms by dependence on a wide range of cargoes -from live animals to fresh fruits and vegetables and from individual consignments of manufactured goods to processed foods. While each of these groups of cargoes may be transported in specialized vessels, the limited volumes involved and the seasonal changes in tonnages of such cargoes discourage capital investments in specialized vessels and related port facilities. Further, as each of these groups of cargoes is normally presented in different shipping units -break-bulk, pallets, barrels, containers, bales, live animals and indivisible odd-sized units- an inter-island transport system must be sufficiently flexible to transport all of them.

Due to the structure of inter-island cargo movements, many short-sea carriers avoid such trade unless it is containerized. As the majority of inter-island carriers operate on a tramp or informal basis with old and inadequately maintained vessels ^{30/}, most Caribbean shippers and consignees prefer their goods be moved by short-sea liner vessels. As a result, containerized cargo movements between islands are dominated by short-sea operators; that is, short-sea carriers transport containerized inter-island cargoes which are compatible with their schedules, vessels and ports of call in order to enhance load factors and profitability. While the inter-island movement of goods for short-sea carriers is an indirect product of their principal service, unless there are sufficient short-sea cargoes to ensure the presence of such carriers the inter-island component will suffer.

The current operations of WISCO would seem to provide a working example of an inter-island carrier's need to have access to short-sea cargoes. As will be recalled, WISCO was originally established to provide inter-island transport services and to generate trade between Caribbean countries. In 1980 WISCO began to offer short-sea services between Antigua and Barbuda, Barbados, Jamaica, St. Lucia, and Trinidad and Tobago, and Miami, Florida, USA. As an indication of the importance of that short-sea service for WISCO (see table 11 of Annex II), cargo volumes from Miami to those Caribbean destinations have grown steadily from a low of 1 808 freight tons in 1980 to 65 752 freight tons or 39.4 percent of all cargoes carried during 1983. By way of comparison, only Jamaica comes close to the importance of Miami as a source of cargoes with 38 813 tons or 23.3 percent during 1983.

^{30/} UNCTAD, Small vessels (Regional Shipping Development Project (UNSHIPRO) for the Eastern Caribbean countries -Antigua and Barbuda, Dominica, Grenada, Montserrat, St. Christopher and Nevis, St. Lucia and St. Vincent and the Grenadines- CAR/80/004 and RLA/79/051), revised November 1984, pp. 1-23.

Today WISCO utilises three vessels -the CARICOMs Venture and Express (113 TEUs each) and the chartered M.V. EVE (153 TEUs)- in its short-sea service between Miami and earlier mentioned five Caribbean countries, with only the CARICOM Enterprise (96 TEUs) dedicated to the inter-island trade. With reference to other North American ports, WISCO and SCOTT currently provide a joint inter-island/short-sea service between New York (USA) and Dominica; that is, cargoes from Dominica bound for New York are transported to Port of Spain, Trinidad and Tobago, by WISCO and then transferred to a SCOTT vessel for on carriage, and vice-versa for New York cargoes destined to Dominica. WISCO has also indicated that it plans to expand short-sea services to other North American ports and to establish a new route to the Netherlands Antilles 31/.

As the inter-island services of short-sea vessels are not offered to a wide range of ports, inter-island vessels play an important role in the economies of the countries served. For example, there is a growing trade of fresh fruits and vegetables transported by inter-island vessels from Barbados, Grenada, St. Lucia, and St. Vincent and the Grenadines to the CARICOM jetty at Port of Spain, Trinidad and Tobago, for the wholesale agriculture market held in that country every Thursday. Thus, inter-island vessels normally are employed to transport cargoes that are not containerized or between those islands which do not have short-sea services and to avoid situations in which cargo moving from Barbados to St. Lucia, for instance, must be first transported to Miami, Florida, USA.

31/ The Economist Intelligence Unit, Quarterly Economic Review of Trinidad and Tobago, Guyana, Barbados, Windward, and Leeward Islands, No. 1, 1985, p. 11.

III. Challenges and opportunities

Of the many challenges currently facing Caribbean short-sea vessel operators and the countries they serve, some of the more pressing are related to (a) excess short-sea transport capacity and methods by which such excess might be reduced -operational strategies, liner conferences and the Japan Federation of Coastal Shipping Associations (JFCSA); (b) cargo flow imbalances; (c) ports -services and costs; and (d) new short-sea transport technologies -sail assisted and tug-and-barge systems. These challenges also present ministries of transport, carriers, port authorities, shippers and consignees with opportunities to make many improvements. For instance, overtonnaging might be reduced and, at the same time, the quality of the short-sea fleet improved.

A. Excess Caribbean short-sea transport capacity

Short-sea vessel operators consider the Mediterranean an ideal operating environment, since behind its northern shore is the European industrial hinterland, while quite close to the south and east are mainly developing countries. This is similar to the Caribbean, in that the Caribbean islands, the east coasts of Central America and Mexico and the north coast of South America are all areas of developing countries, separated by sea, which rely upon North America not only as a principal market for many of their products but also as a source of many capital and consumer goods. Consequently, the growth of short-sea services in the Caribbean in the last decade has been dynamic. For example, in 1981 a New Orleans port official indicated that

"...four years ago, not a single RO-RO vessel regularly served the trade with Latin America, while today as many as 35 operate in scheduled services between New Orleans and Latin America" 32/.

The excess short-sea transport capacity or overtonnaging in the Caribbean is the result of numerous factors such as the operational environment highlighted above as well as reduced trade volumes caused by the current economic recession, freedom with which new services can be established and trade flow imbalances. Short-sea vessel operators estimate that cargo volumes of 1978-1979 have been reduced from a low of 20 to a high of 50 percent 33/. If one also takes into account the

32/ Seatrade, US Gulf Study, June 1981, p. 3.

33/ Transport 2000, July/August 1983, pp. 43-45.

imbalance between import and export cargo volumes and seasonal changes in trade flows, both of which greatly affect the demand for short-sea transport services, the excess capacity could be even greater than that brought about by the reduction in cargo volumes. Short-sea vessel operators interviewed for this analysis estimate that utilising 1978-1979 as a base, the excess transport capacity is 30-35 percent. This estimate corresponds to those for worldwide 34/ and trans-Pacific 35/ overtonnaging. One operator indicated that, due to declining cargo volumes, overtonnaging and the freedom with which new vessels can be placed in Caribbean short-sea trades, such trades are inherently not profitable. Despite these negative factors, shipbrokers indicate that the Caribbean continues to be an attractive area for European RO-RO vessels 36/. As examples of the impact of overtonnaging on short-sea operators, Nedlloyd Lines (Antilles) N.V. during 1983 suspended its three-weekly service with the 169 TEUs Hector, Mentor and Stentor between the US east and Gulf coasts and Antigua, Aruba, Barbados, Curacao, Guyana, Suriname and Trinidad and Tobago due to the high level of costs and the low level of freight rates 37/. Pan Atlantic Line ceased operations in 1984 for largely the same reasons.

In response to the overtonnaging of Caribbean short-sea trades, short-sea vessel operators have adopted different strategies. For purposes of this analysis, these strategies may be conveniently divided into two general areas; first, changes in the operational patterns of short-sea lines in order to be more responsive to market demands; and second, establishment of a liner conference for north- and south-bound short-sea trades which utilise the port of Miami, Florida, USA.

As other island nations are faced with a similar excess of short-sea and inter-island transport capacity, the operational strategy of Lorenzo Shipping Corporation (LSC) of the Philippines and measures developed by the Conference of Inter-island Shipowners and Operators (CISO) of the Philippines and the Japan Federation of Coastal Shipping Associations (JFCSA) are presented. It should be recognised, however, that both CISO and JFCSA developed measures for the control of transport capacity in national settings. While the

34/ Containerisation International, January 1985, pp. 49-53.

35/ Far Eastern Economic Review (Hong Kong), 10 February 1983, p. 42.

36/ Fairplay International Shipping Weekly, 3 March 1983, p. 9.

37/ Via Port of New York-New Jersey, July 1983, p. 4; and Containerisation International, July 1983, p. 5.

Caribbean, the Philippines and Japan all have requirements for short-sea and inter-island transport, the Caribbean is composed of many continental and island nations whose individual goals in trade and short-sea transport would have to be taken fully into account before adopting similar measures.

1. Responses to changes in market demand. While not readily apparent, the ocean carriage of goods is an inflexible means of transport when adjustments must be made in the supply of shipping services to reflect changes in market demand. These inflexibilities fall into four categories -vessels, services, cargoes and ports. In the short run all four of these areas are beyond control of ocean carriers who own their vessels. If owners of short-sea vessels face a reduction in cargo volumes, possible short-term responses are limited to the sale of excess tonnage, chartering out or laying up, i.e., placing an inactive vessel at a safe berth or anchorage with a small maintenance crew until better trading conditions return. Each of these choices has its advantages and disadvantages and must be evaluated in the light of the time needed for a recovery in the demand for transport services. On the other hand, in the medium and long terms owners respond to changes in trade volumes through the types and sizes of vessels they place in a trade, as well as through service frequencies.

For those ocean carriers that charter vessels, additional tonnage can be placed in a trade as well as removed therefrom in a very short period of time. However, if port authorities which are to load and discharge such additional vessels do not have sufficient capacity, the building of needed facilities, from design until completion, can take from five to ten years and even longer ^{38/}. As a result, the services offered by ports are flexible only to the extent that excess capacity has been built into existing facilities. While short-sea vessel operators can influence the facilities and services offered at ports on their routes, responses to operators needs are usually in the medium and long terms. Finally, other than reduce freight rates and maintain service frequencies, short-sea operators can do little to generate cargoes.

In recognition of these inflexibilities Caribbean short-sea lines have utilised the only areas they can influence -vessels and services- to create operational strategies which seek to respond to current cargo volumes and competition on the routes each serves. Even though such structures are understandably different, they all appear to have the same goal -to provide an appropriately dimensioned short-sea service to specific Caribbean countries in order to survive the

^{38/} Transport 2000, April 1985, 25.

current economic recession. With reference to vessels, three general tendencies can be highlighted. First, certain lines own all vessels operated and temporarily lay up excess vessels to reduce capacity. Other short-sea lines also own vessels but with insufficient capacity to meet peak demands. The difference between transport capacity and demand is usually made up through short-term charters. The last group of short-sea lines usually charter all vessels and operate on an entrepreneurial basis, i.e., the Caribbean countries served, vessels utilised and frequencies change with greater rapidity than those of the other two groups.

With regard to the relation between service frequency and size of short-sea vessels, Mr. José Go, executive vice president of LSC, considers that even though inter-island cargo movements in the Philippines have been decreasing since 1980, his firm has continued to enjoy the same load factors and level of profitability. Of the many reasons for this, Mr. Go believes that inter-island shipping lines with larger vessels have had to reduce their frequencies in order to obtain sufficient containers for a break-even load. On the other hand, LSC with its smaller vessels, i.e., 10 vessels of 48-60 TEUs and one with 120 TEUs, has been able to maintain published frequencies and, at the same time, shipper loyalty. In fact, Mr. Go indicated that many shippers which had traditionally utilised the vessels of his competitors have switched to those of LSC because frequencies are maintained.

2. Liner conferences. Recent investigations have traced the establishment of liner conferences back to 1837, when two Dublin, Ireland, based short-sea operators, the British and Irish Steam Packet Company and the City of Dublin Company, together with the Peninsular Steam Navigation Company prepared and signed the Irish Sea trade-allocation agreement 39/. While this early conference agreement did not contain all of the elements relating to areas such as membership, loading rights, freight rates, rebates, revenue pooling and service frequencies, by 1868 when the Transatlantic Shipping Conference was established those elements were largely present 40/.

39/ Moore, K.A., The early history of freight conferences, 1981, published by the Trustees of the National Maritime Museum, London, United Kingdom, pp. 7 and 21.

40/ Ibid., p. 23; see also Via Port of New York-New Jersey, October 1980, p. 4.

A major reason underlying the original establishment of ocean liner conferences was to control the transport capacity committed to a given trade and to stabilise freight rates. Without the conference mechanism, history shows that excess vessels will be attracted to a trade and uneconomic rate reductions break out to attract more cargo. In this situation weaker lines are either forced to close or absorbed by the stronger lines. Since the survivors have little or no competition, rates are raised until such time as new carriers are attracted to the trade and the cycle of rate reductions commences once again. Liner conferences seek to deter this cycle from occurring, thereby bringing a degree of stability to the transport capacity in a trade and, hence, ocean freight rates.

Ocean transport is a highly capital-intensive industry which employs physical capital of considerable longevity. For example, while the international road transport industry has found that trucks have an average economic life of from three to five years, the average economic life of a vessel is approximately 20 years. In circumstances such as these a decision to purchase a vessel is particularly influenced by the rate of return on capital and methods which may be utilised to insure such return. One method employed by shipowners to assure an acceptable rate of return is the formation of associations or conferences among all shipping lines serving a particular trade.

a) Liner conference agreements in Caribbean short-sea trades.

Due to the openness of the economies of Caribbean countries, the low entry barriers to participation in short-sea trades and the abundance of ocean transport services which pass through that subregion, many short-sea operators do not participate in conference-type arrangements. For example, the Associated Latin American Freight Conferences (Federal Maritime Commission (FMC) of the USA agreement No. 9876), which is an amalgamation of nine other conferences 41/, has only seven members 42/ which provide short-sea services. Likewise, of

41/ Atlantic and Gulf/West Coast of South America Conference, East Coast Colombia Conference, United States Atlantic and Gulf/Ecuador Freight Conference, United States Atlantic and Gulf/Jamaica and Hispaniola Steamship Freight Association, United States Atlantic and Gulf/Panama Freight Association, United States Atlantic and Gulf/Southeastern Caribbean Conference, United States Atlantic and Gulf/Venezuela Conference, United States Florida/Ecuador Freight Association and the West Coast South America Northbound Conference.

42/ Compañía Anónima Venezolana de Navegación, Concorde/Nopal Line, Coordinated Caribbean Transport, Inc., Puerto Rico Maritime Shipping Authority (PRMSA), Sea-Land Service, Inc., Shipping Corporation of Trinidad and Tobago (SCOTT) and Trailer Marine Transport (TMT).

the 32 shipping lines which are members of the Colombia Pacific and Islands Sections of the Association of West India Transatlantic Steamship Lines (WITASS) 43/, only seven offer Caribbean short-sea services 44/. On the other hand, all members of the Eastern Canada-Caribbean Freight Association provide Caribbean short-sea services 45/, while only Empresa Lineas Maritimas Argentinas S.A. (ELMA) 46/ and VenCaribe C.A. of the seven members of the River Plate/Caribbean/River Plate Conference provide such services 47/.

Many of the small Caribbean short-sea carriers have been reluctant to become members of existing conferences, as they fear losing their independence. Nonetheless, in response to the decreasing volumes of cargoes and the excess offer of transport services, 8 of these carriers 48/ recently formed a conference called the Florida Caribbean Liner Association (FCLA). The FCLA agreement applies to both in and outbound cargoes which utilise Florida ports. This agreement was submitted to the FMC of the USA for approval and should be effective mid-February 1985.

43/ Bridges, R.K., Croner's World Directory of Freight Conferences, Croner Publications Limited, United Kingdom, December 1984, p. 24-25.

44/ Containerisation International Yearbook 1984, pp. 225-298. (Booker Line Ltd., Compañía Anonima Venezolana de Navegación, Hapag-Lloyd AG, Saguenay Shipping Ltd., Sea-Land Service, Inc., Shipping Corporation of Trinidad and Tobago (SCOTT) and the Streamline Consortium -EFFOA, Flota Mercante Gran Centro Americana, Johnson Line and Royal Mail Lines).

45/ Bridges, R.K., Croner's World Directory of Freight Conferences, Croner Publications Limited, United Kingdom, December 1984, p. 134; and Containerisation International Yearbook 1984, pp. 225-298. The shipping lines are: Concorde Nopal Lines, Navieras de Puerto Rico, Saguenay Shipping Ltd., Sea-Land Service Inc., and the Shipping Corporation of Trinidad and Tobago Ltd., (SCOTT).

46/ Containerisation International Yearbook 1984, p. 250.

47/ Bridges, R.K., Croner's World Directory of Freight Conferences, Croner Publications Limited, United Kingdom, December 1984, p. 244a.

48/ Bermuth, Calipso Lines, Marine Bulk Carriers, Saguenay, TEC, Tropical Shipping Company, West European Container Lines and WISCO.

b) Conference of Inter-island Shipowners and Operators (CISO) of the Philippines. The Philippine Islands Shipowners Association (PISA) is an umbrella organisation whose scope of activities encompasses the carriage of goods by inter-island liner and tramp vessels as well as fishing operations. With regard to inter-island liner transport, CISO was established in 1960 as a forum in which inter-island shipowners and operators might meet to discuss their problems. Since that time, according to its general manager, Mr. Vicente Gambito, CISO has become a strong organisation due to the common desire of its members to survive the current economic recession. Other than keeping PISA informed of its activities, CISO functions autonomously.

