An Assessment of Maritime Trade and Technology

October 1983

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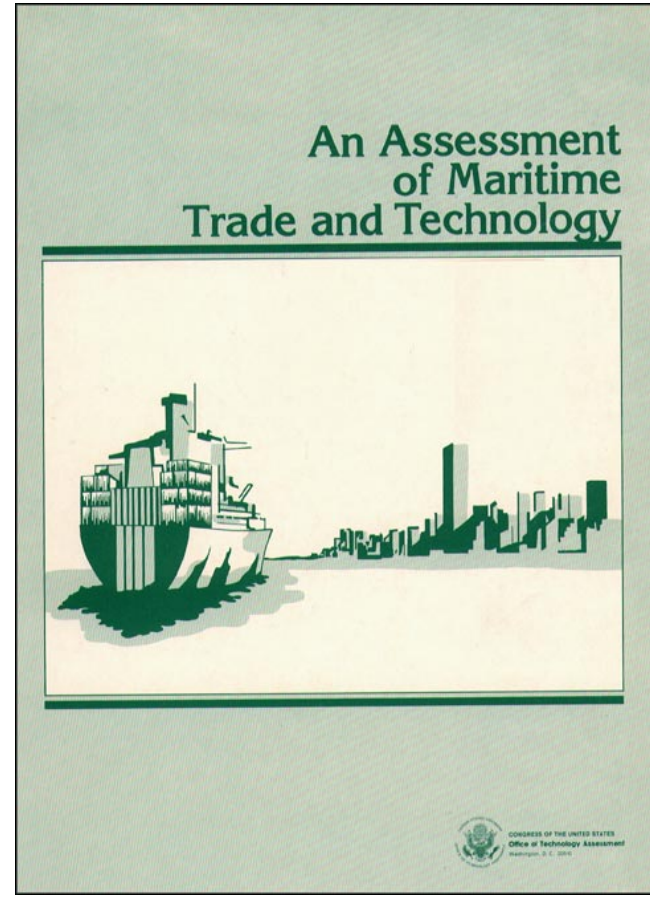

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Foreword

World trade now totaling nearly $2 trillion—a fourfold increase in the past two decades—has become a dominant factor in the economic performance of both industrialized and developing countries. The international shipping industry exists to serve that trade. In the past two decades its capacity has grown almost 250 percent, as well as changed in character in response to new trading conditions and cargo demand. However, both trade and shipping volume reached a plateau in recent years, and the industry's concerns about meeting demands for growth have been replaced by concerns about managing overcapacity and improving efficiency. Prospects for merchant shipping and shipbuilding therefore must be evaluated in terms of these changing trade patterns.

Because of their concerns about the viability and productivity of U.S. maritime industries as well as the future U.S. position in world trade, the House Committees on Merchant Marine and Fisheries and on Ways and Means jointly requested OTA to prepare this assessment. The committees asked OTA to undertake an analysis and forecast of long-term trends in global seaborne trade and maritime technology in relation to the U.S. maritime industry.

This assessment of Maritime Trade and Technology traces prevailing conditions and dominant trends that are important to the way the Federal Government assumes its responsibility for developing and implementing policy. The report contains analyses of the world outlook for trade, shipping, and shipbuilding. It identifies the extent of U. S. participation in these enterprises. It analyses the U.S. shipping and shipbuilding industries and identifies certain weak and strong attributes. It discusses trends in technology as well as in the policies of the United States and of our major trading partners.

OTA received valuable assistance in the preparation of this assessment from its advisory panel, which represented a cross section of U, S. maritime industry, labor, and user interests. The panel provided critiques and advice throughout the assessment and particularly during a detailed review of this final report. Other contributors to the assessment were contractors and individual consultants who provided valuable analyses of specific topics that were integrated into the overall report. OTA sincerely appreciates the quality of work and dedication of all contributors.

OTA has found that, although there are both healthy and troubled segments of the U.S. maritime industries, all sectors are becoming increasingly dependent on Federal policy decisions. And, with increasing competition in world trade as well as shipping services to carry that trade, intervention by all governments is more and more prevalent.

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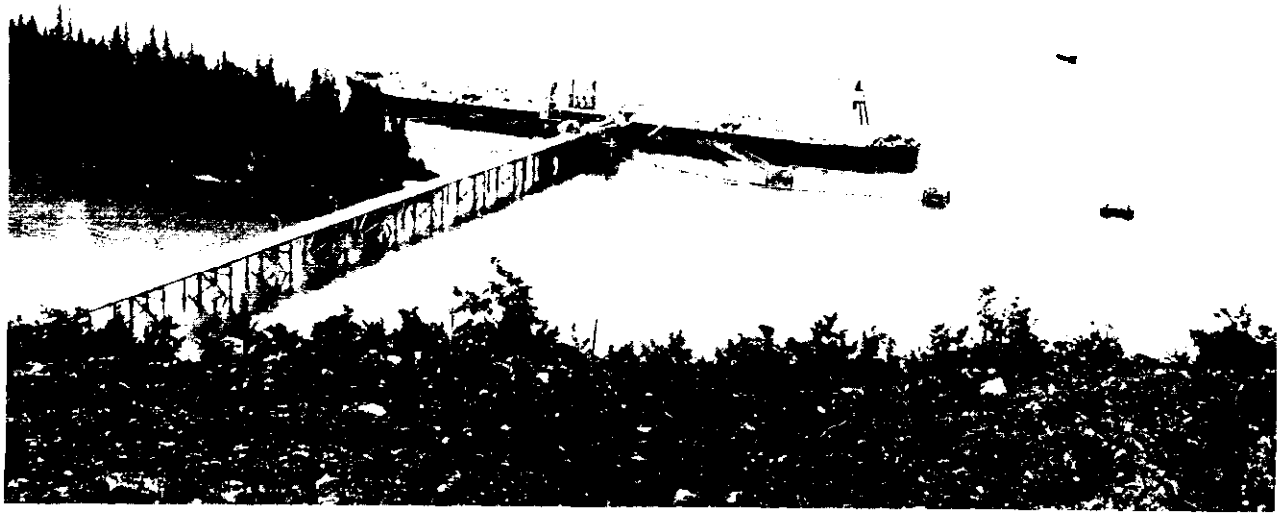

Photo credit. Atlantic Richfield

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INTRODUCTION

Almost all international trade in goods is transported by sea. Thus, ocean shipping plays a central and essential role in the world economy and in world trade. The United States is the world's largest trading nation, and international markets are increasingly important to U.S. industries. The United States annually engages in trade of $1 billion or more with each of 58 other countries worldwide.

The importance of world trade for the U.S. economy has increased dramatically in the past two decades. During the 1970's, the value of U.S. international trade more than doubled. Although the U.S. ratio of exports to gross national product is still below that of most other industrial countries, it stood in 1980 at 8.5 percent, nearly double the 4.4 percent of 1970. Some projections of that percentage reach 15 percent by 1990.

In 1982, world maritime trade in goods totaled 3.21 billion metric tons (tonnes), down from an all-time high of 3.77 billion tonnes in 1979. Maritime trade generally is divided into three broad categories: liquid-bulk, dry-bulk, and general cargo. Petroleum alone accounts for nearly all of the liquid-bulk trade and for almost half of the total world tonnage shipped. About one-fourth of world tonnage consists of dry-bulk commodities—principally mineral ores, coal, and grain. The remaining one-fourth consists of the variety of manufactured goods and consumer products called general cargo.

The two principal modes of ship operation are the liner mode, which serves the general cargo trade, and the bulk mode, which serves both the dry- and the liquid-bulk trades. The liner industry carries general cargo from port to port at fixed rates and on regular schedules. Modern container ships are typical of the vessels used in liner trade. The industry commonly operates within conferences—international groups of private liner companies that collectively agree on routes, schedules, rates, and other aspects of liner service. The bulk industry normally does not form conferences. It employs a variety of ships, usually on a time- or voyage-charter (rental) basis, to carry single, large-volume commodities (e. g., iron ore, grain, coal, crude oil) over fixed and sometimes long periods of time. The liner industry thus tends to manage competition among major companies while the bulk industry operates under much more open competition. The liner trades involve by far the largest portion of world trade when measured by dollar value, while the bulk trades account for the largest portion of volume or tonnage.

The world shipbuilding and operating industries, generally referred to as ' 'maritime industries, " recently have been through a major boom followed by a drastic downturn. Prospects for early recovery are uncertain. Not only has the recent world recession reduced total trade, but overbuilding of ships—particularly oil tankers—in the 1970's has added substantially to a huge surplus of shipping capacity in the 1980's. Scrapping supertankers has become more profitable than building them, and 25 to 50 percent of the world bulk fleet is laid-up or underemployed. The world's major shipbuilders in Europe and Japan are facing serious declines in demand and turning to their governments for support. The U.S. maritime industry has been affected by this slump in world trade but not to the same extent as many other major maritime nations—primarily because the U.S. maritime industry had already declined to a minor role among the larger nations.

A variety of rapid changes over the past few decades have transformed the maritime industries of the world and of the United States in particular. In just 25 years, the U.S.-flag merchant fleet has changed from the largest and most diverse in the world to a specialized fleet of modest size, aggressively engaged in the foreign liner trades and serving a variety of domestic bulk and liner trades. Many of the U.S. maritime business interests that

Photo credit: Hampton Roads Maritime Association

One of the world's largest coal export terminals at Norfolk, Va.

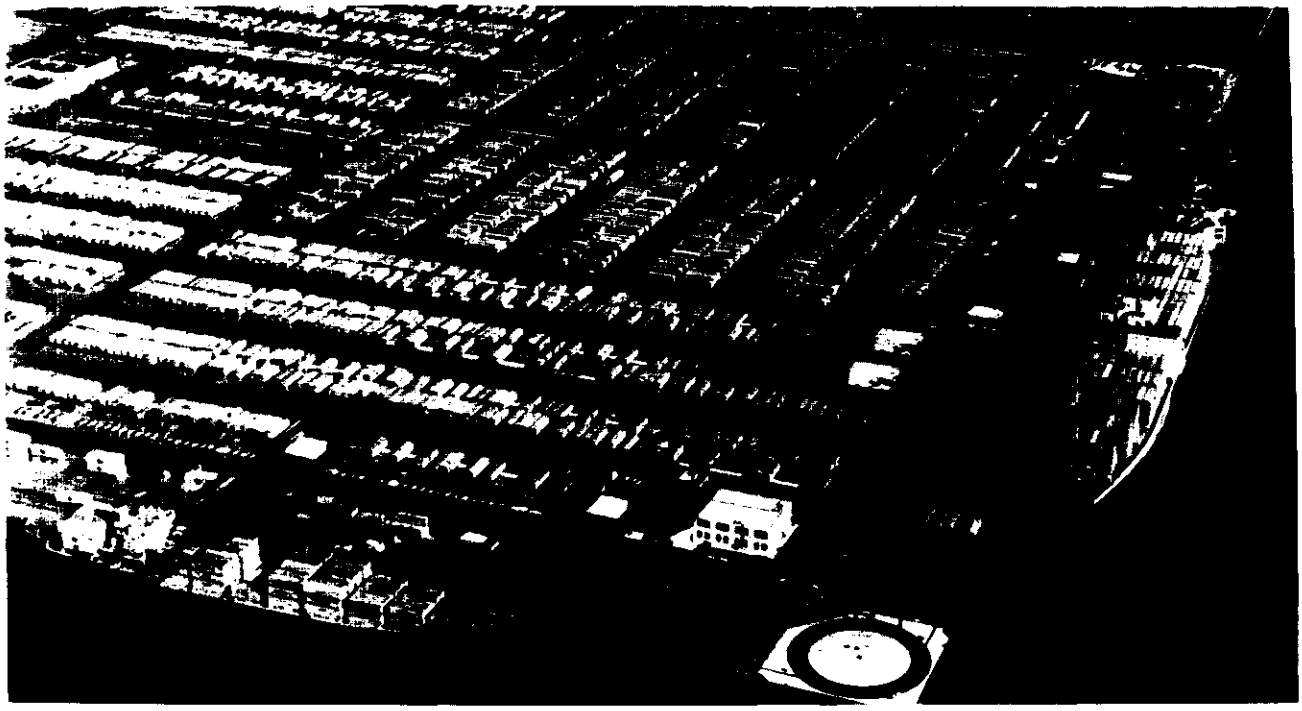


Photo credit: Sea-Land Industries

The world's largest privately operated containership terminal at Elizabeth, N.J., and a model for port planners the world over

were dominant in U.S.-flag merchant shipping in 1950 are now owners of huge bulk fleets registered in Liberia and Panama. These fleets (known as "U.S.-controlled, foreign-flag' fleets) now carry practically all of U.S. petroleum imports and sizable proportions of our exports of coal, grain, and other key commodities. U.S. shipyards, which built virtually the entire world's merchant fleet in existence following World War II, now rarely build merchant ships but are world leaders in complex warship and offshore oil-vessel construction. Japan and Korea, presently the largest commercial shipbuilding nations, have taken shipbuilding production systems that were introduced in U.S. yards during World War II, and by combining these with modern assembly and manufacturing technologies and lower wages, have gained a sizable productivity and competitive advantage in merchant ship construction.

Changes in the maritime industries have been accompanied by international political changes that seem to be having a significant impact on the management and economics of international shipping and shipbuilding. In recent years, there has been significantly more governmental control of trade and access to cargo than at any time in the past several decades. Of major importance is the implementation of a multinational regime to allocate liner cargoes among the fleets of importing and exporting nations, passed under the aegis of the United Nations Conference on Trade and Development (UNCTAD).

The nature of international marine transportation itself also is changing, as evidenced by the concentration of businesses in fewer, larger firms; by rapid worldwide transfer of technologies; and by more and more ship-operating firms offering intermodal rates and services, thus supporting the *no*tion that ocean shipping is just one link in a larger integrated transportation system that includes terminals, trucking and rail.

POLICY STATUS

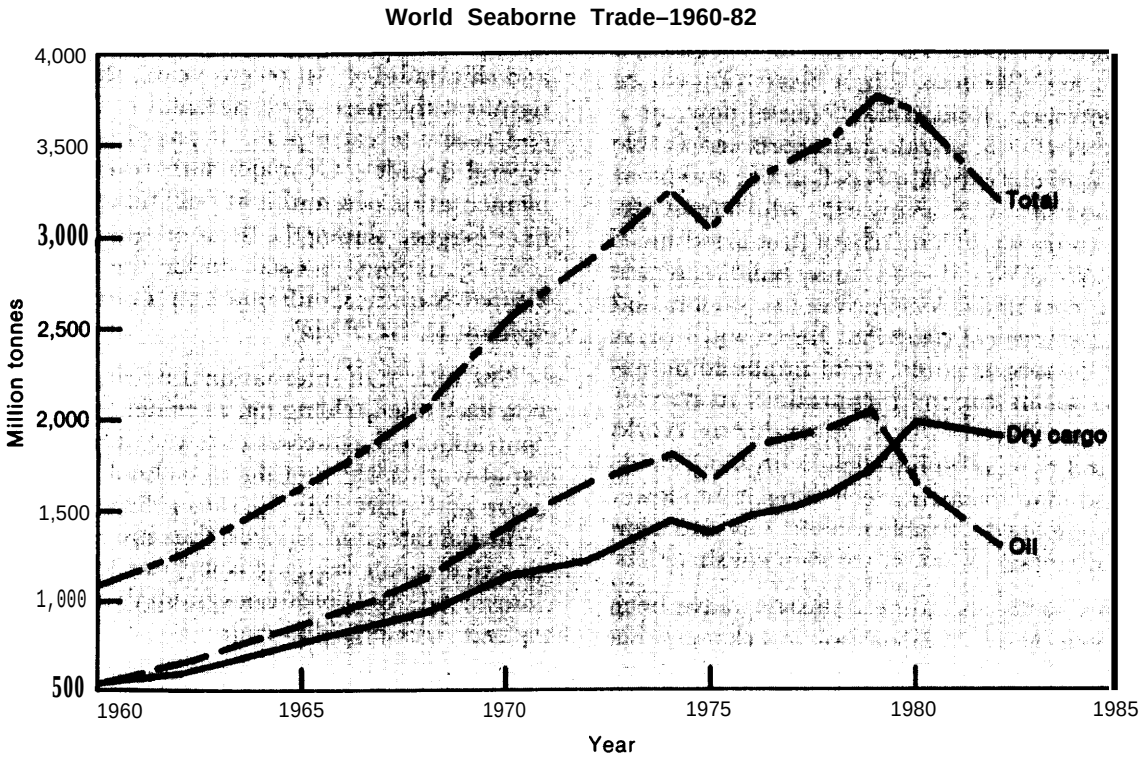
U.S. maritime policies have not kept pace with changes in world trade or the maritime industry. They remain aimed at conditions that prevailed in decades past. The U.S. maritime policy framework that exists today is outdated and appears inadequate to address critical maritime problems of national concern.

Based on this OTA assessment of maritime trade and technology, it is clear that major new or revised Federal policies are needed if the U.S. maritime industries are to remain healthy in the decades to come. If there are no policy changes, most U.S. maritime industry segments probably will continue to decline in size and influence.

Trade- and cargo-allocation policies related to international shipping often are considered separately, both within U.S. Federal agencies and among international organizations. However, adequate consideration of cargo allocation would in turn make trade more efficient and effective. For the most part, U.S. shipping policies reflect historical patterns and do not cope effectively with major shifts in trading patterns and increasing governmental intervention worldwide.

The Federal Government has a wide range of policies and programs with the goal of aiding or promoting the U.S. maritime industry. However, analysis indicates that the United States has no overall, coordinated and effective maritime policy that responds to the major trends and realities confronting the U.S. maritime industry in the increasingly competitive and complex arena of world seaborne trade. Existing maritime policies are a patchwork of measures adopted at various times to address specific needs. They do not add up to a comprehensive and coherent policy with clearly defined purposes and elements specifically designed to achieve those purposes. In particular, there is no sharp definition of what the Federal role should be in maintaining a maritime industrial base, in assuring competition, and in coordinating national and international initiatives.

Whatever maritime policies are developed for the future, if they are to be broadly supported and ef-



SOURCE: OECD & Fearnleys, 19S2.

fective, they will require balancing a variety of national interests. **There is a vital link between the U.S. economy and U.S. participation in international commerce of which ocean transportation is an integral component.** However, it is not clear what level of Government assistance or involvement in maritime affairs is in both the national interest and in the interest of a healthy, competitive enterprise. Therefore, an overriding objective of any future maritime policy is to clarify national benefits as well as benefits to any one industrial sector. Such national benefits could include:

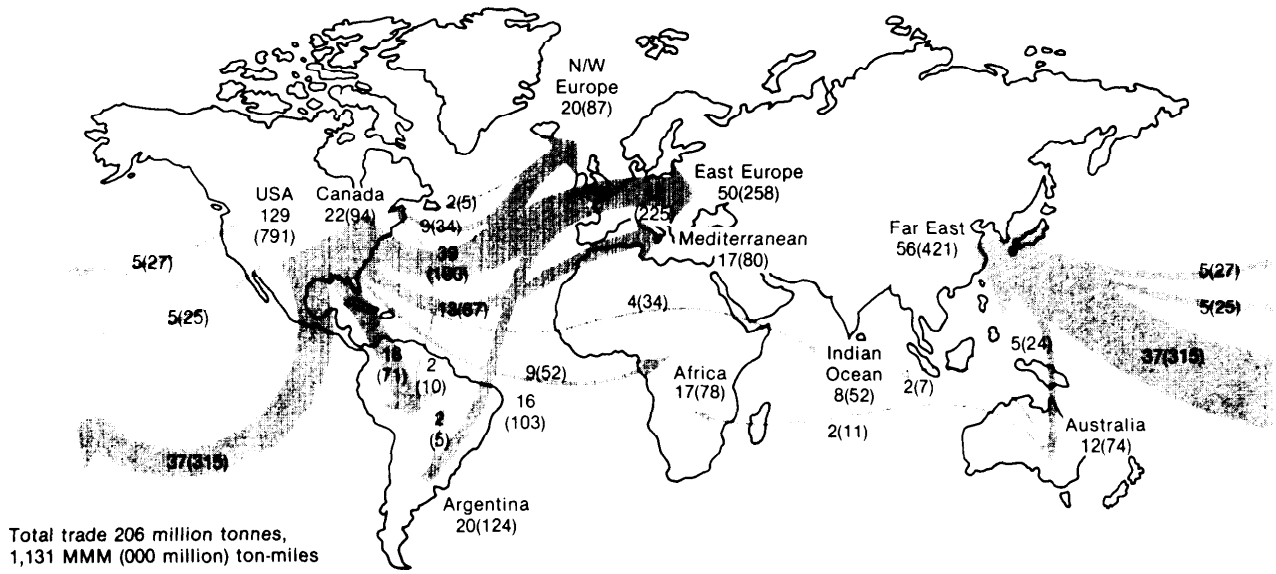
- maximizing U.S. participation in world trade and its overall economic benefits;
- promoting international stability through trade and economic interdependence;
- maintaining technological preeminence in U.S. industries;
- providing for national defense needs;
- ensuring independence from foreign control of vital trade or shipping services;
- assuring the viability of the essential and productive sectors of the maritime industry;
- promoting fair trading practices for U.S. business interests; and
- providing an adequate level of employment, skills, and training in a vital transportation industry that is important to the national economy.

THE FEDERAL ROLE

The Nation clearly depends on international trade and shipping services to maintain a healthy economy. The Federal Government thus has an obvious interest in those areas where the public as a whole would accrue benefits. Policies to promote U.S. participation in world trade, to assure fair ac-

Grain: Seaborne Trade–1981

Main inter-area movements in million tonnes. (million ton-miles in brackets.) Only main routes are shown. Area figures are totals including smaller routes not shown separately.



SOURCE: *World Bulk Trades 1981*, Fearnleys, Oslo, Norway, 1982.

cess to cargoes, to assure adequate and efficient shipping services, or to provide for just consideration of U.S. interests in international bodies—all fit into such a Federal role. Policy options for these purposes thus can be judged on the basis of how effectively the Federal role is carried out and how efficiently the national goals are pursued.

The Federal Government also may have a role related to support or promotion of the maritime industries. The extent of this role is more difficult to measure, but it is based on two possible national benefits. One is that the maritime industry provides for national security and must be measured by needs for and costs of national defense options. The second is the overall economic benefit that shipping and shipbuilding may provide the Nation as a major industrial sector in promoting or maintaining U.S. participation in world trade.

Naturally, there are a range of plausible levels of Federal promotion or support to any U.S. industry. If the support requires merely "fair" taxation or regulatory treatment, then it may be justified based on inherent benefits to an important industry and labor force. If the support requires major Federal subsidies or other outlays that the public must provide, then national benefits need to be quantified and demonstrated.

If a stronger merchant marine encourages greater opportunities for export of U.S.-produced goods, specific Federal support of the industry might be justified but must be compared to other effective ways to utilize finite Government resources. Only if the net economic gain from Government subsidy of the maritime industry were greater than the gain to the economy from equal Government support of another industry, could maritime subsidies be justified on purely economic grounds.

The rationale used by most maritime-subsidy proponents is that U.S. shipyards and the U. S.-flag merchant fleet are vital components of our national defense. The U.S. Navy historically has supported this contention. The so-called shipyard mobilization base consists of those yards that would be essential to a war effort, either in building or repairing vessels. Virtually all major merchant shipbuilding facilities are considered to be part of this base. Likewise, it is contended that during a conflict the U.S. merchant marine would have vital responsibility in logistic support for the military and carriage of goods essential to support the civilian

economy at home. There is little question that these roles would have to be filled. However, a number of questions remain unresolved. The required size of the mobilization base never has been defined adequately, although a number of studies have addressed the issue. Another question is the adequacy of the fleet of U.S.-owned, foreign-flag ships or the national flag ships of friendly nations to fulfill some or all of the duties of merchant-ship support during a national emergency.

An in-depth analysis of national defense requirements is outside the scope of this assessment. However, it is important that such questions be resolved before any cohesive policy about the role of the U.S. Government in support of the maritime industry can be developed, and if it is determined that national defense is a legitimate reason for Government aid to the industry, logically such aid should be directed toward those types of yards and vessels that are most useful to the military.

THE U.S. SHIPPING INDUSTRY

Many define the present condition of the U.S. shipping industry as one of universal nonprofitability. Even with substantial subsidies, the U. S.-flag liner operators as a group showed a loss for the first quarter of 1983. Large portions of the U. S.-flag tanker and bulk fleet are in layup. Some of the most productive sectors, such as the offshore oil, tug, and barge businesses, also are now in a serious slump.

In the U.S. shipping industry, the two major distinct business sectors (liner and bulk) have very different problems and outlooks. Policies directed toward each sector need to reflect those differences. During 1982 and 1983, the U.S. liner industry suffered substantially from the worldwide recession, and the overall cargo volume in the key trades shrank markedly. **Some companies now are left in a difficult financial position—especially the smaller operators who are not well capitalized. On the other hand, a few of the larger companies are aggressively expanding their service and building new, large container ships to modernize their fleets.** The most prominent liner companies increasingly are engaged in the transportation of cargo to and from inland locations in which ocean-going ships serve as only one link in an overall transport system. The liner fleet has growth potential but is very dependent upon new Federal policy initiatives.

Bulk companies include the shipping departments of major petroleum corporations who operate tanker fleets, as well as independent bulk-ship operators, who may operate tankers, dry-bulk carriers (ore, coal, grain), and combination ships. The U.S.-flag dry-bulk and tanker fleets face a very uncertain economic picture. Very few U.S.-flag bulk carriers are engaged in international trade because they have not been able to compete with foreign-flag operators, even with substantial subsidies. The domestic trade U.S. bulk fleet also is small and only serves what may be considered captive markets. Pressures to shift subsidized U.S.-flag tankers from the international to the domestic trades and to reduce both subsidies and preference cargoes could affect the remaining U.S. bulk-carrier and tanker fleets dramatically.

A long-term world trade outlook developed for this assessment indicates that U.S. trade volume probably will grow throughout the rest of the century, but at slower rates than in the last 10 to 15 years. Trade with developing countries, particularly in the Far East, could grow at a faster rate than total trade. However, such trade growth could be affected adversely by aggressive protectionism in the United States and abroad, particularly in the short term, as a response to the worldwide economic problems of many countries.

If the trade growth rate is slow in comparison to the previous decade, U.S. carriers will be forced to compete with rapidly growing foreign-flag fleets for the limited cargo available—and will need continually to increase service efficiency and capability. It also is likely that intermodal services will continue to expand and increase the efficiency of international transport. This trend may offer opportunities for those U.S. liner operators

that are in the forefront of intermodal technology and management systems.

The future of the U.S.-flag fleet is uncertain. **Some** experts believe that without policy changes, the size and capabilities of the U. S.-flag fleet will decline markedly over the next 10 years, Policies to promote growth in U.S. trade and assure fair access to all international trade for U.S. carriers naturally would benefit all sectors of the shipping industry. However, such policies would be most useful for continued success of those businesses that already have attained high productivity and now are reasonably competitive in world shipping. Such characteristics apply to certain U. S.-flag liner companies and to the U.S.-controlled, foreign-flag bulk fleet.

Several other Federal policy initiatives are also of major importance to the U.S.-flag liner operators. These include: maintenance of existing Government impelled cargo preference; modification to the Shipping Act of 1916 granting wider antitrust immunity, which would promote higher utility of capital assets through service rationalization; and modifications to taxation policies or other financial incentives, which would allow future capitalization on a cost competitive basis with other shipping nations. Policies to promote more competitive industry capitalization are also critical to the U. S.-controlled fleet. For the already small U.S.-flag bulk fleet (tankers and dry bulk) in foreign trades, future viability appears bleak unless support is applied, either in the form of direct Federal subsidies or of cargo preference.

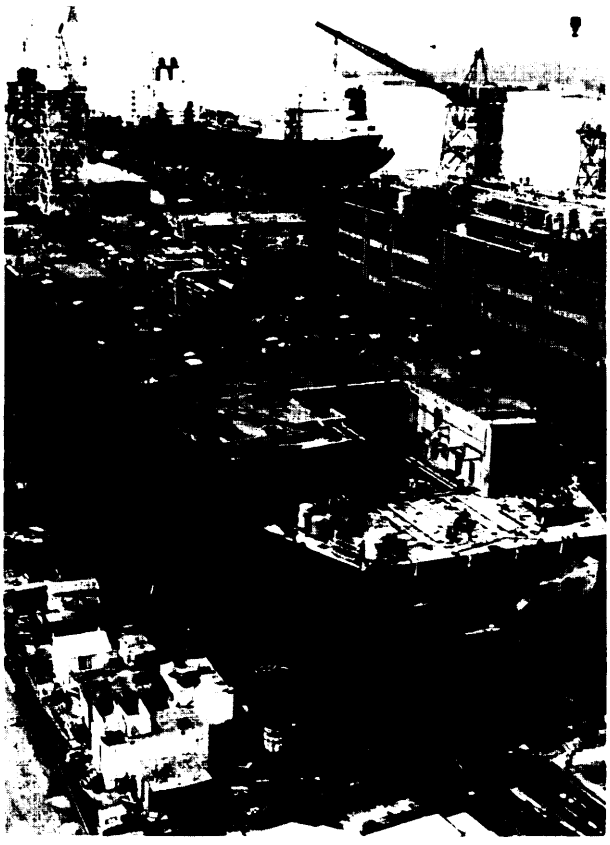
THE U.S. SHIPBUILDING INDUSTRY

Over the past two decades, the United States has built major merchant ships only when Federal subsidies were used to pay a large portion of the cost or when laws, such as the Merchant Marine Act of 1920, required that the ship be built in a U.S. yard. U.S. shipyards have been isolated from international competition for these types of vessels by virtue of having a protected domestic market. The U.S. shipbuilding industry today therefore is basically quite different from that of Europe, Japan, and Korea, where most of today's modern merchant fleets are built and where companies compete for orders in a world market.

However, the United States does have a large and diversified shipbuilding industry and is foremost in construction of large and complex naval warships. Its total employment (175,000 in 1982) is even larger than Japan 's. The U.S. industry also has some very productive and technologically innovative segments, including those who build barges, tugs, supply boats, and offshore oil rigs.

The U.S. shipbuilding industry has faced a severe decline in new buildings of major merchant ships. The elimination of Federal funds for construction subsidy programs has made future prospects for commercial shipyards bleak. While the U.S. Navy has embarked on an expanded building program, it will not require much additional shipyard capacity until 1985-86, and only the yards that specialize in major warships will benefit substantially. The trends in the industry thus are toward more U.S. Navy work, more concentration in fewer large firms and hard times for those firms that, in the past, have depended on commercial shipbuilding subsidies. Although U.S. yards have made recent strides in improving productivity in the construction of merchant vessels, the primary focus of the industry remains on building U.S. Navy ships, which require high-technology and custom work and where productivity is not of paramount concern.

One approach to improving U.S. shipbuilding productivity would focus on developing other emerging markets for U.S. shipyards, assuming that there is little chance that the U.S. industry can reduce costs of conventional merchant ships below the level of the low-wage countries. The U.S. shipbuilding industry is geared to custom work and the integration of highly technical with conventional systems. Markets for such skills may develop in the future in fields like Arctic or deepwater resource



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extraction. A challenge for industry and Government would be to cooperate to identify and develop the most promising markets.

OTA analysis suggests that U.S. shipyards can improve their competitive position in the world, but only with a major concerted effort on the part of both industry and the Federal Government. However, productivity improvements alone probably will never close the very large foreign-merchant-ship price differentials of today, which are partly the result of lower wages and partly the result of direct and indirect subsidies of other governments. Federal policy therefore must assume that **the future viability of U.S. commercial shipbuilding will depend on some form of Federal support.**

At present the large U.S. Navy building program is supporting the U.S. shipbuilding industry. It would be useful for policy makers now to look beyond the current U.S. Navy building program and devise a plan for U.S. shipyards at least 5 years hence. While the existing U.S. Navy program can be helpful for encouraging productivity improvements in the near term, new markets must be developed or Federal support must be increased when U.S. Navy work slackens, or U.S. shipyards will probably contract to a much smaller base.

POLICY OPTIONS

OTA analysis suggests that whatever new maritime policies are developed, a comprehensive and coordinated approach is necessary to clarify the national interest, bring effectiveness to Federal programs, and ensure consistency in any industry promotion offered. The following policies are subject to current debate and are important elements of such a comprehensive approach. Each will be discussed here and some options presented. Further analyses are contained in the policy chapters of the complete report.

Cargo Policies

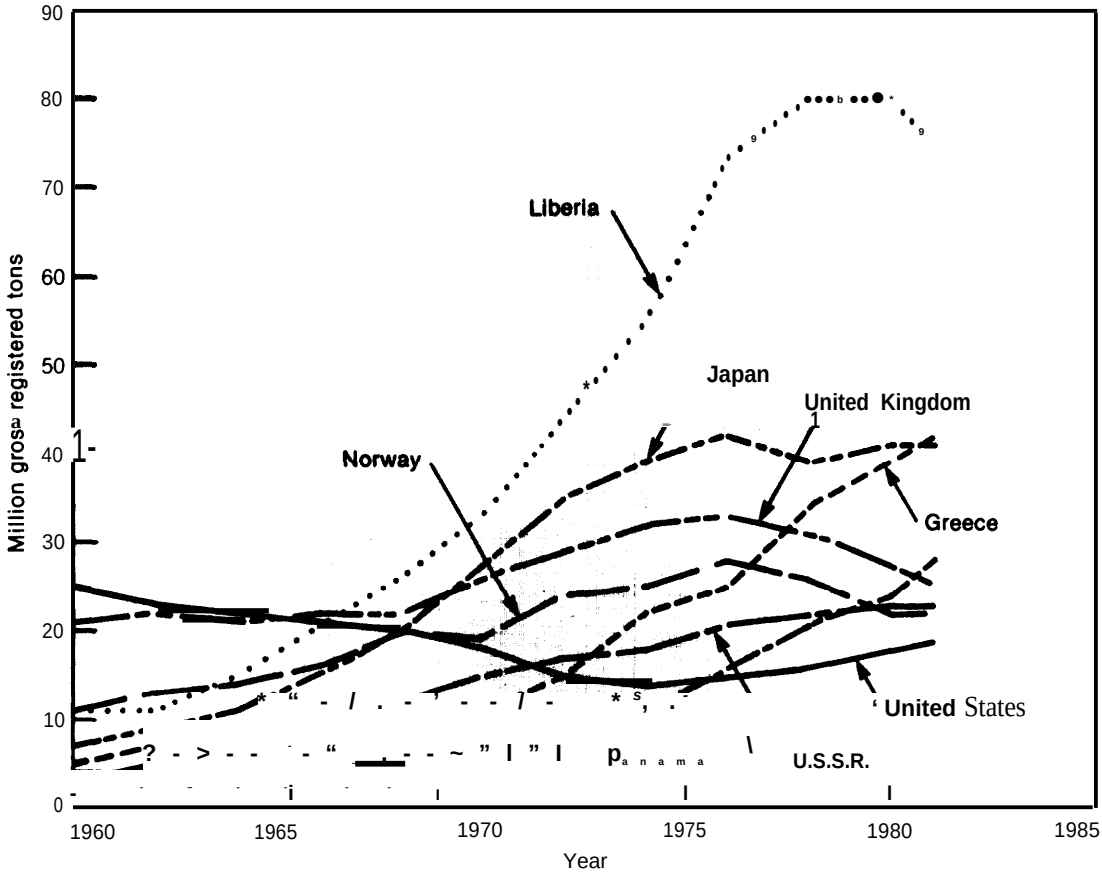
All trading nations have a self-interest in expanding their exports and controlling their imports. As trading complexities increase, governments have attempted to manage their flow of imports and exports. As nations try to manage trade policy to their best economic advantage, they tend to increase governmental involvement in shipping. Most countries have policies which unilaterally reserve some portion of their import/export cargoes for their own

national fleets. In addition, many nations, particularly developing countries that are attempting both to capture more export trade and to bolster their national-flag fleets, are pushing for the establishment of bilateral and multilateral cargo-sharing agreements. The latter objectives have been achieved recently in the form of the UNCTAD Code of Conduct for Liner Operations. The requisite number of countries has ratified this code to enable it to go into effect in October 1983. It calls for an even division of liner conference cargoes between trading partners, with a small percentage possibly reserved for vessels of other nations, if agreed by the national-flag lines engaged in the trade. The United States is not a signatory to the code and has opposed it since it was first proposed several years ago. As a result, there are concerns that U.S. carriers may be prohibited from some cargoes and that the United States may be forced out of certain trades when it is implemented.