CISO has a president who co-ordinates activities with the Government of the Philippines, an executive committee and members. The executive committee meets weekly and has 9-10 members who are, usually, general managers of inter-island shipping lines. While the larger shipowners and operators are represented on the executive committee, all lines have the right to designate one person who can attend and participate fully in its meetings. All measures adopted by the executive committee are through consensus. Current matters being considered by the executive committee are (1) credit periods for the payment of freight by shippers, (2) freight rates for the inland carriage portion of door-to-door movements and (3) different freight rates for containers and break-bulk cargoes.

Mr. Gambito indicated that certain measures must be approved by a meeting of principals, i.e., the presidents of all CISO member lines. For instance, a proposal for a freight rate increase is currently being prepared and will be submitted, after approval by the meeting of principals, to the Maritime Industry Authority (MARINA) of the Philippines for consideration. CISO also prepares and submits to MARINA annual financial data and statistics on the volumes of cargoes transported for each member line.

Membership in CISO is not a prerequisite for a shipping line to engage in Philippine inter-island transport, although approximately 95 percent of all vessels providing such services belong. CISO is financed by contributions from its members. These contributions are calculated on each carrier's tonnage and gross revenues. The largest Philippine inter-island carrier currently pays approximately US\$ 500 per month, which is substantially less than the nearly US\$ 1 million per year paid by members of, for example, trans-Pacific conferences 49/. Any expenses other than for CISO operations, such as participation in a convention, must be approved by the executive committee and are paid by CISO members separate from their

49/ Transport 2000, November 1984, p. 9.

tonnage/gross revenue assessments.

During November 1984 CISO member lines adopted a memorandum agreement which prohibits freight rebating and undermeasurement of cargoes, and establishes fines for any violation of such provisions. To ensure compliance with the agreement and create a source of funds for the payment of fines, each CISO member line made a cash deposit of from US\$ 5 000 to US\$ 27 000, depending on its gross revenues, and executed a surety bond of US\$ 50 000.

3. The Japan Federation of Coastal Shipping Associations (JFCSA). The Coastal Shipping Association law was enacted in 1964 to permit coastal shipping interests to form associations. Since that time five associations have been established for various types of shipping operations, i.e., dry and liquid-bulk, liner, etc., and these five formed the JFCSA. Of the many functions carried out by the JFCSA, one of the more important is related to the adjustment of fleet tonnage.

The JFCSA is composed of a 15 member board of directors (each of the five coastal shipping associations has three members), a president and five vice presidents. The activities of the JFCSA are undertaken by its 11 standing committees and two ad hoc committees. Under these committees are subcommittees and working groups. In all committees, subcommittees and working groups each of the five coastal shipping associations have equal participation. All measures adopted are by unanimous agreement.

The need for a reduction in inter-island and short-sea tonnage in Japan, according to the president of Sumikin Shipping Company (SSC) Mr. H. Matsuzaka, results from decreased cargo volumes due to the current economic recession and changes in the composition of cargoes being carried in Japanese domestic trades. As industries in Japan have begun to focus on knowledge-intensive areas such as electronics, informatics, etc., domestic cargoes have become lighter, thinner, shorter, smaller and more valuable, all of which create an incentive to utilise rail and road transport for their movement. Mr. Matsuzaka believes that irrespective of the economic situation the cargo volumes available for short-sea vessels in the domestic trades of Japan will continue to decrease.

An adjustment of domestic fleet tonnage, according to a vice president of the JFCSA, Mr. S. Takai, is accomplished through one of four measures; that is, first, overage tonnage may be scrapped and new vessels constructed in accordance with the appropriate scrap/build ratios; second, excess or overage tonnage may be scrapped with compensation from the JFCSA; third, excess or overage tonnage may be sold to operators in other countries; and fourth, excess tonnage may be laid up with compensation from the JFCSA.

Common to these measures is the preparation of an estimate of the current demand for inter-island transport capacity with a projection for the following five years. Participating in these calculations are the Ministry of Transport of Japan, shippers and shipowners. Once the current and future demand for transport capacity has been agreed, the JFCSA prepares scrap and build ratios for general cargo/dry-bulk and liquid-bulk vessels. The current scrap and build ratios are 1.3:1 per dead weight ton (dwt) for the former and 1.1:1 per cubic metre for the latter. These ratios will result in a yearly decrease of 80 000 dwt of general cargo/dry-bulk vessels and 100 000 cubic metres of liquid-bulk vessels. If the yearly calculations for transport capacity indicated that a larger fleet were needed these ratios would be reversed.

The first and third measures are merely an application of the above ratios to existing vessels, i.e., an excess or overage vessel of 1 300 dwt could be sold to an operator in another country or scrapped and replaced with one of 1 000 dwt. On the other hand, the second and fourth measures permit the JFCSA to compensate shipowners who temporarily do not build replacement vessels or lay up vessels for the benefit of other operators. The JFCSA has two sources of funds to compensate such shipowners - contributions from shipowners who will be benefited from the non-replacement of vessels and the sale of dwt "rights" to shipowners wishing to increase the size of their vessels or fleets. Assuming an overage liner vessel of 1 300 dwt is either sold to an operator in another country or scrapped, the shipowner would be entitled to construct a vessel of only 1 000 dwt. If the shipowner wishes to construct a vessel of 1 500 dwt, he may purchase "rights" from the JFCSA or another shipowner for an additional 650 dwt [(1.3 X 1 500) - 1 300].

B. Cargo flow imbalances

From tables 6-9 of Annex II the unbalanced nature of Caribbean short-sea cargo flows can be seen. For example, table 6 indicates that during 1980 short-sea vessels transported 2 802 112 metric tons of dry-cargo imports. In that same year table 8 shows that short-sea vessels carried 1 839 862 metric tons of dry-cargo exports. The difference between import and export volumes of 962 250 metric tons does not appear excessive. However, such difference represents the total for one year and does not reflect the seasonality of most Caribbean imports and exports. As for refrigerated foods, from tables 7 and 9 it can be seen that during 1980 Caribbean countries utilised short-sea vessels to import 215 188 metric tons and to export 62 526 metric tons resulting in a difference of 152 662 metric tons.

The large excess of refrigerated food imports over exports would seem to indicate that there is a surplus of refrigerated containers at all Caribbean destinations, but such is not the case. The reason for this is the unequal distribution of empty refrigerated containers, as

an unneeded empty unit at one Caribbean island usually must be shipped through Miami, Florida, USA, to be relocated on another island. In an effort to solve this problem an innovative Jamaican agriculture programme called "Agro 21", which exports directly to Winn Dixie Supermarkets in Florida, USA, is trying to convince short-sea lines to utilise refrigerated containers for dry cargoes destined to Jamaica so that fruits and vegetables may be loaded for the return voyage.

To place these cargo flow imbalances in perspective, it can be assumed that each container is loaded with an average of 12 tons of cargo. Caribbean imports of 3 017 300 metric tons (2 802 112 + 215 188) generated a demand for 251 442 TEUs and exports of 1 902 388 metric tons (1 839 862 + 62 526), 158 532 TEUs. Containers with imports exceed those with exports by 92 910 TEUs. To gain some insight into the cost of this imbalance and seasonal changes in demand for transport capacity, it will be assumed that seasonal fluctuations for import cargo volumes occur during the same period each year with October to March having two-thirds of the demand for transport capacity (see part II. B.) and the other six months the remaining one-third. Based upon the above assumptions, the following can be calculated:

1. Seasonal changes in container flows:

TIME PERIODS	INBOUND CONTAINERS	X	SEASONAL ADJUSTMENT	=	SIX / MONTHS	=	TEUs/ MONTH
-----	-----		-----		-----		-----
October/March	251 442	X	.67	=	168 466 / 6	=	28 078
April/September	251 442	X	.33	=	82 976 / 6	=	13 829

			Total		251 442		

2. Imbalance of containerised imports:

$$\text{April/September } 13\ 829 / 28\ 078 \times 100 = 49.3 \text{ percent}$$

Based upon the 49.3 percent seasonal reduction in demand for short-sea transport services, many ship operators reduce capacity by seeking alternative employment for excess vessels or by placing them in lay up. Unquestionably, a reduction in transport capacity during the April to September period creates problems for those Caribbean importers and exporters who require a reliable and frequent short-sea service throughout the year.

An important aspect of the imbalance in import and export usages of containers is the cost of transporting empty units. In response to such imbalances, container owners such as leasing companies and shipping lines require importers and other users to pay for

repositioning costs incurred. One container leasing company charges lessees US\$ 25 to 625 ⁵⁰/₁, depending on the degree of imbalance and distance to next use, to relocate empty containers. This empty container relocation cost usually results in an increase in the price of imports to pay for such "dead freight". Short-sea operators estimate that the cost for repositioning empty containers from Caribbean countries to various ports in North America would be an average of approximately US\$ 150. Assuming that all 92 910 units are so relocated, the cost to Caribbean importers and consumers would be US\$ 13 936 500 per year. To avoid such extra costs, every effort should be made to utilise arriving containers in Caribbean export trades.

C. Ports

While there is a direct relation between the efficiency and cost of a country's port services and the health of its import and export trades, this relation varies greatly between continental and island countries. For example, if a labour dispute were to close all US west coast ports, vessels can and do utilise the ports of Canada and Mexico. Cargoes discharged at ports in either of those countries would simply be carried by truck or railway to their final US destinations, while export cargoes could be transported to such ports by the same means. As importers and exporters in continental countries have alternative ports through which their goods might flow, a powerful incentive is created for port authorities and stevedores to resolve their labour disputes without work stoppages and to keep their costs in line with competing ports. By way of comparison, ports of island nations usually operate without such competition. As a result, any work stoppages at island ports, whether for the resolution of labour disputes or the repair of equipment, have a direct and important impact on the economy of the country served. If such work stoppages are prolonged and island inventories of goods become depleted, the level of economic activity of an entire nation can be reduced.

1. Costs. Almost all short-sea vessel operators highlighted what they consider to be excessive Caribbean port charges. One operator indicated that 30 percent of its gross revenues are so spent, while another stated that his port charges at the Caribbean islands served in 1983 were five times higher than those for the port of Miami, Florida, USA. For example, the cost of stevedore labour at Belize City, Belize, to unload 155 TEUs in 22.5 hours amounted to US\$ 10 986 or US\$ 70.76 per TEU. If it is assumed that this vessel

50/ CEPAL, Establishing container repair and maintenance enterprises in Latin America and the Caribbean (E/CEPAL/G.1243), p. 17.

utilised only 15 hours to load 155 containers at nonunion facilities on the Miami River, where six-man stevedore gangs are employed at direct wages of US\$ 12 per hour and approximately double that amount once fringe benefits -vacation, retirement, etc.- are included, the total cost would be (6 X 24 X 15) US\$ 2 160 or US\$ 13.94 per TEU. To place the cost for loading and discharge of containers at Belize City and on the Miami River in perspective, it should be understood that at other US South Atlantic ports which are represented by the International Longshoreman's Association (ILA) 22-man stevedore gangs must be employed at direct wages of US\$ 16 per hour and double that amount once fringe benefits are included 51/. Assuming that 15 hours are utilised to load 155 containers at an ILA port, the total cost would be (22 X 32 X 15) US\$ 10 560 or US\$ 68.13 per TEU.

As can be seen from the above calculations, the stevedore costs at Belize City would be 5.1 times (10 986 / 2 160) those of nonunion Miami River facilities. However, the stevedore costs at US South Atlantic ILA ports are 4.9 times (10 560 / 2 160) those of nonunion river facilities. In confirmation of this relation between stevedore costs, one vessel operator which utilises a Miami River facility indicated that the greatest threat to his company is that the ILA recently won a representative election among longshoremen and warehousemen and that the costs of waterfront labour would increase dramatically in the near future.

A greater analysis of the charges at the ports utilised in Caribbean short-sea trades is beyond the scope of this document. Nonetheless, countries of that subregion might wish to consider jointly undertaking a study to determine not only the level and structure of such charges at their and selected continental ports but also the services offered and organisational structures employed. With regard to the latter, Caribbean port authorities might wish to include an evaluation of the advantages and disadvantages of being operators versus landlords of ports, i.e., owners of the physical infrastructure and lease such facilities on a long-term basis to the private sector. For instance, in the Caribbean the ports of the Bahamas, Bermuda, St. Croix, St. Martin and St. Thomas are operated on this basis and considered efficient by short-sea operators.

Marine pilots are usually selected based on their qualifications as mariners and on their familiarity with the characteristics of a given port. With the exception of the Panama Canal and entering and leaving a drydock, pilots function only in an advisory capacity and do not relieve a ship's captain of his responsibility. Due to the

51/ Transport 2000, February 1985, pp. 37-38, and Fairplay International Shipping Weekly, 11 April 1985, p. 29.

frequency with which short-sea vessels call at Caribbean ports on their routes, vessel captains are just as familiar with those ports as are the marine pilots they are required to employ. Moreover, with technical developments such as bow and stern thrusters, rudder and controllable-pitch propellers and electronic instruments which accurately measure the depth of water under a vessel's hull, the need for harbour tugs is also placed in question. The costs of pilotage, according to a Caribbean short-sea carrier, for one vessel during 1983 was US\$ 130 000. In response to this situation, Caribbean port authorities might wish to consider the procedures utilised in the short-sea trades of other countries. For example, port authorities in Denmark are permitted to exempt a vessel from pilot services if its captain has entered and departed the port 10 times 52/. Other countries such as the United Kingdom have also begun to study pilotage rules with a view to reducing costs 53/.

2. Services. Based upon the close relation between the services of short-sea vessel operators, of Caribbean country ports and those of national customs authorities, various procedures utilised for the handling and dispatch of containers should be carefully studied to ensure the greatest benefit to each nation's economy. For example, at certain ports container handling charges increase on a sliding scale in relation to the number of units handled per hour. This scale of charges was adopted as a means to ensure a basic wage for stevedores in the light of decreased vessel port stay times. In response to this situation short-sea vessel owners do not permit stevedores to discharge or load more than 10 containers per hour. While reduced discharge and loading speeds would appear to somewhat limit the impact of such charges, such is not the case. As vessels remain in port two to three times longer than necessary, this extra port stay time must be recovered in their freight rates. Other areas which should be evaluated include requirements for stuffing and stripping of containers within the port area, personnel requirements for loading and discharge of short-sea vessels, national customs regulations to ensure that customs officials might perform their tasks during normal working hours and the use of consular documents in international trade.

D. New short-sea transport technologies

52/ Caribbean Shipping, August 1984, p. 21.

53/ Fairplay International Shipping Weekly, 7 March 1985, p. 9, and 24 January 1985, p. 9.

Of the many maritime transport decisions currently facing Caribbean countries, two of the most pressing are: first, what type of marine transport system is most suitable for Caribbean short-sea trades; and second, once such a system has been selected, what is the most appropriate means for training personnel to operate and manage it. To assist Caribbean countries in their efforts to identify and evaluate new short-sea transport technologies, a survey was conducted of two sail-assisted and five tug-and-barge systems.

1. Sail-assisted systems. The emphasis on sail-assisted systems for commercial transport has come about as a direct result of the increasing prices of petroleum products. As will be recalled, during October 1973 the Organization of Petroleum Exporting Countries (OPEC) decided to raise the price of crude oil from US\$ 1.88 per barrel to US\$ 3.15 per barrel and on 1 December of the same year to US\$ 11.65 per barrel 54/. Based upon these and subsequent increases in the price of crude oil, those for lubricating oils and bunker "C", i.e., the residue from the refining process, which are utilised on merchant ships proportionately increased with the latter reaching approximately US\$ 200 per ton 55/ today.

Of the many responses to this situation, two can be highlighted; that is, the utilisation of existing energy products more efficiently 56/ and the investigation of alternative propulsion systems. With reference to the latter, numerous efforts have been undertaken to look once again at harnessing wind energy through the use of sails 57/. For example, during January 1984 Clipper Cargoes launched a 30.5 metre (100 foot) sailing vessel called the "Guinness Clipper" for the transport of cars, engine spare parts, agricultural equipment and textiles between the United Kingdom and the Caribbean 58/. While it

54/ Mullen, J.W., World oil prices: Prospects and implications for energy policy-makers in Latin America's oil-deficit countries, "Cuadernos de la CEPAL", 1978, pp. 15-16.

55 Fairplay International Shipping Weekly, 10 January 1985, p. 14.

56/ Seatrade, November 1984, p. 99; Fairplay International Shipping Weekly, 25 October 1984, p. 18; and Shipping World and Shipbuilder, July/August 1984, pp. 393-397.