U.S. ship operators face a significant disadvantage in dealing with countries where industry and government have established close ties and where national and corporate goals are better meshed than in the United States, which tends to disavow governmental interference in international trade and cargo allocation. U.S. shipping companies find it increasingly difficult to compete in markets that are protectionist. Many foreign governments also tend to intervene specifically on behalf of their national interests and their own carriers while the U.S. Government has usually not intervened.

There have been attempts by the United States and some of its industrialized trading partners to counter protectionist trends by working within in-

Fleets of the Leading Maritime Nations, 1960"81



SOURCE: Lloyd's Register of Shipping Statistical Tables 1981.

ternational organizations for tariff-barrier reduction and freer trade. However, the reality is that trade is becoming more, not less, managed. Thus far, the United States has not developed a national response that would be effective in protecting our economic position and at the same time remain consistent with our national philosophy of free trade.

Federal policies and practices could have a profound influence on whether U.S.-flag ship operators are treated fairly by other countries and given equal and competitive rights to carry cargo. There is at present no generally accepted U.S. cargo policy because national interests are not defined and no strategies for international negotiation have been developed. Lacking such strategies, the United States has remained on the sidelines while the rest of the world defines the rules of cargo access.

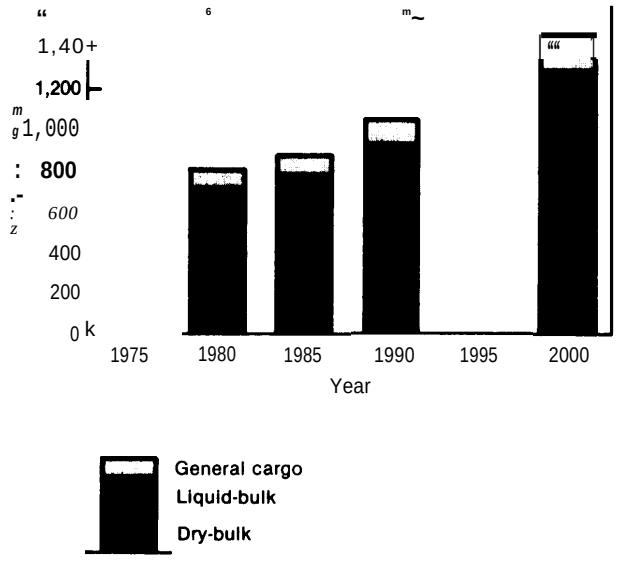
To assure more equitable access to cargoes for U.S. operators in the future, Congress could:

- authorize and direct appropriate agencies to devise guidelines for U.S. Government initiatives in negotiated bilateral agreements with our major trading partners including rules for maintaining certain competitive practices, for assuring fair treatment for both U.S. shippers and carriers, and for promoting future trade;
- authorize and direct appropriate agencies to develop guidelines for similar consideration of multilateral agreements on cargo access;
- define specific and comprehensive unilateral U.S. cargo reservation practices following clearly stated national interest guidelines;
- develop an overall strategy for both U.S. cargo reservation and international agreements on cargo-sharing which could be used in future negotiation.

Incentives for U.S. Ship-Operating and Shipbuilding Industries

There is widespread agreement that U.S. maritime subsidy programs of the past have been largely ineffective and counterproductive to the goal of stimulating a healthy and productive commercial maritime industry in the United States. The present administration has eliminated funding for ship construction subsidies and has sought to phase out

U.S. Seaborne Trade



SOURCE: Wharton Econometric Forecasting Associate.

ship-operating subsidies. New **policies are needed to substitute for these programs, however, if a Federal role of promoting U.S. maritime interests is justified by overall national interests.** The level of Federal promotion also needs to be justified by specific national benefits.

Direct subsidy policies of the past have been aimed at maritime industry promotion in general and assume that different sectors of the industry (i.e., shipbuilding, liner operators, bulk operators) could be cured by the same medicine. These subsidies have not been broadly effective. In fact, the most productive companies appear to be those who did not participate in subsidies.

The current administration has proposed several policies, including allowing foreign construction of U.S.-flag subsidized ships, that would help the U.S. liner industry. Promotion of certain U.S. liner interests is possible with indirect incentives, and this type of approach appears to be consistent with other administration policies. Also, indirect subsidies such as loan guarantees to U.S. operators have been encouraged. The shipbuilding industry, however, has not been encouraged by recent administration maritime policies. Except for the large Navy building program, no Federal incentives have been proposed. Since the shipbuilding sector was so depend-

ent on subsidies in the past, it is difficult for these companies to plan adequately for a future with no Federal support.

Past incentives in the form of loan guarantees appear to have been more successful than direct subsidies in promoting investment in new vessels and in covering broad sectors of the maritime industry. Both builders and operators claim to have benefited from such an approach.

Future policies concerning industry support, if deemed to be in the national interest, could include consideration of which maritime sectors can benefit from each type of promotional effort and how Federal support can encourage high productivity and efficiency. If Federal incentives for the maritime industry are judged consistent with national goals and benefits, Congress could:

- revitalize Federal loan guarantee and financing assistance programs for industry sectors that could utilize such incentives to improve productivity, to expand, to increase profitability, or to enter new markets;
- devise new Federal subsidy programs directed toward sectors that must compete directly with subsidized industries of other nations, including productivity enhancement incentives.

If, however, no justification for Federal assistance to the maritime industry can be made, Congress could :

- phase out all subsidy programs and Federal requirements related to subsidies and allow industry to compete on the open market without Federal intervention.

In any case, it appears important for Congress to:

define specific national defense needs in terms of a shipbuilding base, an operating fleet, and a reserve fleet, and develop a funding program to maintain each utilizing either Government or defense expenditures for that portion of the base that is commercially uneconomic.

Regulatory Systems

It is difficult for U.S. ship operators to compete with foreign operators when international rules of conduct do not match traditional U.S. concepts, which give the Government the role of protecting the public against fixed-pricing or business cartels. In many other major maritime nations, the industry not only is allowed but also encouraged by the government to collaborate. A bill now in Congress seeks to amend the 1916 Shipping Act, assure broader antitrust immunity, and provide other incentives for improving the capability of U. S. operators to compete with foreign carriers. This issue has been debated in Congress for the past several years, and some resolution appears near. Whatever the outcome, it will continue to be important for U.S. policy makers to evaluate international rules of conduct for U.S. and foreign operators and to strive to develop an approach so that U.S. operators can compete on equal terms with foreign carriers.

Passage of some form of regulatory changes is clearly in the interest of the major U.S. liner operators. Proper consideration of U. S. shipper interests and broader goals of enhancing U.S. trade in the future are equally important. U.S. participation in world maritime trade and shipping likely will depend on how well our regulatory policy both protects the national interests and allows for effective competition internationally. Congressional choices include the following alternatives:

- pass the Shipping Act of 1983 and follow with careful oversight of how well carriers, shippers, and the general public are served;
- develop an approach to international shipping regulations that could be presented to other nations for consideration in the future, possibly including cargo-sharing options as well;
- make no changes to the law but monitor mom carefully Federal regulatory policies.

Taxation Policies

Taxation policies for U.S. shipping interests are based on sometimes conflicting goals of providing equivalent advantages to industries that must compete in the international market and of assuring fairness and equity among U.S. businesses. Past taxation policies for shipping (e. g., the Capital Construction Fund) have sought to encourage investments in new U.S. built ships through tax deferrals and to strengthen the U.S. merchant marine's competitive position. Future taxation policies re-

quire careful analysis of the many approaches available and in use to ensure that targeted industry sectors receive the intended benefits.

This assessment includes an overview of Federal taxation policies related to shipping, but further analysis of alternative tax treatments is necessary. However, Congress could address taxation policies for shipping in a comprehensive way, including:

- a review of U.S. industry treatment compared with other competitive maritime nations;
- consideration of tax-incentive goals such as investment in new ships and equipment, business for U.S. shipyards, modernization of the fleet, maintenance of a defense base, or expanding U.S. markets; and
- review of tax treatment versus the sectors that receive principal benefits considering U.S.-flag fleet, effective U.S.-controlled fleet, U. S.-domestic fleet, and U.S. shipyards.

Federal Research and Development

OTA analysis suggests that there is a need for maritime research and development (R&D). An important part of such research is a continuing assessment of those areas in which technological innovation can be applied to acquiring a greater share of the world maritime transportation market and a greater share of world shipbuilding orders. Additionally, the R&D should include an evaluation of the work ongoing in marine and other fields (both U.S. and foreign) that can contribute to commercial marine innovation. It also is important to incorporate these innovations into design, production, and training programs that would lead to building and manning ships, and selling ships to other nations to give the United States an improved posture in world shipbuilding and ship operations. Both long-term financial support and a research plan are needed to assure effective utilization of resources.

There are several basic problems associated with existing Federal maritime R&D programs. First, since there is no comprehensive policy defining the Federal role in maritime affairs in general, there is also no clear policy regarding the Federal role in maritime R&D. **While the Federal approach to industry promotion has changed drastically in recent years, little attention appears to have been given to the resulting impact on R&D. Thus, the R&D program now under the authority of the Maritime Administration has no clear focus or set of long-range goals.** This program is much too small to be expected to address in depth the broad range of technical opportunities in the maritime transportation business; furthermore, there is no rationale for the selection of projects as worthy of Federal support while others are left for industry or some other research enterprise.

Congress could define a more specific Federal role in maritime research before additional funds are allocated and a new program is designed. As discussed in this assessment, near-term needs for energy-saving and automation technology are being addressed by numerous industries and private

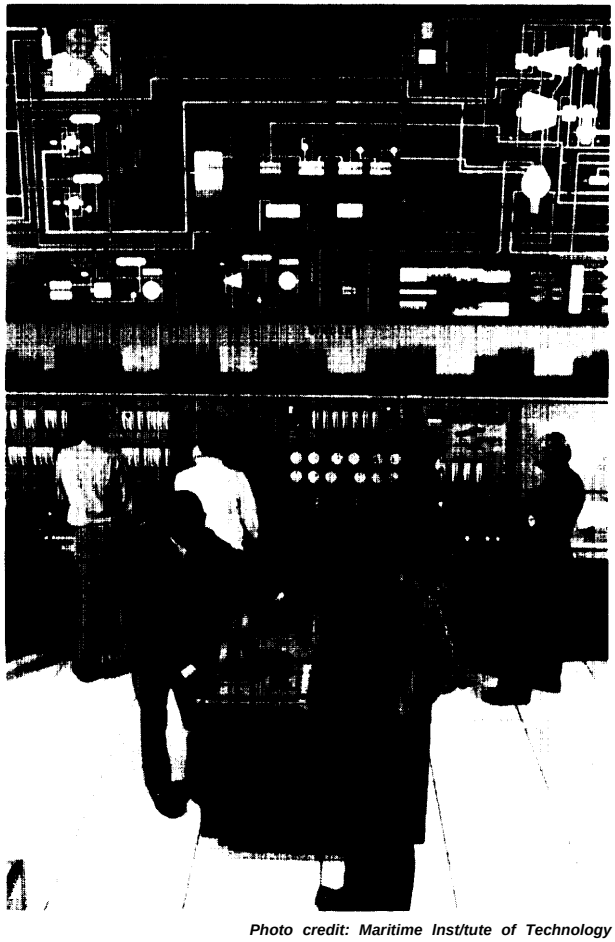


Photo credit: Maritime Inst/tute of Technology

The Masters, Mates and Pilots Union operates this technology training facility for its members

research groups worldwide. New maritime technologies have been developed in a number of other countries and are readily adaptable. The U.S. Navy and other Federal agencies spend considerable funds on basic and applied maritime research problems, and applicable data can be transferred. The National Shipbuilding Research Program has identified promising areas for improving U.S. shipbuilding productivity. Elements of a congressionally defined Federal role in future maritime R&D could include:

- identifying R&D objectives as a subset of an overall maritime policy;
- determining what U.S. industry can do better itself and formulating indirect incentives for industry R&D;
- stimulating coordination and transfer of technology within the industry and from military, foreign, and other sources; and
- focusing on high-risk areas and long-range problems that are not adequately addressed by industry or elsewhere, the solution of which could contribute to national goals.

In addition to the definition of proper Federal support for maritime R&D, Congress may also wish to consider new or modified institutional arrangements to encourage, coordinate, and foster R&D with either or both private and Government support.

Policy Coordination

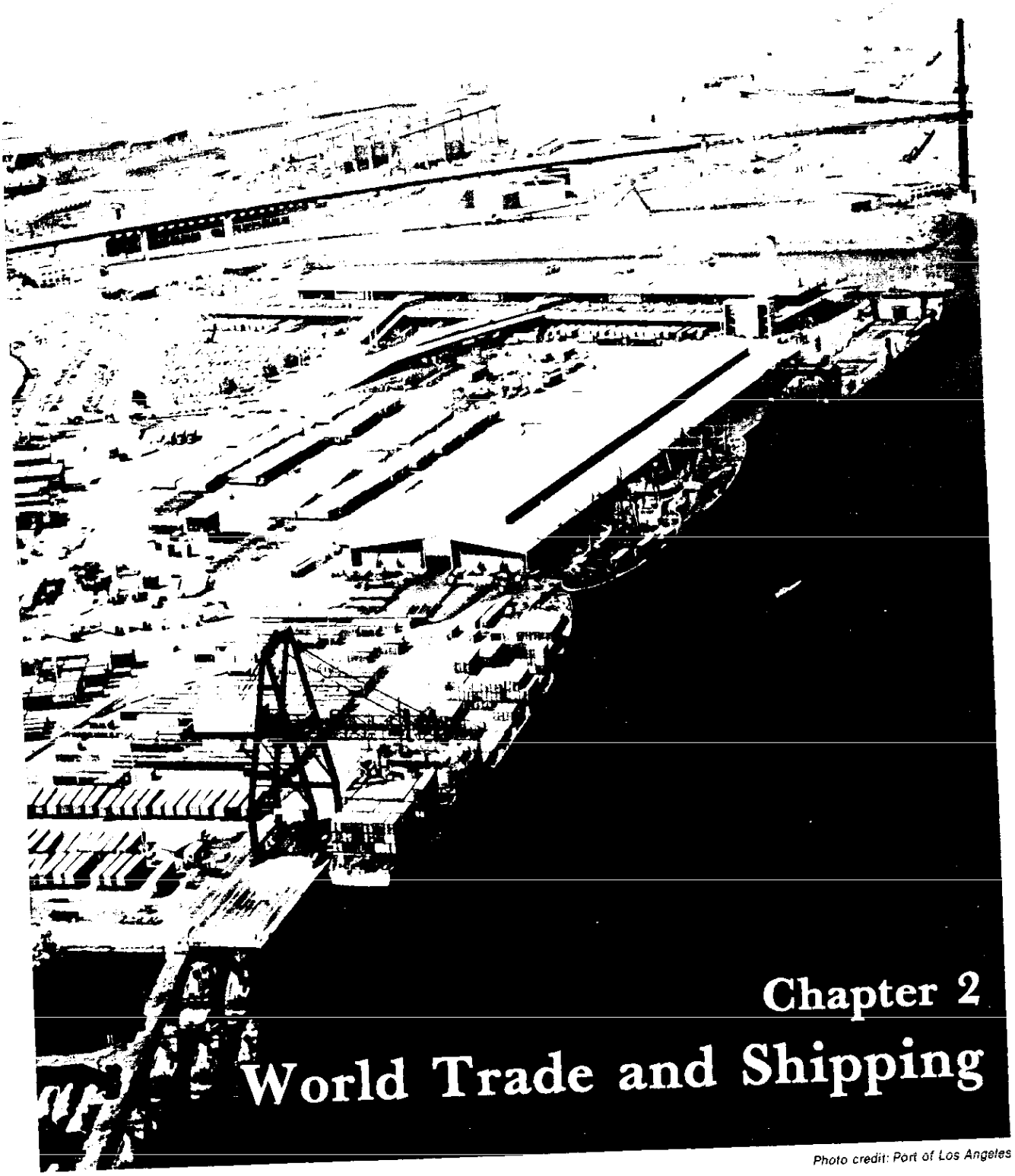
It has been difficult in the past to develop a comprehensive policy that integrates the important aspects of trade promotion, cargo access, maritime regulation, industry incentives, and maritime research. Federal agencies, lacking a coordinated approach, often have sought conflicting goals. While one agency seeks to prosecute alleged antitrust activities, another seeks to allow more industry cooperation. While one agency seeks to broaden cargo preference policies, another seeks to eliminate preference for U.S.-flags. While the U.S. Navy claims the need for an extensive commercial shipbuilding industrial base, it shifts the execution of such a policy to the Maritime Administration which has been able neither to devise a strategy nor provide the resources to maintain such a base,

Congress could seek to resolve some of the major conflicts through comprehensive legislation or through a joint consideration of a range of legislative proposals. While this approach could consume a great deal of time, it may offer compensating long-range benefits.

Even without comprehensive policy coordination, it appears important as a minimum to ensure the coordination of trade and shipping policies at the Federal agency level. Trade policies and cargo policies related to international shipping are often considered separately, both within the U.S. Federal agencies and among international organizations. Those policies can have a direct impact on future international trade and the participation of the United States and its shipping industry in that trade.

The current debate between those advocating completely free trade or free access to cargoes and those advocating degrees of government intervention to protect domestic industries will undoubtedly continue. For example, the national value of a domestic industry can sometimes convince governments to provide certain levels of protection. Even though industries and governments publicly state their opposition to protectionism, they often do not apply those principles to themselves. In addition, reaction to other governments' policies will often also bring restrictions on trade.

The growing involvement of governments and international organizations in trade and shipping policies and growing protectionism worldwide requires the United States to develop and coordinate those trade and shipping policies which serve the national interest. It is also vital for the United States to implement policies which can remain consistent over the long terms that many international issues require for resolution.



Chapter 2
World Trade and Shipping

Photo credit: Port of Los Angeles

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Chapter 2
World Trade and Shipping

OVERVIEW

Almost all international trade in goods is transported by sea. Ocean shipping plays a central and essential role in the world economy and in world trade. Therefore, it is vital to understand the factors affecting trade and shipping growth or decline in order to develop effective policies influencing U.S. participation in world trade or in the transportation industry that serves the trade. This chapter describes the status and trends in world seaborne trade and the international shipping and shipbuilding industries. It will present an outlook for the future for each and note problems and uncertainties.

In recent years, international trade has become a dominant factor in economic growth for most industrialized countries. Many newly industrialized countries have become so through major trade growth. For this reason, OTA commissioned Wharton Econometrics, Inc., to prepare a world trade outlook to the year 2000, utilizing a world economic model to make projections of future maritime trading patterns. The results and implications of that trade outlook are presented in this chapter.

While that outlook is based on a series of economic assumptions with ‘ ‘no major surprises, it is clear that the most radical changes in the past have occurred because of unpredicted events such as wars, oil price ‘‘shocks, the Suez Canal closing in 1967, and numerous politically motivated actions. Less radical, but important, changes likewise have been caused by unpredicted technological innovations, economic pressures, and more gradual political forces. This chapter, therefore, will present an overview of which important forces are acting today to influence maritime trade and shipping, how the world maritime community is reacting to these influences, and what future trends now appear to be most significant.

Maritime Trade Patterns

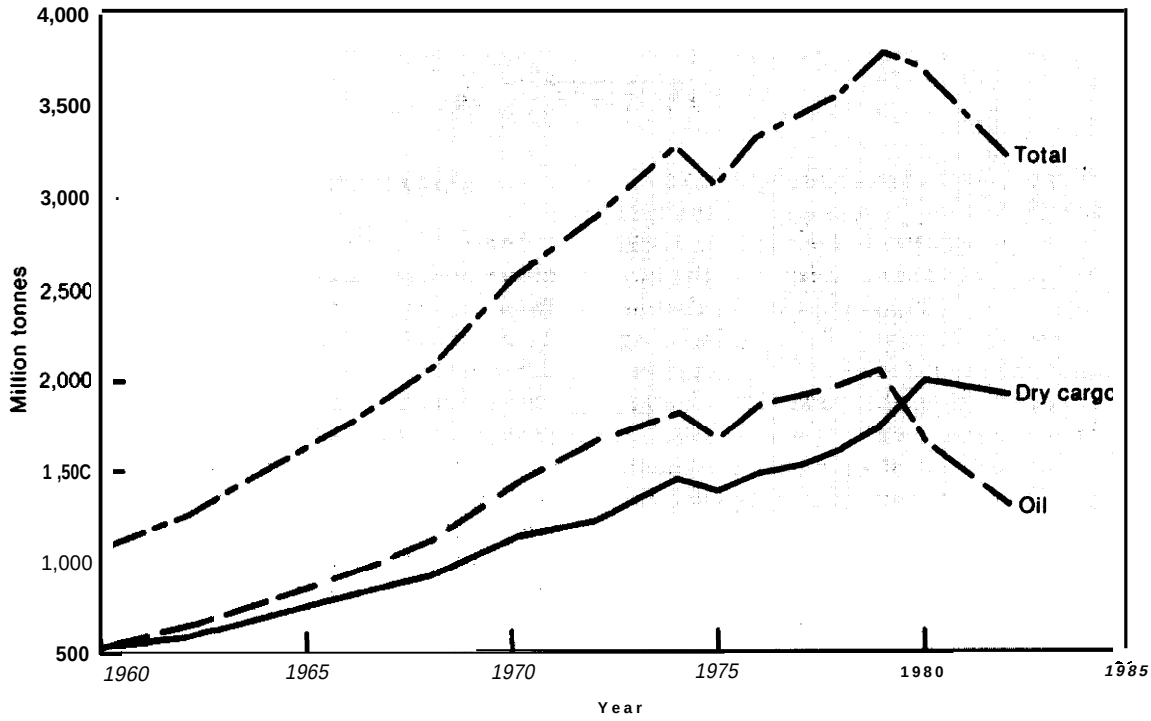
Maritime trade in goods worldwide totaled 3.21 billion metric tons (tonnes) in 1982. This is down from the high of 3.77 billion tonnes in 1979 (fig. 1). As shown in figure 2 (for 1980), petroleum is the dominant single commodity and accounts for almost one-half of the total world tonnage transported. The dry-bulk commodities traded likewise are dominated by a few major groups: iron ore, coal, and grain. These and other bulk goods traded total another one-fourth of world tonnage. The remaining quarter, referred to as general cargo, includes a great diversity of manufactured goods and consumer products.

The differences in requirements of the trades have led to establishing two principal modes of world shipping—the liner mode, which provides the general cargo trade with regular, scheduled service including container carrying ships; and the bulk mode, which employs a variety of ships on a time- or voyage-charter (rental) basis serving both the liquid- and dry-bulk trades. The liner trades involve by far the largest portion of world trade when measured by dollar value, while the bulk trades account for the largest portion of volume or tonnage.

Figures 3, 4, 5, and 6 provide examples of trading networks that have developed for petroleum and dry-bulk commodities. They illustrate both the major trade routes and the relative tonnages carried on each. If one were to expand these pictures to cover the huge variety of other products and goods transported worldwide, the lines would fill the map solidly. The United States is involved in almost every aspect of this trading network.

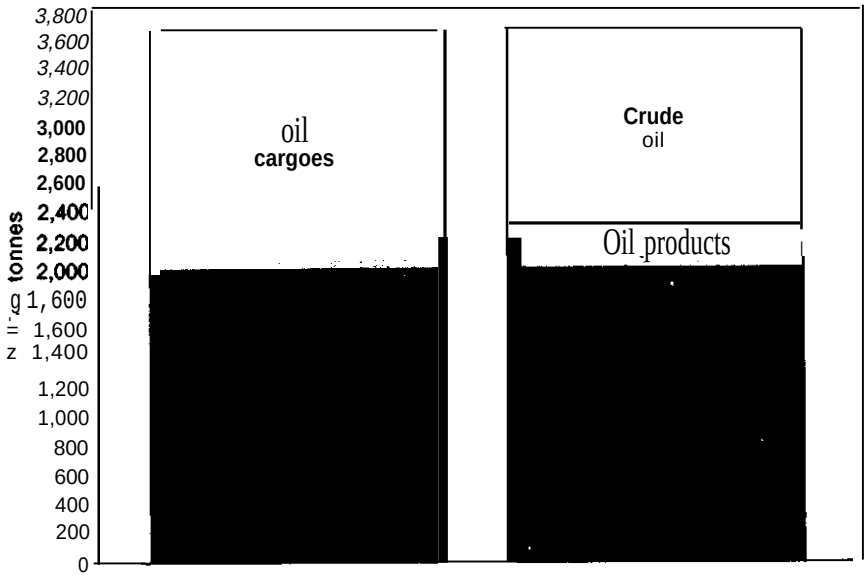
The United States is a major trading nation, with international markets increasingly important to **U.S.** industry. During the 1970’s the value of U.S.

Figure I.–World Seaborne Trade–1960=82



SOURCE: OECD & Fearnleys, 1982.

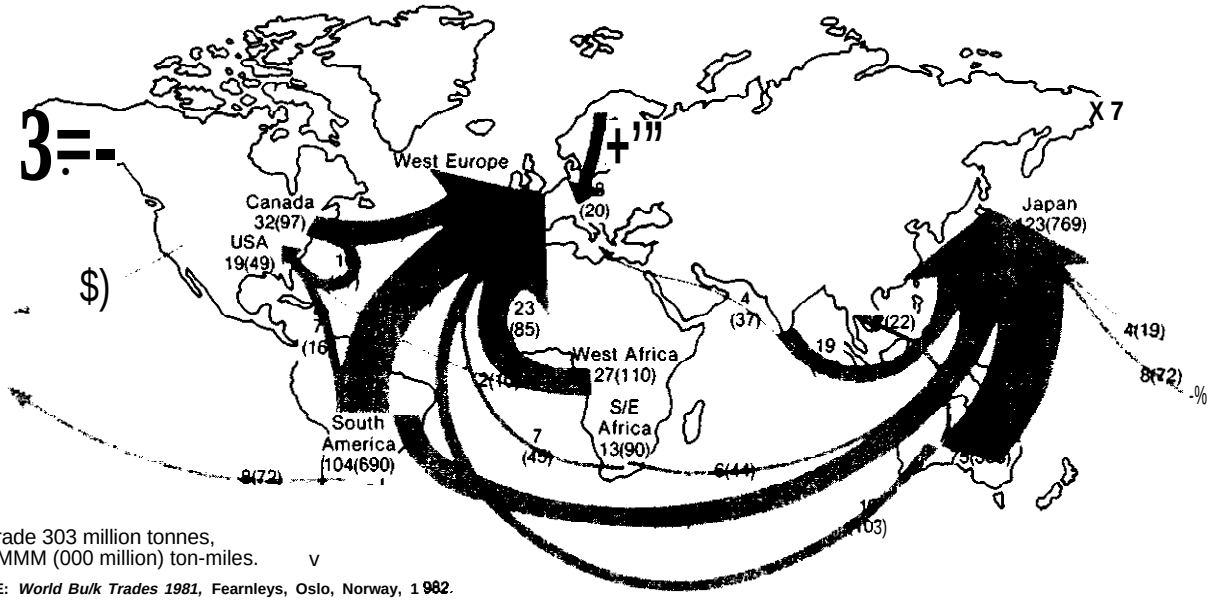
Figure 2.—Principai Commodities in Worid Seaborne Trade—1980



SOURCE: Fearnleys Review, 1982.

Figure 3.— Iron Ore: Seaborne Trade-1981

Main inter-area movements in million tonnes. (MMM ton-miles in brackets.) Only main routes are shown. Area figures are totals including smaller routes not shown separately.

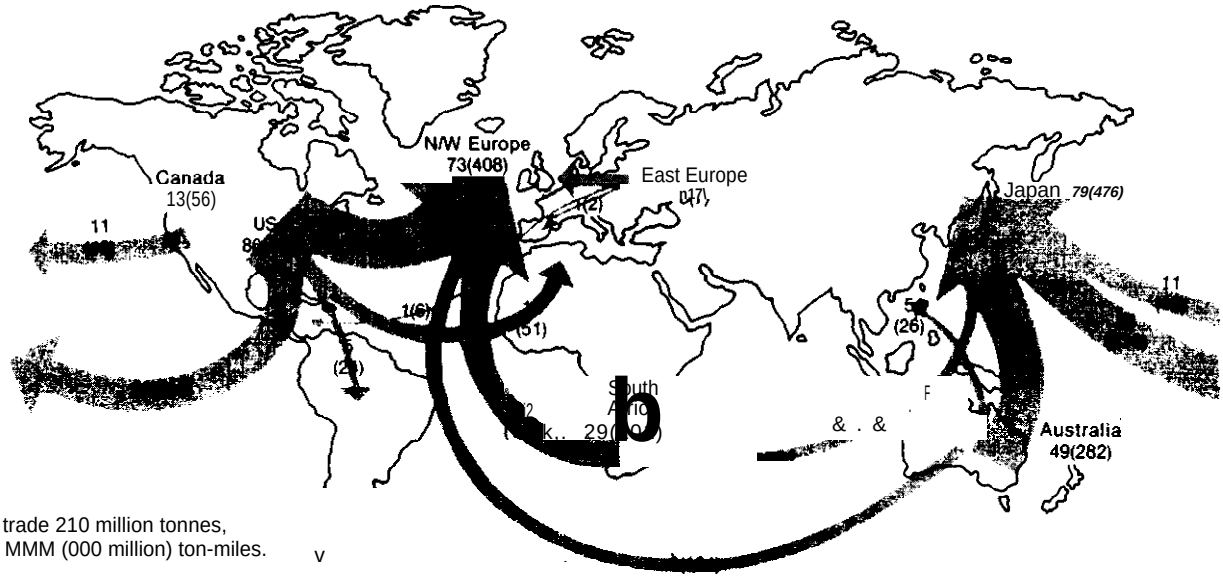


Total trade 303 million tonnes,
1,508 MMM (000 million) ton-miles.

SOURCE: *World Bulk Trades 1981,* Fearnleys, Oslo, Norway, 1982.

Figure 4.— Coal: Seaborne Trade–1981

Main inter-area movements in million tonnes. (MMM ton-miles in brackets.) Only main routes are shown. Area figures are totals including smaller routes not shown separately.

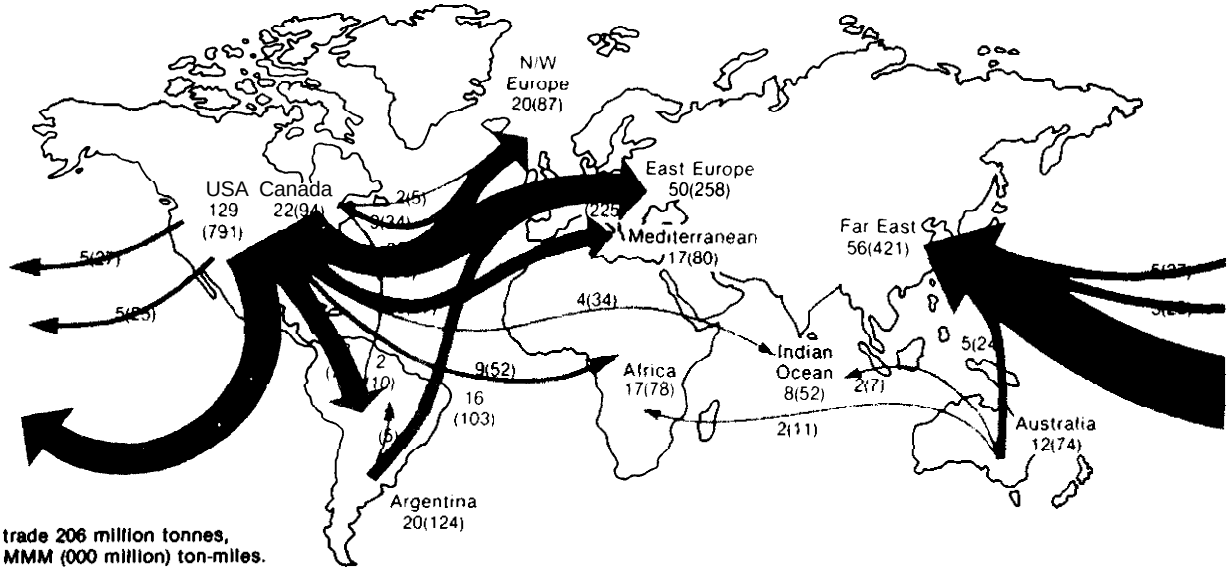


Total trade 210 million tonnes,
1,120 MMM (000 million) ton-miles.

SOURCE: World *Bulk Trades 19S1,* Fearnleys, Oslo, Norway, 1982.

Figure 5.- Grain: Seaborne Trade—1981

Main inter-area movements in million tonnes. (MMM ton-miles in brackets.) Only main routes are shown. Area figures are totals including smaller routes not shown separately.

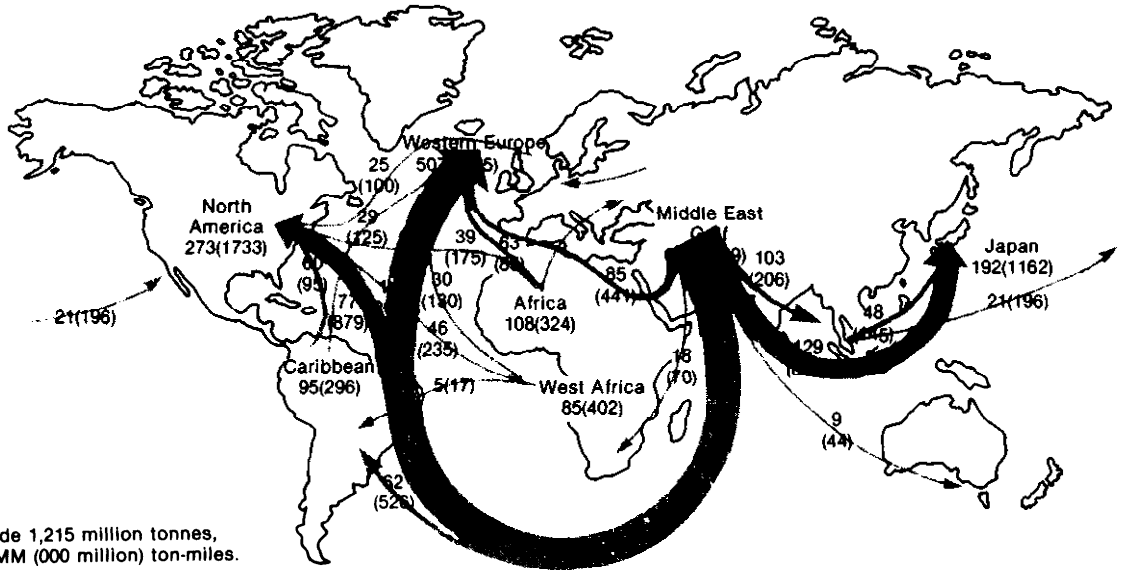


Total trade 206 million tonnes,
1,131 MMM (000 million) ton-miles.