57/ Fairplay International Shipping Weekly, 25 October 1984, pp. 23-28, and 9 December 1982, p. 15; Seatrade, November 1984 pp. 6, 111 and 113, September 1984, p. 77, November 1983, p. 75 and January 1983, pp. 73 and 75; and Marine Propulsion International, December 1983/January 1984, pp. 30-38.

might be thought that these efforts would be limited to cargo vessels, such is not the case. During the latter part of 1984 Windstar Sail Cruises of the USA contracted with a shipyard in France for the construction of two luxury sail-assisted cruise ships. These vessels are scheduled for delivery in October 1986 and early 1987 and have an overall length of 133.8 metres (439 feet) with accommodations for 150 passengers. These sail-assisted passenger vessels are to have diesel-electric propulsion systems capable of 10.5 knots and in favourable winds the sails would increase this speed to 14 knots 59/.

It should be understood that the majority of these contemporary efforts do not, as was the case from ancient times until the end of the last century, seek to utilise the wind as the only means of propulsion but rather to reduce the consumption of petroleum products through a decrease in the propulsive requirements from a vessel's main engine. Indeed, it has been estimated that fuel savings of up to 50 percent are possible with sail-assisted vessels 60/. The two sail-assisted systems selected for this analysis are that developed by the Japan Marine Machinery Development Association (JAMDA) and first applied to a coastal products tanker the Shin Aitoku Maru, and the joint effort of the Asian Development Bank (ADB) and the Government of Fiji which resulted in fitting auxiliary sails to the diesel propelled inter-island general cargo vessel Na Mataisau.

a) The Shin Aitoku Maru (SAM). In 1978 JAMDA was commissioned by the Japanese classification society, Nippon Kokan K.K., to develop a new merchant vessel propulsion system which would incorporate a special hull design, an energy-efficient engine and the application of computer, electric and hydraulic power and controls to an aerodynamically designed sail system. A ship model was constructed and subjected to tank and wind tunnel tests to determine the most appropriate hull and sail designs. JAMDA contracted with the Hanshin Diesel Works to develop a slow-speed, fuel-efficient main engine, and this work was completed in 1979. Based upon these efforts and at the request of JAMDA, Aitoku Co., Ltd. decided to build the sail-assisted products tanker SAM (1 600 dwt). The keel for this vessel was laid on 10 July 1980 at Imamura Shipbuilding Co., Ltd., and the launching took place two months later on 10 September 1980 61/. Since that time SAM

58/ Seatrade, January 1984, p. 13, and October 1983, p. 79.

59/ Fairplay International Shipping Weekly, 20/27 December 1984, p. 11.

60/ Fairplay International Shipping Weekly, 7 February 1985, pp. 33-34.

61/ JAMDA, Sailing tanker "Shin Aitoku Maru", September 1983,

has been continuously operated in both Japanese domestic and short-sea trades to China, Singapore, Southeast Asia and Taiwan.

As can be seen from the photograph on page 81 of Annex III, SAM has two sets of rectangular sails, arranged fore and aft, with each measuring 12.15 metres (39.9 feet) high and 8.0 metres (26.3 feet) wide for a total sail area of 194.4 square metres (2 091.7 square feet). The wind speed and direction are sampled at five-minute intervals by the sail control computer. Based upon this information the computer automatically adjusts the sails by opening, closing and rotating them around their individual masts so that the optimum position in relation to the wind is maintained. The thrust created by the wind against the sails is fed into the engine control computer and serves to automatically change either engine speed or propeller pitch or both. During its first three years of operation SAM recorded an average fuel savings of 51.4 percent 62/, as calculated from the estimated fuel required by a comparable conventional vessel. This fuel saving is quite unusual when it is taken into account that since bunker "C" fuel is utilised in the diesel engine, the engine speed cannot be reduced below 40 percent of its maximum continuous rating unless that fuel is blended with a lighter petroleum product.

JAMDA estimates that the sails and computers -sail and engine control- increase the cost of a traditional vessel 10-15 percent, and require an average payback period of three to five years. Due to the high degree of automation, SAM operates with a crew of five instead of the normal six for a vessel of this size. During the first three years of operation it was found that the sails were in use 70 percent of the time. While it was originally considered that the sails would last only one year, those on SAM have been in operation since launching and require no special repair and maintenance skills. The SAM has an average running speed of 12 knots, while a traditional vessel of the same size would operate at 11 knots 63/.

Since the launching of SAM, 10 additional liquid and dry-bulk vessels of a similar design have been constructed and are in operation (see table 12 of Annex II). Of these vessels, nine are engaged in short-sea trades and range from 390 to 4 894 dwt, while the Agua City

61/ (Cont.) published by the Japan Marine Machinery Development Association, p. 1.

62/ Fairplay International Shipping Weekly, 7 June 1984, p. 31.

63/ JAMDA, Sailing tanker "Shin Aitoku Maru", September 1983, published by the Japan Marine Machinery Development Association, pp. 3-19.

(30 900 dwt) and the Usuki Pioneer (26 000 dwt) are utilised in the deep-sea transport of logs and lumber from the North American Pacific coast ports of Seattle and Vancouver, to Japan. With reference to design problems with the larger sail-assisted vessels, JAMDA found it necessary to reduce the area of each sail of the Usuki Pioneer from 800 to 640 square metres, (8 608 to 6 886.4 square feet), due to the heights of bridges and the cost of additional equipment to raise and lower sail masts.

The sail-assisted technology developed by JAMDA has, thus far, been utilised only on liquid and dry-bulk vessels. It might be thought that this technology is not applicable to short-sea container vessels, but such is not the case. While wind acting on a deck load of containers could increase or reduce the propulsive force of the sails, depending on the direction and velocity of the wind, according to Mr. Y. Narita, JAMDA project leader, there is no technical reason why this technology cannot be applied to short-sea container vessels. Some of the considerations for the application to such vessels would be mast height in relation to the deck load of containers and heights of fixed structures such as bridges which must be passed when entering and leaving the ports to be served, as well as desired vessel speed. With reference to the latter, Mr. Narita indicated that the JAMDA sail-assisted technology is most appropriate where desired vessel speed is approximately 10 knots per hour.

b) The Na Mataisau. During January 1983 the Asian Development Bank (ADB) and the Government of Fiji undertook a joint research project which sought to evaluate the potential for fitting auxiliary sails to existing inter-island motor vessels. The vessel selected for this project was the 300 gross ton motor vessel Na Mataisau, as it was considered representative of small inter-island motor vessels utilised in Fiji as well as many other parts of the world. Based upon computer stability and performance analyses of the vessel, the sail configuration and related equipment were designed.

During July 1983 the vessel entered the government shipyard at Suva, Fiji, for installation of masts, spars and sails as well as instruments to monitor wind velocity and fuel consumption. On 12 September 1983 the vessel departed Suva for its first voyage as a motor/sailer. Since that date extensive sail trials and crew training have been conducted. In these trials three operating modes were utilised; that is, sails only, sails and engine, and engine only. Typical results of these trials are as follows: (1) sails only -wind velocity 12 knots on beam and ship's speed 6.2 knots; (2) sails and engine running at slow speed -wind velocity 13 knots 60 degrees off bow and ship's speed 8.3 knots with a fuel consumption of 5.13 litres/mile; and (3) engine at full speed -ship's speed 8.3 knots with a fuel consumption of 7.3 litres/mile. From these operating results it has been estimated that a fuel saving of approximately 30 percent can be achieved by utilising the second operating mode, i.e.,

sails unfurled with the engine running at slow speed.

As can be seen from the photograph on page 82 of Annex III, the sails and rigging appear traditional. However, modern winches and rigging have been employed to reduce needed manpower and simplify procedures utilised to furl and unfurl sails. A crew of five can unfurl all 201 square metres (2 162.8 square feet) of sails in less than five minutes. The sails remain permanently on the masts clear of decks and cargo working spaces and only need to be taken down for routine maintenance. The main-sail boom has been successfully utilised as a cargo handling derrick. The cost of the sails, masts, booms, related equipment and instruments as well as those for installation at the government shipyard were US\$ 40 000. The ADB estimates that based upon the fuel savings possible when utilising the second operating mode, the payback period for this investment should be one and one-half years.

While this joint effort of the ADB and the Government of Fiji is not yet complete, it is clear that installation of suitably designed sails for existing inter-island motor vessels can significantly contribute to fuel savings and the efficient operation of such vessels.

2. Tug-and-barge systems. Tug-and-barge transport systems offer broad adaptability to a wide range of shippers' needs and ports with differing facilities and water depths. Indeed, this flexibility has resulted in barges being designed as RO-RO for trailers and containers on chassis, as LO-LO and RO-RO for general cargo, as LO-LO cellular for containers and, at the same time, with tanks for bulk liquids. As examples of the inherent flexibility of this transport system, tug-and-barges have been utilised to transport oil drilling rigs and other exploratory equipment to Alaska, where cargoes were transferred to and from the shore by barges capable of being beached; to provide a RO-RO general cargo service between the islands of Hawaii, USA; and in Caribbean short-sea trades for the movement of containers on chassis, trailers and other odd-size cargoes.

While it is true that the RO-RO and LO-LO cargo handling modes as well as tanks for various bulk liquids are utilised on self-propelled vessels, the inherent flexibility of tug-and-barge systems largely results from separating the warehouse or storage and the propulsion functions. There are many advantages to such division. For example, tug-and-barge operators may employ the "drop and switch" method of transport -delivery of a barge and picking up of another- thereby permitting the tug to be fully utilised for the transport of cargo. It has been estimated that under appropriate conditions one tug and three barges can transport the same volume of cargo as three self-propelled vessels, and two tugs and four barges can replace four of such vessels 64/. The "drop and switch" method also permits barges

to be loaded and discharged on a more regular basis to avoid payment of overtime charges for stevedores and equipment, as the cost of barge time in port is a less significant cost factor than that of a self-propelled vessel. As barges normally do not have either engine rooms, crew's quarters or the instruments and facilities which are utilised to direct a vessel, they require relatively smaller financial outlays for construction and can be modified at most shipyards -including those of developing countries- to meet special requirements of goods and ports. Finally, barges can be employed not only for transport and storage of goods but also for almost any function which requires a stable floating platform.

With regard to the tugs, they are considered less expensive to purchase and operate than a self-propelled vessel as they are generally standardized "off-the-shelf" items which require smaller crews. If for any reason one tug is out of service, another can be used in its place. As tugs are more maneuverable than most self-propelled vessels, the need for docking assistance is normally eliminated. For instance, in docking a barge the towing tug would shorten its tow line, make a "U" turn and go alongside the barge to push it against the dock. Tugs can be utilised not only for towing but also for docking, acting as pilot and fire boats, and general salvage work.

Notwithstanding the above advantages for tug-and-barge transport systems, it should be pointed out that towed systems have certain disadvantages. For example, marine insurance rates are higher than for self-propelled vessels due to the risks of breaking a tow line and of hull damage when the tug makes a "U" turn and goes alongside the barge to push it against the dock. Tug-and-barge operations usually have a slower system speed than self-propelled vessels, as there is additional resistance from the tug and barge individually moving through the water as well as from the tow line and barge's fixed rudder. As tugs and barges are separate physical units joined only by the tow line, tug crews have very little control over barge movements and must plan all maneuvers well in advance. For instance, no breaking or astern maneuvers may be carried out. Thus, towage operations require persons with substantial knowledge of the drift characteristics of tugs and barges in different tide, wind and wave conditions and of the power requirements needed for docking operations.

Most of the inherent disadvantages of towed tug-and-barge arrangements are eliminated when the tug, instead of pulling barges, pushes them. For instance, push tug-and-barge systems not only permit turning, breaking and astern maneuvers similar to those of self-propelled vessels but also reduce the friction caused by two independent vessels moving through the water. Traditionally, push tug-and-barge systems have been employed only in calm water, i.e., rivers, lakes and protected waterways. The reason for this is that as tugs-and-barges are normally separate units, they respond independently to the actions of waves, winds and tides thereby creating relative movement between such units. In rivers, lakes and protected waterways the relative movement between push tugs and their barges is either minimal or nonexistent, thereby reducing the possibility of damage through physical contact. However, in unprotected waters, the relative movement between them can cause extensive damage. To avoid this situation numerous systems have been developed to permit the employment of push tugs-and-barges in unprotected waters.

There are three responses to the relative movement between tugs and barges; that is, it may be avoided through a tow line, it may be absorbed through an arrangement such as a pushing frame, and it may be eliminated by making the tug and barge an integrated unit such as with the "notch" system. With the integrated tug-barge system, or ITB as it is commonly known, the tug fits into a "notch" in the barge stern and the two are rigidly coupled through various locking mechanisms to eliminate all relative movement 65/. Due to the high degree of specialisation of both tugs and barges for the "notch" system, it requires a greater capital investment than the other two systems and has less flexibility, as the tug's scope of operations is limited by the number of specialised barges.

As tug-and-barge transport systems have been successfully developed and utilised in the short-sea and inter-island trades of many countries, four have been selected -three which utilise the traditional towing system and the other a push tug-and-barge arrangement- to be included in this analysis; that is, Young Brothers, Ltd., of Hawaii, USA, San Miguel Corporation of the Philippines, Matson Navigation Company of California, USA, and Trailer Marine Transport of Florida, USA.

65/ Fairplay International Shipping Weekly, 8 November 1984, p. 33; and Cargo Systems, April 1984, p. 51.

a) Young Brothers, (YB) Ltd. YB operates a towed inter-island tug-and-barge service between Honolulu on the principal island of Oahu and (1) Kawaihae, Hawaii, (2) Hilo, Hawaii, (3) Nawiliwili, Kauai, (4) Kahului, Maui, and Kaunakakai, Molokai. These four services have a twice weekly frequency, except for Kahului which is three times a week. On all routes except Kahului/Kaunakakai, the tugs remain in port approximately eight hours while barges are discharged and loaded. On the Kahului/Kaunakakai service, the tugs tow two barges when departing Honolulu. In passing Kaunakakai the tug drops off one barge for discharge and loading, and continues its voyage to Kahului. The tug remains at Kahului while the second barge is discharged and loaded, and then departs Kahului for Kaunakakai. At Kaunakakai the tug picks up the barge previously dropped off and tows both barges to Honolulu. As the service frequency is three times a week to Kahului and twice a week to Kaunakakai, the latter port is normally skipped once a week.

The entire service frequency requires three tugs and seven flat-deck barges. The tugs employed in this service are time chartered from Dillingham Maritime Corporation (DMC), YB's parent company. The chartered tugs have from 2 250 to 3 000 horsepower and tow at approximately seven to nine knots. To reduce the risk of breaking a tow line and to enhance the possibilities of recovering a barge should a tow line break, YB does not tow barges in series on a single tow line but rather tows two barges using separate towing winches and tow lines on the same tug boat (see the photographs on page 83 of Annex III). Despite these measures marine insurance rates for YB's tug-and-barge operations are still higher than those for self-propelled vessels.

The seven flat-deck barges employed range from 2 325 to 6 500 dwt and, as can be seen from the photographs on page 84 of Annex III, transport a wide range of break-bulk, palletised, and dry and refrigerated containerized cargoes. The photographs on page 85 of Annex III indicate that these barges utilise the horizontal RO-RO mode for cargo handling operations. However, trailers, chassis and other wheeled vehicles are not employed in such operations. Instead, YB utilises a "circular" system with FLT's and ramps it has placed at each island served for cargo loading and discharge operations. In this system the FLT's move cargoes between dockside storage areas and stowage positions aboard barges. This system permits loading and discharge operations to be carried out simultaneously; that is, the FLT's move outbound cargoes from dockside storage areas to barges and return with inbound goods. However, due to the wide range of shipping units transported by YB and, therefore, individual stowage and lashing requirements, these operations are often performed separately.

Of the seven flat-deck barges utilised by YB, four have two decks -two barges of 2 325 and two of 4 352 dwt. The double-deck barges have a lower deck within the barge hull and a main deck which reaches

from bow to stern. Loading and discharge operations from these two decks can be carried out simultaneously; that is, the ramp to the lower deck is located at the stern of the barge, while that for the main deck is located amidships. The lower deck has 10 feet of verticle cargo space and is normally utilised for palletised goods of less than four tons and for automobiles. On the other hand, the main deck is employed for containers and other cargoes which exceed the space and/or weight limitations of the lower deck. During summer months when the seas around Hawaii are relatively calm, containers can be stacked up to four high on the main deck. To protect break-bulk cargoes from the weather, all barges have covered structures or houses located on the forward part of the main deck. These houses are open towards the stern and cover approximately 40 percent of the main deck.