SOURCE: Wortd *Bulk Trades KXN,* Feamleys, Oslo, Norway, 1982.

Figure 6.— Crude Oii: Seaborne Trade–1981

Main inter-area movements in million tonnes. (MMM ton-miies in brackets.) Oniy main routes are shown. Area figures are totals including smaller routes not shown separately.



Total trade 1,215 million tonnes,
7,371 MMM (000 million) ton-miles.

SOURCE: *World Bulk Trades 1981,* Fearnleys, Oslo, Norway, 1982.

international trade rose by a factor of 2.5. The United States engages in trade of $1 billion or more each year with each of 58 other countries in North and South America, Europe, the Near East, Southern and Eastern Asia, Oceania and Africa. The following illustrates some of the major commodities that are imported to and exported from the United States.[1]

In 1982, U.S. exports totaled $212.2 billion, with less developed countries (LDCS) receiving $82.6 billion, Western Europe $60.0 billion, and Canada $33.7 billion. U.S. imports reached $244.0 billion, with the greatest share from the LDCS ($99.0 billion), followed by Western Europe ($52.3 billion), Canada ($46.5 billion), and Japan ($37.7 billion).

In terms of volumes of trade, the United States is a major exporter of dry-bulk commodities. In 1980 the United States exported 97.2 million tonnes of grain, 72.8 million tonnes of coal, 28.8 million tonnes of soybeans/meal, and 27.6 million tonnes of forest products. On the import side, the biggest U.S. import was petroleum, 318 million tonnes in 1980.

The single most important export sector was capital goods. Out of total exports of $212.2 billion in 1982, capital goods accounted for $75.2 billion. Nonelectrical machinery and parts made up $47.8 billion of this. Industrial supplies accounted for $61.7 billion, food and beverage for $31.3 billion, and consumer goods for $27.5 billion.

U.S. imports in 1982 were valued at $244 billion, with fuels ($66. 4 billion) and consumer goods ($67.7 billion) virtually equal as the leading commodities. Of the fuels, petroleum accounted for almost all of the total, at $60.8 billion. Passenger cars—$20.2 billion—were the most important single consumer good. "Other" industrial supplies amounted to $45.7 billion, and capital goods were valued at $40.6 billion (of which about half was nonelectrical machinery and parts). Food and beverages totaled $17.1 billion.

[1] Data compiled from the Draft Analytical and Statistical Supplement to the Statement of Lionel H. Olmer before the Joint Economic Committee, prepared by the International Trade Administration, U.S. Department of Commerce, Feb. 3, 1983.

Linkage of Economic Activity, Trade, and Shipping

Many comparisons have been made of trade and economic activity. The linkages are important if not always clear and consistent. Figure 7 traces the growth rates since 1970 of both world seaborne trade in dry cargo and total industrial output of the countries belonging to the Organisation for Economic Cooperation and Development (OECD). This indicates that if one leaves out petroleum, shipping closely follows economic activity in industrialized countries. For total trade including petroleum, however, the picture is more complex. Between 1965 and 1973, when the gross national product (GNP) of OECD countries rose by 4.6 percent annually, and that of the world rose by 5 percent, total demand for shipping grew more rapidly at 8.4 percent per year. On the other hand, when between 1973 and 1980 OECD GNP rose annually only by 2.3 percent and that of the world by only 2.6 percent, demand for shipping only increased by 2.2 percent.[2] Trends in the global economy and international trade are clearly related to and can promote or inhibit international shipping activity.

The importance of international trade for the U.S. economy has grown progressively since World War II. Although the U.S. ratio of exports to GNP still is below that of other industrial countries,[3] it stood in 1980 at 8.5 percent, up from 4.4 percent in 1970. Imports also doubled between 1970 and 1980, going from 4.1 percent to 9.5 percent of GNP.

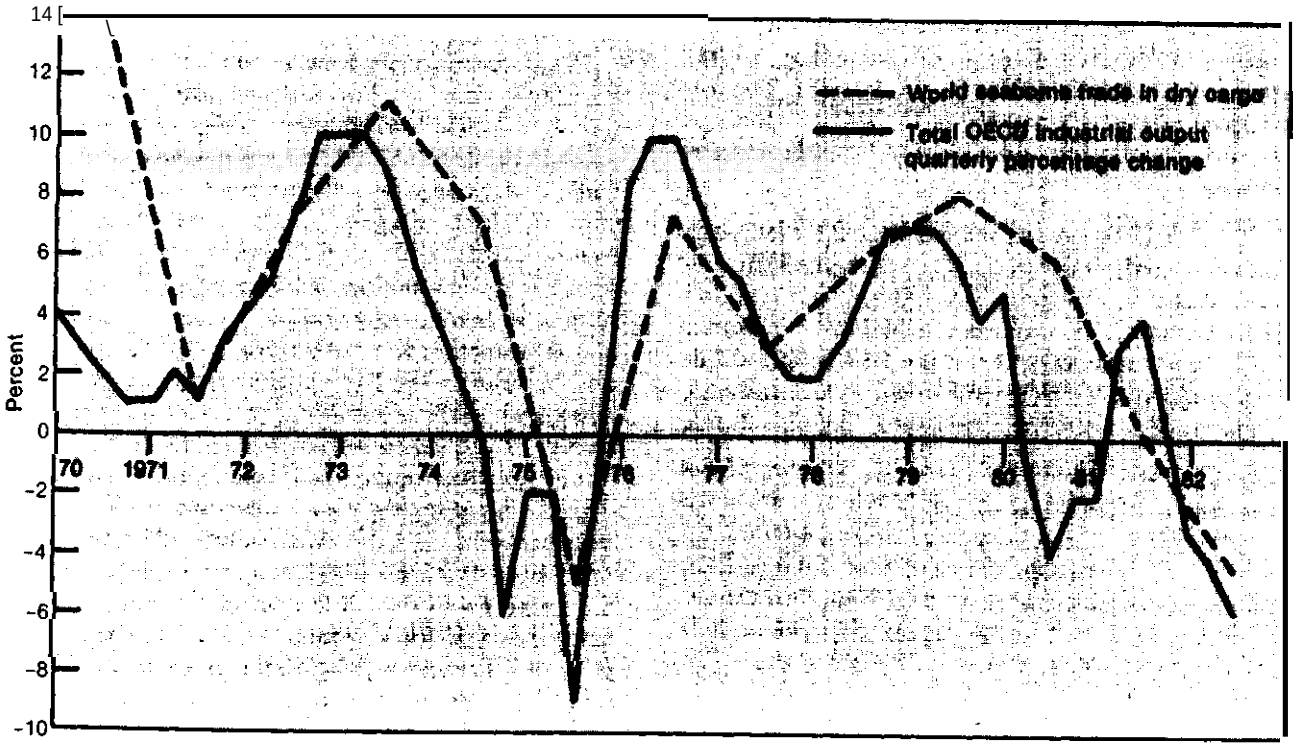
The increased interdependence of the U.S. economy with the international economy is reflected graphically in some of the data contained in the latest *Annual Report of the President on the Trade Agreements Program.*[4] For example, the United States Trade Representative (USTR), which authored the report, estimates that over 5 million workers are dependent on foreign trade for their livelihood, and that 80 percent of all new manufac-

[2] *Maritime Transport, 1981: A Study by the Maritime Transport Committee* (Paris: Organisation for Economic Cooperation and Development, 1981).

[3] *Twenty-Sixth Annual Report of the President of the United States on the Trade Agreements Program, 1981-82* (Washington, D. C.: United States Trade Representative (USTR), 1983).

[4] Ibid.

Figure 7.-Total OECD Industrial Output in Percentage Quarterly Change Related to Percentage Yearly Change of World Seaborne Trade in Dry Cargo



SOURCE: OECD, Fearnleys.

turing jobs created in the late 1970's were linked to exports. In addition, 1 out of every 3 acres planted by American farmers produces crops for exports. This interdependence is expected to continue to grow, with some estimates putting U.S. exports as a percentage of GNP in 1990 at 15 percent.

For the industrialized countries of OECD as a whole, exports accounted for 16 percent of GNP in 1980, up from 9 percent in 1962, The developing countries, especially the newly industrializing countries,[5] also increased their participation in international trade in the last 10 years, with their share of the value of free world exports increasing from 20 to 30 percent between 1970 and 1980. South Korea, for example, increased its exports of goods and services from 3 percent of GNP in 1960 to 34 percent of GNP in 1977, while Taiwan went from 11 to 59 percent in the same period, [6]

Much of the economic growth in the postwar period has been the result of international trade. Recent studies have demonstrated that when the economies of OECD countries grow by more than 1.5 to 2 percent per year—the situation during the postwar period until recently —nonoil imports tended to grow three times as fast. The same studies show a similar negative relationship, with zero growth in OECD economic activity, resulting in a 5-percent drop in nonoil imports. [7]

The foregoing implies that economic prosperity over the long term can result from and lead to growth in world trade, and that a healthy future for world trade both depends on and contributes to the health of maritime transport. There also are negative aspects of trade growth such as the need to promote conservation of world resources, including ener~, over the next several decades—particularly into the next century. This study has not considered such problems except when they obvious-

[5] *The Impact of the Newly Industrializing Countries on Production and trade in Manufactures: Report by the Secretary General* (Paris: Organisation for Economic Cooperation and Development, 1979).

[6] USTR, op. cit., 1983.

[7] Fred Bergsten and William R. Cline, *Trade Policy in the 1980's* (Washington, D. C.: Institute for International Economics, 1983),

ly have affected economics (e. g., with fuel prices). However, it should be recognized that uncontrolled use of vital resources on a large scale will have practical or needed limits. World trade may reach some of these limits and adjustments may be neccessary, especially if economics does not bring about natural adjustments.

CURRENT STATUS OF AND TRENDS IN WORLD SHIPPING

Overview of the World Shipping Industry

World shipping follows the trade it serves, but because of its international and entrepreneurial nature, the industry tends to be even more volatile than trading patterns. The industry presently is experiencing a major excess of tonnage, but large fluctuations in supply and demand in shipping have been quite common for a long time.

The shipping industry consists of several diverse businesses and sectors. In total, it includes those companies that operate the world fleet of over 35,000 major, cargo-carrying ships—tankers, chemical and liquefied gas carriers, combination bulk and oil carriers, ore and dry-bulk ships, general cargo ships, container ships, and many even more specialized types such as automobile carriers and roll-on, roll-off (RO/RO) ships.

The principal sectors today are the tanker operators, the dry-bulk operators, and the liner operators. The tanker and dry-bulk-carrier operators are similar in that fleets of ships usually are owned and/or chartered to carry single, large-volume commodities (i. e., iron ore, grain, coal, crude oil, and petroleum products) over fixed, and sometimes, long periods of time. Shipping thus is closely related to a larger enterprise. Many independent operators participate under ‘ ‘time-charter’ or voyage-charter contracts; in other cases, major petroleum or other resource companies own and operate their own fleets.

The liner industry, or general cargo business, on the other hand, operates more like a railroad—carrying freight from port to port at fixed rates and on a regular schedule. The modern containerships and RO/RO ships are typical of the ships used in this trade within the industrialized world. The liner industry is characterized further by the predominance of conferences, international groups of carrier lines that collectively agree on routes, schedules, rates, and other aspects of liner services.

The composition of the world merchant fleet, as of January 1, 1982, is shown in figure 8. Viewed in the conventional shipping categories, there are roughly twice as many general cargo ships as bulk ships. Within the bulk fleet, nearly two-thirds of the ships arc devoted to carrying liquid (mostly petroleum) cargoes. However, the numbers of ships do not accurately reflect the magnitude of the various shipping sectors. As shown in figure 9, the general cargo ships represent a much smaller portion of the fleet when measured in gross tonnage. The general cargo tonnage is less than one-third of that in the combined bulk fleets. Tankers dominate the bulk fleet in gross tonnage as well as numbers.

While shipping always has been an international business, reflecting the nature of foreign trade, the international complexity of world shipping is increasing. Prior to the 1960’s, the relative magnitude of the shipping industries owned in various nations corresponded to the size of the fleets registered in each country. The significant fleets were found almost exclusively in the industrialized nations with the largest trading volumes.

In the 1960’s, some countries (Cyprus, Lebanon, Liberia, Panama, Singapore [to 1980], Oman, Bahamas [since 1976], and Honduras) developed fleets of ‘open registries’ or ‘ ‘flags of convenience’ that do not require owner citizenship. Tax advantages and, often, less strict vessel and crewing standards

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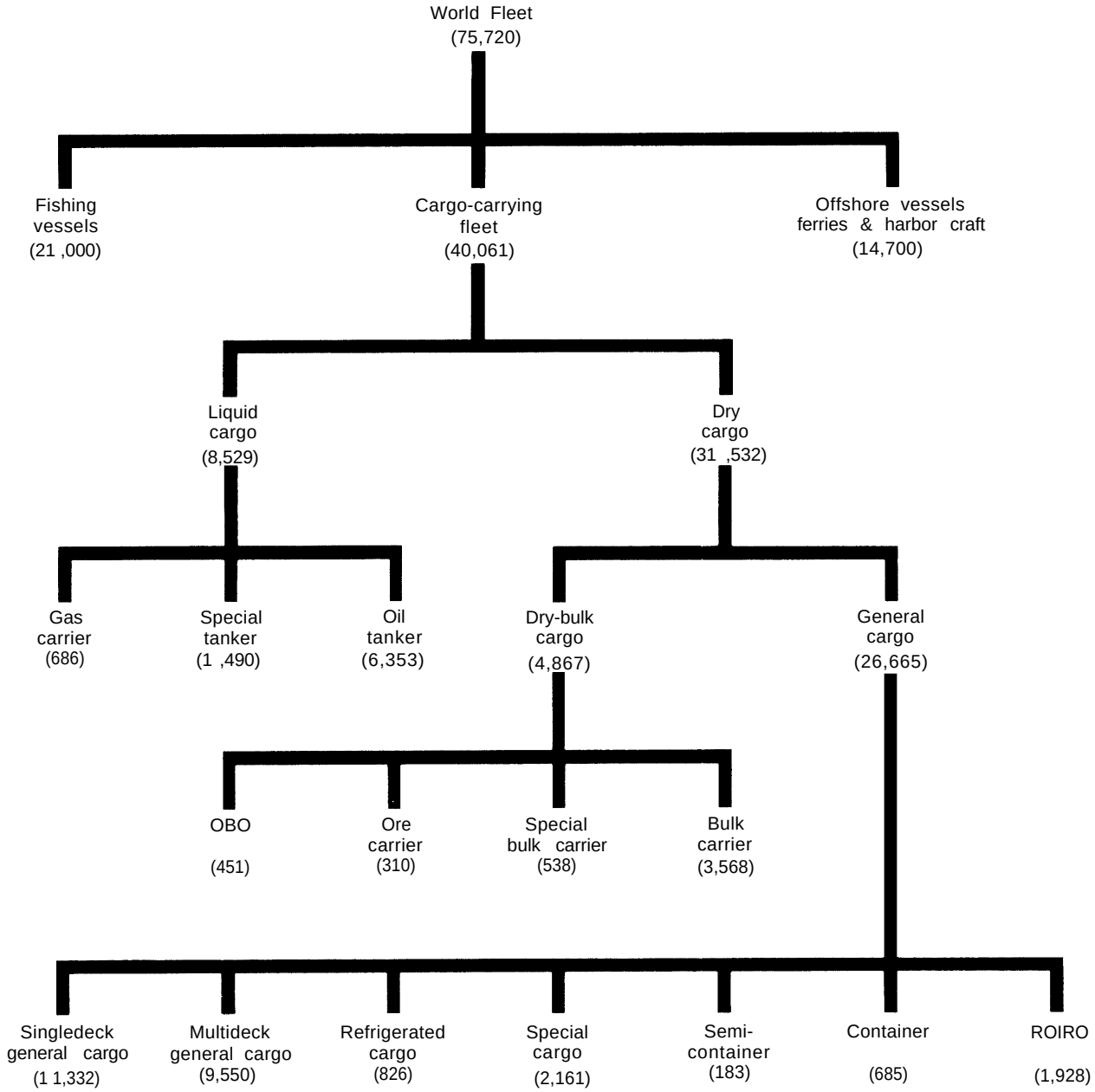
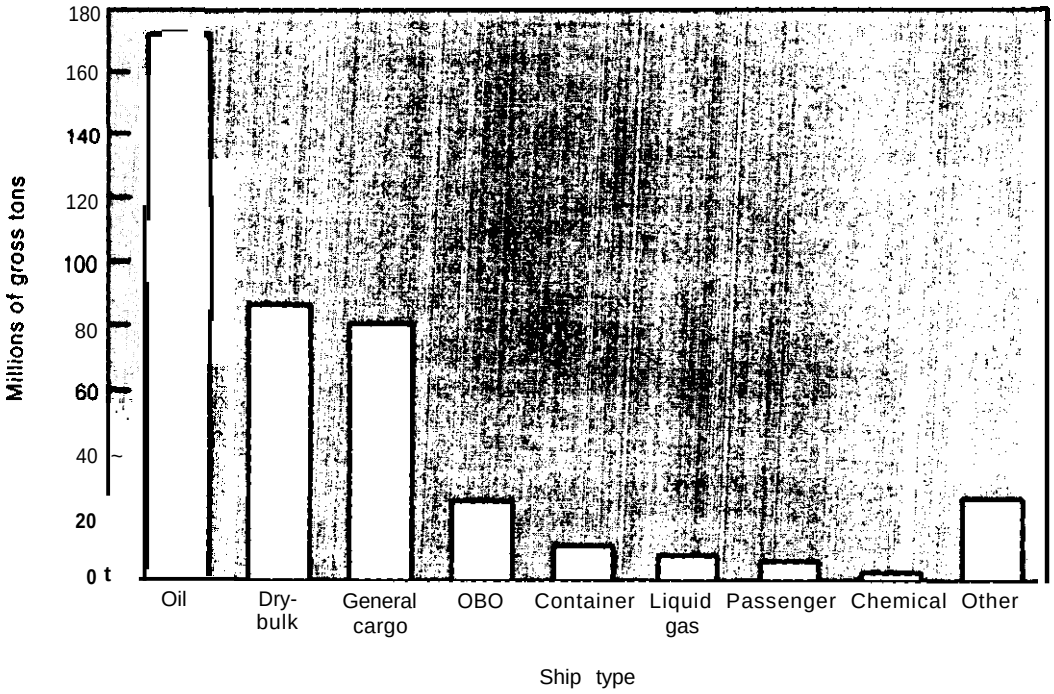
Figure 8.–Composition of the World Fleet (by number) -Jan. 1, 1982



SOURCE: A & P Appledore, 1982.

Figure 9.–Composition of Worid Fieet by Tonnage Juiy 1, 1981
Totai: 421 Miiiion GRT



SOURCE: Lloyd's Register of Shipping Statistical Tables 1981.

attracted ship registrations to these countries. Thus, while the United States had the largest registered fleet by tonnage 20 years ago, Liberia now has the largest fleet in the world (fig. 10),

The spectacular growth in the Liberian fleet (800 percent in 20 years) and other open registries is attributable primarily to business practices of U.S. and other companies of the industrialized world. Two-thirds of the world fleet is registered in eight countries, which are (in order of fleet size): Liberia, Japan, Greece, the United Kingdom, Panama, the U. S. S. R., Norway, and the United States. Fleets-of-open-registry countries accounted for 25 percent of the world fleet in mid-1981.

When the tonnage registered under flags of convenience is distributed among the countries of beneficial ownership* (see table 1), the United States, Hong Kong, Greece, and Japan total 75 percent—clear leaders in ownership of world shipping. Flags of convenience are far more widely used in bulk trades than in the general cargo industry. The Liberian fleet is the predominant world tanker fleet (now over one-half of all ship tonnage) that is, for the most part, owned by or chartered by the multinational petroleum companies.

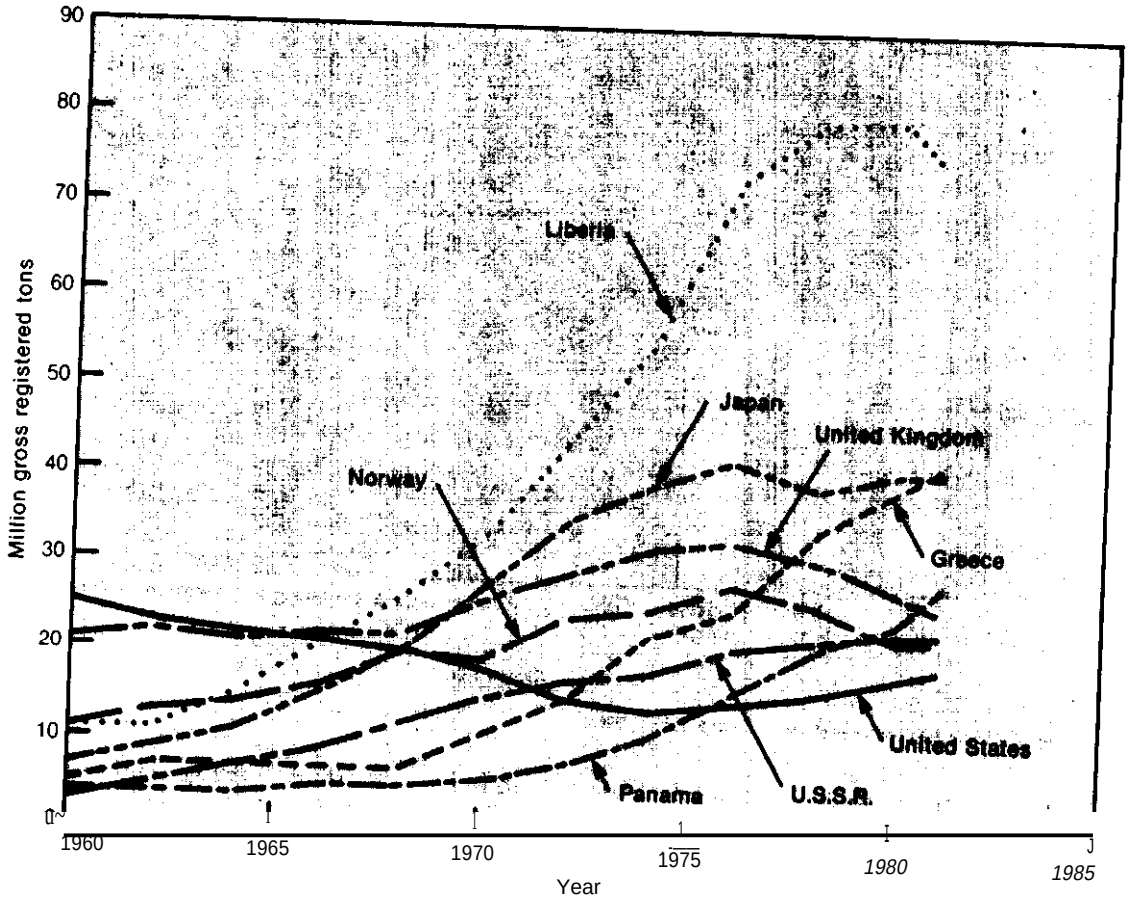
Liner ships have a greater diversity of trade route, flag, ownership, and design than the other segments of the industry. For example, containerships make up 3 percent of the world fleet by tonnage and the largest portion of this fleet is U. S.-flag, followed by the United Kingdom, Japan, and West Germany. Since these countries are also the predominant nations trading in manufactured goods, this fleet tends to match the trade in nationality.

Today, world shipping is in a major slump. Much of the tanker fleet (about one-third in 1982) is surplus to the need for transporting petroleum.[8] A substantial portion of the dry-bulk fleet also is surplus to demand, and the liner trades have not expanded at all in recent years. The oversupply of

*'Beneficially owned" is defined as designating the owner who receives the benefits or profits from the operation.

[8]Fearnley's, *Review* 1982, Oslo, Norway, 1983.

Figure 10.-Fleets of the Leading Maritime Nations, 1960-81



SOURCE: Lloyd's Register of Shipping Statistical Tables 19S1.

Tabie 1.–Beneficiai Ownership of the Open. Registry Fieets (reglstered Llbaria, Panama, Cyprus, Bermuda, and Bahamas)

Country of beneficial owners	Percent of total open-registfy fleet, by deadweight tonnage
United States	31
Hong Kong	22
Greece	12
Japan	10
West Germany	3
Norway	3
10 other European Countries plus Korea and Indonesia	1-2Y0 each
~othercountries	less than o.5%each

SOURCE: UNCTAD, 1961 Rev/ew of A@Wme Transpon, data supplied by A & P Appledore Ltd.

ships has caused substanti~ adjustments in the world fleet, with ship scrapping (especially of large tankers) at an all-time high.

The diversity in maritime transportation makes it difficult to characterize the shipping industry in other than very general terms and adds to the difficulty in developing effective policies on which national governments can agree. In the following sections, trends in three major sectors of world shipping (liquid-bulk, dry-bulk, and general cargo) will be discussed separately.

[1]Statistics on the three shipping sectors were taken primarily from *Maritime Transport 1981* (Paris: Organisation for Economic Cooperation and Development, 1982).

Liquid Bulk

Today, 94 percent of the gross registered tonnage (grt) in the liquid-bulk fleet is in oil tankers, Demand for transportation of oil peaked in 1977 at 10.5 trillion ton-miles. The current slump in this freight market has brought it to pre-1973 levels (under 8 trillion ton-miles) with the recent rate of decrease in ton-miles at 13 percent for 1980 and 12 percent for 1981. This rate of decline in the demand for oil tanker tonnage far exceeds the shrinkage in the oil tanker fleet.

In tonnage, tankers remain the single largest shipping sector, comprising 41 percent of the world merchant fleet. Fifty-four percent of the 172 million grt in oil tankers is registered in OECD countries, with another 31 percent registered in open-registry countries.

After annual growth rates of 12 to 16 percent in the mid-1970's, the tonnage in the oil tanker fleet has been stable or declining since 1977. From mid-1980 to mid-1981, it declined 1.9 percent (grt) (1.4 percent in deadweight tons (dwt)). The net decline in the tanker fleet in 1981 is comprised of an addition of 7.7 million dwt delivered and a reduction of 12.5 million dwt lost or scrapped. Most of the decline is accounted for in the larger tanker categories. Since 1980, the tonnage in ships under 150,000 dwt has been increasing, while that in ships over 150,000 dwt has been declining. Similarly, 10 million dwt were on order as of January 1, 1982 in the smaller category, with only 2 million dwt in the larger tankers. The largest amount of scrapping was in very large crude carriers (VLCCS), totaling 41 ships of 8.9 million dwt in 1981.

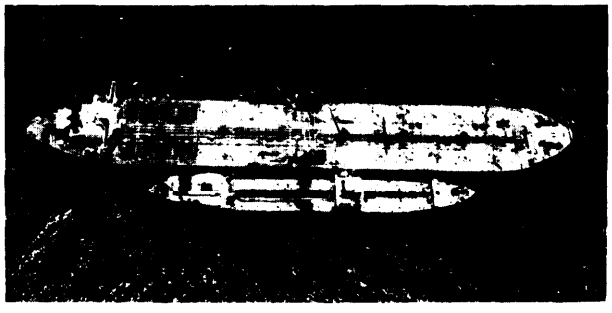


Photo credit: Atlantic Richfield

A supertanker transferring its cargo of crude oil to a smaller tanker in the Gulf of Mexico

The surplus of tonnage resulting from the relatively slow shrinkage of the available fleet is expected to prevail throughout 1983 with no apparent reason for improvement before 1985. The excess tonnage results from ships being used for storage, ships in layup (laid-up tonnage increased 11 million dwt to 17.3 million dwt at the end of 1981), and in less efilcient use of available tonnage, e.g., slower steaming.

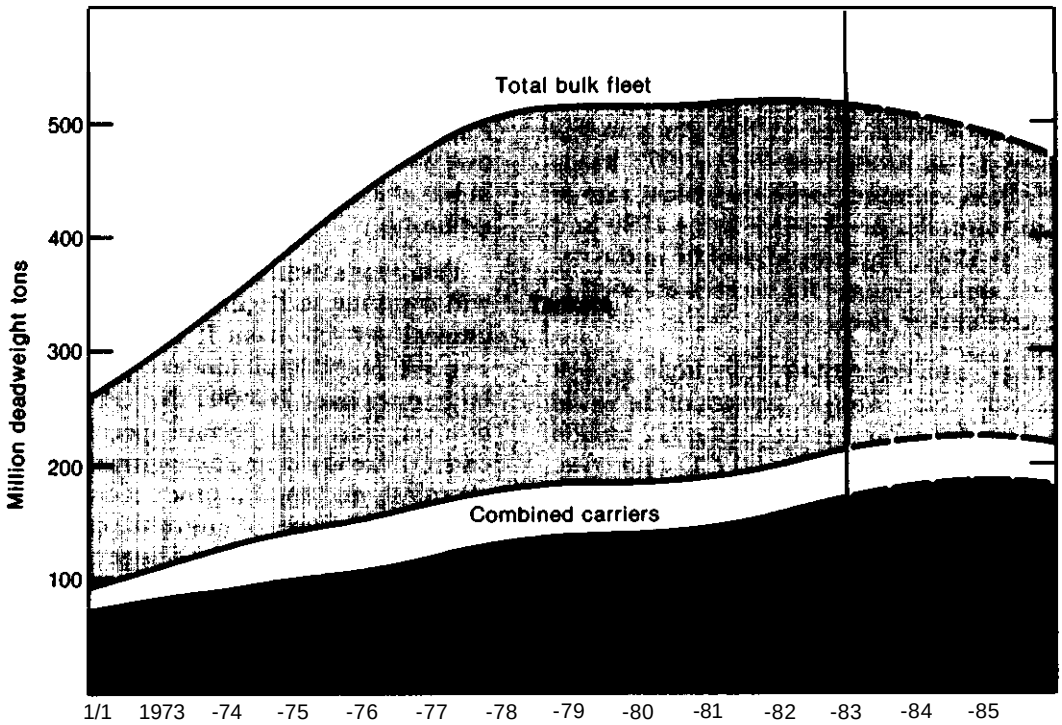
Fearnley's estimates that the world tanker fleet will continue to decline at a rate of about 5 to 6 percent per year from 1983 through 1986 (see fig. 11). While crude-oil tankers (particularly the very large ones over 100,000 dwt) are being scrapped at a *very* fast rate, certain specialized liquid-bulk carriers are showing some growth. Liquefied gas, chemical, and special-product carriers are viewed by some as an area of future shipping growth. Such vessels will never reach the huge tonnage of oil carriers but could serve a variety of changing world economic and trading needs, such as a switch in refining and chemical manufacturing closer to production fields and the need to produce petroleum from smaller and more remote oil and gas finds.

Dry Bulk

While total trade in crude oil was at a level of about 1.2 billion tonnes in 1981, the three major dry-bulk trades (coal, grain, and iron ore) totaled 700 million tonnes.

The dry-bulk fleet is the single major category of ships that was increasing in tonnage in 1982. While the number of tankers in the world fleet today is the same as 15 years ago, the number of dry-bulk carriers is three times the level of 15 years ago. Ore and dry-bulk carriers included 87.24 million grt in mid-1981, showing a 4. 7-percent annual increase. When grouped with the combination-carrier fleet (73 percent of which, on average, were in the dry-bulk trades in 1981), at 25.84 million grt, these ships comprise 27 percent of the world fleet. The rate of expansion of the dry-bulk fleet is increasing, owing to the delivery of ships ordered during good freight years in 1979 and 1980. Fearnley's data shows annual increases for the dry-bulk fleet of 8.9 percent and 9.4 percent for 1982 and 1983 respectively. Cargoes, however, are expanding less rapidly, only 2.5 percent in 1981, resulting in sur-

Figure 11.–World Bulk Fleet



SOURCE: Fearnleys, World Bulk *fled,* January 19S3.

plus tonnage in the fleet, Relatively little scrapping has occurred in the dry-bulk fleet in recent years.

The major commodities in the dry-bulk trades are grains, iron ore, and coal. Table 2 presents data on recent growth or decline in the volume of these commodities, as well as changes in the tonnage in the various ship-size categories. Most of the growth in the fleet is occurring in the larger size categories, while the iron ore trade, which uses the largest ships, is declining as steel production shrinks in the world recession.

Predictions of growth in the major dry-bulk trades include wide variations. Forecasts of growth in the 1980's of the iron ore trade, which is very sensitive to changes in economic growth, vary from 1.4- to 7.3-percent annual increase. For the coal trade, estimates of the tonnage to be shipped by the year 2000 range from 3.5 to 6 times the 1979 levels. Grain tonnages are closely linked to climatic events and are even more difficult to predict. Even though trade may grow, Fearnley projects that the size of the dry-bulk fleet will level off by 1985 because of the large present oversupply of tonnage.

Table 2.—Comparison of Changes in the Dry-Bulk Fleet and Dry-Bulk Seabome Trade

	End 1980	End 1981	
DWT category	**1,000 dwt**	**1,000 dwt**	**%growth**
Drybulk fleat			
10,000-17,999	**11,624**	**11,643**	**0.2**
18,000-24,999	**18,522**	**19,110**	**3.2**
25,000-39,999	**47,312**	**49,126**	**3.8**
40,00049,999	**11,379**	**11,739**	**3.2**
50,000-79,999	**38,917**	**42,663**	**9.6**
Over 80.	**61,570**	**65,682**	**6,7**
Total	189.324	199.963	5.6
Commodity	**1960**	**1981 (est.)**	**o/o growth**
Major bulk seabome trade			
Grain:			
Miiiion tonnes	198	**204**	**3.0**
Miiiion tonne-miies	**1,087**	**1,120**	**3.0**
Average cargo size 27,000 dwt			
Coai:			
Miiiion tonnes.	**188**	**1%**	**4.3**
Miiiion tonne-miies	**952**	**1,030**	**8.2**
Average cargo size 51,400 dwt			
iron ore:			
Miiiion tonnes	**314**	**303**	**-3.5**
Miiiion tonne-miies	**1,613**	**1,580**	**-2.0**
Average carao size 88,500 dwt			

SOURCES: Fearnley8, World Bulk Fleet, January 19S1 end January 19S2, including combination carrtere.
Fearnleys, "Review 19S1." Compiled in Maritime Transport, 19S1 OECD.

Future developments in the world dry-bulk fleet could have a significant impact on the United States as a major bulk exporter and significant importer, with the possibility of substantial future growth in selected commodities later this century. The fleet and the trades need to be monitored carefully by the Federal Government if policies are to reflect accurately changing world needs.

General Cargo

The world general-cargo fleet encompasses a variety of ship types, including breakbulk, partially or fully containerized, vehicle carriers, lighter ships, and RO/RO ships. Due to the greater diversity of this fleet, there are fewer general statistics describing its status and trends. The amount of tonnage in all types of general cargo ships either was declining or was growing at a slower rate in 1980 and 1981 than in previous years, The general-purpose cargo fleet included 81 million grt in mid-1981 for an annual decline of 2.2 percent, the first absolute reduction in the fleet since 1974. In part, this reduction is due to the shift to containerization, as ships without container-handling capabilities are excluded from some trades. The tonnage in unit-load ships (including fully container, vehicle, and lighter carriers) grew at a reduced annual increase of 10.5 percent to a level of 15 million grt. The slowing of the expansion of the unit-load carriers reflects overcapacity in this sector. However, growth in the container fleet is expected to surge again over the next few years due to orders for new ships placed in 1981. At the end of 1981, the additional capacity on order was 23 percent of the existing fleet. Interestingly, however, most of the ordering in 1981 was for ships capable of handling both containers and breakbulk cargoes.

In 1981, growth of the containerized fleet (estimated at 15 percent in twenty-foot-equivalent units (teu)), far exceeded the 8-percent growth in containerized cargo. For the liner trades in general, the amount of cargo available has been level. Thus, the rate of increase in supply of shipping is exceeding the increase in demand. Part of this may be explained by a switch to slower speeds to save fuel costs, which in turn requires more ship capacity to move cargo at the same rate. An additional pressure on the historically dominant fleets is increasing competition from noncommercial nationalized shipping lines, notably from the U.S.S.R. and newly industrialized East Asian countries.

Photo credit: Maryland Depadment of Transportation

A heavy-lift crane loading general cargo (a large machinery part) for export

Trends in National Fleets

Comparing the distribution of ship tonnage today with that in 1970, the developing countries and the open-registry countries significantly have expanded their share of the world fleet, at the expense of OECD countries. The most recent data (mid-1980 to mid-1981) indicate that the developing countries are continuing to make gains in absolute and relative terms. Several of them, notably in Southeast Asia, are pursuing explicit policies to ex-

pand their fleets and to carry a substantial portion of their foreign trade in their own ships.

The composition and age of the fleets vary. In the OECD and open-registry flag fleets, nearly one-half of the tonnage is in oil tankers, with almost another one-quarter in ore and dry-bulk carriers. In contrast, nearly one-half of the fleets of the U.S.S.R. and Eastern Europe are general cargo ships, with oil tankers comprising another one-quarter. The developing countries have more diverse fleets, consisting of about 30 percent of the tonnage in each of the oil tanker and general cargo categories. In comparing the age of the major fleets, the United States has by far the greatest percentage, 21 percent, of its fleet by tonnage, in the oldest category, greater than 30 years, with 45 percent less than 10 years old. About 73 percent of the Japanese fleet is less than 10 years old. In general, the OECD fleet tends to be younger than the rest of the world, which often receives OECD ships secondhand. 1°

It is important to note that major U.S. maritime business interests participate in the ownership, management, and decisionmaking for very large shipping enterprises that use the so-called flags of convenience, This fleet typically operates outside direct U.S. Government control or influence but within a variety of internationally agreed standards and accepted practices. This ''United States effective control' fleet, however, does ci.rry almost all of our petroleum imports, a large portion of our coal and grain exports, and many other commodities significant to our international trade. U.S. maritime policies, therefore, must recognize the importance of this fleet both to U.S. business interests and as a factor in our ability to promote trade in the future.

Trends in Ship Types and Features

Two major changes influencing shipping in recent decades, and likely to continue to do so in the future, are automation of ship systems and specialization of ship types. Developments in both of these areas are discussed in greater detail in chapter 5. (A third important trend is in changes in both propulsion systems and ship design to promote energy efficiency, also discussed in ch. 5.)

The past decade has seen a proliferation of specialized ship types, causing a number of changes in the world shipping industry. One result is that there is now less flexibility to shift ship tonnage from one trade to another as markets change. As an example, ships designed for specific trades, such as VLCCS for the Arabian crude oil trade, cannot be used economically in other oil transport routes, Consequently, the economic risks when a tonnage surplus exists are magnified.

A second major impact from specialization is the trend toward unitization of cargo. Many ships are designed now to carry a specific type of cargo, such as vehicles, or cargo that is transported in uniform units, such as containers. Containerization has transformed the general cargo business. Not only has the type of ship changed dramatically, but trade routes are shifting depending on the availability of container-handling facilities at the various ports. The compatibility of containerized cargo with both land and water transportation systems has led to the streamlining of intermodal transportation services with the introduction of single through rates and through bills of lading. Ocean carriers have expanded their activities from providing strictly port-to-port service to offering consolidated intermodal transport in which the seaborne leg is just one part of point-to-point service. As a result, the availability and interface with rail service is also altering traditional trade routes.

The rate of technological change in general is increasing and maritime policies must be able both to foster and to accommodate that change if the United States is to participate in future shipping innovations.

Trends in Shipping Economics

The economic status of any shipping operation will be determined by the relative levels of costs (capital and operating) and revenues. As discussed previously, demand and freight rates, which determine revenues, are presently at severely depressed levels in all shipping sectors. Given the global nature of the shipping business, the slump in the market tends to affect all operators. Competition

[10] Data on the composition and age of the fleets is from *Maritime Transport 1981* (Paris: Organisation for Economic Cooperation and Development, 1982).

among commercial fleets for the available revenues is intensified by political factors. More and more countries have instituted cargo preference policies reserving some or all cargoes for their own fleets. In addition, some countries have nationalized, noncommercial fleets that are insensitive to nonprofitable freight rates. These political trends are discussed more fully in chapter 7.

Traditionally, operators in the liner trades have formed cartels or adopted cooperative business practices within conferences that are intended to restrict competition and allocate the available market. Such practices are common worldwide and competition is even more restricted in non-U. S. trades. Bulk operators, on the other hand, traditionally have favored and followed practices of open competition. Bulk shipping also has been populated by many individual entrepreneurs who take extreme risks for high returns. Present economic conditions and the massive oversupply of bulk-ship tonnage, placing some large banks at risk, have led some to reconsider bulk-shipping practices. The larger economic risks of future shipping ventures probably will foster industry restructuring toward managing competition.

There are wide variations in both the capital and operating costs among various countries. National policies to protect and promote national fleets and industries (see ch. 7) complicate this side of the economic equation as well. Capital costs are a major concern to shipping interests. New investment packages are becoming larger and more difficult to finance. Joint ventures and cooperative arrangements are growing. And there is a trend toward reducing high-risk investments caused by speculative building in the past.

Increasing fuel costs are felt by all fleets. For U.S.-flag vessels, they currently represent nearly 50 percent of operating costs, as compared to 10 to 15 percent in the early 1970's. Responses include both changes in ship design and propulsion systems, notably shifting from steam to diesel ships, and changes in operating procedures, such as slower steaming speeds to increase fuel efficiency. While fuel prices currently are lower than in the recent

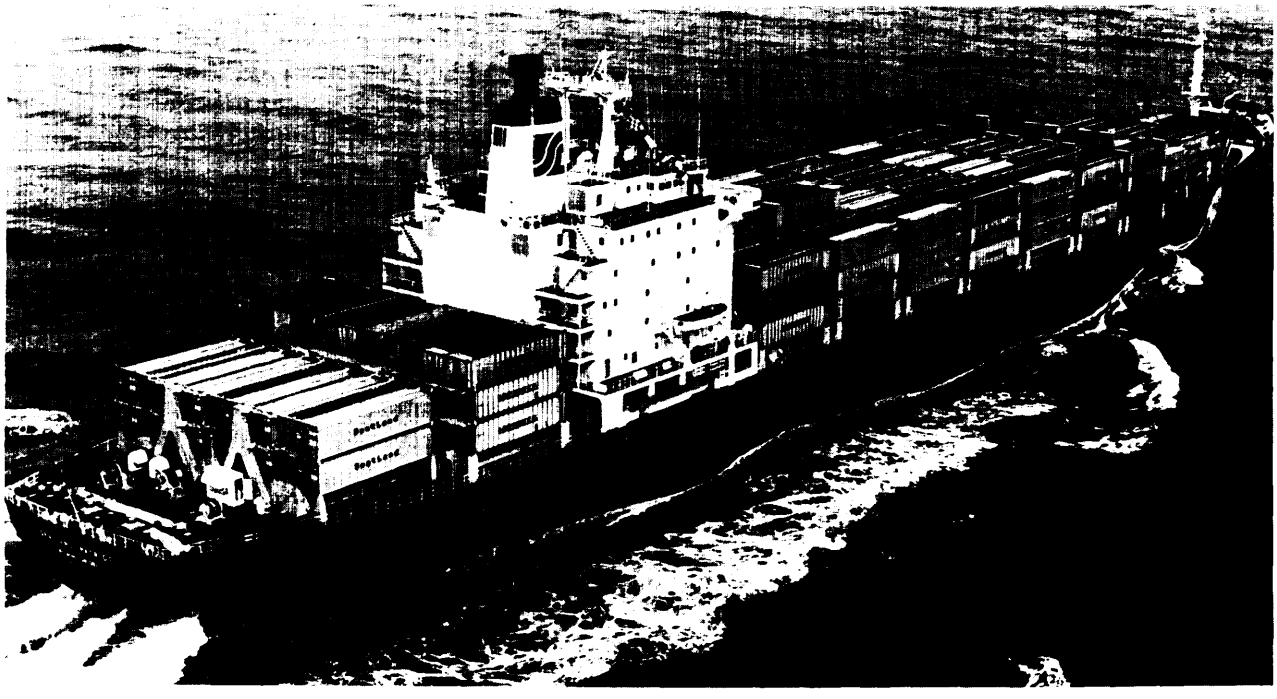


Photo credit: Sea-Land Industries

Economics have forced a shift to slower speed, fuel-efficient containerships—the *Sea-Land Patriot,* first of 12 diesel-powered ships built in Japan and Korea in 1980 for Sea-Land Service

past, they can be expected to resume their increases later in the decade, and fuel conservation will continue to be an important influence on shipping. Advances in fuel efficiency are discussed further in chapter 5.

Crew costs represent one of the larger variables among maritime nations. One estimate places U.S. wage costs at six times that of a Chinese crew and twice that of a Japanese crew. 11 With wages on U.S.-flag vessels accounting for 20 to 50 percent of operating costs, 12 13 depending on vessel type) there are increasing pressures for greater automation of ship systems. It is particularly important for maritime policy makers to monitor trends in crew requirements and costs as key factors in the competitiveness of shipping operations.

[1] I Paul Ackerman, ' 'Comparative Operating Costs for U. S.- and Foreign-Flag Ships, " *SNAME, A Combined Symposium on Ship Costs and Energy*, New York, Sept. 30-Oct. 1, 1982.

[12] Ibid.

[13] Gary J. Baham, "Final Report, Trends in Vessel Technology for Maritime Trade and Shipping, " for the Office of Technology Assessment, December 1982.

CURRENT STATUS OF AND TRENDS IN WORLD SHIPBUILDING

Shipbuilding Industry Today

Merchant shipbuilding serves the demand for world shipping discussed above. The output of merchant shipbuilding over the recent past is summarized in figure 12. Output is expressed as grt, which is a measure of total ship volumetric capacity, and thus provides a better guide to shipbuilding output than the number of ships.

The dominance of Japan is readily seen in figure 12, followed by the Association of West European Shipbuilders (AWES), which was responsible for one-third of world merchant shipbuilding output in the period. AWES is strictly a voluntary association with the main purpose of lobbying the European Economic Community (EEC) and in no sense represents a unified commercial force. The relative significance of the nations participating in world shipbuilding today is seen best in the orderbook shown in figure 13 and table 3. The most striking feature is the rise of South Korea to second place, principally at the expense of AWES.

The majority of the shipyards of the developed world are suffering from the lack of orders and cutthroat competition brought about by the world recession and the heavy overtonnaging in the major ship types. The yards that survive the crisis either will be those with government support or those that so improve productivity that they can compete without actually losing money until a recovery comes.

Government aid has been available in one form or another to almost all the shipyards of the world over the past few years. Now, however, many governments either are cutting aid altogether or tying its provision to massive yard improvements in an attempt to drive the yards to greater productivity so that the aid is not wasted.

Thus, either as a result of the removal of government aid, the terms of its provision, or the orders crisis previously mentioned, most of the shipyards of the developed world are aiming for vast improvements in productivity. These will be gained by a mixture of improved efficiency of operations and the applications of new technology in shipbuilding.

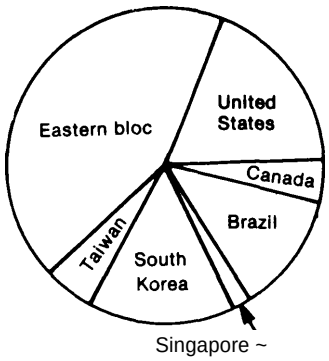
Meanwhile, technological advances are occurring in shipping operations, advances with which shipyards must keep pace if they are to produce marketable ships and remain competitive.

Shipyard Capabilities and Capacities

The period from 1970 to 1975 saw a general upsurge of expenditures on facilities development in

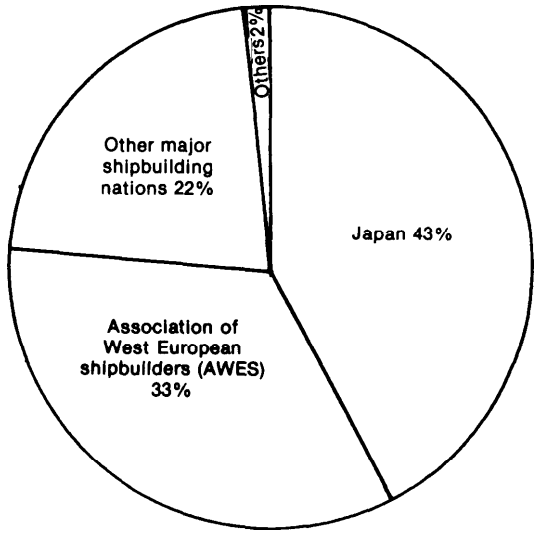
Figure 12.—World Merchant Shipbuilding Production, 1976-81, by Country

Production in other major countries measured in gross registered tons (grt)



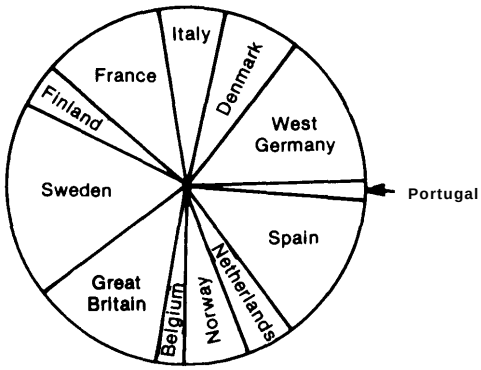
Production 26 million grt

World production measured in gross registered tons (grt)



Totai production 120 miiiion grt

European (AWES) production measured in gross registered tons (grt)



Production 40 miiiion grt

SOURCE: Fairplay, Aprii 19S3.

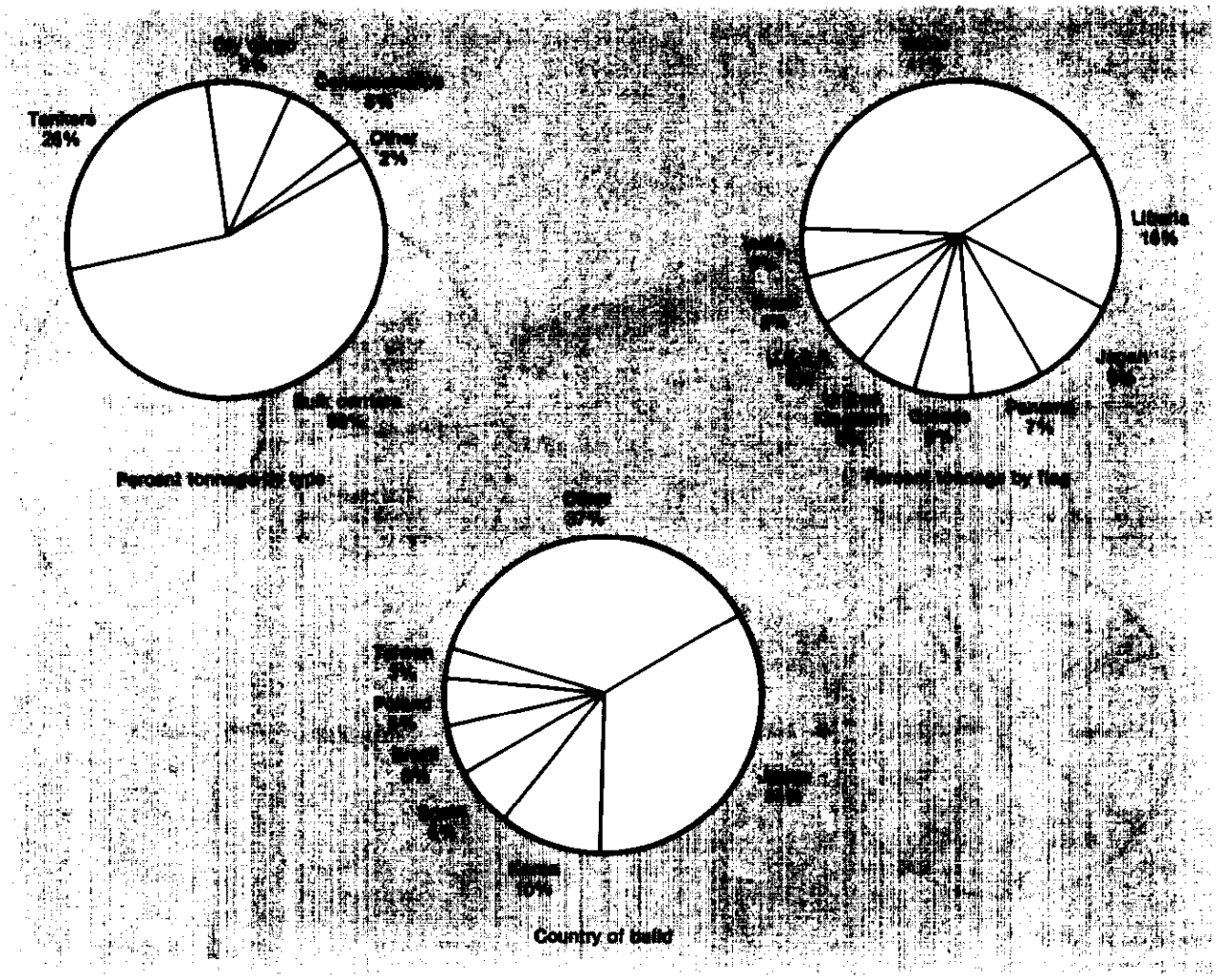
most of the world ~hipbuilding nations. To some extent this resulted in improvement of existing facilities, although many new yards also were built. The culmination of this investment period around 1973 to 1975 saw the peak of world shipbuilding demand. Since that time, demand (and therefore output) has declined worldwide and only in certain developing countries (notably South Korea) has investment in new facilities continued. In the majority of established shipbuilding countries the very sharp decline in output since 1975 has led to:

- large reductions in labor force numbers;
- closure of many facilities;
- diversification into other activities (notably offshore and land-based industrial fabrication); and
- a virtual "credit war' and, in many countries, a degree of overt or covert protectionism.

The last 2 to 3 years have seen the development of a second phase in most countries' reactions to the continuing surplus of shipbuilding capacity:

- those countries that had *undertaken major* cutbacks in capacity in the period 1975-81 (including Japan and most AWES countries) have generally decided that "enough is

Figure 13.—Merchant Ships on Order Worldwide



SOURCE: Fairplay, April 1983.

enough' and, for both sociopolitical and strategic reasons, further cutbacks are being resisted increasingly;

- those countries that had resisted cutbacks during the late 1970's—including some AWES countries—are now facing up to the necessity of making cutbacks;
- in the majority of countries, increasing emphasis has been placed on improving productivity (i. e., making better use of existing facilities) as a means of cutting losses; and
- with the notable exception of South Korea, those advanced developing countries that in the 1960's and early 1970's had seen shipbuilding as a priority area for development (e. g., Brazil, Taiwan) have lost much of their original enthusiasm.

Throughout this period, several developing countries (e. g., India, Indonesia) have expanded their shipbuilding industries in line with their general policies of increasing industrial independence.

South Korea is the prime example of a country that intends to consolidate its past expansion, regardless of the lack of orders worldwide. The country claims a total building capacity of 4.1 million grt in 1981 and the aim is for 6 million grt per year by 1986. The South Koreans are aiming

Table 3.—Ships Currently on Order (countries with 1 million dwt or more, with the United States added for compadson)

Country of build	Dry cargo		Tankers		Bulkers		Total	
	Number	Millions of dwt	Number	Millions of dwt	Number	Millions of dwt	Number	Millions of dwt
Japan	186	2.2	[illegible]	2.8	271	12.5	530	17.9
Republic of Korea	60	0.8	[illegible]	1.0	44	3.2	128	5.0
Spain	46	0,3	16	0.4	37	2.5	99	3.2
Brazil	20	0.2	11	0.5	41	2.1	72	2.7
Poland	61	0.8	14	0.9	20	0.9	95	2.5
Taiwan	23	0.4	3	0.2	15	1.3	41	1.8
U.S.S.R.	30	0.3	19	1.0	14	0.5	63	1.7
China	40	0.4	5	0.1	31	0.8	76	1,4
Yugoslavia,	13	0.1	34	1.0	6	0.3	53	1.4
Romania	46	0.2	4	0.2	17	1.0	67	1.4
United Kingdom	24	0.1	3	0.2	21	0,9	48	1.2
Portugal	7	0.1	7	0,8	6	0.3	20	1.2
Germany	76	0.7	5	0.1	9	0.4	90	1.1
India	3	0.1	—	—	24	1.0	27	1.1
Denmark	49	0.3	6	0.2	7	0.4	62	1.0
United States[a]	8	0.2	13	0.5	1	0.1	22	0.8
All others.	232	1.8	81	2.0	49	2.1	362	6.2
Total (April 1983)	924	9.0	318	11.9	613	30.3	1,835	51.2
Total (September 1982)	929	9.3	393	14.9	650	33.4	1,972	57.6

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for 10 percent of world orders by 1986; they now have 8.5 percent.

The productivity of South Korea's shipbuilding workers is only about half that of the Japanese—about 15 tonnes/man-year. (The South Korean Government aims to double this to 30 tonnes/man-year by 1986,)[14] The reasons for South Korea's success are several, but the most important is undoubtedly the low cost of labor.

If Korean yards succeed in doubling their productivity, coupled with their very large capacity, they will be a force with which to be reckoned. Their prices are already very low (average 15 percent below typical AWES prices), although it has been suggested that they have been making little or no profit at these levels. 1[5] They have in the past attempted to gain a key position by massive undercutting, and initially succeeded, but future petiormance may be different. South Korea's situation is important to the United States not only because they are a major ally and trading partner, but also because U.S. ship operators recently have contracted for major new buildings in Korean yards,

Since the massive slump in orders in 1975, the majority of the world's shipbuilders have agreed to reductions in capacity. Japan, by far the largest shipbuilding nation in the world, has reduced its capacity by 35 percent, according to the Shipbuilders Association of Japan (SAJ). The 23 major companies represented by SAJ employed 112,000 people in April 1974. By mid-1979 this was reduced to about 72,000 and remained at about that level through 1982. Unlike the Western European nations, whose capacity reductions took place in a piecemeal fashion, the Japanese industry cutbacks took place under what appears to have been fairly strict government control.

Despite the reduction, total Japanese shipbuilding capacity still is massive, and the yards are aware of the need to contract further if they are to remain competitive under the dearth of orders expected over the next 3 or 4 years. However, they do not intend to reduce their manpower further, except by the process of natural wastage,

[14] A & P Appledore Ltd., *Technical* and Capability *Developments in Shipbuilding,* prepared for the Office of Technology Assessment, November 1982.

[15] Ibid.

The Japanese philosophy, which is aided by the makeup of their conglomerate firms, is to restructure, shifting the emphasis away from direct marine involvement. The nonmarine activities consist primarily of shore-based machinery manufacture. In this way, they do not lose potential capability, but are not desperate for orders to maintain their present situation. They also are preparing to weather the orders slump by:

- concentrating on high-technoloy vessels; and
- carrying out concerted market research and a forceful marketing drive.

AWES is not a governing body, but acts as a consultative and monitoring organization. Thus, the actions taken by different yards and different countries within AWES do not all correspond to the stated aims of that body. For instance, in Belgium, Cockerills Yard (one of only two major yards) closed in 1982, but the government has stimulated naval building and construction for the inland waterways to help the industry. Building for their inland waterway industry serves a useful purpose in itself. In addition, the shipbuilding industry is a major consumer of steel, and the Belgian steel industry also is suffering greatly from the recession. Also, in the Netherlands, the government turned down a request for shipbuilding subsidies in early 1983, a situation that has led to the closing of the Verolme yard and the loss of 6,000 jobs.

The reductions in numbers employed in merchant shipbuilding by the member countries of AWES (except Portugal and Finland) are shown below:

Country	*Employees (end 1975)*	*Reduction in employment (December 1975-December 1981)*
Netherlands	22,700	*56%*
Sweden	14,000	48%
United Kingdom.	54,600	47%
West Germany	46,800*	*46%*
Italy	25,000	36%
Denmark	16,600	**30%**
France	27,600	29%
Norway.	18,600	29%
Spain	43,000	24%
Belgium	6,100	11%
AWES (overall)	275,000	about 3370

"Excludes military sh]pbuildmg,

SOURCE AWES/EEC/A & P Appledore

Only Finland has a modest but very healthy shipbuilding industry by any standard. They have concentrated on passenger cruise ships and ships that navigate in the polar regions and are recognized world leaders in these markets.

Other Nations

Not all LDCS have succeeded as South Korea has. Taiwan is producing work for its only major yard (China Shipbuilding Corp.) by building up the national fleet. This buildup follows in the spirit of multilateral cargo-sharing, although they are mainly building bulk carriers.

Brazil expects to lay off from 21 to 42 percent of its 178,000 shipbuilding work force in the near future. In the latter 1970's, Brazil was able to build a healthy shipbuilding industry by attracting foreign shipbuilders to open yards there to build their rapidly growing national fleet and to build ships for foreign buyers, backed by healthy credit facilities. Now, faced with a crippling national debt, they are unable to finance foreign buildings, and have to seek foreign finance packages and aid to build ships at all.

In the People's Republic of China the shipbuilding industry neither is expanding nor contracting to any marked degree. The work force remains fairly steady. However, they are making great strides to improve their productivity, which, coupled with low costs (labor and materials), will enable them to become very competitive. At the same time they are building up their national fleet, and the work so generated is keeping their yards busy. In addition, they are now marketing outside the People's Republic of China. They are in the fortunate position of taking orders for foreign new buildings without being driven to it from lack of work. Thus they are only taking work they want—work that brings learning, or that opens trade with a new country. They are building a modern, competitive industry within the existing framework. Should they choose to enter the international shipbuilding market in a major way, they would undoubtedly be a force to reckon with. There is, however, some doubt whether this will happen, given the depressed state of the industry worldwide and the large number of other industrial sectors competing for finance within the People's Republic of China.

The United States has a very large shipbuilding industry (described in ch. 4) compared with other maritime nations, with over 175,000 total employees in 1980 (compared with 160,000 in Japan). However, the United States has not competed in the world market for construction of merchant ships in the past 20 years. Merchant ship construction in the United States during the 1960's and 1970's has been almost entirely under Federal Government subsidy or for the domestic market where construction must take place in the United States by law. During these years the U.S. shipyards have been dominated by U.S. Navy construction, and today naval warship or auxiliary ship construction makes up over 90 percent of the major U.S. shipyards' business.

Finance

The whole subject of finance of shipbuilding is a thorny one but it is certainly true that few, if any, ships are built at present without credit (except behind the Iron Curtain). The battle to attract orders was waged largely with bigger and better credits until OECD laid down guidelines, known as the ''OECD Understanding' on credit terms. These have been modified, and the limit is now a maximum of 80 percent credit over a maximum of 8.5 years at a minimum rate of 7.5 percent per annum.

Not all shipbuilding nations are in OECD, and not all OECD members always abide strictly by the understanding. Thus, the understanding becomes a broad guideline. Meanwhile, merchant bankers feel that the period should be extended more in line with the life of a ship, while many governments, seeing large amounts of credit extended to developing nations that are struggling to service their loans, would like to reduce the credit limit.

It would appear unlikely, with a lack of new building orders and a massive shipbuilding overcapacity, that building credits will be terminated. On the other hand, it would appear very likely that direct yard subsidies will be reduced, if not removed, in many countries, as a means to force a reduction in capacity. Financial assistance is available in some countries for investment in new technology, provided it is linked to reduction of capacity.

Thus, in the near future, shipbuilding subsidies in the form of credit are likely to remain as a means of attracting orders, but direct financing available to the majority of shipyards is likely to be seriously curtailed.

Outlook for Commercial Merchant Shipbuilding

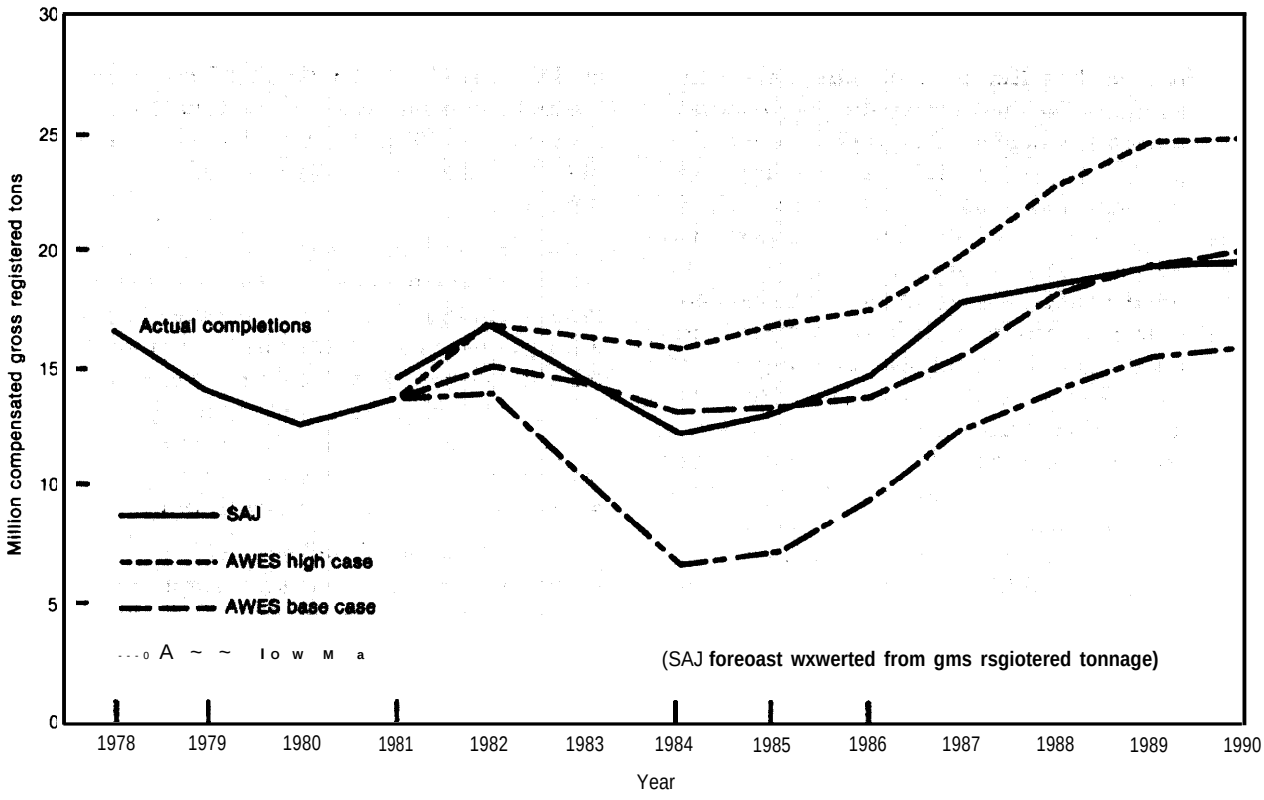
It is the volume and pattern of seaborne trade that generate the demand for cargo-carrying ships. However, the long leadtime in building ships and the uncertainty in predicting future trading markets contribute to an imbalance between supply and demand and to boom and bust cycles in shipbuilding, In addition, there is some purely speculative ordering of ships for the purpose of selling them later at a profit.

The present gross surplus of tonnage is due to ordering of tankers in the 1970's and the more recent ordering of bulk carriers. Petroleum and bulk-cargo markets were expected to expand rapidly, and ship operators and speculative buyers alike anticipated growing demand for new ships. Largely due to the severity of the world recession, the growth in the freight markets did not materialize.

The presence of a tonnage surplus, which is almost always present although fluctuating in size, tends to act as a check, dissuading operators from the more extravagant ordering. For this reason, no sharp increases in new tonnage delivered can be expected for a number of years. The latest forecasts from AWES and SAJ (fig. 14) both show that the level of future ordering is likely to be suppressed for the next 3 to 4 years.

The major shipbuilding industries in Japan, South Korea, Europe, and elsewhere, compete for each order in a worldwide market. The U.S. industry not only is insulated from that world market, producing only a few percent of the world output

Figure 14.—New Building Demand Forecasm, 1982



SOURCE: A & P Appledore, 19S2.

of commercial vessels, but does not meet its own domestic demand for merchant ships.

Table 4 shows an approximate breakdown of the 1982 world orders in terms of the percentages built by each country or group of countries, the percentage expected to be delivered that might go to owners domiciled in the various countries, and the resulting percentage surplus or deficit. While these figures are only projections, they are approximately of the right magnitude. Overall, West European builders will satisfy their own demand, although certain countries such as Denmark, France, and Spain might get more than their share of ships built. Eastern European builders also will build predominantly for their own demand, although yards in Poland and Romania can be expected to take a percentage of external orders. Japan and South Korea have captured the remaining market for foreign construction.

These percentages may well change by the end of the century. But it is of interest to take the tonnages from the SAJ forecast (fig. 14) and to distribute them according to the market shares shown in table 4. This is depicted in table 5. Tonnages produced in 1975, the peak year, are shown for comparison. The forecast tonnages for Japan and Western Europe are considerably less than the shipbuilding capacity remaining in those areas after their reductions in capacity of approximately 35 percent since 1975.