Due to the increasing demand for inter-island services, YB has decided to acquire another barge of 87.8 metres (288 feet) length overall which should be in service by June 1985. As YB seeks to expand its operations more into the transport of containers, the new barge will have recessed container lashing points on the main deck.

During 1983 YB transported 2 376 011 revenue tons of 40 cubic feet or 2 000 pounds in its inter-island service. Since 1978 YB has enjoyed an average annual growth in revenue tons of 10.96 percent. Of the cargoes transported by YB, it is estimated that beginning in 1980 20 percent have been provided by Matson Navigation Company. The reason for this is that the demand for Matson's service from the US west coast to outer Hawaiian island destinations, which involves a transshipment at Honolulu, exceeds the space available on its inter-island cellular vessel the M.V. Manua Kea. Normally all barges depart Honolulu full and return with 20-30 percent load factors. As approximately 40 percent of the containerized goods carried by YB are refrigerated, each barge has a diesel-electric generator. If the number of refrigerated containers to be carried exceeds the capacity of such generators, YB has a number of large portable diesel-electric generators which can be placed on its barges to satisfy the excess demand.

b) San Miguel Corporation (SMC). Since April 1973 SMC has operated a push tug-and-barge system for open-ocean transport between the islands of Visayas and Mindanao in the Philippines. Until the early 1970s SMC depended heavily on domestic tramp and liner services for the transport of its products, principally empty and full beer bottles, to the southern islands of the Philippines. As breakage, freight and handling costs were high and there were frequent delays, SMC decided to provide its own transport services and undertook a study to determine the most appropriate system for its needs.

In an effort to minimize capital requirements and utilise existing port facilities, a push tug-and-barge system called the unit load cargo handling system (ULCHS) was developed by SMC. As can be

seen from the photographs on page 86 of Annex III, the ULCHS is composed of a tug, a pushing frame attached to the bow of the tug and two barges.

In normal ULCHS operations, a tug pushes two barges. With over 10 years of operating experience, tug captains and crews are quite pleased with the ULCHS. It has been found that direct contact between tugs and barges, via the pushing frame, permits greater maneuvering control and eliminates the possibility of damage occurring to barge hulls, as the tug does not make a "U" turn and go alongside barges for docking operations. Notwithstanding these positive aspects, operating personnel indicated that the pushing frame can safely absorb the relative movement between tugs and barges up to a maximum wave height of approximately 1.8 metres (6 feet). As the pushing frame permits only lifting and falling movements between tugs and barges, twisting motions between such units place great strain on the pushing frame and can cause damage. Even in situations where wave heights are no more than 1.8 metres (6 feet) and there is little or no twisting motion, if wave lengths are shorter than the tug and barges -approximately 118 metres (387 feet)- a flapping motion begins that can damage the pushing frame, tug and barges.

The ULCHS permits barges to be towed as well as pushed. If sea conditions are encountered which dictate that the barges should be towed, the pushing frame has a quick release mechanism to permit that operational mode to be utilised. To facilitate such maneuvers, towing cables can be attached prior to departing port. SMC has found that due to the extra weight of the pushing frame, which is attached to tug bows, tugs are down by the head and unstable in heavy seas when towing barges. In fact, if the towing mode is to be utilised, SMC normally removes the pushing frame from a tug prior to leaving port. Thus, the towing mode is viewed as appropriate only when sea conditions are encountered which prohibit the pushing of barges or when a pushing frame is not available due to, for example, repairs being carried out.

The barges SMC utilises in this system and the cargo handling procedures are quite similar to those of YB. The barges are of a single flat-deck construction and have a large warehouse which covers most of the deck area. They are 45.7 metres (150 feet) long, 17.7 metres (58 feet) wide and have a deadweight capacity of 800 tons. The cargoes are not placed in containers but rather on pallets, with cargo handling operations carried out by FLT's. The FLT's enter barge warehouses over an adjustable ramp with outgoing goods and exit with incoming items.

c) Matson Navigation Company (MNC). Since 1963 MNC has provided a cellular feeder service between Honolulu on the principal island of Oahu and Nawiliwili (Kauai), Kahului (Maui) and Hilo (Hawaii) for containerized cargoes transported between the US west coast and Honolulu on its main-line vessels. Between 1963 and 1985 MNC

developed and utilised three different transport systems for the inter-island movement of containers. Two of these systems are towed tug-and-barge arrangements, while the other is a self-propelled vessel.

(i) The Barge Islander (BI). The first cellular system utilised by MNC in its inter-island service was the BI. This barge was constructed in 1963 at Bethlehem Shipyard, Beaumont, Texas, USA, and is of 3 403 grt with an overall length of 95.1 metres (312 feet), a breadth of 15.2 metres (50 feet) and a loaded draft of 5.4 metres (17.8 feet). It is a cellular barge with a capacity for 216 Matson 24 foot containers -101 carried below deck in three cargo holds- 19 of which may be refrigerated. The drawing on page 87 of Annex III indicates that the BI has a caterpillar or crawler crane for container handling operations. This crane has its own diesel engine and operates independent of barge and shore power systems. For the electrical power needs of refrigerated containers, the BI has two diesel-electric generators of 350 kw each. These generators are equipped so that if the operating engine stops for any reason the other will automatically commence supplying electrical power to the refrigerated containers.

For container loading and discharge operations the crane has complete freedom to move about the main deck of the BI. To do this the crane does not have permanent tracks on the main deck but rather moveable ones that it places and removes as needed. As the three hatches are separated and raised above the main deck, the tracks are employed to permit the crane to move from one hatch cover to the next, as well as to protect hatch covers covers from damage. The operational sequence is as follows: once having discharged all the containers within reach of the crane, its operator would then use the crane to place tracks either on the hatch cover or between hatch covers to permit the crane's movement towards the next stack of containers. This procedures is merely reversed for loading operations.

The studies which led to the change from a towed to self-propelled inter-island service were undertaken in 1965. These studies were carried out during the very early period of containerisation; that is, before the first containers moved across the Atlantic. At that time the utilisation of containers had given rise to large increases in productivity without similar cost increases. Indeed, some years later MNC indicated that the modification of its fleet to carry containers commenced in 1958, and by 1964 those efforts were sufficiently advanced that freight rates had been reduced to their 1961 level and there were no more increases until 1971, when inflation finally overtook container operations 66/. The high earning capacity of self-propelled cellular vessels at that

time and the disadvantages of towed tug-and-barge systems -slower system speed, higher marine insurance rates and the possibility of hull damage during docking operations- influenced those studies. As a result, it was decided to construct a self-propelled vessel for the inter-island services of MNC. However, the BI was neither sold nor inactive. After being replaced by the M.V. Mauna Kea, the BI was utilised for a short period between the US west coast and Hawaii, and for the last eight to ten years has been dedicated to a 28-day service between Hawaii and two of the Marshall Islands -Majaro and Kwajalien.

(ii) The M.V. Mauna Kea (MK). The cellular feeder vessel utilised in a weekly inter-island service until March 1985, the MK, was constructed in 1967 at Bethlehem Shipyard, Beaumont, Texas, USA, and is of 3 875 grt with an overall length of 103.1 metres (338.3 feet), a breadth of 15.8 metres (52 feet) and a loaded draft of 5.5 metres (18 feet). To make the vessel as independent as possible from port services, it is fitted with a gantry crane (see photographs on page 88 of Annex III) for cargo handling operations and has twin propellers and a bow thruster to eliminate the need for a docking tug.

The MK was originally constructed to carry 212 Matson 2.44 X 2.44 X 7.32 metres (8 X 8 X 24 feet) containers, 20 of which can be refrigerated, and 6 946 barrels of molasses. The containers were carried in three holds, with only one tier on deck. However, the number of containers destined for outer islands has been growing at a constant rate of about three percent for many years. In response to the growth in demand for more inter-island container transport capacity, the legs of the gantry crane have been lengthened three times, with three tiers of containers now carried on deck and the vessel's capacity finally reaching 230 units. This increased container transport capacity has reduced the independent character of its original construction by making shoreside crane services necessary for the third or highest level of deck-carried containers.

MNC considers that the MK reached its maximum container capacity with the last modification of the gantry crane. As the demand for inter-island movements has exceeded the MK's capacity since 1980, MNC began contracting with YB for the transport of containers and automobiles between Honolulu and various Hawaiian outports. The quantities of cargoes transported by YB for MNC were small in the beginning. However, during 1983 YB was utilised to transport the following quantities of containerised cargoes:

INTER-ISLAND TRANSPORT DEMAND OF MATSON NAVIGATION COMPANY
DURING 1983 AND THE AMOUNTS CONTRACTED WITH YOUNG BROTHERS, LTD.

	TOTAL DEMAND	TRANSPORTED BY YB	PERCENT YB
Containers	23 800	4 089	17.2
Automobiles	9 621	2 877	29.9
Total units	33 421	6 966	20.8

Source: Based upon information provided by Matson Navigation Company.

This contractual arrangement resulted in YB carrying 20.8 of MNC's main-line cargoes to final outer-island destinations and cost MNC an estimated US\$ 2-3 million per year. As a result, a study of alternative transport systems was undertaken.

The alternatives considered were divided into two principal areas; that is, increase MNC's inter-island transport capacity or utilise the services of another company. With reference to the first, MNC evaluated (1) placing another vessel similar to the MK in service, (2) selling the MK and purchasing general-purpose flat-deck barges, (3) selling the MK and rescheduling MNC's main-line vessels to call at outer island ports, (4) selling the MK and purchasing a small LASH vessel 67/, (5) selling the MK and placing the S.S. Matsonia, a currently laid up MNC cellular container vessel, in service between Honolulu and outer island ports, and (6) selling the MK and designing specialised barges for its inter-island service. The other alternative was to enlarge its contractual arrangement with YB or another carrier for the transport of all MNC inter-island cargoes.

Based upon this study it was decided that specially designed barges would permit MNC to provide the desired service at the lowest capital and operating costs. Of great influence in this decision was that for many years MNC had acquired experience in the operation of both self-propelled and towed inter-island transport systems. Thus, MNC was well aware of the relative merits of each transport systems when it decided to design specialised barges.

67/ The lighter aboard ship or LASH system consists of barges carried in a mother vessel. Barges are loaded and discharged over the stern of the mother vessel with its own barge-handling elevator. For such operations LASH vessels require only tugs to move barges between the dock and the mother vessel, and a bay or other protected waters.

(iii) The barges Haleakala and Mauna Loa (H and ML). As can be seen from the drawing on page 89 and the photograph on page 90 of Annex III, the two identical barges designed by MNC enlarge upon and make use of many concepts employed on the BI. The H and ML were constructed at McDermott Shipyard, New Iberia, Louisiana, USA, and have an overall length of 106.7 metres (350 feet), a breadth of 19.7 (64.5 feet), a loaded draft of 4.3 metres (14 feet) and a deadweight of 4 017.9 tons. The H and ML entered service during March 1985. These barges have moveable cell guides to carry any combination of 20-, 24- and 40-foot containers. The cell guides which rise 37 feet above the deck obviate the need for container lashing. The maximum capacity of each barge is 216 Matson 24-foot units, of which 60 may be refrigerated. Each barge has two diesel-electric 230 kw generators for refrigerated containers. These generators are equipped similar to those on the BI -if the operating generator stops for any reason the other will automatically commence supplying electrical power to the refrigerated containers. In addition to space for containers, each barge has tanks for 1 700 tons of molasses. To assist with docking operations, the barges have radio-operated stern thruster of 1 165 horsepower which rotates 360 degrees.

Each barge has a container crane with a capacity of 31.8 metric tons (70 000 pounds) which operates on two raised parallel tracks that run from bow to stern. The tracks are approximately four container heights above the main deck and have units stacked two wide between the tracks as well as two wide on the port and starboard sides of the tracks. While the containers immediately beneath the crane can be stacked only four high, all other rows can be stacked five high. The crane has a horizontal or slewing movement of almost 270 degrees and can "eat its way" into the four high container stacks by unloading them on the dock.

Even though MNC has offered inter-island barge services since 1963, it has time-chartered tugs for its towage requirements. As a result of its lack of direct operating experience with tugs and especially that related to the horsepower needed for the desired towage speed, MNC decided to time charter two tugs, one for each of the new barges. Due to the high cost of the H and ML, fast port turn arounds are required. Thus, MNC does not foresee use of the drop-and-switch method utilised, for example, by YB on its route between Honolulu and Kahului/Kaunakakai. The combined capacity of the two barges (432 Matson 24-foot containers) exceeds current trade demands by approximately 141.6 (432 - 230/.792) units or 32.8 percent, but as the trade is growing such excess should give MNC some flexibility.

d) Trailer Marine Transport (TMT). Since 1954 TMT has provided RO-RO trailer services between Florida and Puerto Rico. TMT began services with a converted World War II landing ship tank. In 1974 the company was purchased by Crowley Maritime Corporation (CMC) and since

that time has expanded its services and made major technological innovations in the transport systems employed. Today TMT offers services between San Juan, Puerto Rico, and (1) US North Atlantic east coast -weekly to Philadelphia (Pennsylvania); (2) US South Atlantic coast -twice weekly to Miami (Florida); and (3) US Gulf coast -twice weekly to Jacksonville (Florida) and weekly to Lake Charles (Louisiana) and Mobile (Alabama). These main-line services are supported by three feeder services from San Juan (1) weekly to the Dominican Republic, (2) weekly to St. Martin and (3) twice weekly to St. Croix and St. Thomas 68/.

For its Caribbean service TMT has developed a unique transport system based upon triple-deck barges with matching triple-deck ramps at each of the above main-line ports. There are nine barges in the TMT fleet, five of which are to be lengthened in 1985 from 121.9 to 222.5 metres (400 to 730 feet) thereby increasing capacity from 288 to 512 12.2 and 13.7-metre (40 and 45-foot) trailers 69/. The remaining four barges all have lengths of 176.8 metres (580 feet) and can transport 376 trailers each.

Since loading and discharge operations can be conducted on all three decks simultaneously, 376 trailers can be discharged and a similar number loaded (a total of 752 trailer movements) in an eight hour period 70/. To better understand the quantity of cargo that these trailer movements represent, it can be assumed that each trailer carries an average of 12 tons of cargo. As a result, 752 trailer movements would represent 9 024 tons of cargo or a handling rate of 1 128 tons per hour. By way of comparison, a container handling rate of 40 TEUs per hour for a gantry crane at most terminals would be considered excellent. If each container carries an average of 12 tons, the cargo handling rate would be 480 tons per hour or only 42.6 percent of the rate obtained by TMT.

68/ Transport 2000, February 1985, p. 63.

69/ Containerisation International, July 1984, pp. 37-38; Transport 2000, July/August 1984, pp. 32-33.; and Container News, January 1981, p. 22.

70/ Cargo Systems, February 1981, p. 45.

IV. Conclusions and recommendations

One of the more fundamental transport decisions facing Caribbean countries is related to the means by which they might participate as ship operators in their short-sea trade flows. In an effort to assist those countries in their deliberations concerning such participation, this study has sought to analyse short-sea transport and related trade movements. As was shown in part II of the study, approximately 50 percent of all Caribbean imports and exports are concentrated in short-sea trades. Of these imports and exports, 80 to 85 percent are transported between Caribbean countries and North America by short-sea lines. Further, the vessel sizes and types dedicated to Caribbean short-sea trades are quite uniform; that is, they are either RO-RO or cellular container of approximately 2 000 dwt.

The concentration of short-sea trade flows between North America and the Caribbean is somewhat illusory; that is, as the Caribbean Sea is a vast area encompassing many widely separated countries, the North American end of short-sea trade flows is concentrated, while that of the Caribbean countries is quite dispersed. In response to the geographical dispersion of Caribbean countries as well as their limited volumes of import and export cargoes, most short-sea lines offer services to a reduced number of countries, usually three to five. The concentration-dispersion dichotomy of Caribbean short-sea trades has an important impact on the choice of routes, service frequencies, number of vessels in operation, load factors and earning potential of short-sea lines. Due to the difficulties this dichotomy creates for short-sea operators, as well as the unbalanced and seasonal nature of trade flows, further study should be directed towards developing a greater understanding of the interaction of these factors on the demand for short-sea services. Such studies might indicate, for instance, that for those Caribbean countries which have sufficient volumes of cargo moving between themselves and similar continental ports, and are not too geographically dispersed, consideration might be given to the formation of trading units. These trading units could provide Caribbean countries with a basis for establishing joint shipping services, e.g., utilising the vessels of other short-sea carriers through slot or vessel chartering, joint operating agreements with existing carriers, or an independent Caribbean service.