The picture that emerges, therefore, is one of:

. increased de facto dependence on nat ion a] fleets (including vessels owned by nationals but sailing under another flag) as the basis of future new building orders;

Table 4.—Approximate Percentages of the World Orderbook

Country	Percentage of total dwt	Percentage for national fleets[a]	Percentage building surplus
Japan	40 "/0	320/o	80/0
South Korea	9	3	6
China	3	3	—
Taiwan	2	2	—
AWES members	23	23	—
United States	1	2	-1
Eastern Bloc	20	18	2
Other	2	17	-15
Total	100	100	0

aAS per Count~ of domlcjle of owner (ie, not by registered f~a9)

SOURCE "Fairplay" World Ships on Order, October 1982

Table 5.—Comparison of Shipbuilding Forecast Tonnages[a] and 1975 Production for Selected Countries

Country	*1975b* product ion	1985C forecast	*1990'* forecast
Japan	17.0	5.6	9.9
South Korea	0,4	1.3	2.2
Taiwan	Negligible	0.3	0.5
AWES members	12.9	3.2	5.7
United States	0.5	0.1	0.2
China	(d)	**0.4**	**0.7**
Eastern Bloc	(d)	2.8	4.9

aTonnages expressed In milllons of 9fl
[b]Lloyds Register
[c]SAJ Forecast
'Figures not available individually

. a much smaller international ' 'open market for new buildings, in which the principal protagonists are Japan and South Korea;
. many developing countries building up or maintaining existing shipbuilding industries specifically to cater to local demand;
. continuing emphasis among the **AWES nations**, Japan and also Korea on:
  — diversification into allied sectors as a means of creating work,
  — technological development, both of the \'essels themselves and in the way they are built, as a means of improving competitiveness; and
. some further reductions in capacity (particu - larly among AWES countries) but much less on average than has been seen over the 1975-82 period.

Most of the established shipbuilding nations of the world accept the need for the industry to contract further, but do not want to contract further themselves. The Japanese need to maintain some 40 percent of the world new building market in the future if they are to maintain reasonable employment in their yards. South Korea is expanding and will need to attain 10 percent of world output. This they will probably succeed in doing since their productivity is rising faster than their costs.

China and Taiwan are unlikely to be in the market for foreign orders in any major way, but by keeping their yards occupied with domestic orders, they will still have the capacity and capability to take foreign orders whenever the upturn in orders should occur. Improving productivity and low costs will make them competitive.

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WORLD ECONOMIC AND TRADE OUTLOOK 1982-2000

Introduction

In order to assess the "long-run" outlook for shipping, OTA asked Wharton Econometrics, Inc., to prepare an outlook for world trade through the year *2000.* It is presented because any analysis of the future of shipping or shipbuilding must consider the directions world trade will take. Trade is dependent on economic growth, and the demand for ships is derived from trade. It is important to note that any forecast that attempts to predict events many or even several years ahead is subject to error. This forecast assumes no major surprises.

Based largely on their world econometric model, Wharton prepares 10-year world economic outlooks covering some 27 countries and regions, forecasting parameters such as gross domestic product (GDP), inflation, and unemployment. For purposes of this study, Wharton's 1982-92 outlook was extrapolated to the year 2000. Using this baseline outlook, dynamic trade-flow matrices, which ensure global consistency, were used to generate annual bilateral trade flows in value terms for all countries and regions in the system, for all years of the forecast for three merchandise groups: bulk commodities, fuels, and manufactured goods. The units of measure are based on value converted to dollars for all countries. These, in turn, are adjusted in order to generate constant-dollar measures (in 1975 dollars) of the volume of exports and imports. At this point, the bilateral trade flows in constant-dollar volume terms are converted to bilateral *maritime* trade tonnages by application of conversion equations developed econometrically on the basis of U.S. Bureau of Census, OECD, and U. N. trade data on total maritime trade tonnages by category. In addition, corrections were made to eliminate nonmaritime trade flows and to shift coal tonnage from fuels to bulk commodities. Thus, the final product is an overall projection to 2000 of world waterborne trade flows broken into dry-bulk, liquid-bulk, and general cargo sectors.

Economic Forecast

The economic outlook developed by Wharton is presented in two parts: the near-term outlook, 1982 to 1987, derived from Wharton's December 1982 World *Economic Outlook,* and the long-term outlook, derived from Wharton' January *Long-Term Wor/d* Economic Outlook 1987-92, with extrapolation of key indicators to 2000. Tables 6 and 7 summarize the assumptions and major trends predicted for parameters relevant to this study.

Near- and long-term projections of growth of GDP for selected countries and regions are shown in table 8. The basic economic outlook based on this projection for the 5 years, 1982-87, is for con-

Table 6.—World Economic Outlook, 1982-87

Forecast:
- World economic growth will average 3.2 percent from 1983 to 1987. U.S. economic growth will average 3.4 percent after -1.6 percent in 1982.
- Unemployment rates will fall slowly from their postwar historical highs.
- Inflation will moderate worldwide.
- Balance-af-payments problems of developing countries will persist because of high real interests costs on their accumulated debts and sluggish growth in the developed countries.
- Economic growth in the oil- and nonoil-exporting LDCS will be constrained by balance-of-payments problems and retarded demand for their exports. The major bright spot in the developing world will be the newly industrializing countries of the Pacific Basin.[a]

Assumptions:
- Real "fuel- and nonfuel-commodity prices will decline in 1982 through 1985 or 1986, respectively, reflecting slow world growth.
- Monetary policies will be moderately restrictive, resulting in high real interest rates that will retard investment as well as inflation.
- Fiscal policies will not be stimulative as governments attempt to bring large fiscal deficits under control.
- High unemployment and lack of flexibility to use monetary and fiscal policies will encourage more protectionism in the developed countries, slowing world trade growth, especially manufactured goods.

what Is, the Phillipines, Taiwan, Singapore.

SOURCE: Office of Technology Assessment.

Table 7.—World Economic Outlook, 1987"2000

Forecast:
- World economic growth will average 3.0 percent with U.S. growth averaging 2.8 percent.
- Unemployment rates will decline slowly but will remain discouragingly high, encouraging protectionism. Mismatches of jobs available in growth industries and skills of unemployed will persist, encouraging more artificial employment-creating techniques.
- Lower growth of real and nominal wages will lower inflation.
- Labor force growth will moderate due to lower participation rates (discouraged workers) and demographic factors.
- Regeneration of depleted capital stocks will promote relatively faster growth in Japan, but in Europe the existing capital stock will not be quickly regenerated because of low rates of return and low competitiveness with newly industrializing countries.
- Real interest rates will tend to decline to historical averages of 2 to 3 percent.
- Pacific Basin developing countries will continue their relative rapid growth. Latin American countries will show much slower growth compared with the 1970's.

Assumptions:
- Real fuel- and nonfuel-commodity prices will rise relative to manufactured goods prices.
- Monetary policies will be moderate, permitting money stocks to grow in line with nominal GDP growth.
- Fiscal policies will continue to be nonstimulative as the importance of Government spending declines because of demographics and public policy.

SOURCE: Office of Technology Assessment.

tinuing setbacks to sustained recovery in the United States, Europe, Japan, and Canada. The most significant feature is the projected weakness of growth in Europe and Japan compared with the 1960's and early 1970s. The delays in Japan and, particularly, Canada are related to the sluggish U.S. performance, but more general causes are the effects of persistently high real interest rates, especially in Europe and Canada, and the continued pessimism among investors and consumers, reinforced by higher unemployment rates. Also, a significant part of the growth of the developed countries in the 1970's was due to exports to the developing countries and to the centrally planned economies (CPES). Import retardation or restriction by the LDCS and selected CPES, as they seek to correct their external accounts, will diminish this impetus from abroad.

Forecast economic growth beyond 1987 actually is slower overall than predicted for the previous 4 years. In part, this is because the 1983-87 growth rates appear higher due to the trough-to-peak problem of using 1983 as the initial year, when most countries are at a lower-than-trend rate of growth. However, the more fundamental causes include the relative changes in capital formation, labor force dynamics, and labor productivity.

This extrapolation may be pessimistic given the long period of sluggish growth in the 1980's. By 1992, a buildup of corrective forces could be generated by a general recognition that inflation was under control and structural adjustments in old industries generally were completed. Capital stocks would have to be replenished, and new industries would be burgeoning. However, for some purposes, a conservative outlook may be the most prudent, given the tendencies of the maritime industry to overanticipate periods of recovery,

Outlook for Trade Flows, 1982-2000

Using the model, Wharton has forecast total trade flows (including nonmaritime trade) in three major commodity groups: fuels (including coal), nonfuel commodities, and manufactured goods.

Table 8.–Growth of Real GDP (annual average compound growth rate)

	1960-73	1973-83	Recovery 1983-87	Moderate growth 1987-2000
World	5.5	2.6	3.3	3.1
Developed countries	5.0	2.1	3.1	2.7
United States	4.1	1.9	3.5	2.8
Japan	9.9	3.4	3.3	2.7
Europe	4.8	1.8	2.6	2.4
West Germany	4.5	1.5	1,9	2.0
Developing countries	6.3	3.6	4.6	4.6
Oil-exporting	8.2	1.6	4.9	4.3
Oil-importing	5.5	4.3	4.6	4.8
Centrally planned economies	7,2	4.0	2.9	3.0

SOURCE: Off Ice of Technology Assessment.

Past and predicted average compound-growth rates for world exports are shown in table 9. For comparison, GDP growth rates for comparable periods have been included. Following the trend in growth of world GDP, world trade is predicted to expand faster after 1985 than during the current period. For the world as a whole, trade in manufactured goods is expected to regain its traditional position as the fastest growing sector. Growth in trade in nonfuel commodities remains level. We should note especially that growth in trade in fuels picks up after a ''reconstruction' period, when the movement to conserve fuel relative to GDP growth, due to the dramatic upward shifts of energy prices in the 1970's, has run its course.

The trends and predictions for bilateral trade flows include several shifts with ramifications for the shipping industry. The changing pattern of fuels trade among countries and regions has already caused major dislocations in the bulk-shipping sectors. The first and second oil shocks, emanating initially from the Organization of Petroleum Exporting Countries (OPEC) members among the developing countries, led to efforts by the developed countries to reduce fuel imports and to increase their own exports of fuels. This was manifested in the shipping industry by the well-known glut of oil tankers and the strenuous efforts to move coal by dry-bulk carriers across the oceans—the latter trade had been declining steadily. The share of volume of trade in fuels shifted dramatically from the developing to the developed countries as relative prices shifted.

The other major shift of note in the trade outlook is the change in the status ofJapan. Wharton's projection shows only average growth for Japan as her period of rapid industrialization fades and a high-technology, more consumer-oriented society emerges. Accordingly, after the export drives that were evident until 1981, import growth is expected to overtake export growth in the 1985-90 period. Market forces and the threat of protectionism will open Japan's manufactured-goods marketplace to new competition, especially from the newly industrializing nations of the Pacific Basin. Indeed, Japan could be an engine of growth for all southeast Asia analogous to the role played by the United States vis-a-vis all developing nations. The developing countries of the Pacific Basin region thereby could have two sources of export growth—the United States and Japan—and thus grow faster than other developing areas.

Table 9.—Average Compound Growth Rates for World Trade Exports and GDP

	1975-80	1980-85	1985-90	1990-2000
World trade (exports):				
Total	5.7	3.1	4.7	**5.0**
Nonfuel	5.7	4.0	3.9	3.9
Fuel	1.6	-0.2	3.4	4.0
Manufactured goods	6.8	3.6	5.2	5.5
World GDP	3.8	2.2	3.0	3.1

SOURCE: Office of Technology Assessment.

A shift toward the Orient could mean a decline in the relative importance of trade with Europe—and what trade would remain could become regional rather than intercontinental. European-based sources of energy, **including the U.S.S.R. also** could lower the importance of oil shipping. Nonfuel-commodities growth would not take up the slack. This, coupled with the relative slowdown of U.S. nonfuel-cornmodities-imports growth, would lower the relative importance of the dry- and liquid-bulk Atlantic trades between 1987 and 1992, compared with the fairly vigorous growth during the 1973-79 period. The glut of shipping in Atlantic bulk trades today is a harbinger of these trends.

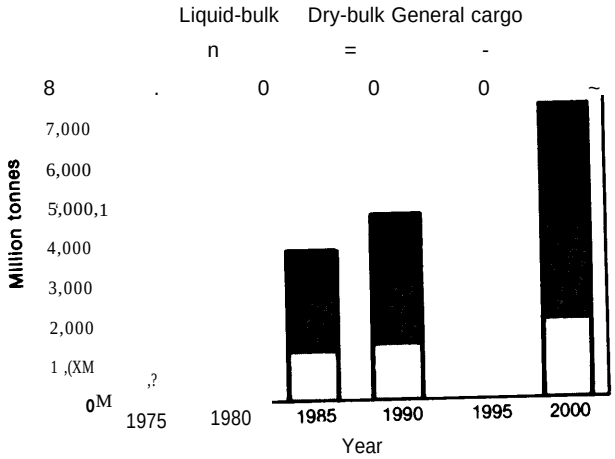
Outlook for Seaborne Trade

World Trade Patterns

This section summarizes Wharton's projections of bilateral maritime trade flows between countries or regions to 2000. The total tonnages shipped or projected to be shipped from 1975 to 2000 in the liquid-bulk, dry-bulk, and general cargo categories are shown in figure 15. * Between 1985 and **2000,** the fastest growth is projected to be in general cargo trade with the slowest growth in liquid-bulk shipments. As a result of these differing rates, liquid-bulk, which represented the largest share of total trade in 1975 and 1980 (45 and 40 percent, respectively), in this forecast would account for only 28 percent in 2000. The volume of trade in both dry-

*In this section, data for liquid-bulk include only petroleum and petroleum products. However, other liquid-bulk cargoes, such as chemicals and liquefied natural gas, account for such a small fraction of the total that this approximation is appropriate for forecasting purposes.

Figure 15.—World Seaborne Trade

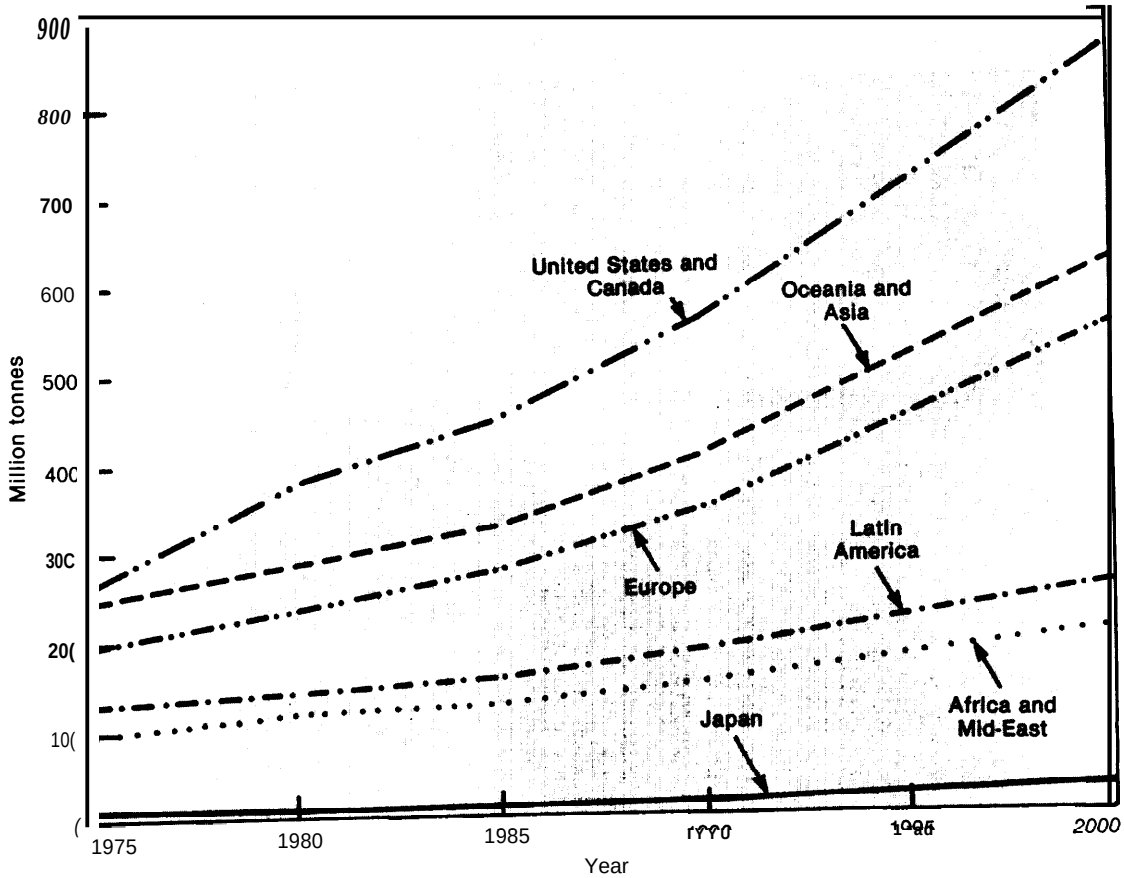


bulk and general cargo is projected to exceed that in liquid-bulk by 1990.

In the dry-bulk sector (fig. 16)* expanding exports of coal from the United States, and of subsidized agricultural products from Europe, are expected to increase the shares of export trade from these regions. The shares of the traditional commodity suppliers in the developing world, (i. e., Africa and Latin America) correspondingly decline.

● For figs. 16 through 21, showing regional distribution of world seaborne trade, Oceania and Asia includes Australia, New Zealand, Afghanistan, and Pakistan to Thailand and south, plus South Korea, Taiwan, and Hong Kong and the Asian CPEs. Europe includes the British Isles, Mediterranean, and Northern Europe, and the European CPEs.

Figure 16.—World Seaborne Dry-Bulk Exports, Regional Distribution



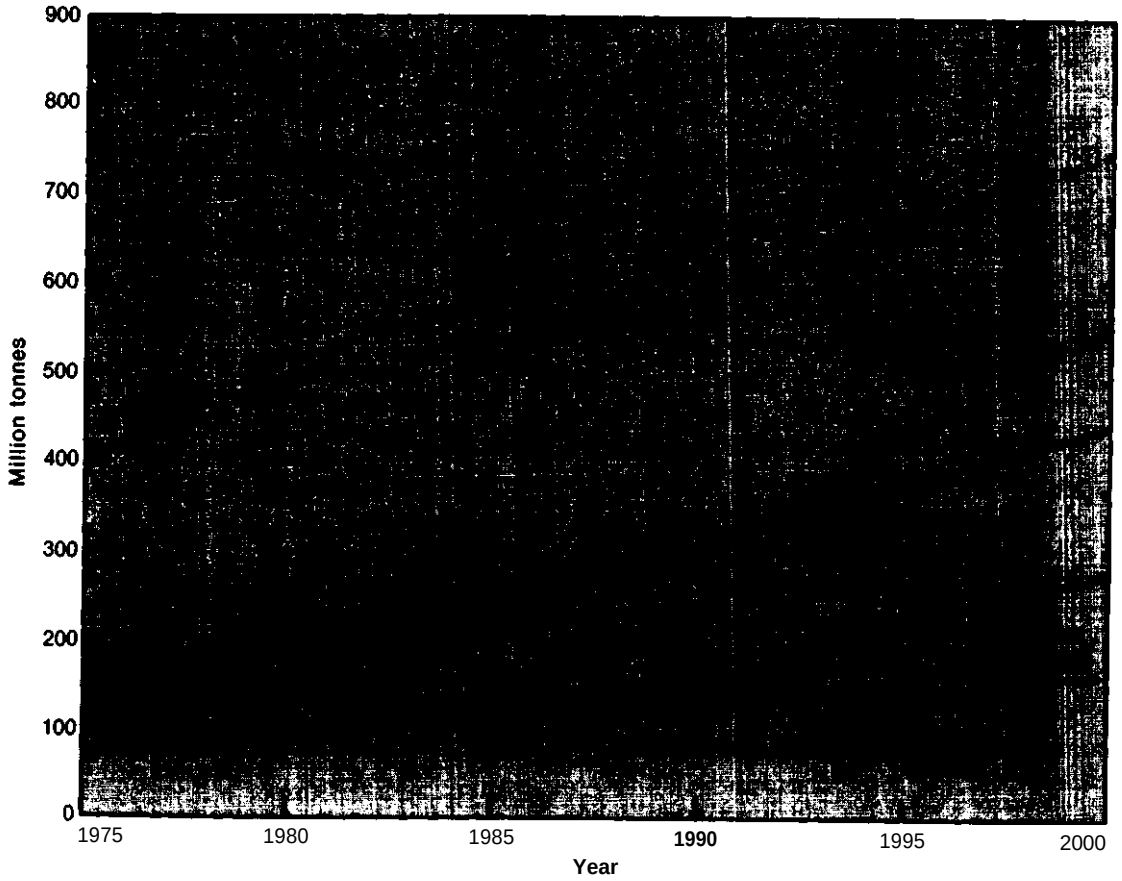
SOURCE: Wharton Econometrics, Inc

These trends for the developing world are to be expected as market forces, as well as public policy, shift these economies away from being traditional agricultural- and mineral-commodities suppliers and toward industrialization with growing exports of manufactured goods. This generalization is true especially of South Asia, whose share of general cargo will be seen to grow even faster than its bulk-commodity share.

For shipborne imports of dry-bulk goods (fig. 17), there are few surprises given the economic outlook for rapid growth in South Asia and the industrialization pace of developing countries in general. Thus, their own production of dry-bulk commodities is projected to become either less important or more devoted to serving their own internal development. Hence, they will tend to import more and export relatively less of this cargo. Shares of dry-bulk imports in Europe and the United States are expected to decline.

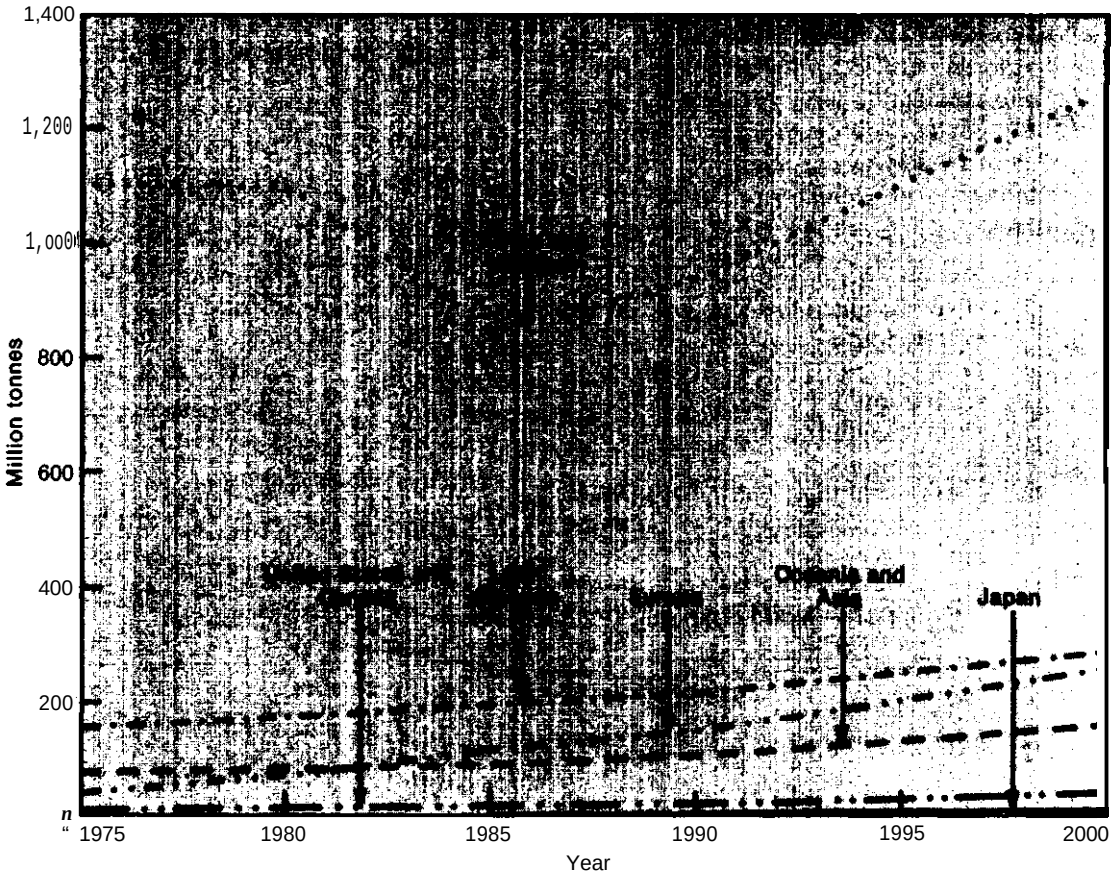
In liquid-bulk exports (fig. 18), this outlook suggests that the Middle East share will decline to 1985 due to generalized world recession, the oil glut's effects on Persian Gulf suppliers' shares, and the culmination of major non-OPEC oil and gas substitution efforts involving Mexico, the U. S. S. R., the United Kingdom, and the Alaskan slope. In spite of this decline, however, the Middle East will continue to dominate world petroleum exports with over 50 percent of the trade. After 1985, the Middle East share is expected to stabilize, as world energy conservation slows and Middle East petroleum product shares grow based on the industry developments in the early 1980's. Latin America and Africa appear to remain the major secondary petroleum exporting regions, with Latin America

Figure 17.-Worid Seaborne Dry-Bulk Imports, Regional Distribution



SOURCE: Wharton Econometrics, Inc.

Figure 18.—World Seaborne Liquid-Bulk Exports, Regional Distribution



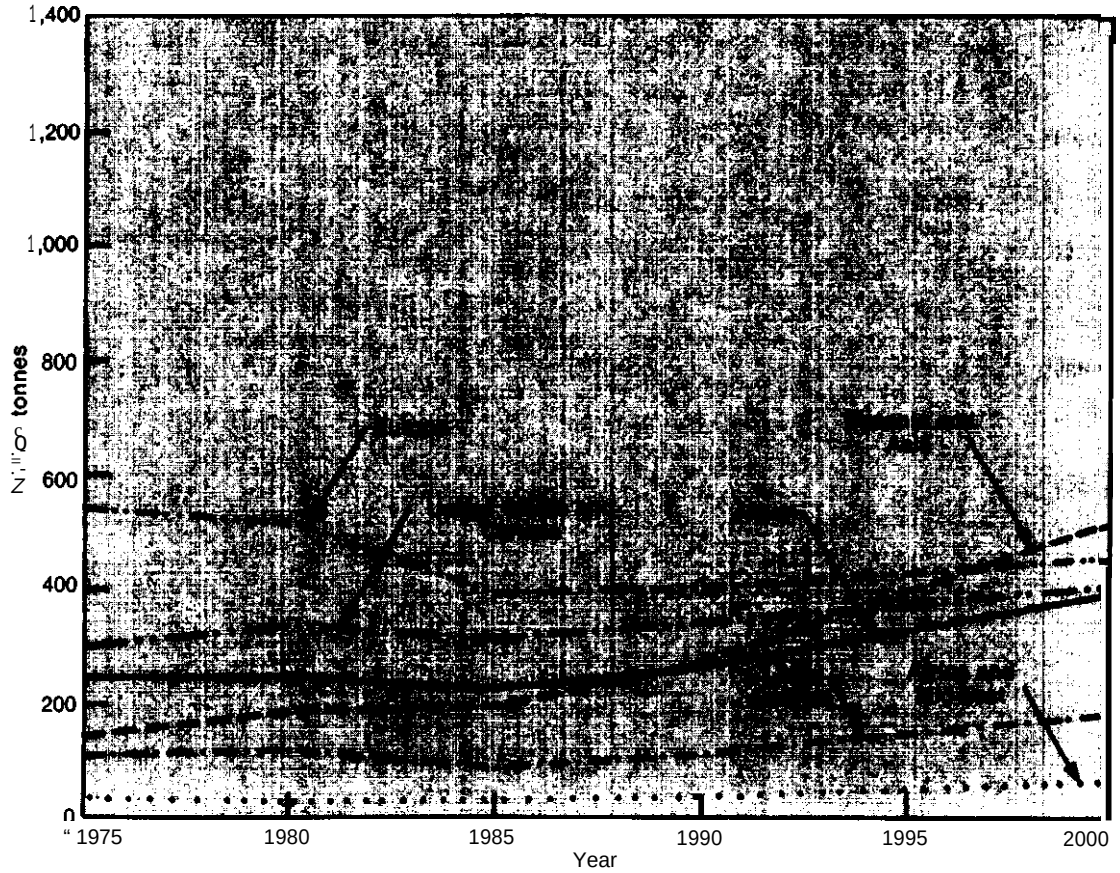
SOURCE: Wharton Econometrics, inc.

overtaking Africa after 1985. This forecast assumes, of course, that the real price of energy falls until 1985 **and** rises modestly thereafter. **It** also implicitly assumes no significant Middle-East supply interruptions and steady use of new supplies from the non-OPEC world.

Imports of liquid-bulk (primarily petroleum) cargoes are more evenly distributed than exports, and some shifts are expected over the next two decades, as seen in figure 19. South Asia's share is likely to grow very rapidly, shown here **as** doubling between 1980 and 2000. U.S. and, particularly, European shares decline. Japan, due to its large dependency on oil with few alternatives that could be landborne, as is the case for the United States (coal, gas pipelines) and Europe (gas pipelines from the U.S.S.R.), is expected to have an increasing share of petroleum imports.

The pattern of relatively high growth of South Asian trade is repeated for exports of general cargo, as seen in figure 20. The newly industrializing countries of South Asia are joined in growth by the industrializing countries of Mediterranean Europe. The U.S. share declines. In this outlook, Northern Europe's share is level to 1990, and thereafter falls swiftly. Such a projection is based on combined assumptions of a more realistically valued U.S. dollar, tired European industries, growing intra-Europe trade with the Mediterranean and CPE countries, and structural shifts toward service industries that make Northern European countries the leading examples of postindustrial societies.

Figure 19.—Worid Seaborne Liquid-Buik imports, Regionai Distribution



SOURCE: Wharton Econometrics, Inc.

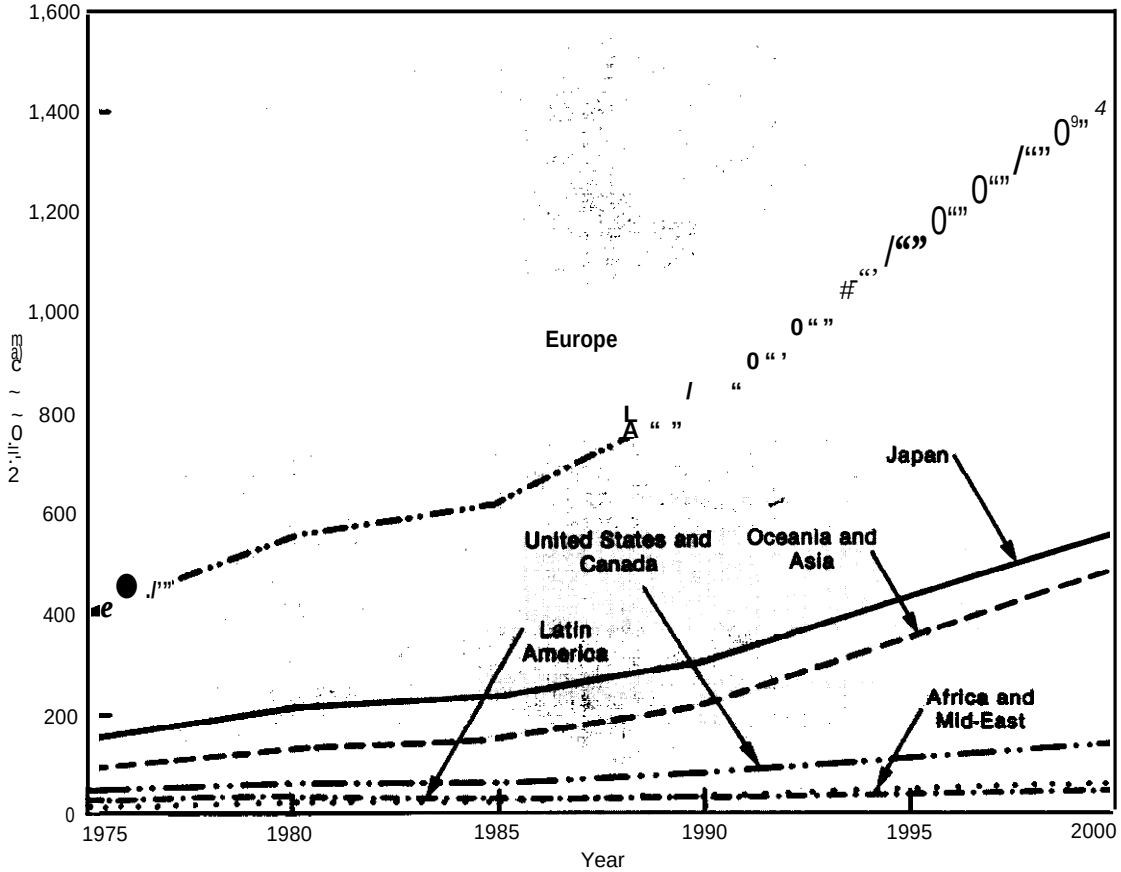
Imports of general cargo are more evenly distributed than the other commodities (fig. 21). While no dramatic shifts are predicted in this growing trade, the largest increases by 2000 are anticipated in the shares going to Japan and South Asia.

In summary, for the particular Wharton base-case-economic outlook discussed at the beginning of this section, world seaborne-trade tonnages are predicted to grow by compound rates of 3.9, 1.6, and 5.4 percent for dry-bulk, liquid-bulk, and general cargo, respectively, from 1980 to 2000. Economic growth and industrialization in South Asia is reflected in rapidly growing shares of imports, especially in exports of general cargo, and in expansion of liquid-bulk imports. In the dry-bulk trades, U.S. and European shares of exports are expected to increase while shares of imports decline.

U.S. Trade Patterns and Networks

The total tonnages of U.S. seaborne trade in the three commodity sectors from 1975 projected to 2000 are shown in figure 22, including both imports and exports. In 1980 the greatest tonnages were in imports of petroleum and dry-bulk exports. Due to current and projected low growth rates for the oil trade, it is far outstripped by exports of dry-bulk cargoes as the largest sector in this forecast. The trends in dry-bulk imports contrast with the other trades. Between 1975 and 1980 dry-bulk imports declined while the other sectors were expanding. While the outlook indicates that growth in all other trades is lower currently (1980-85) than during the previous 5 years or projected to 2000, dry-bulk imports are shown to have their best growth during the current interval. The dry-bulk sector as

Figure 20.—World Seaborne Generai Cargo Exports, Regionai Distribution



SOURCE: Wharton Econometrics, Inc.

a whole would grow from 49 to 59 percent of the total U.S. maritime trade between 1980 and 2000, while liquid-bulk would decline from 40 to 28 percent.

Overall, the forecast predicts that from 1980 to 2000 U.S. shipborne exports of dry-bulk, liquid-bulk, and general cargo will grow 4.4,6.4, and 3.9 percent per annum, respectively. U.S. imports of the same cargo types are projected to grow at 2.4, 0.9, and 3.7 percent, respectively.

Figures 23 through 25* show the current and forecast geographical distribution of seaborne trade of the United States derived from the data created by Wharton.