In order to assist Caribbean countries identify, evaluate and employ new short-sea transport technologies, five tug-and-barge systems, two sail-assisted vessels and one self-propelled cellular vessel were analysed in this document. While each of these transport systems has its advantages and disadvantages, it is necessary to highlight that the speed of technological change in maritime transport renders it impossible to predict an assured future for any transport system. Nonetheless, there are certain characteristics of Caribbean short-sea trades which came to light during the preparation of this

document that should be taken into consideration when evaluating possible transport technologies.

The characteristics of Caribbean short-sea trades include (1) the dominant role of containers in short-sea trade flows, (2) low cargo volumes which are unbalanced and seasonal, (3) countries which have limited possibilities for trade diversification and for investments in new port facilities, and (4) high cost of petroleum based energy products for vessel propulsion systems. Based upon these characteristics, whether a Caribbean short-sea transport system is self-propelled, towed, pushed or sail-assisted, it should (1) have RO-RO or cellular container capacity, (2) be appropriately dimensioned to operate profitably throughout the year, taking into account the nature of trade flows, (3) be energy efficient, and (4) be able to load and discharge containers independent of existing facilities, and to operate in water depths of no more than 4.3 metres (14 feet). To these requirements one might add that whatever technology is selected, Caribbean countries should possess the needed skills for its operation, repair and maintenance. There are strong grounds, therefore, for recommending only systems with inherent operational and technical flexibility.

Towed tug-and-barge transport systems not only represent a transport technology with inherent flexibility for cargoes and port facilities but also an opportunity for Caribbean countries to participate as vessel operators in their short-sea trades. This participation might be through the joint purchase or charter of one or more tug boats, with each country acquiring the barges it needs. In this way the acquisition and operating costs of the tug boats could be equitably spread among owner countries, while that for the barges would be borne by each independently. The three major costs for the tug boats, i.e., acquisition, repair and maintenance, and operation, could have different bases for their distribution among owner countries. For example, acquisition, repair and maintenance costs might be shared equally, while contributions to operating costs might be based on the tons of cargo transported, with a guaranteed minimum tonnage per year.

An evaluation of technologies for Caribbean short-sea transport need not be made in the abstract, as sufficient trade data exist to determine the volume and direction of trade flows. An analysis of data such as this would lead to an understanding of transport technologies which might be employed as well as required service frequencies. Obviously, finding the right combination of countries, i.e., trade volumes, origins, destinations, etc., and the political will needed to engage in such a venture, would be a major undertaking and is related to the need mentioned earlier concerning greater study of the concentration-dispersion dichotomy of Caribbean short-sea trades. Nonetheless, computer based models might be utilised to determine the cost and benefits of self-propelled, tug-and-barge and

sail-assisted systems in selected Caribbean short-sea trades. This analysis would provide Caribbean countries with important comparative information concerning acquisition and operating costs for each of the systems presented herein, as well as for any others which might be considered appropriate.

Based upon the dominant role of maritime transport in Caribbean commercial exchanges, for those countries which lack sufficient cargo volumes to support a frequent service or have locational disadvantages or both, there exists a very real risk of being caught in a trade-transport vacuum; that is, without sufficient cargoes to induce operators to make more than occasional calls at their ports, this may, in the absence of government initiatives, lead to a reduction in the level of economic activity. The lack of an efficient and regular service acts as a disincentive to expand their production for export. Their earning from exports and their ability to import remain low and in some cases may decline. As fewer inward and outward cargoes are offered, fewer calls tend to be made, thereby reinforcing the disincentive. To avoid this situation or, at least, lessen its impact, governments might give consideration to the establishment of appropriately dimensioned inter-island feeder services to major Caribbean country ports, possibly through the employment of sail-assisted vessels such as the Na Mataisau found in part III. D. of this document.

There are two problems which have a fundamental impact on the commercial viability of all Caribbean short-sea carriers, whatever transport system might be employed. These problems are: first, the current level of overtonnaging in Caribbean short-sea trades; and second, the cost and efficiency of Caribbean ports. Traditionally, outside the Caribbean two institutional means have been utilised to deal with overtonnaging -liner conference agreements and government control in the domestic sphere. In both of these areas innovative conference arrangements and national regulations have been selected and analysed. Due to the pressing need for these problems to be solved, thereby ensuring the commercial viability of investments in short-sea transport systems, Caribbean governments might wish to consider jointly evaluating such measures in the light of Caribbean short-sea transport needs.

As Caribbean countries have scarce natural resources, small domestic markets and are almost totally reliant on overseas markets, low-cost, efficient port services are of fundamental importance. As was indicated at part III. C. of this document, it was found that the costs of Caribbean ports are slightly more than those of Miami, Florida, USA. Notwithstanding the validity of that comparison, Caribbean port authorities might wish to give consideration to the usefulness of formulating new bases for determining whether the level of charges for port services is appropriate. For instance, the remuneration of port workers in Caribbean countries and the costs

charged vessels might be based not on what other ports in the world are charging nor on what "the market will bear" but rather on the level of compensation received by workers performing similar tasks outside the port area of that specific country. Similar comparisons could be made regarding the number of workers required, flexibility of tasks and working hours to avoid situations where an excessive number of workers are employed at a port to carry out tasks normally performed by a lesser number outside the port area.

It is most important to understand that any improvement in Caribbean short-sea transport services and changes in technologies utilised call for not only capital investments and the training of personnel but also genuine co-operation between ministries of transport, port authorities, carriers, shippers and consignees to ensure high productivity at a low cost. Caribbean countries have demonstrated their willingness to co-operate in a number of areas related to maritime transport. For instance, 12 Caribbean governments established WISCO, a multinational subregional carrier, while the private sector has created the Caribbean Shipping Association. The latter is a broad-based organisation encompassing carriers, port authorities, shippers and consignees of the Caribbean as well as their short-sea and deep-sea counterparts. Notwithstanding such efforts, co-operation among the Caribbean countries in matters related to maritime transport needs to be broadened and strengthened to bring about a reduction in the excess of short-sea transport capacity, a reduction of port costs and an improvement of services consonant with carrier, shipper and consignee needs, and the operation of appropriate short-sea transport systems by Caribbean countries.

ANNEX I

Contributing organisations

Japan

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| 1. Economic Planning Agency, | 8. Maritime International Co-
operation Center, |
| 2. International Association of
Ports and Harbors, | 9. Ministry of Transport, |
| 3. Japan Federation of Coastal
Shipping Associations, | 10. Port of Kobe, |
| 4. Japan Machinery Development
Association, | 11. Sumikin Shipping Company, |
| 5. K.K. Uyeno Unyu Shokai, | 12. Tokyo Wan Ferry Company, |
| 6. Kuribayashi Steamship
Company, | 13. University of Osaka Pre-
fecture and |
| 7. Maritime Credit Corporation, | 14. Y.S. Nearseas Line. |

The Philippines

- | | |
|--|---------------------------------|
| 1. Aboitiz Shipping Corporation, | 6. Maritime Industry Authority, |
| 2. American President Lines, | 7. San Miguel Corporation, |
| 3. Asian Development Bank, | 8. Sulpicio Lines, Inc., and |
| 4. Conference of Inter-island
Shipowners and Operators, | 9. Williams Lines, Inc. |
| 5. Lorenzo Shipping Corporation, | |

Trinidad and Tobago

- | | |
|--|---|
| 1. CARICOM Jetty, | 3. West Indies Shipping Cor-
poration (WISCO). |
| 2. Shipping Corporation of
Trinidad and Tobago
(SCOTT) and | |

The United States of America

- | | |
|---|---------------------------------------|
| 1. Concorde Nopal Line, | 7. Oceanic Steamship Company, |
| 2. Co-ordinated Caribbean
Transport, Inc., | 8. Port of Miami, |
| 3. Hyde Shipping Corporation, | 9. Sand Island Container
Terminal, |
| 4. Kirk Line, | 10. Tropical Shipping Company, and |
| 5. Matson Navigation Company, | 11. Young Brothers, Ltd. |
| 6. Norwegian Caribbean Lines, | |

ANNEX II

Statistical tables

TABLE 1
 TRADE STRUCTURE OF SELECTED CARRIBEAN COUNTRIES
 ACCORDING TO PRINCIPAL COMMODITY GROUPS IMPORTED
 (Values in millions of US dollars)

Countries	Years	Values	Main categories of imports in percentages				
			All food items	Agricultural raw mat.	Fuels	Ores and metals	Manuf. goods
Bahamas	1970	337.5	18.9	1.3	17.5	2.9	59.2
	1975 2	696.9	2.6	0.1	91.5	0.3	5.5
	1977 3	568.1	1.8	0.1	94.2	0.1	3.8
Barbados	1970	117.3	24.5	2.6	5.5	3.2	61.1
	1975	216.4	25.3	1.8	16.9	2.2	50.5
	1979	420.8	19.3	2.0	14.1	3.9	58.9
	1980	517.1	17.9	2.4	15.4	4.7	57.9
Belize	1970	33.4	31.5	0.3	5.0	2.4	59.8
	1975	88.5	28.1	0.5	8.3	3.0	60.0
	1979	130.3	27.5	0.5	12.7	2.2	56.8
	1980	148.2	24.8	0.3	18.4	2.3	53.6
Cuba	1970 1	311.0	22.4	4.1	8.7	5.0	59.0
	1975 3	883.3	15.6	1.3	0.4	9.6	72.7
Dominican Republic	1970	278.0	13.9	4.0	6.9	1.9	70.5
	1975	771.8	13.9	2.3	22.6	5.9	55.3
	1980 1	426.3	16.5	2.3	25.4	5.6	50.2
	1982 1	255.8	15.6	2.0	34.1	5.1	43.2
Guade- loupe	1970	127.7	24.1	1.4	4.4	5.3	64.8
	1975	306.7	28.1	1.0	5.9	4.1	60.6
	1980	679.5	26.3	1.4	4.3	3.7	63.0
	1983	661.0	22.0	1.4	14.7	2.6	58.9

Source: UNCTAD, Handbook of international trade and development statistics, 1983, pp. 172-195, and 1984 Supplement, pp.122-145.

TABLE 1 (Continued)
 TRADE STRUCTURE OF SELECTED CARRIBEAN COUNTRIES
 ACCORDING TO PRINCIPAL COMMODITY GROUPS IMPORTED
 (Values in millions of US dollars)

Countries	Years	Values	Main categories of imports in percentages				
			All food items	Agricultural raw mat.	Fuels	Ores and metals	Manuf. goods
Guyana	1970	134.1	15.8	0.4	8.6	4.6	70.0
	1975	343.9	13.0	0.3	16.7	5.6	64.1
	1979	290.2	17.9	0.3	21.8	4.4	55.2
Haiti	1970	52.0	20.8	1.7	5.6	5.0	64.0
	1975	142.5	28.7	3.3	9.1	5.6	49.3
	1979	266.1	23.6	2.6	13.0	5.5	54.8
Jamaica	1970	525.4	18.0	1.9	6.4	7.3	66.3
	1975 1	122.5	20.2	2.4	19.2	4.6	53.4
	1980 1	177.7	20.3	0.9	37.8	3.5	37.0
	1981 1	487.0	18.7	1.5	33.3	3.7	42.2
Marti- nique	1970	145.8	23.6	1.3	4.5	3.9	66.8
	1975	341.2	24.1	0.8	16.5	3.0	55.2
	1980	775.4	22.7	1.1	13.1	3.6	57.3
	1983	734.4	20.3	1.1	18.3	2.1	57.1
Nether- lands Antilles	1970	791.3	5.3	0.2	70.5	2.5	21.4
	1975 2	788.9	3.3	0.1	86.1	0.8	9.8
	1979 4	389.5	3.5	0.1	85.7	0.5	10.2
Suriname	1970	115.3	14.8	4.4	12.4	9.0	59.4
	1975	252.3	11.2	0.1	37.5	2.6	46.9
	1976	281.0	11.8	0.2	27.2	2.3	57.8
Trinidad and Tobago	1970	543.4	11.3	0.8	52.9	3.8	30.7
	1975 1	488.4	10.1	0.5	50.6	6.7	31.9
	1980 3	177.7	11.1	1.5	37.7	5.0	44.6
	1982 3	698.0	11.8	2.1	25.2	5.3	55.4

Source: UNCTAD, Handbook of international trade and development statistics, 1983, pp. 172-195, and 1984 Supplement, pp.122-145.

TABLE 2
TRADE STRUCTURE OF SELECTED CARIBBEAN COUNTRIES
ACCORDING TO PRINCIPAL COMMODITIES EXPORTED

Countries	Commodities	Values in thousands of US dollars			Percentage
		1970	1975	1980	1980
Bahamas		89 525	2 508 333	3 260 671	100.0
	Petroleum, crude	---	1 399 340	1 723 729	52.9
	Petroleum products	31 896	992 777	1 399 887	42.9
Barbados		20 906	107 265	226 567	100.0
	Petroleum products	4 067	14 231	59 002	26.0
	Sugar	16 715	52 665	57 751	25.5
	Electrical mach.	3 227	3 770	30 372	13.4
	Clothing	1 898	13 242	24 502	10.8
	Sporting goods/toys	252	44	5 122	2.3
Belize		18 801	67 157	104 947	100.0
	Sugar and honey	7 148	43 487	35 344	33.7
	Spec. indus. mach.	---	1 771	10 086	9.6
	Clothing	---	4 314	9 423	9.0
	Watches and clocks	---	2 125	7 133	6.8
	Cheese and curd	---	261	6 767	6.4
Cuba		1 046 300	3 683 683	5 540 765	100.0
	Sugar and honey	805 567	3 308 819	4 634 129	83.6
	Ores	171 870	3 198	257 215	4.6

Source: United Nations, Monthly Bulletin of Statistics, March 1983, Vol. XXXVII, pp. XXVI-LVIII.

TABLE 2 (Continued)
 TRADE STRUCTURE OF SELECTED CARIBBEAN COUNTRIES
 ACCORDING TO PRINCIPAL COMMODITIES EXPORTED

Countries	Commodities	Values in thousands of US dollars			Percentage
		1970	1975	1980	breakdown 1980
Dominican Republic		213 957	893 795	703 906	100.0
	Sugar	111 195	568 851	307 130	43.6
	Pig iron	---	102 143	101 927	14.5
	Coffee	29 302	34 704	72 214	11.0
	Cocoa	19 171	27 150	53 790	7.6
	Tobacco, unmanuf.	13 945	34 399	33 328	4.7
Guadeloupe		37 630	83 936	106 893	100.0
	Sugar and honey	22 692	34 369	44 243	41.4
	Fresh fruit, nuts	10 215	31 010	27 728	25.9
	Meal, wheat flour	---	5 155	8 558	8.0
	Alcoholic bever.	3 148	6 037	7 500	7.0
Guyana		130 245	352 850	298 881	100.0
	Ores (bauxite)	69 279	83 908	129 469	44.7
	Sugar and honey	38 107	177 869	92 546	31.9
	Rice	9 141	36 135	31 692	10.9
Haiti		40 517	81 179	158 948	100.0
	Coffee	15 241	18 496	62 277	39.2
	Ores (bauxite) */	6 849	10 462	17 230	10.8
	Sporting goods/toys	922	9 467	16 146	10.2
	Essent. oils/perfum.	2 658	4 882	9 700	6.6
	Furniture	---	104	7 326	4.6
	Cocoa	1 067	1 824	7 145	4.5

Source: United Nations, Monthly Bulletin of Statistics, March 1983, Vol. XXXVII, pp. XXVI-LVIII.

*/ Reynolds Haitian Mines, Inc., ceased bauxite mining activities 31 December 1982.

TABLE 2 (Continued)
 TRADE STRUCTURE OF SELECTED CARIBBEAN COUNTRIES
 ACCORDING TO PRINCIPAL COMMODITIES EXPORTED

Countries	Commodities	Values in thousands of US dollars			Percentage
		1970	1975	1980	1980
Jamaica		334 939	769 352	942 436	100.0
	Inorganic chem.	---	381 810	538 950	57.2
	Ores (bauxite)	224 270	117 546	198 425	21.1
	Sugar	38 723	153 792	55 470	5.9
Martinique		30 037	95 895	116 846	100.0
	Petroleum products	3	19 367	52 891	45.3
	Fresh fruit, nuts	15 330	45 966	25 138	21.5
	Alcoholic bever.	4 922	12 663	13 212	11.3
	Preserved fruit	3 845	6 975	3 525	3.0
Netherlands Antilles		675 539	2 393 116	2 641 019	100.0
	Petroleum products	624 150	2 184 123	2 356 511	89.2
	Petroleum, crude	9 571	118 553	186 160	7.0
Suriname		133 391	255 400	274 600	100.0
	Inorgan. chem.	---	118 770	130 530	47.5
	Ores (bauxite)	96 887	49 860	47 600	17.5
	Rice	5	26 000	15 548	5.7
	Fresh fruit, nuts	2 206	3 400	4 128	1.5
Trinidad and Tobago		481 526	1 772 728	4 077 071	100.0
	Petroleum products	334 307	881 261	2 131 727	52.3
	Petroleum, crude	37 028	660 413	1 635 292	40.1

Source: United Nations, Monthly Bulletin of Statistics, March 1983, Vol. XXXVII, pp. XXVI-LVIII.