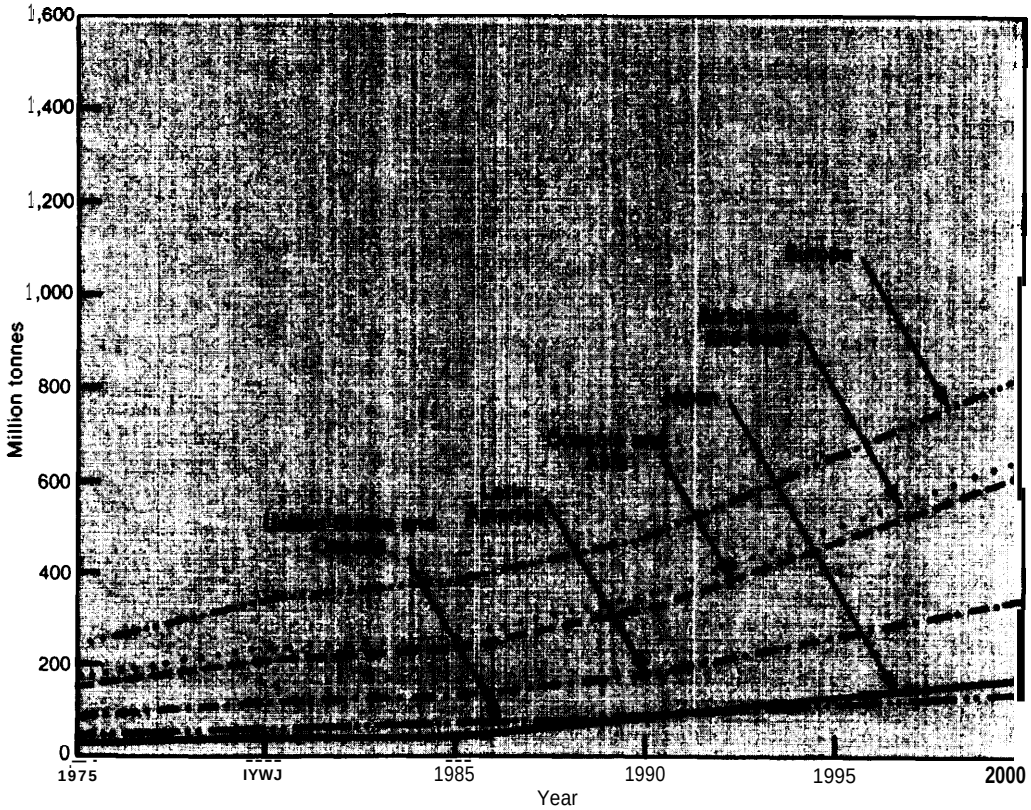
● For figs. 23 through 25, showing the regional distribution of U.S. seabome trade, the regions are the same as for the world figures, *except* that Japan has been included in the Asian region.

In the dry-bulk category, exports to LDCS grow steadily as a share. Among the developing areas, South Asia's share expands most rapidly. The coal trade with Europe grows, but the grain trade appears to decline, lowering the share of dry-bulk trade to that region overall. Almost no growth occurs in the volume of dry-bulk exports to Europe until after 1985.

For **U.S.** imports, this outlook shows Africa's and Latin America's dry-bulk shares progressively declining as industrialization catches up with their interest in commodity exports. Europe's share of our dry-bulk imports appears to increase between 1980 and 1985 due to the strong dollar problem as well as their new strength in agricultural goods.

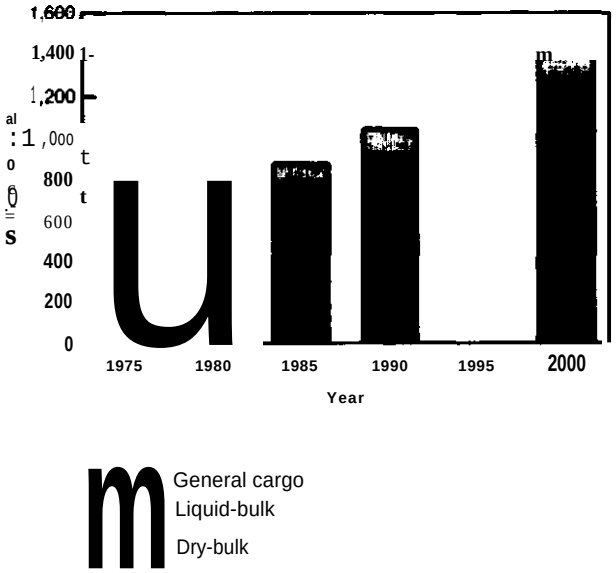
In the small U.S. liquid-bulk (petroleum) export trade, the major projection is for a jump in the

Figure 21.—World Seaborne General-Cargo Imports, Regionai Distribution



SOURCE: Wharton Econometrics, Inc.

Figure 22.—U.S. Seaborne Trade



SOURCE: Wharton Econometric Forecaatlng Associates.

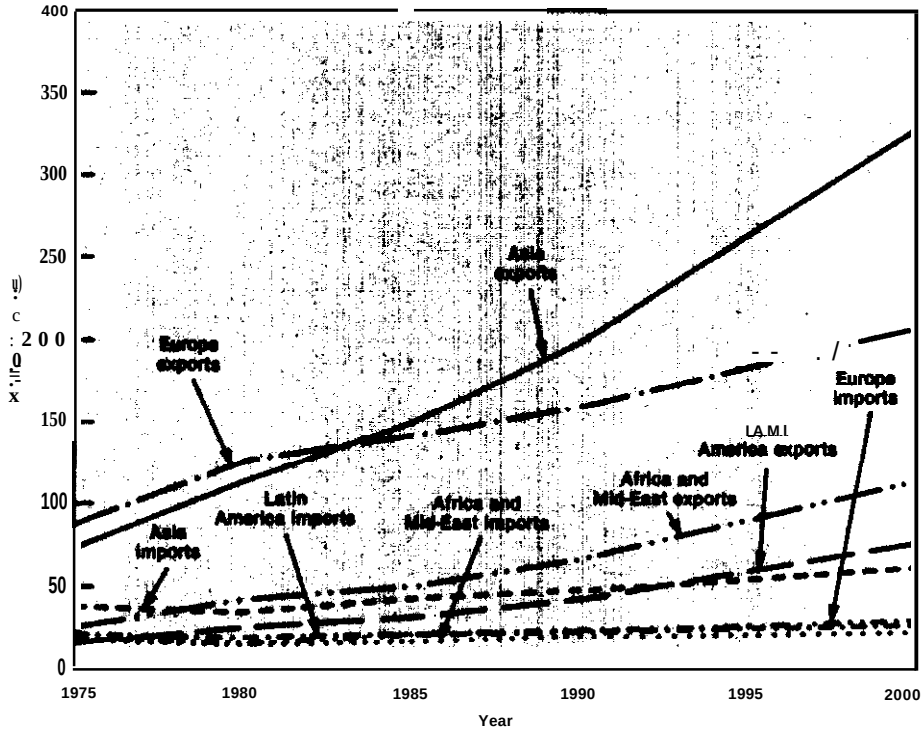
shares going to Japan and South Asia showing up in 1985, associated with petroleum developments in Alaska.

In the fuels-import trade, it is anticipated that Latin American, African, and Middle Eastern sources decline significantly while imports from Europe increase between 1980 and 1985. Beyond 1985, growth is likely in imports from each of those regions. The rate of growth in European imports is projected to slow.

In the general cargo trade, exports in the current period remain level or decline slightly. Thereafter, there are significant projected increases in volume to Europe, Asia, and Japan.

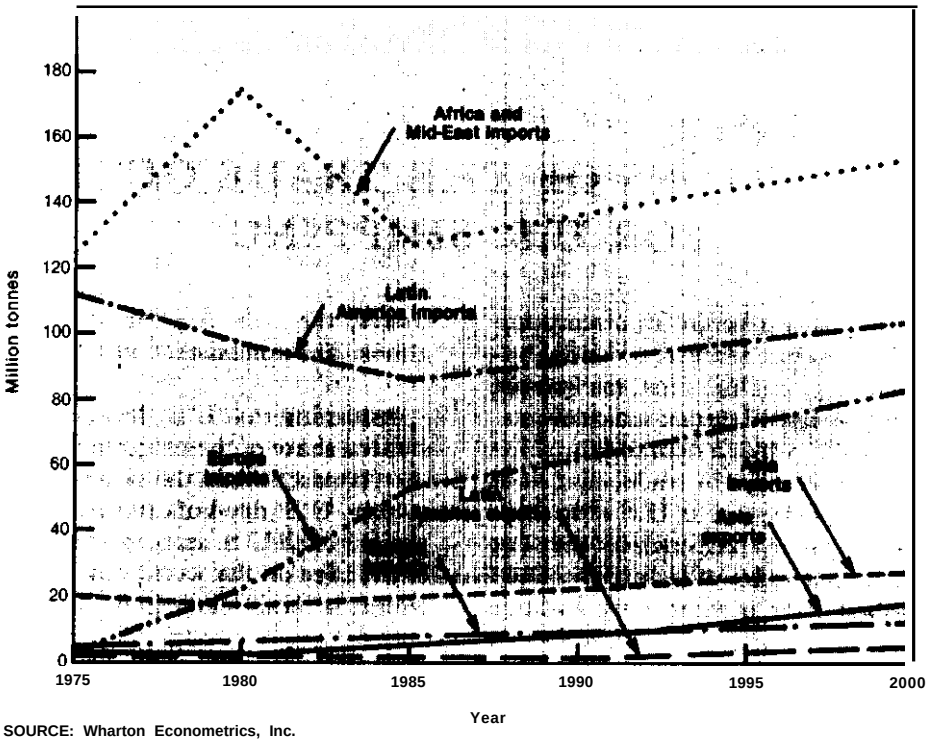
U.S. general cargo imports tend to follow world export share developments. The South Asia region is expected to displace all others after 1990 to emerge by 2000 as the most important supplier, supplanting Japan and Europe.

Figure 23.—U.S. Seaborne Dry-Buik Trade, Regionai Distribution



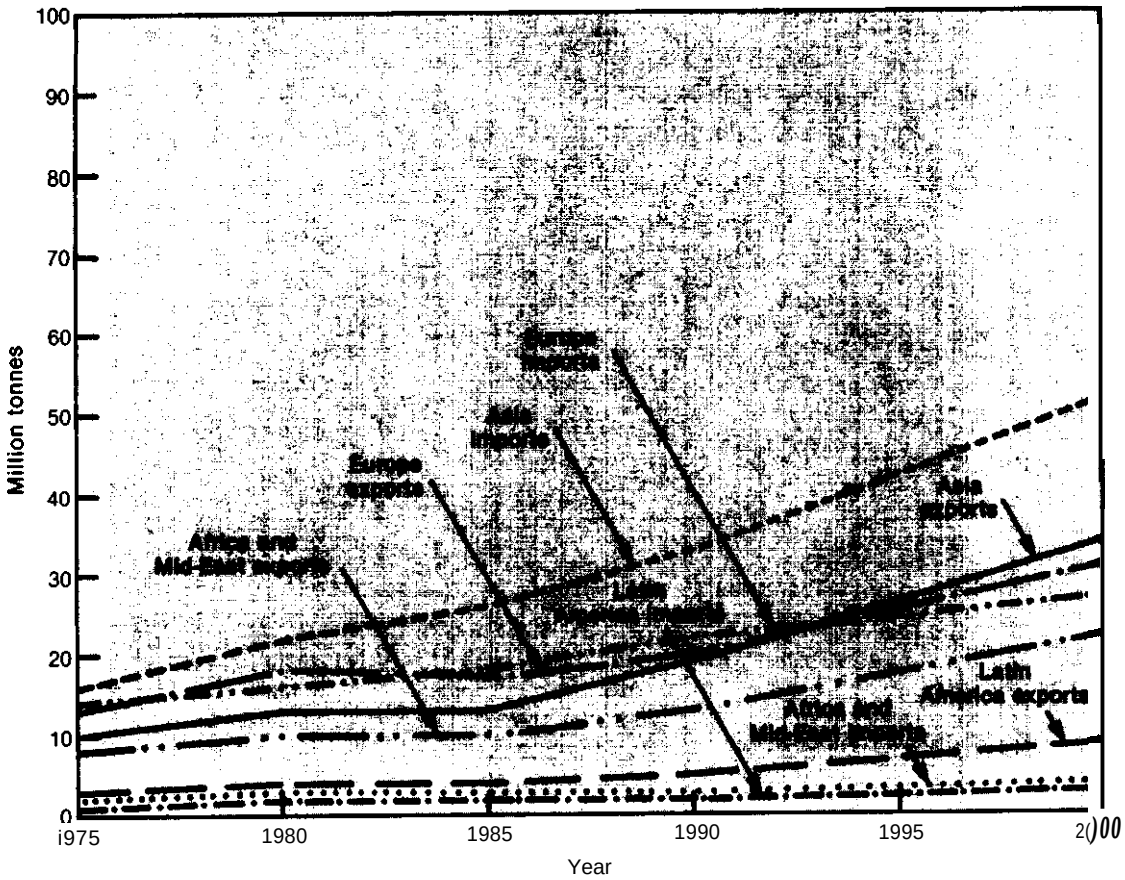
SOURCE: Wharton Econometrics, Inc.

Figure 24.—Seaborne Liquid-.Buik Trade, Regionai Distribution



SOURCE: Wharton Econometrics, Inc.

Figure 25.—U.S. Seaborne General Cargo Trade, Regional Distribution



SOURCE: Wharton Econometrics, Inc.

IMPLICATIONS OF THE TRADE OUTLOOK FOR U.S. SHIPPING

There are several risks inherent in attempting to project from an economic forecast potential opportunities for U.S.-flag shipping. First, the forecast itself may not have anticipated certain major events. Second, if it is accurate, while a demand for ships will be created by an increase in trade, that does not necessarily mean an increase in U.S.-flag shipping. U.S. carriers must be competitive if they are to capture a meaningful share of U.S trade. Currently they maintain such a share only in liner trades; the U.S.-flag liquid- and dry-bulk fleets almost are nonexistent in foreign trade.

Assuming that U.S.-flag ships will carry a substantial share of the projected trade, opportunities should exist both in the general cargo and dry-bulk sectors. U.S. dry-bulk trade will rise from 49 to 59 percent of all U.S. seaborne trade. The current glut of tonnage on the world market should disappear within several years. U.S. trade with developing

countries will rise, particularly in the South Asia region. Ships clearly will be required. However, the real question is whether U.S.-flag carriers will begin to share in the carriage of our dry-bulk trade. It is unlikely that this will occur without major competitive or policy changes.

In the liquid-bulk sector, few opportunities will exist. Trade will rise only moderately through 2000, and the already overtonnaged market is expected to continue for the foreseeable future. Here, as in the dry-bulk markets, the U.S.-flag fleet has been unsuccessful in capturing more than a tiny fraction of U.S. trade in the past.

Future trade growth in the general cargo area could be significant. U.S. exports over the long term are expected to increase to Europe, Asia, and Japan, while South Asia will predominate in the U.S. import trade. Replacements will be needed for older, inefficient U.S.-flag liner vessels, and new capacity will be needed. However, this may not translate into substantial additional numbers of new ships because the newer generation of container ships are massive, suited for high-capacity service. Liner operators will need to restructure their fleets to accommodate the shifting trading patterns.

Finally, long-term trade projections only are useful in a policy sense if they are used as one of the tools in anticipating future needs and opportunities. When major policy changes are proposed, as they have been recently, it is important to determine if the policies are addressing future situations clearly. Forecasting is very difficult, but it is also very necessary for informed action. The development of maritime policy would be enhanced by access to current trade forecasts that take into account a coherent global view of trading relationships and that are simple and flexible enough to be continually matched to changing conditions in the world and in the United States. At present, the Federal Government does not maintain accurate and current maritime trade data and forecasts. The U.S. Government collects and stores monumental quantities of commodity import and export data, but to obtain information relevant to world trade and shipping, we must rely on such countries as Norway and the United Kingdom for timely, quality statistics and analyses.

Chapter 3

The U.S. Shipping Industry

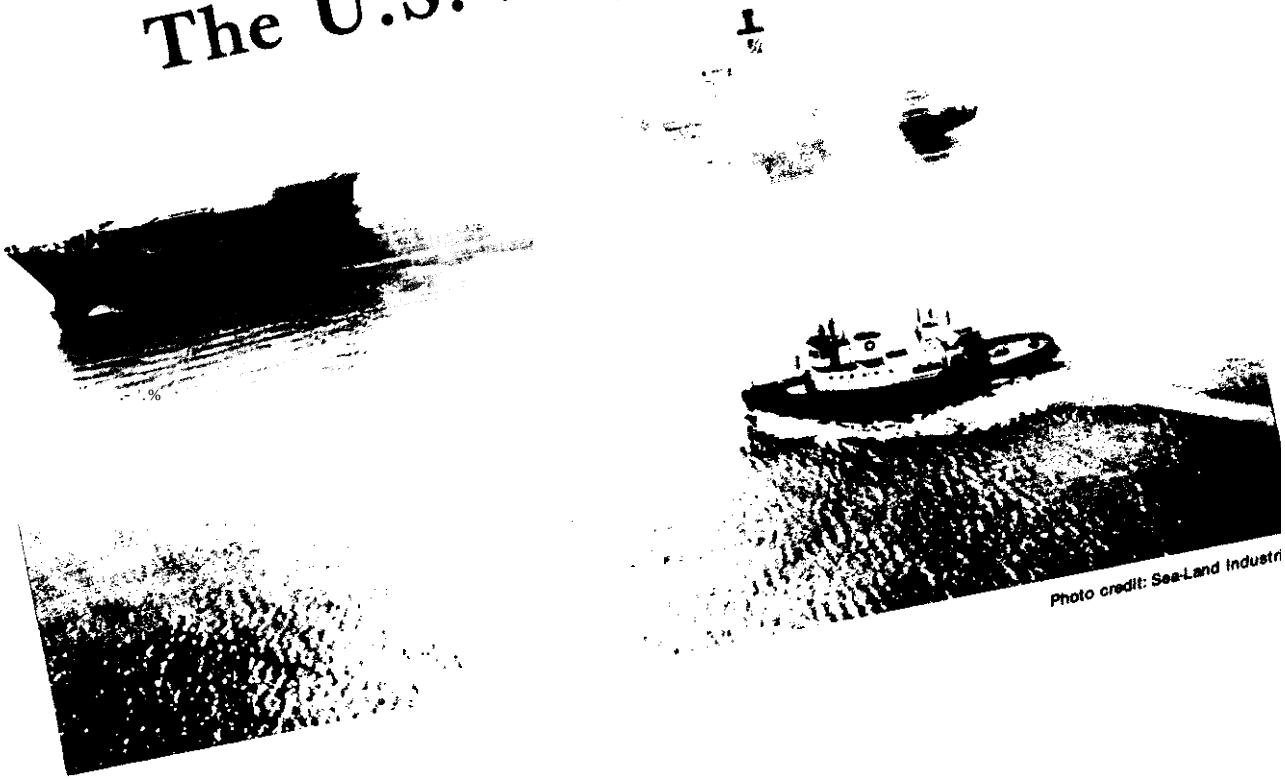


Photo credit: Sea-Land Industri

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The U.S. Shipping Industry

OVERVIEW

The U.S. shipping industry consists of at least two clearly separate business sectors: liner and bulk. Liner companies operate containerships, roll-on roll-off (RO/RO) ships and other general cargo ships in a regular scheduled service carrying diverse cargoes from port to port at set rates, much like a railroad or trucking operation. The largest and most prominent liner companies are engaged increasingly in cargo transportation between inland locations in which ships serve only as links in an overall transport system. The bulk-shipping business usually handles large tonnages of single commodities by operating one or a fleet of ships especially designed for one cargo. Bulk companies include shipping departments of major petroleum corporations who operate tanker fleets, as well as independent bulk ship operators, who may operate tankers, dry-bulk carriers (ore, coal, grain), and combination ships (under various long- and short-term leases or charters) in the bulk and ''neobulk' trades. (Neobulk is a term that describes movements of various cargoes in shipload lots—e. g., lumber, cars, or steel). Bulk and liner businesses often have very different problems and business outlooks, and the effectiveness of Government policies may depend on how well they reflect those differences. * This chapter is therefore divided into separate discussions of these two business sectors.

The U.S. shipping industry is also divided by flag of operation, as well as into international and domestic trades. The U.S. merchant fleet is usually considered to consist of U. S. -flag privately owned, self-propelled vessels of over 1,000 gross tons. This definition excludes inland waterway barge systems, small ships, and most service craft such as fishing boats, pleasure boats, or crew boats. It includes practically all U.S. -flag ships engaged in international trade and the major ships in the domestic coastal and offshore (i. e., Hawaii, Alaska, Puerto Rico) trades.

One could extend a definition of the U.S. shipping industry to include the fleets owned by U.S. corporations but registered in other countries. That fleet-consisting principally of' tankers and dry-bulk carriers—is significant by any standards. About 36 percent of the Liberian-flag fleet and 17 percent of the Panamanian-flag fleet is ' 'beneficially owned' by U.S. companies. *

The term used to describe the merchant ships registered in Liberia and similar countries is ''flag-of-convenience fleet. The term reflects the ease of registration and minimum taxes and regulations prevalent in those countries. The shipowners have the flexibility to use crews of any nationality, to construct the ships in any country, and to operate outside the framework of their own national laws and regulations. The shipowners themselves, prefer to use the term ' 'flags of necessity' for these fleets, reflecting the view that economics dictates the use of such flags where businesses can operate at competitive costs.

The term often given the U.S. flag-of-convenience fleet is the ''U.S. effective-control' fleet. The major petroleum and other U.S. corporations that own this fleet contend that because it is U. S.-owned, it is effectively under U.S. control and can be considered as part of the U.S. fleet, especially in times of national emergency. Although provisions to make this fleet available under emergencies are in effect through agreements between industry and Government and between U.S. and foreign governments, we will not in this report define the U.S. merchant marine to include this fleet. We

•Some analysts have described these two business sectors as "common carriers and "contract carriers'' rather than liner and bulk. Such terms may more clearly denote the differences in the businesses rather than the kind of cargo carried. It is also of interest to note the difference in growth rates of these two business sectors and the difference in effectiveness of Federal policies on them.

*Based on data compiled by A & P Appledore, Inc. for the United Nations Conference on Trade and Development (UNCTAD) Secretariat in 1981. "Beneficially owned' is defined as designating the owner who receives the benefits or profits from the operation.

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will, however, in this chapter present some data on this fleet.

Table 10 lists vessels in the U.S.-flag merchant fleet by type of ships. Table 11 shows the age distribution of these vessels. Of this total fleet, the U.S. liner fleet is the predominant sector in international trade. Certain ships in international trade are eligible for a variety of Government subsidies (discussed in ch. 6) intended to allow them to compete with lower cost foreign-flag ships. Most liner companies belong to steamship conferences (discussed later in this chapter), which set rates and generally establish rules or cooperative operating agreements for their members. The U.S.-flag tanker and dry-bulk fleets dominate the domestic trades. Table 12 lists the ships which are owned by U.S. companies and registered under foreign flags (the U.S. effective-control fleet). The total tonnage is about twice the U.S.-flag fleet; 85 percent of the tonnage is in tankers and most of the remainder is in dry-bulk and combination-bulk carriers.

The domestic trade U.S.-flag fleet operates under entirely different circumstances than the foreign-trade fleet. By law, all domestic waterborne trade must be carried by U.S.-built, U.S.-flag ships.

Table 10.—U.S.-Flag Privately Owned Merchant Fleet (oceangoing ships 1,000 gross tons and over as of Jan. 1, 1983)

	Number of ships	Deadweight tons
General cargo	240	4,312,153
Breakbulk/partial container	104	1,404,688
Containership	97	1,868,274
RO/RO—vehicle carriers	18	274,043
Barge carriers	21	765,148
Bulk cargo	18	618,018
Tankers	233	14,220,469
Special products/liquefied natural gas (LNG)	33	1,601,551
Other (coastal, passenger)	17	110,396
Total	541	20,862,587

SOURCE: "Ship Register," Military Sealift Command, Department of the Navy, Washington, D. C., January 1983.

There is no foreign competition and no direct government subsidy. However, the ships and barges must compete with other modes of transportation (unless they engage in offshore trades, i.e., Hawaii, Puerto Rico) —pipelines, truck, and rail predominantly, and the domestic markets are open to potential new competitors. The following discussions of the foreign and domestic U.S. -flag fleet will examine the important aspects of each and note the dominant trends for both liner and bulk operations.

Table il.—Age Distribution U. S..Flag Privately Owned Fleet (Jan. 1, 1983)

	Total ships	Under 5 years "	5-9 years	10-14 years	15-19 years	20-24 years	25 years and over
Total all ships	541	59	72	81	70	93	161
General cargo	240	24	18	48	56	54	40
Breakbulk/partial container	104	1		7	45	47	3
Containership	97	19	;	22	9	7	37
RO/RO	18	2	8	6	2	0	0
Barge carriers	21	2	6	13	0	0	0
Buik cargo	18	4	3	2	0	1	8
Tankers	233	17	44	28	11	37	96
Special products/LNG	33	11	7	3	1	2	9
Other (coastai, passenger)	17	3	0	0	2	4	8

sOuRCE: 'Ship Register," Military Sealift Command, Department of the Navy,Washington, D. C., January 19S3.

Table 12.—The U.S. Effective=Control Fleet as of December 1982

	Number	000 dwt	Average 000 dwt
Total	*466*	47,221.8	101.33
General cargo	*73*	525.7	7.20
Breakbulidreefer	*52*	334.4	6.43
Containership	10	25.5	2.55
RO/RO	*6*	35	5.83
Barge carriers	*5*	130.8	26.16
Bulk	*106*	6,466,6	61.01
General bulk	*76*	3,537.9	46.55
Combination, ore/bulk/oil	**30**	2,928.7	97.62
Tanker	**259**	39,426.7	152.23
Special product/LNG	**27**	793.3	29.38
Passenger	1	9.9	9.90

SOURCE: Federation of American Controlled Shipping, March 1983.

THE U.S. LINER INDUSTRY (IN INTERNATIONAL TRADE)

The U.S.-flag liner industry engaged in international trade consists of 8 major ship-operating firms with fleets ranging from 3 to 46 vessels (see table 13). The three largest firms own and operate over half of the total tonnage. Seven of the major firms operate their foreign trade ships under the U.S. Maritime Administration's (MarAd) Operating Differential Subsidy (ODS) program whereby a portion (up to 20 percent) of each operator's cost differential with foreign-flag ships operating on the same trade route is covered by direct subsidies (see ch. 6). One of the largest firms, Sea-Land, does not receive direct subsidies. U.S. liner trades have increased about 30 percent in tonnage over the past decade, while the U.S.-flag industry has remained rather constant in tonnage capacity. However, the fleet has changed in character, improved its productivity, and moved toward offering intermodal services.

During 1982 and continuing into 1983, the U.S. liner industry suffered substantially from the worldwide recession, and the overall cargo volume in key trades shrank markedly. Industrywide losses were posted for the first quarter of 1983 even with subsidies. This has left some companies in a difficult financial position—especially the smaller operators, who are not well capitalized. On the other hand, a few of the larger companies are aggressively expanding their services and building new, large containerships to modernize their fleets.

Liner Trades

In the past two decades, U.S. liner cargo growth rates have averaged 2 to 3 percent per year. U.S. trade growth with Southeast Asia, at over 5 percent per year, has been particularly dramatic. At the same time, the mix of commodities has changed to much lower density cargo and thus, demand for shipping space has grown at a faster rate than cargo tonnage.

Table 13.—U.S.-Flag Liner Fleet, July 1983

Company	Number of ships	Gross tonnage (000)	Percent share tonnage
Engaged In International trades:			
● U.S. Lines	37a	708[a]	19
Sea-Land Service, Inc.[b]	36	672	18
● Lykes Brothers Steamship Co.	46[c]	558[c]	15
● American President Lines	Z Id	472[-]	13
● Delta Steamship Lines	z4e	319e	9
● Waterman Steamship Corp.	lof	256f	7
● Farrell Lines	89	1409	4
● Prudential Lines	3	79	2
Engaged in domestic (offshore) trades:			
Matson Navigation Co.	6[h]	135fl	4
Navieras de Puerto Rico	8'	131'	4
Others	18	221	
Total	217	3,691	

"These companies operate with Federal operating differantlal subsidies, which totaled over S350 million in fiscal year 1982.
[a]Includes seven breakbulk ships on time charter to the Military Sealift Command (MSC) and six partial containerships, totaling 70,000 gross registered tons (grt), operated by Moore McCormack Lines.
[b]Sea-Land participates In the domestic trades as Well as the International trades.
[c]Includes nine vessels, totaling 99,700 grt, chartered to MSC.
[d]Includes one vessel, of 15,949 grt, chartered to MSC.
[e]Includes six ships on charter from Prudential Lines.
[f]Includes one LASH vessel, of 28,487 grt, chartered to MSC. Three LASH vessels in the Waterman fleet are on long-term charter from Central Gulf Lines.
[g]Includes two vessels, totaling 52,900 grt, chartered to MSC.
[h]Matson has two additional vessels, presently in indefinite lay-up, totaling 3%311 grt.
[i]Navieras owns three of the ships in their fleet and Charters the remaining five.

SOURCE: Telephone conversations with liner companies; Seatrade, U.S. *Yearbook 1982*; U.S. Maritime Administration.

As can be seen in table 14, more than half of the trade by volume is with Europe (including the Mediterranean region), Japan, and South Korea. There is also significant trade with Central and South America, Southeast Asia, the Middle East, and Africa. In 1981, 84 billion ton-miles of liner carriage was provided to and from these regions. Table 15 illustrates the containerized cargo-shipping routes by percentage of volume transported. More than one-third of the total in 1980 went from the United States west coast to Japan and one-fourth from the United States east coast to Europe.

The world trade outlook in chapter 2 indicates that U.S. trade volume probably will continue to grow throughout the rest of the century, albeit at slower rates than for the last 10 to 15 years. Trade with developing countries, particularly in the Far East, could grow at a higher rate than total trade. One major possible negative development would be aggressive protectionism in the United States and abroad, particularly in the short run, as a response to the worldwide recession and to the serious balance-of-payments problems of many countries, especially oil-importing less developed countries (LDCS).

If a more moderate trade-growth rate does occur, U, S. carriers will be forced to compete with rapidly growing foreign-flag fleets for the limited cargo available and will need to continually increase service efficiency and capability. For example, the LDCS are now developing the infrastructure required for containerization, and may also improve the capabilities and efficiency of their fleets. It is likely that intermodal services will continue to expand in all trades. This could lead to increased competition among those liner conferences that serve the same trades; e.g., the U.S. Pacific coast-to-Europe trade is served by both direct all-water carriers and by using a combination of truck or rail to cross the United States and ships to and from U.S. Atlantic coast ports. But it may also offer opportunities for those U.S. operators that are in the forefront of intermodal technology and management systems.

U.S.-flag operators can also benefit from the increased trade volumes, particularly in the Far East trade. Operators in the less developed trades—particularly South America and Africa—may face declining trade volumes outbound from the United States in the near future, since the LDCS are likely to restrict imports to protect their balance-of-payments positions.

Table 15.—Major U. S. "Foreign Trade Routes for Containerized Cargo, 1980

Trade route	Percent of total containers carried in and out
U.S. Pacific coast to Far East and Australia	38
U.S. Atlantic coast to Europe including Mediterranean)	29
U.S. Atlantic coast to Far East and Australia	11
U.S. gulf coast to Europe	5
U.S. Atlantic coast to Caribbean and South America	5
U.S. Pacific coast to Europe	4
U.S. gulf coast to Far East	2
U.S. gulf coast to Caribbean	1
All others	5

SOURCE: US. Maritime Administration, *Containerized Cargo Statistics— 1980.*

Table 14.—U.S.-Flag Liner Shares, Total U.S. Trade Volumes, and U. S. "Flag Ton-Miles Carried

	U.S.-flag shares			Total U.S. trade volumes (roil LT)			1981 U.S.-flag carriage (billions of ton-miles)
	1967 (" / 0)	1981 ("lo)	1981/1967	1967	1981	1981/1967	
Japan and South Korea	11.8	21.9	1.86	10.22	11.03	1,08	14.3
North Europe	13.7	27.9	2.04	13.97	13.44	0.96	15.4
Australia	19.4	24.5	1.26	1.38	2.37	1.71	4.7
Mediterranean	25.3	30.2	1,19	3.71	5.18	1.40	**7.5**
Southeast Asia	30.4	28.0	0.92	4.11	8.93	2.17	19.2
Mideast/South Asia	30.7	29.3	0.95	3.35	3.66	1.09	7.9
Americas	32.6	30.9	0.95	7.68	9.24	1.20	9.9
Africa	51.0	26.8	0.53	2.28	3.66	1.61	5.1
Total	22.1	27.2	1.23	46.79	57.54	1.23	84.0

SOURCE: Manalytics, Inc., "Assessment of Maritime Trade and Technology—Task on U.S. Shippingl" prepared for the Office of Technology Assessment, U.S. Congress, December 1982.

The Liner Fleet

During the last decade, there has been a substantial transformation of the U.S.-flag general cargo fleet, of which the foreign trade liner segment now accounts for approximately 75 percent. The fleet has changed from mostly small multipurpose general cargo carriers to mostly large special-purpose containerships. Between 1971 and 1981, the total U.S.-flag general cargo fleet tonnage actually declined, largely as the result of scrapping old multipurpose ships. For the remaining component—the liner fleet of full containerships, partial containerships, and RO/ROs—the growth has been dramatic—from 1.5 million to 3.9 million deadweight tons (dwt), or almost 10 percent per year. The growth rate in the U.S.-flag liner fleet in terms of capacity, from 1971 to 1981, was almost 5 percent per year.

Unlike the world fleet as a whole, the U.S.-flag fleet's most important ship type is the containership. The average size of containerships in the U.S. fleet is about 19,000 dwt. U.S. companies have, however, operated some of the largest containerships and at present have on order a group of super containerships. While some other major maritime nations operate fleets of large containerships, they generally are not in service in the U.S. trades. These containerships are in service in the Europe-Far East and other long route trades, usually as part of multiflag consortia.

Most of the U.S.-flag liner fleet is dedicated to U.S.-foreign trades. This is a result of a number of laws, as well as the economics of this trade. For example, a large portion of the liner fleet operates under Federal operating differential subsidies (ODS) which, among other constraints, requires operators to serve specific assigned (i. e., essential) foreign trade routes. Those operators who receive ODS are prohibited from carrying cargo between domestic points except when authorized by MarAd under Section 506 of the 1936 Merchant Marine Act. One unsubsidized liner operator carries some domestic trade cargo when it fits their overall trade route schedule. Others may also carry some foreign-to-foreign (cross trade) cargo along a specific route, but most of this cross trade is not dominated by U.S.-flag operators.

U.S. Liner Shares

Because of successful productivity improvements by some major operators, the U.S.-flag liner fleet has maintained a healthy share of U.S. foreign trade despite effective foreign-flag competition. The U.S.-flag share was 27 percent in 1981, up from 22 percent in 1967. It peaked in 1974-75 at approximately 30 percent. Some claim that Federal subsidies helped to maintain the U.S. liner fleet's cargo share position, while others claim that subsidies have constrained growth because of inflexible requirements (see ch. 6).