TABLE 3
ESTIMATES OF GROSS DOMESTIC PRODUCT,
IMPORTS AND EXPORTS FOR CARIBBEAN COUNTRIES
EXPRESSED IN MILLIONS OF UNITED STATES DOLLARS, 1980

COUNTRIES	GROSS DOMESTIC PRODUCT	IMPORTS C.I.F.	EXPORTS F.O.B.
Antigua and Barbuda	83	70	90
Bahamas	1 169	7 014	6 546
Barbados	825	529	227
Belize	186	150	130
Cuba <u>1/</u>	---	---	---
Dominica	49	40	21
Dominican Republic	6 576	1 498	962
Grenada	60	50	22
Guyana	591	365	389
Haiti <u>2/</u>	1 419	378	226
Jamaica	2 656	1 178	965
St. Christopher and Nevis	59	20	25
St. Lucia	113	100	37
St. Vincent and the Grenadines	62	40	17
Suriname	1 053	504	514
Trinidad and Tobago	5 981	3 178	4 077
TOTALS	20 882	15 114	14 248

Sources: UNCTAD, Handbook of international trade and development statistics, 1983, New York 1984, pp. 5, 15 and 434-435.

1/ --- indicates that the information was not available.

2/ Year ending 30 September.

TABLE 4
ESTIMATES OF GROSS DOMESTIC PRODUCT,
IMPORTS AND EXPORTS FOR LATIN AMERICA COUNTRIES
EXPRESSED IN MILLIONS OF UNITED STATES DOLLARS, 1980

COUNTRIES	GROSS DOMESTIC PRODUCT	IMPORTS C.I.F.	EXPORTS F.O.B.
Argentina	153 331	10 544	8 016
Bolivia	5 507	833	1 033
Brazil	248 592	25 001	20 131
Chile	28 081	5 124	4 671
Colombia	33 508	4 821	4 084
Costa Rica	4 847	1 524	1 002
Ecuador	11 368	2 253	2 481
El Salvador	3 388	976	720
Guatemala	7 853	1 598	1 520
Honduras	2 498	1 009	829
Mexico	186 331	19 416	15 301
Nicaragua	1 975	883	448
Panama	3 391	1 449	351
Paraguay	4 448	517	313
Peru	19 239	3 062	3 898
Uruguay	10 272	1 727	1 059
Venezuela	60 021	10 671	20 950
TOTALS	784 650	91 408	86 807

Sources: UNCTAD, Handbook of international trade and development statistics, 1983, New York 1984, pp. 5, 15 and 434-435.

TABLE 5
VESSELS ENGAGED IN CARIBBEAN SHORT-SEA SERVICES

Short-sea lines	vessels	type	<u>1</u> / TEU	cranes
Alcoa Steamship Company Inc.	charters	SC	?	?
Monthly service between the Dominican Republic, Jamaica, Suriname and US Gulf -Mobile and New Orleans.				
American Caribe Line	Tug-and-barge	RR	600	-
	Tug-and-barge	RR	600	-
	Tug-and-barge	RR	600	-
Weekly service with flat-deck barges between Jacksonville, Florida, USA, and San Juan, Puerto Rico.				
Antilles and Amazon Line	?	?	1 500	?
Service between US East coast, Antigua and Barbuda, Brazil, Dominica, Guyana, St. Lucia, St. Vincent and the Grenadines, and Suriname.				
Agent: Gulf and Eastern Steamship and Chartering Corporation				
Arvida Shipping Ltd.	Olivia	conbulk	670	?
	Henrique Leal	conbulk	670	?
	Alison	conbulk	670	?
	?	conbulk	670	?
	Diana	-	-	?
	Joana	-	-	?
Space charter arrangement with Neutmar of Brazil. Service every 18 days from Montreal to Barbados and Trinidad and Tobago, with feeder connections to other Caribbean destinations.				
Bermuda Container Ln.	Hustler Ebro <u>*</u> /	FC	124	?
	Oleander	FC	190	?
Weekly service between Port Elizabeth (NJ) and Jacksonville (FLA), and Hamilton, Bermuda.				
Bermuth	?	?	?	?

Sources: Containerisation International Yearbook 1984, pp. 225-298; Fairplay International Shipping Weekly, 1983-1985; Seatrade, 1983-1985; and information provided by individual shipping lines.

1/ FC indicates fully cellular tonnage; SC indicates semi-container or multi-purpose tonnage; CC indicates converted to cellular tonnage; and RR indicates roll-on/roll-off tonnage.

*/ Indicates a chartered vessel.

TABLE 5 (Continued)
VESSELS ENGAGED IN CARIBBEAN SHORT-SEA SERVICES

Short-sea lines	vessels	type <u>1</u> /	TEU	cranes
Box Caribbean Lines	Carmen del Mar	FC	200	?
	Kathleen	FC	212	?
	Luisa del Carib.	FC	182	?
Service every two weeks between East coast of North America and the Dominican Republic, Haiti, Jamaica and Trinidad and Tobago.				
Calipso Line	?	?	?	?
CIANAWE, C. por A.	?	?	?	?
Co-ordinated Caribbean Transport (CCT)	Ambassador	RR	400	-
	Senator	RR	400	-
	Lionheart	RR	240	-
	Mar Caribe	RR	112	-
	Stena Mariner <u>*/</u>	RR	108	-
	Nestor <u>*/</u>	RR	170	-
	Ugland Carrier <u>*/</u>	RR	40	-
Weekly service between Aruba, Curacao, the Dominican Republic, Haiti, Jamaica, Miami (USA) and Venezuela.				
Concorde Nopal Line	Flex America <u>*/</u>	FC	240	yes
	Condorde Caribe <u>*/</u>	FC	500	yes
	Condorde Antil. <u>*/</u>	FC	500	yes
	John M <u>*/</u>	FC	564	yes
Service every 10 days between East and Gulf coasts of North America and Antigua and Barbuda, the Dominican Republic, Guyana, Haiti, Martinique, St. Lucia and Trinidad and Tobago.				
Evergreen Line	Ever Better	FC	510	no
	Ever Bridge	FC	510	no
	Ever Breeze	FC	510	no
Weekly service between Aruba, Curacao, the Dominican Republic, Panama, Puerto Rico and Houston (USA).				

Sources: Containerisation International Yearbook 1984, pp. 225-298; Fairplay International Shipping Weekly, 1983-1985; Seatrade, 1983-1985; and information provided by individual shipping lines.

1/ FC indicates fully cellular tonnage; SC indicates semi-container or multi-purpose tonnage; CC indicates converted to cellular tonnage; and RR indicates roll-on/roll-off tonnage.

*/ Indicates a chartered vessel.

TABLE 5 (Continued)
VESSELS ENGAGED IN CARIBBEAN SHORT-SEA SERVICES

Short-sea lines	vessels	type	1/ TEU	cranes
Flota Mercante Gran Centro Americana (FLOMERCA)	?	?	?	?
Hyde Shipping Corporation	Sun <u>*/</u> Tropic <u>*/</u> Traveller <u>*/</u> Clipper <u>*/</u> Intrepid <u>*/</u> Emanuell II <u>*/</u> Brac Express <u>*/</u>	FC FC FC FC FC FC FC	80 87 56 124 124 20 20	no no no no no no no
Weekly services from Miami (USA) to Costa Rica, Grand Cayman, Honduras and Jamaica, and every two weeks to Belize. The Emanuell II and Brac Express are utilised in a feeder service between Grand Cayman, Cayman Brac and possibly Jamaica.				
King Ocean Services	?	FC	180	?
	?	FC	180	?
Weekly service between Miami (USA) and Aruba, the Dominican Republic and Curacao. KOS has a connecting carrier agreement with Trans Freight Lines.				
Kirk Line	Kirk Express Morant Bay <u>*/</u>	RR RR	76 126	- -
Weekly service from Miami (USA) to Grand Cayman, Haiti and Jamaica.				
Lloyd Bermuda Line	Nedlloyd Bermuda	FC	116	?
Service between New York and Bermuda with chartered vessel.				
Marine Bulk Carriers	?	?	?	?
Naviera Multinacional del Caribe (NAMUCAR)	?	?	?	?

Sources: Containerisation International Yearbook 1984, pp. 225-298; Fairplay International Shipping Weekly, 1983-1985; Seatrade, 1983-1985; and information provided by individual shipping lines.

1/ FC indicates fully cellular tonnage; SC indicates semi-container or multi-purpose tonnage; CC indicates converted to cellular tonnage; and RR indicates roll-on/roll-off tonnage.

*/ Indicates a chartered vessel.

TABLE 5 (Continued)
VESSELS ENGAGED IN CARIBBEAN SHORT-SEA SERVICES

Short-sea lines	vessels	type	1/ TEU	cranes
Navieras de Puerto Rico	Arecibo	CC	1 172	?
	Borinquen	CC	1 172	?
	San Juan	CC	1 172	?
	Balder Elms <u>*/</u>	RR	91	-
	Bayamon	RR	428	-
	Caguas	RR	673	-
	Fortaleza	RR	428	-
	Mercandian Tdr <u>*/</u>	RR	418	-
	Ponce	RR	670	-
Puerto Rico	RR	498	-	

Main-line services are weekly between Puerto Rico and (1) US East coast - Baltimore, Charleston, Jacksonville, New York and Miami, and (2) US Gulf coast - Houston and New Orleans. Feeder services twice weekly between Puerto Rico and the Leeward Islands - Antigua and Barbuda, the Dominican Republic, Guadeloupe, Haiti, Montserrat, St. Barthelemy, St. Christopher and Nevis, and St. Martin. Navieras also offers a weekly feeder service from Puerto Rico to Trinidad and Tobago, and three times per week to St. Croix, St. Thomas and the U.S. Virgin Islands.

Republic Marine Lines ? FC 126 ?
Service every 12 days between the Dominican Republic and the Port of Salem, New Jersey, USA.

Samba ? ? ? ?
Caribmar Shipping is the general agent for Samba. Weekly between West Palm Beach (USA) and Jamaica.

Sources: Containerisation International Yearbook 1984, pp. 225-298; Fairplay International Shipping Weekly, 1983-1985; Seatrade, 1983-1985; and information provided by individual shipping lines.

1/ FC indicates fully cellular tonnage; SC indicates semi-container or multi-purpose tonnage; CC indicates converted to cellular tonnage; and RR indicates roll-on/roll-off tonnage.

*/ Indicates a chartered vessel.

TABLE 5 (Continued)
VESSELS ENGAGED IN CARIBBEAN SHORT-SEA SERVICES

Short-sea lines	vessels	type	1/ TEU	cranes
Saguenay Shipping Ltd.	Andros Island [*] /	SC	352	?
	Sunarawak [*] /	SC	204	?
	Sunguajira [*] /	SC	204	?
	Sunmaria [*] /	SC	204	?
	Suntairona [*] /	SC	352	?

Service every two weeks between Canadian East coast ports (Montreal, Halifax and Saint John) and Miami (USA), Barbados, Guyana, Suriname, Trinidad and Tobago, Tortola and the Windward Islands.

Sea-Land Service	?	FC	299	no
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Service every five days between Port Everglades (USA) and Trinidad and Tobago. Weekly service between the Dominican Republic, Puerto Rico and Port Elizabeth (USA). Weekly service between Puerto Rico and US Gulf -Port Everglades and Jacksonville. Weekly service between Guatemala, Honduras, Jamaica and the US Gulf -New Orleans and Port Everglades. Weekly service between Jamaica and Port Elizabeth (USA). Weekly service between Jamaica and US Gulf -Jacksonville and Port Everglades. Feeder services between Puerto Rico, Aruba, Curacao, Costa Rica, Haiti, Panama and Trinidad and Tobago; and between Guatemala, Honduras and Jamaica.

Shipping Corporation of Trinidad and Tobago (SCOTT)	Godewind [*] /	FC	450	yes
	Heinrich S [*] /	FC	450	yes

Service every 10/12 days between US East coast and Trinidad and Tobago. The charters on these vessels terminated 31 December 1984 and were not to be renewed. As SCOTT plans to charter two other vessels between 112-150 TEUs, all calculations are based on the charter of two 150 TEU vessels.

Sources: Containerisation International Yearbook 1984, pp. 225-298; Fairplay International Shipping Weekly, 1983-1985; Seatrade, 1983-1985; and information provided by individual shipping lines.

1/ FC indicates fully cellular tonnage; SC indicates semi-container or multi-purpose tonnage; CC indicates converted to cellular tonnage; and RR indicates roll-on/roll-off tonnage.

^{*}/ Indicates a chartered vessel.

TABLE 5 (Continued)
VESSELS ENGAGED IN CARIBBEAN SHORT-SEA SERVICES

Short-sea lines	vessels	type	<u>1</u> / TEU	cranes
TEC	?	?	?	?
Trailer Marine Transport	Barge 1	RR	576	-
	Barge 2	RR	576	-
	Barge 3	RR	576	-
	Barge 4	RR	576	-
	Barge 5	RR	576	-
	Barge 6	RR	752	-
	Barge 7	RR	752	-
	Barge 8	RR	752	-
	Barge 9	RR	752	-

Weekly service between Philadelphia (USA) and Puerto Rico.
Twice weekly service between Puerto Rico and the US -Miami, Jacksonville, Mobile and Lake Charles. The first five barges are to be lengthened during 1985 with capacity increasing to 512, 40- and 45-foot trailers.

Trans Caribbean Shipping Cavalier I ? ? ?
Three times-a-week service between Port Everglades (USA) and Nassau, the Bahamas.

Sources: Containerisation International Yearbook 1984, pp. 225-298; Fairplay International Shipping Weekly, 1983-1985; Seatrade, 1983-1985; and information provided by individual shipping lines.

1/ FC indicates fully cellular tonnage; SC indicates semi-container or multi-purpose tonnage; CC indicates converted to cellular tonnage; and RR indicates roll-on/roll-off tonnage.

* / Indicates a chartered vessel.

TABLE 5 (Continued)
VESSELS ENGAGED IN CARIBBEAN SHORT-SEA SERVICES

Short-sea lines	vessels	type	1/ TEU	cranes
Tropical Shipping Company	Tropic Jade	RR	176	-
	Tropic Key	RR	176	-
	Tropic Lure	RR	176	-
	Tropic Mist	RR	176	-
	Tropic Isle	RR	60	-
	Tropic Day	RR	60	-
	Tropic Flier	RR	60	-
	Tropic Eve	RR	114	-
	Tropic Gale	RR	24	-
	Trip Charter */	FC	200	no

Services five times-a-week from West Palm Beach (USA) to the Bahamas (Nassau and Freeport). Four times-a-week service from West Palm Beach (USA) to St. Thomas. TSC utilises St. Thomas as its principal transshipment base and provides weekly services with its own vessels from St. Thomas to Antigua, Barbados, St. Barthelemy, St. Christopher, St. Lucia and St. Martin, and twice weekly transshipment services from St. Thomas to St. Croix. TSC also offers weekly transshipment services (via Geest Line) from St. Lucia to Dominica, Grenada and St. Vincent and the Grenadines.

Vencaribe	Mercandian Gigant	RR	554	-
West European Container Line (WEC)	Chartered	FC	350	?
	Chartered	FC	350	?

Service every two weeks between St. Johns/NY and Barbados, Haiti, Jamaica and Trinidad and Tobago.

Sources: Containerisation International Yearbook 1984, pp. 225-298; Fairplay International Shipping Weekly, 1983-1985; Seatrade, 1983-1985; and information provided by individual shipping lines.

1/ FC indicates fully cellular tonnage; SC indicates semi-container or multi-purpose tonnage; CC indicates converted to cellular tonnage; and RR indicates roll-on/roll-off tonnage.

*/ Indicates a chartered vessel.