There is a variation in U.S.-flag share and level of ship sophistication by foreign area of service. Fifteen years ago, U.S.-flag shares were much higher in LDC trades, where both the economies and shipping technology and infrastructure were less developed than in developed countries' trades. Recently, however, U.S.-flag shares have declined in the LDC trades, as national-flag competitors have entered those trades and expanded rapidly from a very small base, often with substantial government support. U.S.-flag shares have increased significantly in the developed countries' trades, mainly in the period 1972-74, due largely to conversion (by now essentially complete) to containerization. Now, as seen in table 14, U.S.-flag liner shares only vary by 10 to 20 percent, from region to region. Furthermore, large segments of the developed countries trades formerly served by liner operators have switched to neobulk/contract/proprietary service (autos, iron and steel products, scrap, and forest products), which tend to move almost entirely in foreign-flag ships, leaving behind the common carriage, high-service segment of the developed countries' trade for U.S. -flag carriers.

Technological Developments

As discussed in chapter 5, most recent technological innovations in liner shipping have been spurred by a need to reduce costs. The United States has been among the world's leaders in the introduction of major new technologies in the 1960's and 1970's, such as containerships and other intermodal concepts like lighter aboard ship (LASH) and integrated tug barges (ITBs). Coun-

tries other than the United States quickly adopted the most successful of these technologies into their fleets, however, and have been much more active in the introduction of certain fuel- and cost-saving features and automation to reduce crew size. In these respects, the United States has been constrained by certain union agreements regarding crew reduction and by some Government policies which, until waivers were granted very recently, prohibited the use of foreign-built main machinery in ships constructed with either title XI loan guarantees (see ch. 6) or construction subsidies. Since there are no U.S. manufacturers of large, slow-speed diesels, this Federal policy, in effect, denied U.S.-flag operators access to an advanced fuel-efficient technology common in other major maritime nations. Because of this, it probably will be some time before U.S. liner operators catch up to other countries.

Chapter 5 also describes the recent emphasis on reducing energy costs. This has manifested itself in the reduction of operating speeds for liner ships and the introduction of new technologies and procedures such as more efficient diesel engines, better controls to maximize the efficiency of the powerplant, fuel-treatment systems that allow use of lower grade fuels, and bottom scrubbing.

In the liner trades, there has also been a trend toward specialized ships (particularly container, but also LASH and RO/RO) over the past two decades. This trend is expected to continue but not to the point where the conventional multipurpose ships are completely phased out of service. Ships with flexible capabilities will undoubtedly be necessary for certain trades where:

- significant amounts of heavy-lift cargoes are moved;
- a substantial container imbalance exists;
- there is a significant amount of cargo in both directions that is only marginally containerizable; and
- national priorities and investment strategies do not favor the development of the domestic transportation infrastructure needed to support container service.

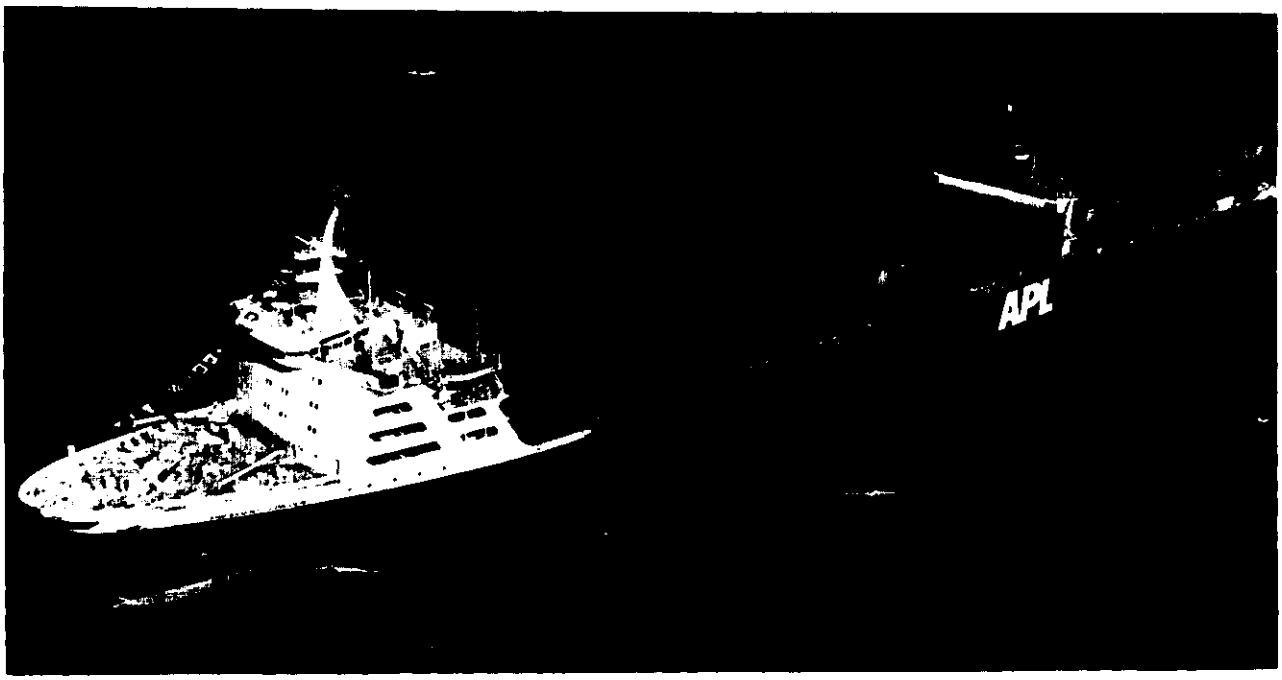
New ship types such as auto carriers and wide-hatch forest products ships have been introduced during the 1970's and are referred to as ''neobulk' ships, These ships have specialized hulls and cargo-handling systems designed to significantly reduce costs. U.S.-flag operators have not developed these systems to the same extent as foreign operators. Combination ships such as auto/bulk and container/bulk ships also have been introduced, often sailing on triangular voyages with foreign-to-foreign legs incorporated into their itineraries. The development of these neobulk and combination vessels is expected to continue,

There is also a clear trend toward larger ships in the liner trades, brought about in large part by the trend toward specialized ships. However, the largest such ships currently on order (U.S. Lines' 4,200-teu ships) are approaching the draft, beam, length, and shoreside crane constraints imposed by the world's harbors and channels. *

According to the 1982 yearbook published by Containerization International, of the approximately 930 containerships over 500 teu, about 5 percent are in the super carrier size range of over 2,000 teu. A sizable number of new buildings, however, are of these larger ships and in the more distant future, as intermodal activity concentrates on fewer, larger volume ports, with great economies of scale, there will be more incentive to deepen or widen channels to accommodate even larger, more specialized ships. Thus, liner shipping operations may become more focused around fewer major port complexes with feeder services to and from the "hub" ports.

The average crew size of the U.S.-flag liner ships has been declining (but very slowly) as automated engine rooms and other labor-saving devices have been introduced. The cost savings, however, are not proportional to the reduction in crew size due to expenses associated with the automated equipment and increases in shoreside contracts for maintenance and repair formerly performed by shipboard personnel. Discussions with maritime unions to decrease personnel requirements are likely to continue since the technology exists for further reductions in crew size. One possible change is

*Containership sizes are commonly stated in terms of teu (the number of twenty-foot-equivalent units, or twenty-foot containers, the ship could carry). The U.S. Lines' 4,200-teu ship designs are reported to be about 58,000 dwt. The recently completed 2,500-teu containerships for American President Lines are each 49,000 dwt with a length of 860 ft, a beam of 105 ft, and a draft of 35 ft.



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modification in the seamen per billet ratio (the total number of employees compared to the number required onboard ship at any one time). Typically in the United States today, that ratio is 2 to 1, with each crew member on board ship 6 months per year, as per typical union contracts. Discussion of a 3 to 2 ratio is taking place. Other possible trends include multiskilled crew designations and elimination of certain exclusive billets, such as radio operator. These changes, while brought about by technology and automation advances, will require labor policy changes by the unions and in Federal regulations. The U.S. seafaring unions, to date, have been reluctant to accept reductions in crew size except for certain new ships.

Terminals, particularly container terminals, have been increasingly automated to reduce labor costs and improve service levels. Automated terminals can stack containers higher than nonautomated terminals, thereby reducing the amount of land required for a given amount of cargo handled. This trend toward automation is likely to continue. A development that has not been apparent, at least in the United States, is the introduction of large, multiberth, multiuser terminals. These can reduce land requirements and thus may reduce costs (per unit of through capacity) significantly. If the apparent cost effectiveness of this type of terminal is proven, it could be introduced in the United States.

The U.S. maritime industry has developed more than its share of advanced technology. However, it has not excelled in the economic use of new technology or the adoption of technology from other countries and other industries. U. S, -flag carriers have been slow to introduce shipboard automation and to convert to diesels. As noted above, foreign-built diesel engines were prohibited by law for vessels built with construction differential subsidies (CDS) until 1977, and U.S. Navy policies promoted the use of steam turbines as acceptable defense features for subsidized merchant ships because they could be more readily designed with large reserve power. Some U.S.-flag carriers now are buying management services regarding diesel operation from divisions of European companies set up just to provide these services.

Since the 1977 MarAd waiver which permitted a new class of American President Lines containerships to be built with foreign-supplied diesel power-

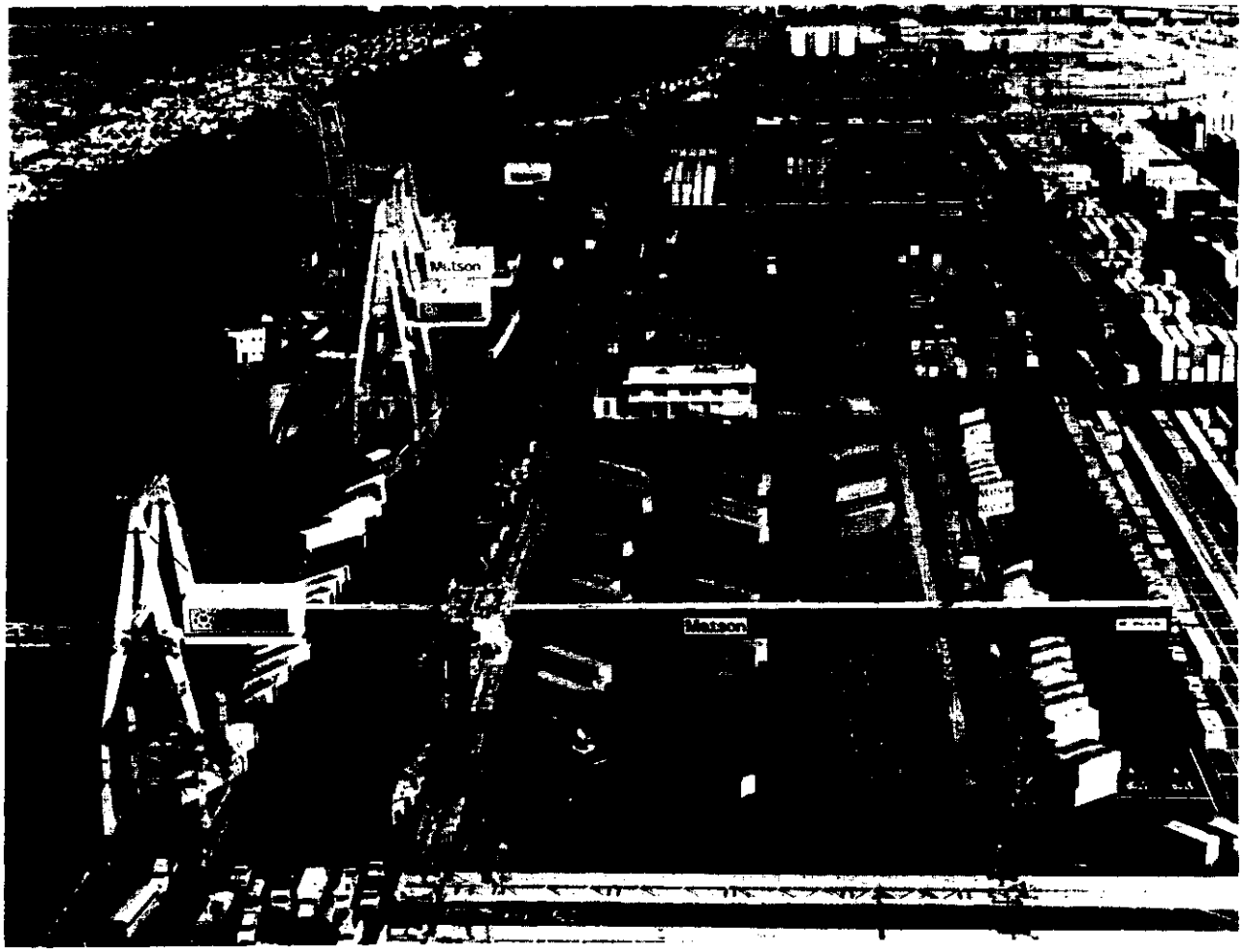


Photo credit: Matson Lines

Modern container-handling terminals, such as this one in Los Angeles, have markedly increased the productivity of liner shipping

plants, a major shift toward the use of medium- and low-speed diesel engines in the commercial shipping industry in the United States has been underway. This shift was also prompted by the oil embargo of 1973, which resulted in fuel costs becoming the fastest growing operating expense. U.S. operators are also now constructing a number of ships in foreign yards and are not constrained by either CDS ''buy America' policies or a need to meet U.S. Navy requirements for generous ' 'reserve power. Recently, there also has been a change in U.S. naval vessel propulsion designs to medium-speed diesel and lightweight gas turbine engines. Thus, the rationale for requiring the use of steam propulsion as a national defense feature has been eroded. The U.S. Navy and its logistics support arm, the Military Sealift Command, have incorporated new technology medium-speed diesel engines into several new classes of logistic support and amphibious ships.

Some observers believe that the ODS Program, with its downside protection and service constraints, is largely responsible for the rather poor record of U.S.-flag operators in the adoption of new technologies. Others contend that the high manning levels negotiated between the carriers and the unions (and paid for in part by the taxpayers through ODS) are to blame, since investment in innovation requires as a quid pro quo a reduction in labor

costs. Whatever the cause, a valid goal for future policies should be to eliminate such distortions and barriers to more productive shipping, whether subsidized or not.

Among the most notable of U.S.-flag management successes has been the extensive implementation of intermodal service, particularly in landbridge* offerings in the U.S./Far East trade and the U.S./Europe trade. Microbridge " (point-to-point intermodal service with through 'rates) is becoming more important and the volume of these activities can be expected to grow significantly.

Containerization technology was an American innovation and has provided opportunities for U.S..-flag carriers who took advantage of intermodal service opportunities to penetrate trades where their all-water market shares were small. The ability to offer intermodal service is considered a prime reason for the large increase in the U.S.-flag share between 1967 and 1981 in trade with Japan, South Korea, and Europe. An important example is the Far East-U. S. Atlantic and gulf coasts trade, where the U.S.-flag share in 1967 was approximately 15 percent. Half of that trade has now been diverted to the Pacific coast, where the U.S.-flag share was 30 percent in 1981, up from 23 percent in 1967.

*' Landbridge'' and "microbridge'' are terms describing a combination of land and seaborne intermodal service. In *landbridge*, rates and total service are offered by a carrier for cargo shipments from a foreign port to a U.S. port, across U. S. land to another U, S. port and finally by sea to a fore ign port destinat ion. *Microbridge* refers to total rates and service offered by a carrier for cargo shipments from any inland U S locat ion to a port, by sea to a foreign port and finally overland to another inland destination. It also refers to variations of such service from point -to- port and port-to-point.

Cost, Productivity, and Competitiveness

Compared to other major U.S. industries, the liner industry as a whole has had a mediocre performance in terms of return on equity. Out of 10 major industry groupings, in 1980 liner shipping ranked eighth. It is interesting to note, however, that the 9th and 10th places were held by two other transportation industries—railroads and air transport. Tables 16 and 17 summarize the financial sta-

Table 16.—Financial Data for U.S.-Flag Liner Companies Engaged in Foreign Trade

Aggregate total	1977	1978	1979	1980	1981
● Net profit (loss) ($000)	$63,865	$105,998	$32,512	$159,956	$99,351
tReturn on equity	5.9 "/0	10.4 "/0	3.2°\o	10.6°\o	6.80/0
tReturn on invested capital (total debt Plus equity)	6.1°/0	6.8"!0	3.90/0	7.5 "/0	6.7°)o
t"current assets to current liabilities	1.3	1.1	1.0	1.3	1.1
● Long-term debt to owner's equity	0.84	1.60	2.03	2.67	1.65
t Operating revenue per freight payable ton (subsidized operators)	$81.95	$91.15	$99.13	$110.03	$120.43
t Subsidy per freight payable ton	$13.38	$14.83	$14.82	$14.05	$15.04
t Operating expense per freight payable ton (subsidized operators)	$76.15	$83.45	$93.22	$99.19	$108.03
t Nonoperating expense per freight payable ton (subsidized operators)[a]	$17.45	$19.01	$20.31	$22.59	$22.55
t Operating margin per freight payable ton (subsidized operators)[b]	$1.73	$3.52	$0.42	$2.30	$2.89

KEY ● = Includes nonsubsidized companies; t . Weighted average,
alnterest, overhead, vessel depreciation, and charter hire.
bo$_m$r$_a$tin$_g$ revenue plus subsidy less operating and n0n0peratin9 exPense

SOURCE: U.S. Maritime Administration, Office of Financial Management.

Table 17.—U.S..Flag Liner Companies in Foreign Trades: Summary of Financial Results, 1980-83 (millions of dollars)

Category	1983 (first quarter only)	1982	1981	1980
Gross revenue	1,116	4,200	4,671	4,308
Subsidy	93	307	312	299
Gross operating expenses	1,110	4,225	4,765	4,429
Gross profit (water line)	99	282	218	178
Interest, taxes, and other expenses less other income	121	95	122	20
Net profit	(22)	187	96	158

NOTE: The above figures represent aggregate financial data from all subsidized and one unsubsidized liner operator(s) in the foreign trades. For the years 1980 and 1981, some small portion of the data includes the domestic operations of one operator; for the 1982 and 1983, the domestic trade portion has been extracted. The 1982 net profit total includes over $80 million of extraordinary income items such as the sale of ships.

SOURCE U S Maritime Administration, Office of Financial Management, personal communications, July 1983, with OTA additions from data furnished by Sea-Land Industries

tus of U.S. liner companies. (Note that some data is not available for nonsubsidized operators, who do not have to report to the Federal Government the extensive financial data required from the subsidized operators.)

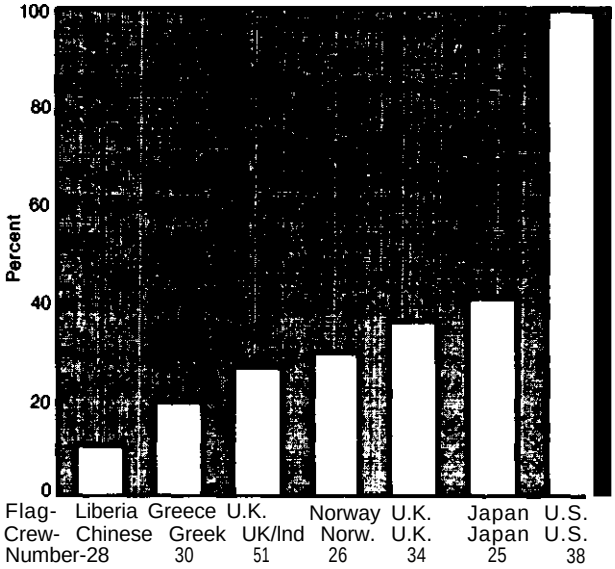
U.S.-flag ship costs are substantially higher than foreign-flag costs for both ship acquisition and operation. Data from MarAd for 1982 indicate that new construction costs for containerships are 2 to 2 times higher in U.S. shipyards than in comparable foreign yards, such as Japan. Even this cost ratio of U. S.-to-foreign building, however, understates the effective ratio from the buyer's perspective because the figures given represent shipyard costs, and market prices now quoted are substantially lower than costs. Furthermore, those price comparisons refer to Japanese yards; prices at Korean yards, where Sea-Land placed its recent orders and where U.S. Lines is now planning to build its new ships, are lower still. *

While all operating expense categories are usually higher for the U.S. operator than the foreign operator, crew costs are a major item of difference, particularly due to differentials in manning scales rather than in per-man wages. Foreign crew costs for containerships range from one-half to one-sixth of equivalent U.S.-flag crew costs (see fig. 26). In most cases, U.S. crew size exceeds foreign crew size, which, for comparison with developed countries, is much more significant than the wage rates.

The U.S. standard of living largely accounts for much higher wage rates compared with those in LDCS, However, it should be noted that European and Japanese seamen wages are no longer ''cheap, and that national crews of these nations are also facing a competitive disadvantage with LDC crews. Many European and Japanese ship operators have countered the wage rate problem with smaller crews, use of foreign nationals in ship's crews, and more automation—an approach only now beginning to be applied by U.S. operators.

Subsistence, stores, and supplies are usually proportional to crew costs. U.S. maintenance and repair costs are also higher than foreign counterparts, because it costs more to repair a ship in a U.S. yard and because a U.S. operator who repairs in a foreign yard must now pay a 50-percent ad valorem tax on the value of the repair. U.S. insurance costs reflect the higher capital costs of U.S. ships and the fact that settlements made to injured U.S. seamen are considerably higher on the average than comparable foreign settlements.

Figure 26.—Relative Costs for Crew for a Typicai Containership Operating Under Various Flags



SOURCE: "Comparative Operating Costs for U.S. and Foreign-Flag Ships," by Paul Ackerman, presented at SNAME Ship Cost and Energy Symposium, October 1982.

Another significant reason for high U.S. operating costs is fuel. Most of the U.S.-flag liner fleet is still powered by steam turbine engines which are much less efficient than modern slow-speed diesel engines which predominate in foreign-flag ships. That portion of the differential, however, will disappear as new U.S. ships come into the fleet. In fact, it is the need to increase energy efficiency and reduce crew size which justifies modernizing the U.S. fleet, rather than the age of the ships. When these two goals are achieved, the U.S.-flag liner fleet will become more competitive with the rest of the world.

For a number of reasons, U.S. liner vessels—even with their higher capital cost, higher wage cost, and higher fuel cost—are able to compete in some trades with their foreign-flag counterparts. In the

*In May 1983, U.S. Lines announced signing a contract with Korea's Dae-Woo Shipbuilding Co. for 12 large containerships (4,200 teu and 58,000 dwt) at a price of $50 million each. Even this price was 10 percent lower than that announced a year earlier for the same ships.

past, U.S. construction subsidies were available to mitigate higher construction costs. Operating subsidies also helped. In addition, three other major factors are important in explaining this success—factors that are not applicable to the same degree to the bulk trades. They are:

1. U.S. preference cargoes are available to cover some added costs;
2. some U.S. operators have made substantial advances in ship and cargo-handling productivity; and
3. some U.S. operators excel in marketing.

Liner operations have a broad scope, covering cargo-handling and often intermodal movement as well. The annual capital, crew, and fuel costs for a liner operation are only about one-quarter of the carrier's total costs (whereas, these costs can be more than 75 percent of a bulk ship operator's costs). A liner operator incurs higher cargo-handling, sales, documentation, and administrative costs than does a bulk ship operator. Further, a liner operator incurs other costs—e. g., such as container stuffing/stripping, pick up/delivery, inland transportation, and container leasing—which have no equivalent in bulk operations, U. S, -flag liner operators have no inherent advantages or disadvantages with respect to their foreign-flag competitors on these nonvessel costs. The advantage could, however, depend on effective and efficient management and marketing practices.

U.S. liner productivity is, in some cases, comparable with foreign competition, and productivity improvements have helped mitigate significant U.S. cost disadvantages. During the 1970's, the U.S.-flag merchant fleet underwent major productivity improvements. Table 18 shows that in the liner sector, the fleet went from 403 ships in 1971 to 303 ships in 1976 (a 25-percent reduction), with an 11 -percent increase in deadweight ton-mile capacity. Modern technology and management innovations are important to maintaining these improvements. However, as discussed in chapter 6, the availability of regulatory advantages is also a major consideration in meeting foreign competition.

Influence of Cargo Preference

Many of the major liner trades are heavy inbound—i. e., more loaded containers are imported than exported. U.S.-flag liner operators have historically reduced the economic impact of this imbalance by carrying Government *cargoes outbound*. The United States has long had a policy of granting preference to U.S. carriers on its own cargoes. (Cargo preference is discussed in ch. 7.) The primary components are Agency for International Development (AID) and Export-Import Bank cargoes and military cargoes.

Table 19 gives an indication of the importance of preference cargoes to U.S.-flag liner operators. The impact of these cargoes on individual carriers varies widely. In some cases, up to 30 to 40 percent of total revenue is derived from such carriage. But it is difficult to determine the fraction of liner company profits produced from preference cargoes. In some cases, the addition of preference cargoes is significant enough to a U.S.-flag operator that the resulting higher utilization of his ships will bring down unit costs by a sizable amount.

Table 18.—Productivity Comparison of U.S. Privately Owned General Cargo Fleet, Annual Maximum Deadweight Ton-Mile Capacity per Year

	1971 fleet	1973 fleet	1976 fleet
30 knot intermodal ships. .	—	4 ships = 13,304 MTM	8 ships = 26,608 MTM
20 knot intermodal ships. .	35 ships = 73,920 MTM	68 ships = 145,044 MTM	87 ships = 214,542 MTM
20 knot conventional ships	98 ships = 108,682 MTM	86 ships = 95,288 MTM	86 ships = 95,288 MTM
15 knot intermodal ships. .	80 ships = 77,600 MTM	61 ships = 58,743 MTM	49 ships = 48,956 MTM
15 knot conventional ships	190 ships = 138,890 MTM	94 ships = 74,072 MTM	73 ships . 61,574 MTM
Total	403 ships = 399,092 MTM (5,389,000 dwt)	313 ships = 388,451 MTM (4,651 ,680 dwt)	303 ships = 446,968 MTM (5,058,185 dwt)

NOTE: Intermodal catego~ Includes containerships, roll-on/roll-off ships, and barge carriers.
MTM = miliion deadweight ton-nautical-miies.
Deadweight ton-nautical-mile capacity (DTMC) = S x T x K x C
St = Seadays (165 per year per conventional ship); S, = Seadays (220 per year per containership); T = Time, 24 hours; K = Maximum nautical-miles per hour; C - Capacity, average dwt capacity for ship category.

SOURCE: Maritime Transpotiation Research Board, NAS, *Toward An Improved Mercfranf Marine: A Recommended Pro6rrmn of Stud/es,* Washington, D. C.: January 1976, p. 17.

Table 19.—Importance to Liner Vessels of Carriage of Government Preference Cargoes

	1978		1979		1980	
	($ millions)	percent	($ millions)	Percent	($ millions)	Percent
Total U.S. operator revenue. .	$3,105	–	$3,707	–	$4,308	–
Preference revenue—civilian cargo	283	9	266	7	294	7
Preference revenue—military cargo.	201	7	376	10	401	9
Total preference revenue . .	484	16	642	17	695	16

SOURCE: U.S. Maritime Administration, Office of Policy and Plans, November 1982,

It is interesting to note that during 1982 a new carrier submitted bids for a Military Sealift Command (MSC) contract to carry military cargoes to Europe and underbid the other carriers who had historically won these contracts. When MSC announced the next round of bidding in 1983, two of the operators which had been underbid on the previous contract lowered their bids by about one-half from the earlier round, It therefore appears that this Government cargo is important to operators even at very low rates.

To demonstrate the importance of preference cargo to a U.S.-flag operator, an illustrative example was presented in a recent paper. It showed (see table 20) that some U.S. operators who take advantage of military or other preference cargoes which are reserved for U.S. flags, can increase their profits to exceed foreign-flag competitors. Government policy has probably played a key role in competitiveness in this case without direct or complex subsidy arrangements.

Most experts agree that U.S.-flag liner operators can be productive and competitive in the world market despite some cost disadvantages. Government policy can mitigate important cost disadvantages, in some cases, without direct subsidy. The record of Sea-Land, the largest U.S.-flag operator (without direct subsidy), seems to illustrate this contention. On the other hand, a number of subsidized U.S.-flag operators appear to depend heavily on direct subsidy payments for their financial survival. These companies would require major productivity improvements or substantial future cost reductions to meet foreign competition. If future subsidies are eliminated, attention to productivity improvements for these operators must receive high priority.

Table 20.—Hypothetical Profit Impact of U. S..Flag Preference Cargo on Containership Operations[a]

Given:

- Vessels of 1,200 teu
- Vessel operating cost per voyage of $270,000 excluding labor
- Foreign crew cost of $30,000 per voyage
- U.S. crew cost of *$60,000* per voyage
- Average load is 900 teu @ $725 revenue per teu
- Container and other variable costs are $333 per teu

Financiai resuits based on commercially competitive cargo oniy:

	Foreign flag	*U.S. flag*
Revenue.	$652,500	$652,000
cost	600,000	630,000
Profit	$52,000	$ **22,000**

Financiai resuits with 15% extra cargo (miiitary and coastwise-generated) to U.S. carrier

	Foreign flag	*U.S. flag*
Revenue.	$625,500	$749,800
cost	600,000	659,970
Profit	$ 52.000	$89,830

aAll data for illustrative purposes only.

SOURCE: John Blnkley, "Impacts of the U, S.-Flag on Shipping Cost and Productivity, " presented at SNAME Symposium on Ship Costs and Energy, October 1982.

Conferences, Pooling, and Cooperatives

Liner operators employ a wide variety of commercial agreements in world trade whereby cargo shares, revenues, prices, and other factors are set between two or more parties in order to restrict competition and reduce overcapacity. The degree of cooperation and kinds of restrictions that are followed range from a simple allocation of sailings between regions to complex agreements allocating shares of specific commodities among parties.

Shipping is a very old industry, and problems stemming from aggressive competition and highly

variable rates were of even greater concern when ships were the only feasible means of long-distance transportation. After the opening of the Suez Canal in 1869, fierce shipping competition resulted, in particular on the profitable Indian trade. This led to the first successful liner conference, the Calcutta Shipping Conference of 1875, in which all lines in the trade agreed to apply the same rates between Calcutta and British ports. The conference system of establishing common rates and agreements to regularize service quickly became well established in many trades. It also was partially a response to excess capacity resulting from a technology change (larger, more reliable steamships were replacing smaller, slower sailing ships).

The liner conference is now a very common system employed by operators in most developed trades. Typically, a conference is an agreement among a group of shipping companies serving the same trade route, and includes some form of price or rate fixing. Thus, members of a conference would charge the same prices for similar services. In many trades outside the United States, the conferences are closed (new members are not admitted without consent of existing members) and the agreements are confidential. In all U.S. trades, the conferences are open to any new member who meets the terms of the agreement. The agreements must be approved by the Federal Maritime Commission (FMC), and the terms are public.

U.S. liner operators are members of several of the major conferences governing the key trading routes for U.S. exports and imports. Some operators join and leave conferences frequently when business opportunities make it worthwhile. In some trades—particularly with South American countries where the United States has bilateral agreements—the U.S. operators have longstanding and static arrangements for cargo-pooling and other practices.

For most of the past two decades, conferences serving U.S. trades have been relatively weak due largely to the historical U.S. free-trade philosophy. U.S. conferences are open, and all agreements between carriers, including cargo and revenue pooling and service rationalization, must be approved by FMC. Rebating is prohibited, independent action by conference members is encouraged and there are strong limitations on service rationalization. Independent operators have thus been able to enter U.S. liner trades easily and compete against the conferences. But many routes suffer from chronic overcapacity.

Beyond conference agreements, other arrangements seek to further control the market, A common arrangement is pooling, whereby parties to an agreement fix the shares of specific cargoes each may carry and thus limit service competition. Pools are a natural conference adjunct but in U.S. trades are subject to FMC review and approval and thus cover only a small fraction of U. S. liner trades. In general, FMC has approved pools where they have resulted from foreign government unilateral actions on cargo reservation. At present, a number of pooling agreements are in effect in U.S. trades with Brazil, Argentina, and Peru.

A cargo pool usually controls the carriage of a certain commodity or group of commodities. In a revenue pool, each member is entitled to receive a specified percentage of the total freight revenue earned by all the pool members. The pooling agreements filed with FMC pursuant to Section 15 of the Shipping Act of 1916 as amended, are all revenue-pooling rather than cargo-pooling agreements.

In return for a share of the revenue pool, each party must agree to a minimum number of sailings imposed by the agreement. A few of the agreements also require a minimum number of port calls. Some of the agreements require that the parties provide a certain amount of cargo space per sailing. If a specific amount is not required, then the parties must agree to provide cargo space sufficient to carry all the cargo covered by the agreement.

If a party fails to meet a sailing, port call, or cargo requirement, its share of the pool revenue is reduced. Some agreements provide a formula for calculating the loss. Others simply say that the revenue share is reduced in proportion to the deficiency in sailings, port calls, or cargo space.

The U.S./South American pooling agreements reserve certain cargo exclusively for pool members. Since pools guarantee each member a share of revenues, there is usually no incentive to increase sail-

[1]See Edgar Gold, *Maritime Transport, The Evolution of International Marine Policy and Shipping Law* (Toronto: Lexington Books, 1981), pp. 114-118.

ings above the minimum required by the agreement or to attract more cargo. Thus, pools appear to improve the carrier's capacity utilization since pool members tend to limit their capacity to that required by the terms of the agreement.[2] Many believe, however, that the final results can be and have been—particularly in the Brazil and Argentina trades—very detrimental to competition and good service.

Pools represent a form of carrier cooperation short of a joint service, a consortium, or joint venture. Many lines outside of the United States commonly operate under one of these types of cooperative arrangements. The following description of such commercial operating agreements is excerpted from a 1981 Review of Existing Agreements and Potential Cargo Sharing Arrangements:[3]

> Joint Service (Cartel or Syndicate). In this type of arrangement, some or all of the activities are provided as an integrated operation. Usually vessels and offices retain the separate identities of the two lines. A financial agreement between the parties outlines terms for splitting revenues and certain costs.
>
> **Consortium.** A form of cooperative intercompany agreement in which most capital assets are jointly owned (sometimes only the ships remain under separate ownership) and the operating company is jointly owned. Consortia have been discouraged in U.S. trades for U.S. -flag carriers by the U.S. Government as allegedly anticompetitive.
>
> **Joint Venture.** The closest form of cooperation between independent liner companies in which the participants jointly own (or lease) vessels, equipment, and terminals, and the venture has its own management. Tax considerations dictate that most joint ventures are among companies from a single country.

Table 21 illustrates typical areas of cooperation for the above forms and gives some examples of joint operations.[4]

Conference agreements and pools, while having the basic effect of limiting competition among parties to the agreements, also seek to reduce malpractice, stabilize rates, and improve efficiency by so doing. If competition is also assured among cooperating groups or with nonmembers, then the twin

[2] *See Changes in Federal Maritime Regulation Can Increase Efficiency and Reduce Costs in the Ocean Liner Shipping Industry* (Washington, D. C.: U.S. General Accounting Office, Report No. (GAO)/PAD-82-11, July 1982).

[3] See "Impact of Cargo Sharing on U.S. Liner Trade With Countries in the Far East and South East Asia' for the Federal Maritime Commission by E. G. Frankel, Inc., September 1981.