TABLE 5 (Continued)
VESSELS ENGAGED IN CARIBBEAN SHORT-SEA SERVICES

Short-sea lines	vessels	type	1/ TEU	cranes
West Indies Shipping Corporation (WISCO)	CARICOM Express	SC	113	yes
	CARICOM Entprse.	SC	96	yes
	CARICOM Venture	SC	113	yes
	M.V. Eve */	FC	153	yes
<p>Service every two weeks with CARICOMs Express and Venture between Antigua and Barbuda, Barbados, Dominica, Grenada, Jamaica, St. Lucia, St. Vincent and the Grenadines and Miami (USA). On inducement calls are also made at Montserrat, and St. Christopher and Nevis. The CARICOM Enterprise provides a monthly service between Barbados, Dominica, Guyana, Jamaica, Montserrat, Puerto Rico, St. Christopher and Nevis, St. Lucia, and Trinidad and Tobago. The M.V. Eve provides a service every two weeks between the Dominican Republic, Trinidad and Tobago and Miami (USA).</p>				
Zim Israel Navigation Co.	Zim Kingston	FC	350	yes
	Zim Caribbean	SC	377	?
<p>A 10 day service between the Dominican Republic, Haiti, Jamaica, Puerto Rico and the USA (Houston and Miami).</p>				

Sources: Containerisation International Yearbook 1984, pp. 225-298; Fairplay International Shipping Weekly, 1983-1985; Seatrade, 1983-1985; and information provided by individual shipping lines.

1/ FC indicates fully cellular tonnage; SC indicates semi-container or multi-purpose tonnage; CC indicates converted to cellular tonnage; and RR indicates roll-on/roll-off tonnage.

*/ Indicates a chartered vessel.

TABLE 6
GENERAL CARGOES */ IMPORTED BY CARIBBEAN COUNTRIES
ACCORDING TO ORIGINS

Origins	Quantities in metric tons				Percentage breakdown 1980
	1977	1978	1979	1980	
World Total	5 455 506	5 937 879	5 924 534	5 775 931	100.0
Short-sea Total	2 239 514	2 613 087	2 993 097	2 802 112	48.6
Great Lks.	6 336	4 908	26	3 388	0.1
Can. Atla.	319 210	433 377	599 897	538 275	9.3
US N. Atla.	195 105	174 837	141 600	125 170	2.2
US S. Atla.	526 797	589 879	645 050	702 076	12.2
US Gulf	780 257	798 205	861 666	974 737	16.9
Cen. Am.	129 111	101 276	34 793	30 449	0.5
N. Coast. S. Am.	233 357	463 171	662 280	377 360	6.5
E. Coast. S. Am.	49 341	47 434	47 785	50 657	0.9
Caribbean Inter-island Total	275 657	266 907	338 575	306 799	5.3
Deep-sea Europe Total	2 754 694	2 860 498	2 436 033	2 434 377	42.1
British Is.	199 111	225 389	208 627	181 458	3.1
N. Europe	428 237	375 152	366 142	367 071	6.4
Ctpld Baltic	29 284	30 001	1 308 949	1 221 060	21.1
Atlan Europe	470 524	454 714	410 261	501 630	8.7
Med Europe	330 852	189 419	140 225	162 975	2.8
Ctpld BkSea	1 296 686	1 585 823	1 829	183	-
Others	185 641	197 387	156 829	232 643	4.0

Source: United Nations Statistical Office, Commodity Trade (By Sea) Statistics, 1980 Maritime Transport Study, 1983, (ST/ESA/STAT/SER.D/77/78/79/80), pp. 161-164.

*/ Dry cargoes include coffee, tea, non-refrigerated foods, beverages, tobacco, textiles, crude rubber, leather, oils, fats, chemicals, paper, machinery (appliances) and other manufactured goods.

TABLE 7
REFRIGERATED FOODS ^{*}/ IMPORTED BY CARIBBEAN COUNTRIES
ACCORDING TO ORIGINS

Origins	Quantities in metric tons				Percentage breakdown 1980
	1977	1978	1979	1980	
World Total	423 625	385 470	446 553	495 493	100.0
Short-sea Total	144 717	146 326	197 814	215 188	43.5
Greek Iks.	10	10	-	-	-
Can. Atla.	19 905	22 993	49 167	58 454	11.8
US N. Atla.	29 319	21 173	22 917	21 639	4.4
US S. Atla.	62 300	67 320	79 153	98 531	19.9
US Gulf	3 011	5 434	5 932	5 059	1.0
Can. Am.	4 542	3 308	2 471	1 066	0.2
N. Coast. S. Am.	24 146	23 496	35 663	28 547	5.8
E. Coast. S. Am.	1 466	2 592	2 511	1 892	0.4
Caribbean Inter-island Total	6 198	7 977	7 195	13 482	2.7
Deep-sea Europe Total	202 394	188 178	190 642	237 947	48.0
British Is.	3 871	9 412	10 315	21 023	4.2
N. Europe	58 664	55 636	40 395	59 768	12.1
Ctpld Baltic	-	-	76 639	71 384	14.4
Atlan Europe	56 117	49 276	61 763	84 005	17.0
Med Europe	3 341	4 430	1 530	1 767	0.3
Ctpld BkSea	80 401	69 424	-	-	-
Others	70 316	42 989	50 902	28 876	5.8

Source: United Nations Statistical Office, Commodity Trade (By Sea) Statistics, 1980 Maritime Transport Study, 1983, (ST/ESA/STAT/SER.D/77/78/79/80), pp. 151-154.

^{*}/ Meat, milk, cream, butter, cheese, eggs, fish, fruits and vegetables.

TABLE 8
GENERAL CARGOES */ EXPORTED BY CARIBBEAN COUNTRIES
ACCORDING TO DESTINATIONS

Destinations	Quantities in metric tons				Percentage breakdown 1980
	1977	1978	1979	1980	
World Total	8 649 602	8 997 721	4 271 242	3 713 612	100.0
Short-sea Total	5 292 837	5 918 945	2 380 174	1 839 862	49.5
Great Lks.	256 120	326 038	764	24	-
Can. Atla.	17 943	7 714	57 810	43 353	1.2
US N. Atla.	1 248 728	1 002 069	724 001	505 577	13.6
US S. Atla.	2 837 912	3 358 080	801 950	613 726	16.5
US Gulf	571 871	579 886	432 166	335 543	9.0
Cen. Am.	107 556	147 501	130 708	123 163	3.3
N. Coast. S. Am.	168 044	400 926	130 462	140 653	3.8
E. Coast. S. Am.	84 663	96 731	102 363	77 823	2.1
Caribbean Inter-island Total	275 657	266 907	338 575	306 799	8.3
Deep-sea Europe Total	1 937 778	2 240 886	1 307 901	1 277 315	34.4
British Is.	635 452	736 626	402 609	446 106	12.1
N. Europe	850 065	827 125	333 647	434 637	11.7
Ctpld Baltic	44 348	105 962	16 002	15 023	0.4
Atlan Europe	81 891	106 155	74 156	108 932	2.9
Med. Europe	74 717	213 713	218 419	148 689	4.0
Ctpld BkSea	251 305	251 305	263 068	123 928	3.3
Others	1 143 330	570 983	244 592	289 636	7.8

Source: United Nations Statistical Office, Commodity Trade (By Sea) Statistics, 1980 Maritime Transport Study, 1983, (ST/ESA/STAT/SER.D/77/78/79/80), p. 164.

*/ Dry cargoes include coffee, tea, non-refrigerated foods, beverages, tobacco, textiles, crude rubber, leather, oils, fats, chemicals, paper, machinery (appliances) and other manufactured goods.

TABLE 9
 TYPES OF GENERAL CARGOES EXPORTED
 BY CARIBBEAN COUNTRIES

Commodities	Quantities in metric tons				Percentage breakdown	
	1977	1978	1979	1980	1980	
Coffee	92 259	81 181	68 794	61 605	1.7	
Tea and Mate	116	112	91	23	-	
Other foods	175 716	179 872	949 953	805 772	21.7	
Beverages	63 546	68 847	124 357	123 689	3.3	
Tobacco	44 100	53 723	60 074	26 866	0.7	
Crude rubber	3 378	6 167	6 801	6 388	0.2	
Textile fibres	3 844	6 581	2 904	2 681	0.1	
Other crude mat.	9 486	11 760	8 173	6 134	0.2	
Non-energy petro- leum prod.	5 182 279	4 721 470	1 631 481	1 288 557	34.7	
Oils and fats	2 491	6 113	23 027	23 061	0.6	
Chemicals	2 841 925	3 215 328	765 042	912 541	24.6	
Paper, etc.	13 116	19 162	37 675	23 170	0.6	
Textiles	6 147	8 886	12 182	12 415	0.3	
Machinery	10 057	65 274	25 192	19 459	0.5	
Other manuf.	201 142	553 245	555 496	401 251	10.8	
Totals	8 649 602	8 997 721	4 271 242	3 713 612	100.0	

Source: United Nations Statistical Office, Commodity Trade (By Sea) Statistics, 1980 Maritime Transport Study, 1983, (ST/ESA/STAT/SER.D/77/78/79/80), pp. 172-311.

TABLE 10
REFRIGERATED FOODS */ EXPORTED BY CARIBBEAN COUNTRIES
ACCORDING TO DESTINATIONS

Destinations	Quantities in metric tons				Percentage breakdown 1980
	1977	1978	1979	1980	
World Total	751 372	856 866	793 261	616 884	100.0
Short-sea Total	74 710	68 693	66 778	62 526	10.1
Great Lks.	-	-	-	-	-
Can. Atla.	7 311	4 362	3 877	2 675	0.4
US N. Atla.	9 108	6 043	6 881	6 673	1.1
US S. Atla.	39 846	42 849	47 784	47 342	7.7
US Gulf	87	211	1 708	149	-
Gen. Am.	17 550	14 682	6 391	5 507	0.9
N. Coast. S. Am.	808	366	137	180	-
E. Coast. S. Am.	-	-	-	-	-
Caribbean Inter-island Total	6 198	7 977	7 195	13 482	2.2
Deep-sea Europe Total	659 633	775 964	683 761	487 557	79.0
British Is.	191 586	212 608	204 576	112 563	18.3
N. Europe	14 542	12 446	8 113	8 792	1.4
Ctpld Baltic	73 516	108 959	206 622	219 796	35.6
Atlan Europe	291 696	320 430	214 498	130 821	21.2
Med. Europe	60 697	73 580	49 912	15 585	2.5
Ctpld BkSea	27 596	47 941	-	-	-
Others	10 831	4 232	35 527	53 319	8.7

Source: United Nations Statistical Office, Commodity Trade (By Sea) Statistics, 1980 Maritime Transport Study, 1983, (ST/ESA/STAT/SER.D/77/78/79/80), p. 153.

*/ Meat, milk, cream, butter, cheese, eggs, fish, fruits and vegetables.

NOTES TO STATISTICAL TABLES 6-10

<u>COASTAL AREAS</u>	<u>DESCRIPTION</u>
1. Great Lakes	Great Lakes and upper St. Lawrence of North American river ports above Montreal.
2. Canada Atlantic	St. Lawrence River ports, Montreal and below; Greenland, St. Pierre and Miquelon.
3. US North Atlantic	From Maine to Virginia, inclusive.
4. US South Atlantic	From North Carolina to Miami, Florida, inclusive, and Puerto Rico.
5. US Gulf	From Key West, Florida, to Texas, inclusive.
6. Central America	From coasts of Mexico to that of Panama, inclusive.
7. W.Coast of S.America	From Caribbean Colombia to French Guiana, inclusive.
8. E.Coast of S.America	Coasts of Argentina, Brazil and Uruguay and the nearby islands.
9. Caribbean Islands	All the Caribbean Islands and Bermuda, excluding Puerto Rico.
10. British Isles	U.K.; Ireland; Iceland and Faeroe Island.
11. Northern Europe	Belgium; Netherlands; Germany, F.R.; Denmark; Norway; Sweden and Finland.
12. Ctpld. Baltic	USSR; Poland and German Dem. Rep.
13. Atlantic Europe	French Atlantic coast; Spanish Northern coast and Portugal.
14. Mediterranean Europe	From Spanish south coast, including Canary Islands, to that of Greece, inclusive, and Malta.
15. Ctpld. Black Sea	Bulgaria, Romania and USSR.

TABLE 11
 GENERAL CARGOES 1/ TRANSPORTED BY WISCO
 ACCORDING TO COUNTRY OF ORIGIN, 1980-1983

Country of origin	Years				Percentage breakdown for 1983
	1980	1981	1982	1983	
Totals	138 292	165 281	129 760	167 009	100.0
Antigua and Barbuda	3 839	2 104	2 881	6 393	3.8
Barbados	10 522	10 735	6 020	9 241	5.5
Dominica	2 351	5 362	7 478	6 795	4.1
Dom.Rep.	-	-	-	3 206 <u>2/</u>	1.9
Grenada	181	1 001	387	158	0.1
Guadeloupe	-	-	-	44 <u>2/</u>	-
Guyana	41 391	44 741	13 331	10 490	6.3
Jamaica	44 889	40 952	30 171	38 813	23.3
Montserrat	102	197	129	200	0.1
Puerto Rico	-	5 623 <u>2/</u>	5 445	3 925	2.4
St. Christopher and Nevis	28	19	213	342	0.2
St. Lucia	2 696	2 990	4 592	5 181	3.1
St. Vincent and the Grenadines	1 346	34	196	83	-
Tortola	0 <u>3/</u>	-	-	0	-
Trinidad and Tobago	29 139	27 903	25 301	16 386	9.8
Miami (USA)	1 808	23 620	33 616	65 752	39.4

Source: Based upon information provided by the West Indies Shipping Corporation.

1/ In freight tons -2 000 pounds or 40 cubic feet.

2/ Year service commenced.

3/ Service to Tortola was commenced in 1980, terminated in 1982 and recommenced in 1983.

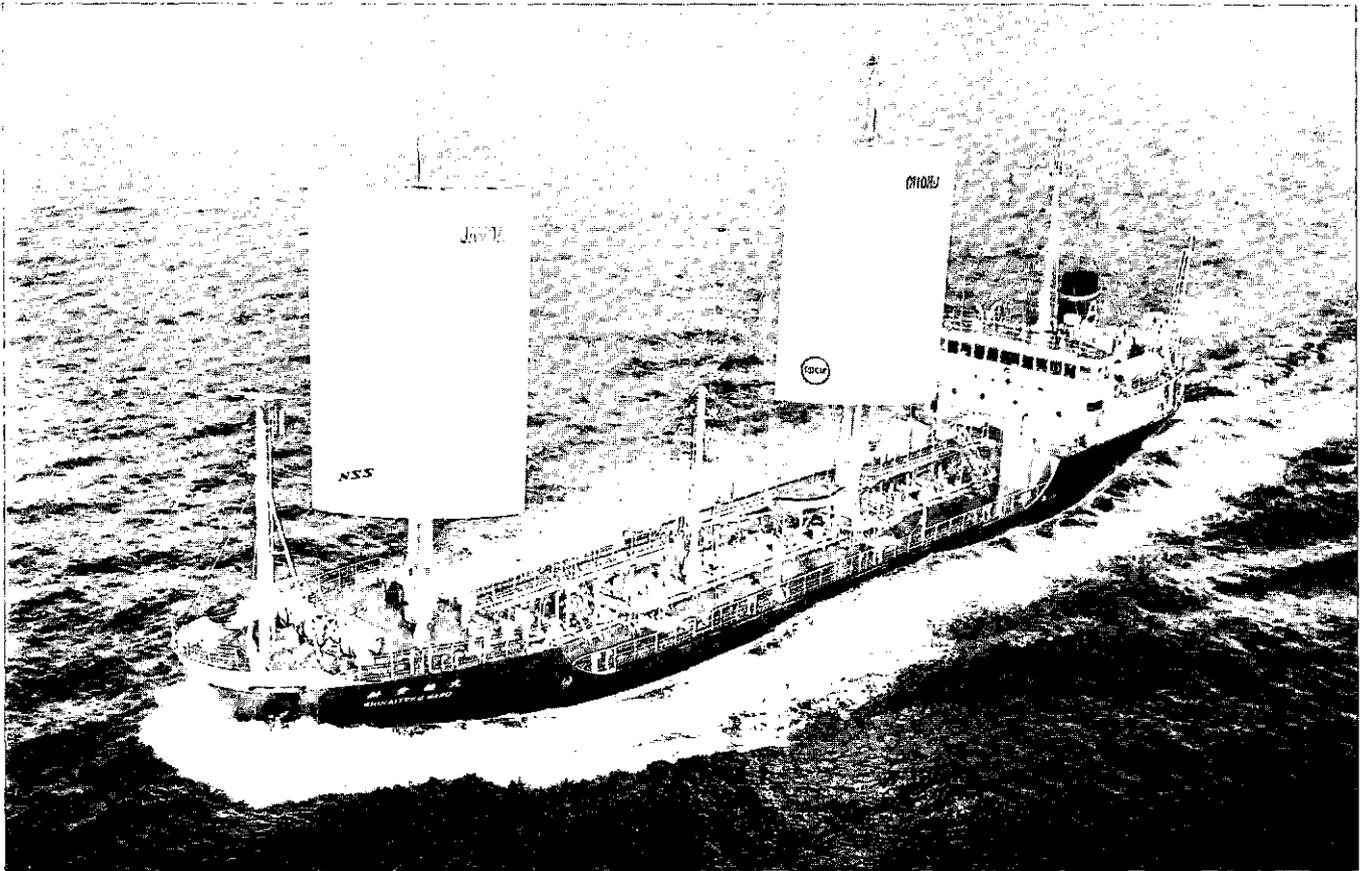
TABLE 12
SAIL-ASSISTED VESSELS CONSTRUCTED IN JAPAN

NAME OF VESSEL	COMPLETION DATE	VESSEL TYPE	DWT
SHORT-SEA VESSELS:			
Shin Aitoku Maru	August 1980	Tanker	1 600
Aitoku Maru	April 1982	Tanker	1 680
Nittoku Maru	June 1983	Chemical tanker	633
Senyo Maru	April 1983	Bulk carrier	2 081
Nissan Maru	May 1983	Bulk carrier	2 098
Diichi Kyoei Maru	May 1984	Tanker	4 894
Karubi Poteto Maru	October 1984	Bulk carrier	1 480
(name not avail.)	January 1985	Tanker	1 250
(name not avail.)	January 1985	Chemical tanker	390
DEEP-SEA VESSELS:			
Agua City	October 1984	Bulk carrier	30 900
Usuki Pioneer	November 1984	Bulk carrier	26 000

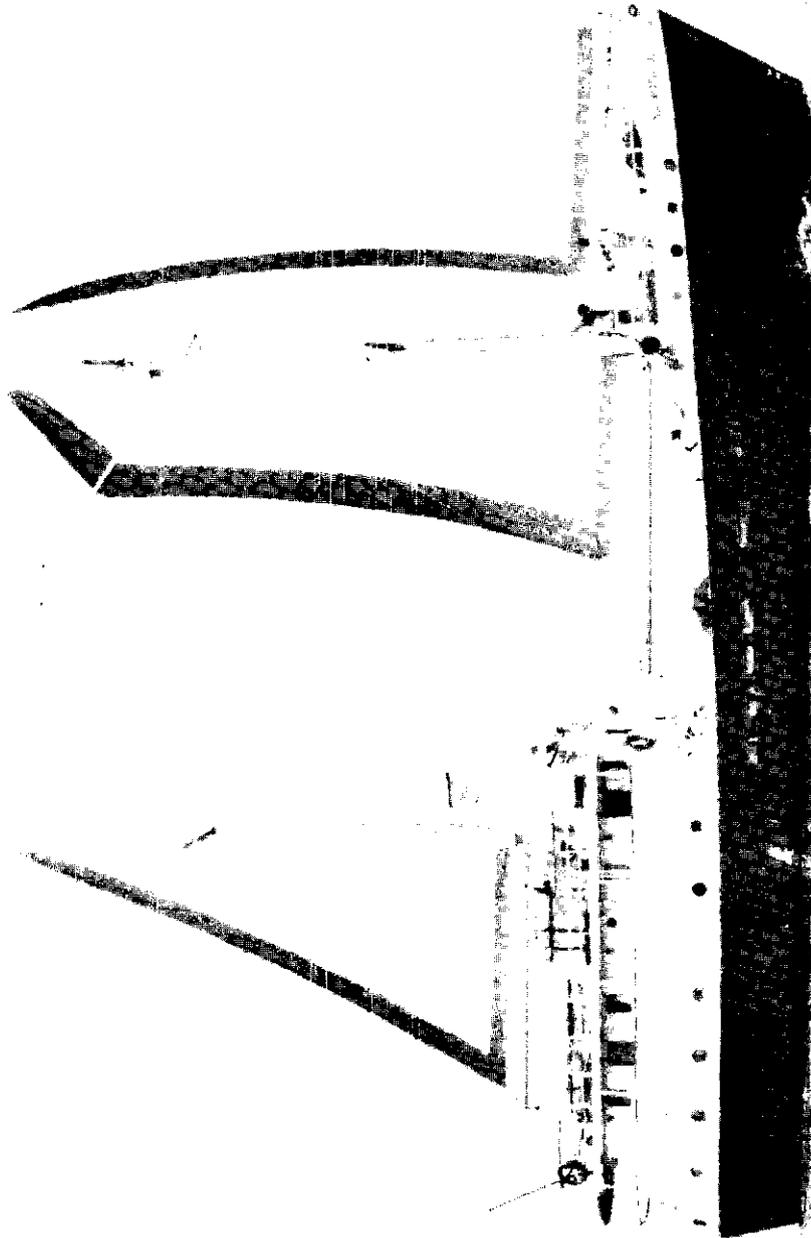
Source: Based upon information provided by Japan Marine Machinery Development Association (JAMDA).

ANNEX III

Vessels



Sail-assisted tanker "Shin Aituku Maru"



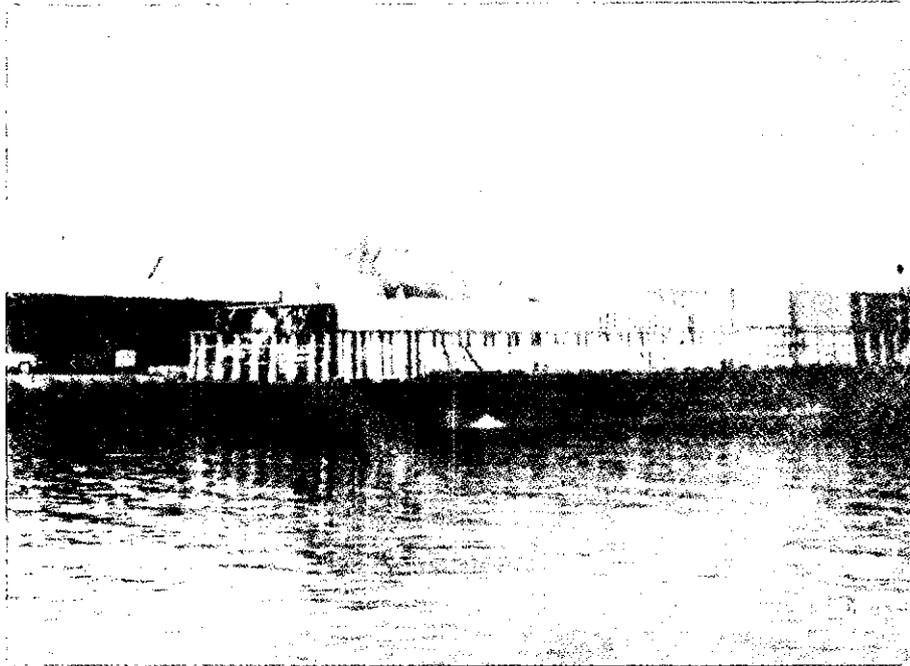
Sail-assisted inter-island cargo vessel "Na Mataisau"



Young Brothers tug with two towing winches



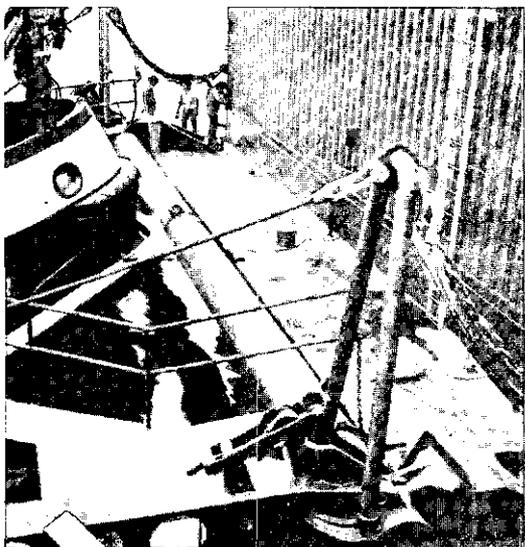
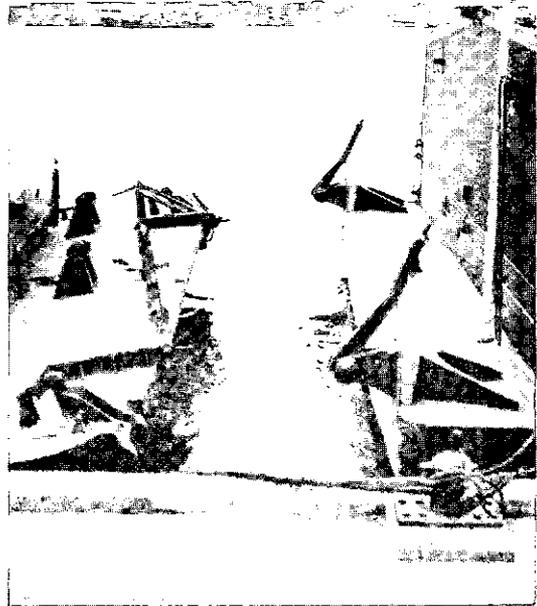
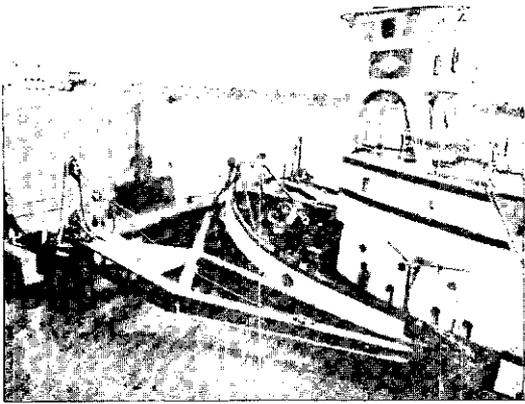
Double tow by Young Brothers using two towing winches



Young Brothers general-cargo flatdeck barges



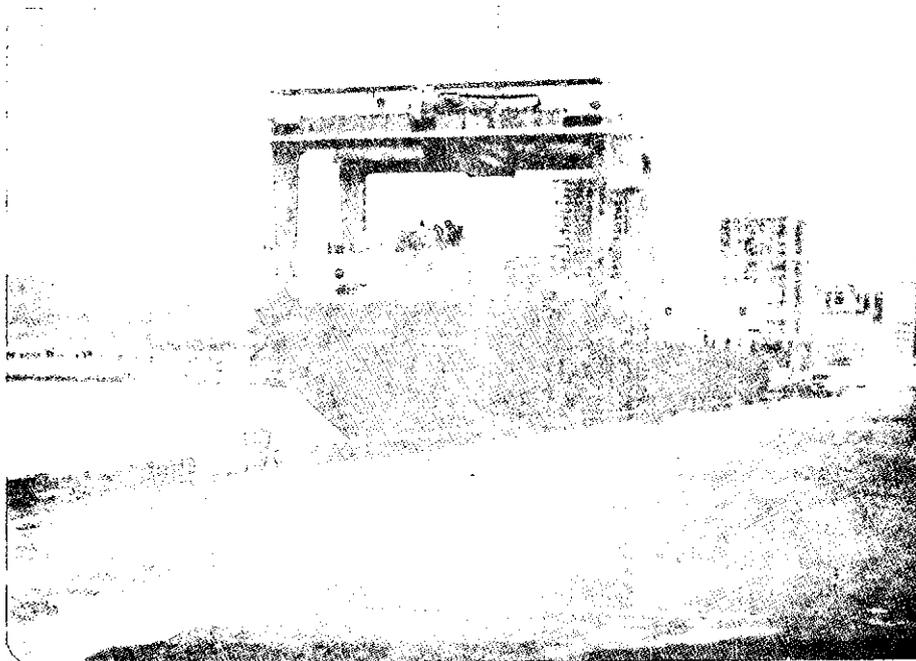
Young Brothers RO-RO container handling operations



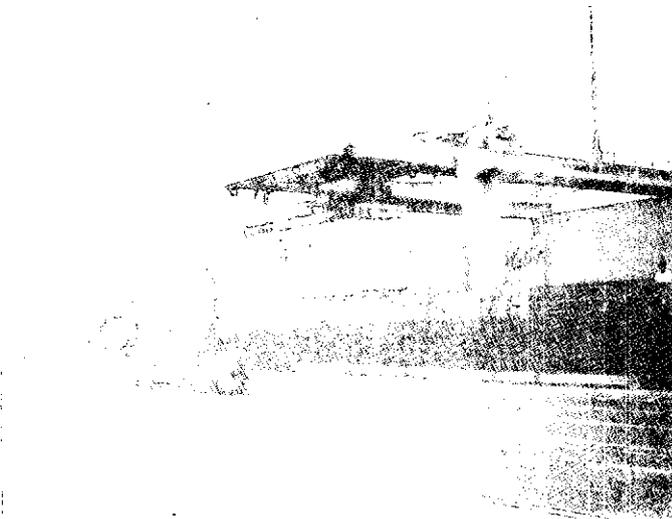
The San Miguel ULCHS is composed of a tug, a pushing frame attached to the bow of the tug and two barges.



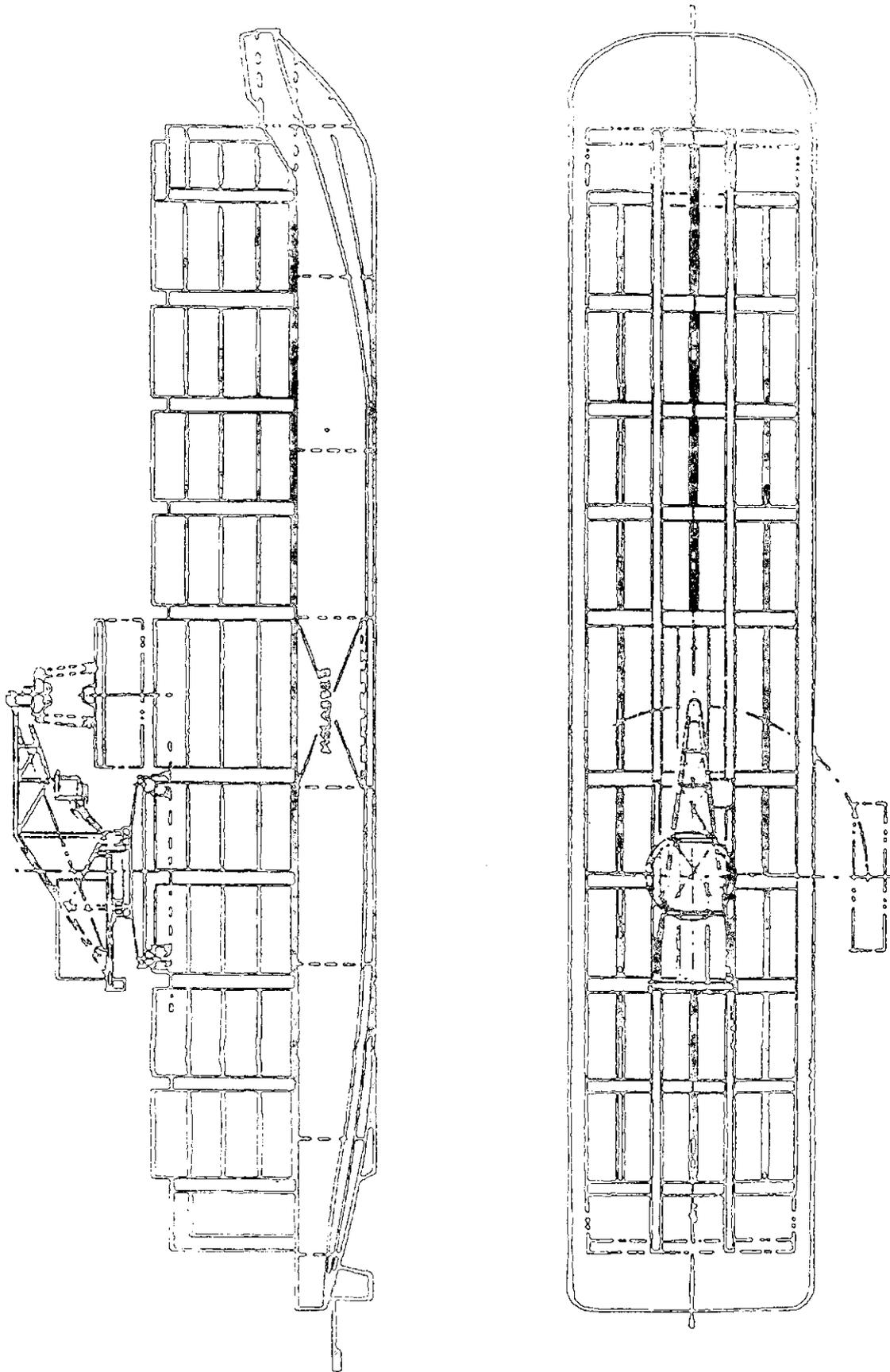
The M. V. Hawaiian
Princess



The M. V. Hawaiian
Princess



Gantry crane of the
M.V. Hawaiian Princess
discharging containers



The barges Haleakala and Manua Loa.



The Barge Haleakala