[4] For a more detailed discussion of joint operations, see VonSchirach-Szmigiel, *Liner Shipping and General Cargo Transport* (Stockholm: Stockholm School of Economics, 1979).

Table 21.—Cooperation Forms Practiced by Liner Operators

Cooperation areas	Cartel	Syndicate	Consortium	Joint venture
Service scheduling	common	common	common	common
Operation of:				
Vessels	common	common	common	common
Terminals	common	common	common	common
Tariffs	common	common	common	common
Revenues	common	common	common	common
Name	common	common	common	common
Marketing	individual	common	common	common
Inland container operations	individual	common	common	common
Management	individual	partly common	common	common
Investment plans	individual	partly common	common	common
Ownership:				
Vessels	individual	individual	individual	common
Terminals	individual	individual	common	common
Examples of joint operations	Trio Group Asia Container Europe (ACE) Scan Australia Caribbean Overseas Line (CAROL)	Scan-Dutch Australia/Europe Container Service (AECS) South Africa Group	Atlantic Container Line (ACL) Associated Container Transportation (ACT) Dart Container Line Atlantica SD. A.	Overseas Container Ltd. (OCL)

SOURCE: C. VonSchirach-Szmigiel, *Liner Shipping and General Cargo Transport*, Stockholm School of Economics, 1979.

goals of efficiency and best rates could be compatible. However, there continues to be concern over whether allowing certain restrictions on competition will be beneficial to shippers and the general public as well as to ship operators. Many believe that the anticompetitive features of revenue pools should be of much greater concern than simple conference agreements on rates.

Chapter 6 discusses the U.S. Government's regulatory policy toward conferences. The U.S. shipping industry is anxiously awaiting congressional action on the Shipping Act regulatory reform which would permit liner operators to engage more freely in cooperative business practices and thus increase utilization and lower costs,

Pricing, Rates, and Shippers' Councils

Those who purchase the transportation services to move their cargo are called shippers. Those who operate ships and provide transportation services are called carriers (though some confuse these terms). Even though this chapter primarily addresses the industries that operate ships, those industries only exist to serve shippers. In the liner business it is important to understand how rates and pricing structures are derived and how shippers are both involved in and affected by the process before policies are developed. Actions which are detrimental to shippers will quickly influence the demand for shipping services. One should also understand the benefits that high utilization and carrier cooperation can bring to shippers.

Individual carriers or conferences follow one of two basic theories of ratemaking: cost-of-service pricing and value-of-service pricing.

Simply put, in cost-of-service pricing the carrier computes its total costs for each voyage, adds a desired rate of return, and divides by the average number of containers it carries. Thus, it arrives at a rate which covers the cost of moving the container, regardless of what the container carries.

However, as reasonable as cost-of-service pricing appears, it is not the method generally in use. The method that is most widely used is value-of-service pricing, also known euphemistically as ' 'charging what the traffic will bear. The theory underlying this method is that rates should be set at a level which makes transportation charges a minimum percentage of a commodity's landed cost. Under this theory, a containerful of electronic equipment can bear a much higher transportation charge than a containerful of rags, and still move. If equal rates covering all costs were charged for rags and electronics, the price for rags would be so high that the rags probably would not move. Under value-of-service pricing, both commodities can move. Underlying this method is a system of cross-subsidization. By charging high-value commodities more than their fair share of costs, and the lower valued commodities less than their fair share, the higher valued commodities actually subsidize the lower valued commodities. However, since lower valued commodities probably would not move if charged their fair share for space, the entire cost of the voyage would otherwise be borne by the high-va.lued commodities. Any contribution to overhead by the low-valued cargo actually brings the cost of the movement down for the high-rated cargo.

Container shipping is a capital-intensive business, with very high fixed costs. The break-even point is usually cited at about 85 percent capacity; i.e. , the carrier has to be 85 percent full to cover its fixed costs. In an overtonnaged trade, with lots of unused capacity, carriers may be tempted to carry cargo at anything over their variable costs, so long as some contribution is made to fixed costs, Since case law requires that rates be fully compensatory, that temptation is sometimes expressed in the form of rebates, whereby a carrier returns part of the tariffed rate (usually secretly) to the shipper in order to get his cargo. However, rebating and similar malpractice are strictly illegal under the Shipping Act, because they result in differential (i.e., discriminatory) treatment among shippers. Under the principles of common carriage, all shippers are entitled to the same rate for the same service. To enforce this principle, FMC requires strict adherence to the tariffed rates by both carrier and shipper. Any deviation is considered a violation of the Shipping Act and can result in penalties for both the carrier and the shipper.

The high break-even costs of liner operations and the above regulations tend to distort traditional supply/price relationships. For example, generally the greater the supply of cargo space available,

the **higher** the price, since a great supply of cargo space (i. e., overtonnaging) results in underutilized ships, which must spread their high fixed costs over a fewer number of containers. Thus, the rate generally rises.

The converse of this is that the lower the supply of cargo space available—i. e., ships running full to capacity—the lower the price can be, since the high fixed costs can be spread over a greater number of containers. This relationship of high supply high price and low supply low price is used as the best argument for close cooperation among carriers, for when carriers can limit their supply of cargo space and rationalize their sailing schedules, they are in a position to offer lower prices to shippers.

Under present U.S. policy and practices, a shipper has the following recourse if he feels that rates are too high: first, he can go to the conference and appeal for a lower commodity rate on the basis that his landed price is uncompetitive and he may lose the business. If the conference is not responsive, he can ship on an independent carrier—usually at a lower rate. Sometimes, when faced with the loss of the cargo, carriers may take some rate action to meet a shipper's needs. If the shipper suspects that he may be a victim of discrimination vis-a-vis the rates charged other domestic shippers or foreign shippers, he can file a protest with FMC, which will investigate the claim under section 16 and/or 17 of the Shipping Act.

In practice, however, shippers have not had very much interaction with FMC. They rarely become involved and they rarely protest agreements.[5]

In many trading countries outside the United States, shippers' councils are a counterpart to carrier conferences and other cooperative agreements. These councils are organizations of shippers formed to collectively negotiate rates and service with the conferences. In the United States, shippers' councils have not been granted antitrust immunity and shippers fear they would be in violation of the antitrust laws.

Shippers appear to be divided on the question of whether shippers' councils should be granted antitrust immunity. A survey of shippers taken by the General Accounting Office in 1980-81 indicated that shippers strongly supported the council concept and believed they would have a beneficial effect on rates and service quality.[6] However, some large shippers have recently argued against antitrust immunity for shippers' councils as a counterbalance to carrier antitrust immunity.[7] The general belief is that large shippers have enough economic "power" to deal effectively with carriers individually, and do not need councils to protect their interests.

The debate about shippers councils continues with congressional consideration of the Shipping Act of 1983; the Senate and House versions of mid-1983 have different shippers' provisions.

The question of industry (shipper and carrier) support for alternative policies, such as shippers' councils, is only one consideration. Another is how to develop a system that will encourage growth in overall trade through fair and equitable treatment of shippers combined with competitive rates and service. For example, U.S. exporters compete with exporters from other countries in many markets around the world, and transportation is an integral part of that competitive equation. In the future, U.S. shares of that trade may depend on how effective and efficient our ocean carriers can transport U.S. goods abroad.

Future Competitiveness of U.S. Liner Fleet

Already the most successful sector of the U.S. fleet, the U.S.-flag liner fleet operating in foreign trades, will become even more cost competitive as it is replaced and upgraded with modern, automated, large, diesel-propelled ships.

However, if the trend toward specialized neobulk ships for certain trades continues, it may result in the diversion of cargo from the liner to the nonliner sectors. This may reduce the opportunity for

[5]The foregoing discussion was excerpted from a speech by Dr. Leslie Kanuk, former Chairman of the Federal Maritime Commission, before the Georgia World Congress Institute and International Trade Association, September 1980.

[6]*Changes in Federal Maritime Regulation Can Increase Efficiency and Reduce Costs in the Ocean Liner Shipping Industry,* op. cit.

[7]See *American Shipper,* July 1983, p. 11.

U.S.-flag ships since few U.S.-flag ships are being built for the neobulk trade (carrying contract cargoes). The introduction of combination vessels, such as container-bulkers can be expected to have a negative impact on U.S.-flag liner operators in the same way. These trends are therefore important to monitor and to consider when Federal policies are developed.

There is a trend in the U.S.-flag fleet to significantly increase containership size. American President Lines' new ships, and U.S. Lines' planned ships, point in that direction. Major constraints are the substantial risk of not being able to fill the ships and the difficulty of achieving high service frequency. Both these problems have been significantly reduced in the foreign-to-foreign trades as carriers have combined into consortia to reduce the risk of individual carriers. Whether such an avenue will be available to the U.S.-flag carriers will depend on U.S. regulatory and antitrust policies.

Labor unions can be expected to resist the reductions in crew size to the 18- to 24-men levels often employed by foreign competition. If economic pressures force reductions in manning levels, at least to the high end of that range, the ability of U. S.-flag liner ships to compete will be enhanced.

Ancillary ship-related, container, and terminal technologies should not significantly increase or decrease the ability of U.S.-flag liner ships to compete with foreign-flag ships as these technologies, once proven, are easily transferred from U.S. -flag operators to foreign-flag operators and vice versa.

THE U.S. BULK FLEET IN FOREIGN TRADES

As is the case worldwide, the U.S. bulk trades greatly exceed its liner trades in tonnage. In 1980, U.S. bulk trade (both liquid and dry) totaled 736 million metric tons (tonnes), while general cargo trade totaled 78 million tonnes. However, the U. S.-flag foreign trade dry-bulk and tanker fleets carry only a small percentage of this trade.

Worldwide, trade in the major dry-bulk commodities (iron ore, coal, and grain) increased by 50 percent between 1972 and 1982. At the same time, the world fleet of bulk and combined carriers increased by 119 percent, from 91.5 million dwt in 1972 to 200 million dwt in 1982. The world dry-bulk fleet continued to grow between 1982 and 1983 to a current level of 211.3 million dwt.[8]

An oversupply situation also exists in the world tanker fleet, although at the present time the size of the fleet is decreasing, along with demand. World trade in oil and oil products has dropped sharply, from 1,748 million tonnes in 1977 to an estimated 1,287 million tonnes in 1982, for a decline of 26 percent. In 1982, the world tanker fleet was essentially the same size as in 1977, 320 million dwt. A 6-percent reduction in the fleet occurred in 1983, to 301 million dwt. [9]

The magnitude of the surplus in the world bulk fleet is reflected in the market value of the ships. A number of dry-bulk ships with useful life remaining sold for under $1 million each in the second half of 1982. Prices for tankers were nearly as low. In some cases, ships have been abandoned because the scrap value of the vessel is less than the costs of the scrapping process.

In the best of times, U.S. bulk operators have had difficulty competing in the world market because U.S. costs far exceed those of foreign competitors. The major difference in operating expenses between U. S.- and foreign-flag ships lies with crew costs. U.S. Department of Transportation (DOT) data show a ratio of U.S. daily costs v. comparable average costs for Organisation for Economic Cooperation and Development (OECD) countries for a 26-man dry-bulk ship crew of about 3 to 1. Expenses for crew and fuel account for a significantly higher proportion of overall operating costs for bulk ships than for liners, limiting the opportunities to reduce the cost differential through efficiency improvements in other operating cost components.

Construction costs for tankers and dry-bulk carriers in U.S. yards are two to three times the costs

[8] Fearnleys, *Review 1982, Oslo,* Norway, 1983.
[9] Ibid.

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in foreign yards (see table 22). The final cost differential to buyers is even greater because:

1. in recent years, prices at foreign yards have usually been lower than construction costs, the amount of difference varying according to the degree of excess capacity at shipyards;
2. delivery times at foreign yards are 1 to 2 years quicker, which reduces net present value costs;
3. foreign cost schedules often do not include cost escalation factors during the construction phase; and
4. financial terms (downpayment required, progress payments, etc.) at foreign yards are more favorable, further reducing the effective price.

The 1970 Merchant Marine Act allowed payment of CDS for bulk ships in hopes of enlarging the U.S.-flag bulk fleet. Thirty tankers and a few dry-bulk ships were built under the program, but no funds have been appropriated since 1980. Even when CDS was available, it was limited to 50 percent of the U.S. cost. Since foreign prices in 1983 tend to be less than half of U.S. costs, it would still be cheaper to buy ships abroad than from U.S. yards even with CDS.

The U.S.-flag foreign trade tanker fleet is small and is attracting little business in the severely overtonnaged international markets. Since 1976, U. S.-flag tankers have never carried more than 4.5 percent of the very large U.S. petroleum import trades. Of the 30 tankers built with CDS since 1970 (see table 23), only 3 have been delivered since 1977. Due to the lack of opportunities in the world market, much of the U.S. subsidized fleet took advantage of a provision allowing such vessels to enter the domestic trade on a 6-month-per-year basis, with a pro rata payback of subsidy.

Table 22.–Typicai U.S.- and Foreign-"Ship Construction Costs-1982 (miiiions of doiiars)

	25,000 dwt	*70,000* dwt	*120,000* dwt	*265,000* dwt
Tanker				
United States	59.0	85.0	109.0	189.0
Foreign	23.0	35.2	44.3	75.7
	25,000 dwt	60,000 dwt	120,000 dwt	150,000 dwt
Dry-bulk				
United States	52.0	83,0	107.0	119.0
Foreign	19.6	33.0	42.6	47.0

SOURCE: U.S. Maritime Administration, Office of Shipbuilding Costs, "'Construction Cost Estimates for United States and Foreign-Flag Vessels."

Tabie 23.—CDS-Buiit Tanker Fieet

Vessei	Deadweight tons	Year buiit
Coronado	39,712	1973
Brookiyn	225,281	1973
Wiiliamsburgh	225,281	1974
Cherry Vailey	39,675	1974
Golden Endeavor	89,700	1974
Chelsea	39,740	1975
Massachusetts	264,073	1975
Golden Monarch	91,388	1975
Mormacstar	38,300	1975
Worth	91,849	1976
Patriot ... ,	35,100	1976
Beaver State	91,849	1976
New York	264,073	1976
Mormacsun	39,232	1976
Rose City	91,849	1976
Ranger	35,100	1976
Chestnut Hill	91,295	1976
American Heritage	91,849	1976
Courier	35,000	1977
Rover	35,000	1977
Mormacsky	38,300	1977
Kittanning	91,344	1977
Arco Spirit	262,376	1977
Arco independence	262,376	1977
Stuyvesant [a]. ... ,	225,281	1977
Bay Ridge	225,000	1979
UST Atiantic	398,143	1979
UST Pacific	398,141	1979

NOTE: In addition, two CDS tankers are currently under construction, Falcon Leader and Falcon Champion, both 34,000 dwt. An additional ship, the *Golden Dolphin, was* built in 1974 with CDS but was lost.

%DS haa been repaid.

SOURCE: U.S. Maritime Administration, Office of Trade Studies and Statistics; "Ship Register," Military Seallft Command, Department of the Navy, Washington, D. C., January 19S3.

The very large tankers (known as very large crude carriers—VLCCS) have had a difficult time in international trade. In the late 1970's, two VLCC owners requested and were granted permission by MarAd to refund to the Government all CDS which had been paid and to enter the domestic trade permanently. Protracted court cases ensued, with the Supreme Court finally ruling for one vessel that MarAd had acted within its power. The case involving the second ship is still subject to litigation.

Following this precedent, a number of subsidized tanker owners are now interested in paying back subsidies in order to enter domestic operations, primarily in the Alaskan trade. Current domestic operators oppose such a policy as unfair, and hold that it will result in overtonnaging in these trades. Further complicating the issue is the question of

exporting Alaskan oil, which is currently prohibited. Allowing such exports would significantly reduce the markets reserved for domestic tankers.

The entire U.S. dry-bulk fleet operating in international trade consists of 23 vessels, many of which are over 20 years old (see table 24). Most of the ships continue to operate because they carry Government preference cargoes, primarily AID shipments, where they do not have to compete with foreign ships.

A major characteristic of the U.S. dry-bulk trades is the intense price competition. The shippers/consignees are large, sophisticated enterprises, many generating substantial volumes with access to proprietary carriage of their cargoes as well as to long-term contracts with independent carriers. Low-cost operators have essentially driven the higher cost operators (most significantly, the U.S.-flag operators) out of the market. Lower costs have been achieved through increasingly large, specialized ships with small crews paid low wages (relative to U.S.-flag crews).

Thus, it is likely that the U.S. dry-bulk fleet will continue to depend heavily on whatever preference cargo is available. The existing cargo preference laws which are significant to the bulk trades are those requiring 50 percent U.S.-flag shipping for Government-aid cargoes, primarily grain. Two new large grain carriers just entered this trade. They are former liquefied natural gas tankers which were converted in Korea and fitted with coal-fueled propulsion plants. These ships—large, modern, and fuel-efficient— have reduced grain export costs by a substantial amount—although not to the foreign-flag level.

Proposals to reserve some percentage of commercial bulk cargoes for U.S. -flag have been debated for several years. Studies have indicated that such cargo preference could encourage building a more modern, efficient U. S, bulk fleet, which would, in

Table 24.—U.S. Dry-Bulk Carriers in International Trade (as of Mar. 1, 1983)

Name of vessel	Type	Deadweight-tons	Year built
Inger	Bulk	23,510	1945
Jade Phoenix	BO (Bulk/Oil)	63,200	1982
Kopaa	Bulk	24,233	1944
Marine Princess	Bulk	52,565	1967
Merrimac	Bulk	25,002	1944
Overseas Harriette	Bulk	25,541	1978
Overseas Marilyn	Bulk	25,541	1978
Point Manatee	Bulk	15,316	1944
Point Susan	Collier (Coal)	24,345	1945
tPride of Texas[a]	Bulk	35,389	1981
Seadrift	Bulk/Oil	15,155	1942
tSpirit of Texas[a]	Bulk	32,100	1982
tStar of Texas[a]	Bulk	36,614	1982
Sugar Islander	Bulk	29,648	1973
Tamara Guilden	Bulk	23,800	1961
Traveler	Bulk	25,130	1945
tUltramaF	OBO (Ore/Bulk/Oil)	82,199	1973
tUltrasea[a]	OBO (Ore/Bulk/Oil)	82,199	1974
Walter Rice	Bulk	23,510	1945
Betty Wood	Bulk (Tug/Barge)	23,751	1973
Calrice Transport	Bulk (Tug/Barge)	25,000	1976
Jamie A. Baxter	Bulk (Tug/Barge)	24,372	1977
Moko Pahu	Bulk (Tug/Barge)	25,931	1982
Total (operating)		764,051	
tGolden Phoenix[b]	BO (Bulk/Oil)	129,000	1983
Ogden Parana[c]	Bulk	45,000	1983
Ogden Trent[c]	Bulk	45,000	1983

tvessel built with CDS.

%rrently operating in preference trades under Sec. 614 of Merchant Marine Act.

bunder reconstruction, Former LNG carriers

[c]Under construction.

SOURCE: U.S. Depafiment of Transportation, Maritime Administration, Office of Trade Studies and Subsidy Contracts, Division of Statistics, Mar. 8, 1963.

turn, reduce the cost disadvantages of U.S.-flag bulk shipping. IO No. test of this hypothesis is available, however, and the opposition, principally from the farmers who would bear the burden of increased costs for exporting, is very strong. It is significant, however, that efforts to modernize the fleet and make some segment cost competitive could bring sizable benefits to this industry because of the magnitude of present and future U.S. bulk trades. (Existing and proposed cargo-preference policies are discussed further in ch. 7.)

U.S.-bulk cargo reservation schemes and the authority for U.S. carriers to operate foreign-built, foreign-crewed ships under the U.S. flag are the only proposals now under consideration, which would bring a significant U.S.-flag bulk fleet into existence. While the ability to buy foreign-built ships would eliminate the capital cost disadvantage, there would remain a large differential between U.S. and foreign crew costs. As previously mentioned, the aggregate crew cost differential (including effects of higher U.S. manning scales and indirect costs) is perhaps more important than merely wage rate differentials.

The foreign-flag tanker and dry-bulk fleet under ‘ ‘effective’ U.S. control is cost competitive on a worldwide basis. In the past, this fleet (and the fleet on long-term charter to U.S. companies) has grown substantially and serves a large portion of U. S. international trade and many other foreign-to-foreign trade routes. The cost and technology advantages available anywhere in the world generally have been adopted by this fleet.

[10]See “Development of a Standardized United States-Flag Dry-Bulk Carrier, a report prepared for the Maritime Administration by M. Rosenblatt & Son, January 1979.

If U.S. dry-bulk export trade growth follows the Wharton Econometric forecast of over 4 percent per year between 1980 and 2000, such growth clearly will require additions to the fleet serving that trade. Table 25 illustrates trade-growth projections for several major bulk commodities. Without Government policy changes, the future fleet makeup will depend largely on the business strategies of large bulk shippers (the multinational natural resource companies) and the ship owners and operators who carry that cargo. Those business strategies clearly point toward expanding the U.S. controlled fleet under foreign flags rather than the U. S.-flag bulk fleet.

Table 25.—U.S. Dry-Bulk Export and Import Trades (million tonnes)

Commodity	1980 (actual)	1990 (projected)
Coal	72.8	133.0
Iron ore	25.5	57.7
Grain	97.2	143.6
Alumina/bauxite	20.2	22.6
Phosphate rock	14.8	19.6
Rice	2.0	2.6
Sugar	4.8	5.1
Sorghum	5.4	6.3
Soybeans/Meal	28.8	30.0
Forest products	27.6	35.7
Fertilizers	13.4	17.8
Potash	1.2	,2
Sulfur	1,7	.8
Chrome ore	1.2	.9
Gypsum	6.8	9.5
Manganese ore	1.2	.9
Iron/steel scrap	10.7	11.4
Petroleum coke	8.0	13.0
Other	4.9	4.8

SOURCE: U.S. Maritime Administration, 1979 and FACS, 1982.

THE U.S. DOMESTIC FLEET

Under the Jones Act, all vessels in the domestic trade must be constructed in the United States and be of U.S. registry. The domestic trades include coastwise, intercostal, noncontiguous, and inland waterway trades. Since this report focuses on seaborne trade, we have not included information or statistics on tug and barge transportation even though it is a very significant U.S. transportation sector on the inland waterways and on some coastal trades.

Table 26 summarizes the domestic fleet. As the table shows, the vast majority of domestic trade ships are tankers. As of May 1983, of a total ac-

Table 26.—Active U.S. Flag Domestic Fleet as of May 1,1983

	Number of vessels	Deadweight-tons
General cargo.	34	484,000
Bulk cargo	7	202,000
Tankers [a]	175	9,139,500
Total.	216	9,825,500

NOTE: Includes vessels of 1000~ gross tons and over.
Excludes vessels operating exclusively on the Great Lakes and inland waterways, those owned by the U.S. Army and Navy, and special types such as cable ships, tugs, etc.
~hera are an additional 6 tankers, totaling 1,427,500 dwt, built with CDS, presently operating in the domestic trades.
SOURCE: U.S. Maritime Admlnistration, Off Ice of Trade Studies and Subsidy Contracts, Dlvlsion of Statistics, July 1963.

tive fleet of 216 ships, totaling 9,825,500 dwt, 175 vessels of 9,139,500 dwt were tankers (93 percent).

The major domestic liner trades—Hawaii, Puerto Rico, and Alaska-have shown very little change since 1970. Trade volumes are mostly dependent on domestic economic growth, with some negative impact coming from the increase in foreign sources of goods for domestic consumption. For example, between 1970 and 1981, U.S. real economic growth was a rather modest 3 percent per year. Since much of this growth was in the service sector, the growth in the goods component was probably less than half that amount. This slow economic growth in goods correlates with very low annual growth rates in domestic commodity movements—5 percent per year for total U.S. intercostal movements and 2 percent per year for the domestic noncontiguous trades.

Most dry-bulk domestic cargo is carried on barges. Eight major bulk commodities accounted for 80 percent of total barge carriage. Barge service is generally lower cost than equivalent ship service because of the low manning levels which have been negotiated for tug and barge operations as compared with ships. Even if operators had access to foreign-built bulk ships, high U.S. crew costs probably still would favor barge service in the U.S. domestic trades unless major technological advances allow significant manning reductions. The shorter distances in the domestic trades also help to make barging more economical. While most of the barge carriage is of bulk commodities, some U.S. operators (notably the Crowley Maritime Corp.) have been successful with short-haul liner-type service on barges, especially in the west coast-to-Alaska trade and the east coast-to-Puerto Rico trade.

The Domestic Tanker Trades

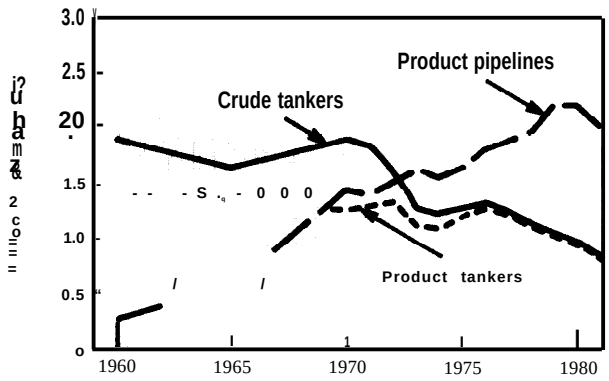
Domestic oil movements have undergone significant geographical shifts over the past 20 years, and this change has affected the demand for tankers. Twenty years ago the major oil trade was from the gulf coast to the east coast. Crude and product tanker movements totaled 2 million barrels per day then. These movements remained essentially constant until the early 1970's. In 1971 domestic crude production along the gulf coast began to decline and with it the demand for tankers to move this oil. Today, this crude trade—once accounting for over 25 percent of tanker movements—has essentially disappeared.

With the decline in crude production, product movements also began to fall in the late 1970's. In addition to less production, this also reflected a decrease in overall product demand and an increase in pipeline capacity. Product movements from the gulf to the east coast are expected to remain static for the foreseeable future.

Figure 27 illustrates the decline in tanker trade and the current increase in pipeline carriage from the gulf to east coast from 1960 to 1982. The tanker demand—for both crude and product movements gulf to east coast—is now less than 50 percent of what it was 20 years ago as pipeline systems have proven more cost effective than ships.

While tanker demand was declining on the other coasts, the west coast emerged as an area of crude surplus. Huge oilfields on the North Slope in Alaska were brought into production in the mid-1970's.

Figure 27.—Gulf-East Coast Tanker Movements



SOURCE: Exxon Shipping Co., 1963.

By 1978, production from the North Slope, which is pipelined to a tanker terminal at Valdez in southern Alaska, reached 1.1 million barrels per day and exceeded the capacity of west coast markets. Substantial tanker tonnage was needed to move this crude to the gulf and east coasts. Nineteen Jones Act tankers with deadweights in excess of 100,000 tons each were built during the 1970's to serve the Valdez, Alaska, trade. Currently, an average of 1.6 million barrels per day is transported.

Today, more than half of the domestic tanker tonnage is associated with the crude oil trade from Alaska, and many experts believe that the future of the U.S. tanker fleet rests primarily with the petroleum industry's search for oil reserves off the coasts of California and Alaska. Not only will new discoveries lead to new demand for tanker services, but much of the future potential is in Arctic or other hostile environments where improved transportation methods and technology will be the key to economic petroleum production. 11 However, future production off the coast of California and in the Arctic is extremely uncertain. By 1988, Alaskan North Slope production is expected to peak and then decline through 2000. The deficit in domestic tanker tonnage in the recent past has become a surplus in 1983 and will probably continue in the near future. Without new discoveries, a significant surplus of tankers could exist by 1995. However, offshore Alaska and California are the most promising regions in the United States for future oil and gas discoveries.

Recent estimates for California put the offshore oil resource potential of the region at 3.7 billion barrels, with two-thirds of this off southern California. New discoveries have already been announced in the Santa Barbara Channel and the Santa Maria basin.

The disposition of future offshore California production —estimated at 300,000 barrels per day by 1990—is uncertain. It could be transported via pipeline to Texas or alternately by tanker to the same area. A third possibility is displacement of Alaskan crude in west coast markets. This would increase tanker demand for the Alaska trade because that oil would be transported to more distant locations.

The largest potential source of undiscovered petroleum reserves lies in and off the coast of Alaska. Estimates have placed this total as high as 25.5 billion barrels. Lease sales, followed by exploration drilling scheduled for the next few years, could determine actual levels.

The areas where industry is most likely to discover producible oil and gas in the near future are the Beaufort Sea near-shore area (9.5 billion barrels possible) and the North Slope area adjacent to Prudhoe Bay (6.5 billion barrels possible). Assuming these fields are commercially viable, about 10 years can be expected to elapse between lease sale and production. Thus, the Prudhoe Bay production decline could begin before new fields start, and demand for new tanker tonnage to serve Alaska would not be significant until after 1995. Figure 28 is a projection by Exxon of the demand for tankers serving Alaskan petroleum production with a wide range of possibilities by the year 2000.

As shown, in the more distant future, major new finds in the Alaskan Arctic could result in significant demand for tankers. However, this area represents formidable technological challenges because

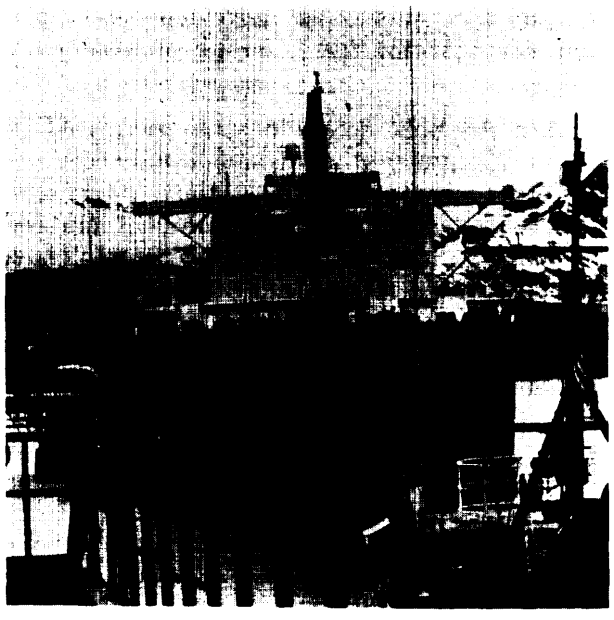
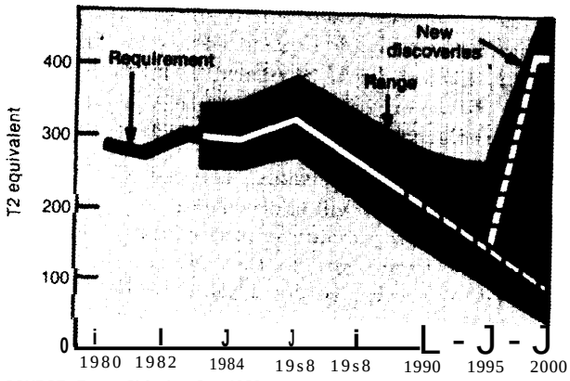


Photo credit: Atlantic Richfield Co.

Loading crude oil at Valdez, Alaska

[11] "Future Requirements for Tank Vessels" by F. J. Iarossi, Exxon Shipping Co., presented at the SNAME Spring Meeting, April 1983.

Figure 28.—industy Outlook for the Alaskan Tanker Trade



SOURCE: Exxon Sh{pplng Co., 19S3.

of the physical conditions there. The costs of extracting and transporting such reserves would be enormous. Potentially, a large market could result for domestic tankers, but major challenges would have to be met by ship designers, builders, and operators.

Regulation of Domestic Liner Trades

The coastwise, intercoastal, and noncontiguous trades are subject to regulation by the Interstate Commerce Commission (ICC), which in recent years has reduced or eliminated rate regulation of domestic rail and truck carriers, effectively freeing the carriers to set rates at market levels, The noncontiguous trades are also subject to regulation by FMC. FMC and ICC require carriers in those trades to justify requests for rate increases to FMC. The currently accepted level of reasonableness for such rates in the Hawaiian trade provides carriers with a 13-percent return on assets. A recent request from FMC—under Docket No. 82-14—for recommendations for changes in regulation of the noncontiguous trades received a unanimous response from the carriers asking that the test of reasonableness for rates be dropped. FMC is still considering the issue.

Continuing the test of reasonableness by FM(3 should not prove a hardship on the carriers or the service provided during times of low inflation. In times of high inflation, however, the profits generated by rates limited by the current Ievel of reasonableness are inadequate to encourage either new investment by existing carriers or to attract new carriers to the trades because the rate base on which the 13-percent return is calculated is depreciated book value rather than current market value,

Use of Foreign-Built Ships in Domestic Trades

Some in the U.S. shipping industry, as well as consumer interests, have proposed that foreign-bufit ships be allowed to enter the domestic trades. In the noncontiguous domestic liner trades—Alaska, Hawaii, Puerto Rico, and Guam—use of foreign-built ships could result in lower freight rates and thus somewhat lower cost goods. Combined with the trend toward attempts at Government "buy-outs' of ODS for U.S.-flag liner carriers, use of foreign-built ships could permit a number of U. S.-flag carriers to begin serving these trades en route to or from their foreign-trade destinations. There is considerable debate on the overall costs and benefits of allowing foreign-built or previously subsidized vessels to participate in domestic trades, as discussed further in chapter 6.

In the coastwise and intercoastal trades, where ocean shipping is in competition with truck and rail, access to foreign-built ships by itself would be unlikely to lead to new transportation services. The availability of lower cost foreign-built ships combined with mixed proprietary and common carriage and flexible union manning requirements, however, might well lead to new, more competitive intercoasta. services.

Significant opposition to these proposals for foreign-built domestic ships has been voiced by U.S. shipbuilders. Chapter 6 discusses that issue in more detail.

In some domestic offshore trades, the U.S. liner fleet is limited in size and capabilities, and shippers have had difficulty when there was a need for special handling or equipment. Under present law, a U.S.-flag, U.S.-built ship must be used for domestic offshore carriage, even in cases where it is marginally able to carry the shipment compared to a foreign-flag ship of much more suitable design,

It has also been proposed to increase the limit on foreign ownership of U.S. carriers (from 25 to

75 percent in the domestic trades and from 49 to 75 percent in the U.S.-foreign trades). The rationale used is that, historically, foreigners have been more willing than U.S. citizens to invest in shipping—even though it is a low-return industry. Thus, the argument runs, as owners they would be more likely to invest in new ships and facilities, thereby enhancing the efficiency and productivity of the fleet. However, the countervailing argument that increased foreign presence in U.S. shipping could have a detrimental impact on national security should also be considered. Of particular concern would be any investment by the U.S.S.R. or citizens of other controlled economies.

There is no reason to think that a good foreign operator would make business decisions in the U.S. environment any differently than would a good U.S. operator, except that, being less involved with U.S. shipping traditions, they might be expected to phase out marginally profitable or unprofitable businesses more quickly. Yet the current trend in the U.S.-flag liner fleet toward takeover of marginally profitable U.S. companies by financially stronger U.S. companies is already causing some industry restructuring and revitalizing. It is not clear that a change in the limitations on foreign ownership is in the best interests of the U.S. industry at present.

Opening U.S. carriers to majority ownership by foreigners could, however, increase the availability of capital and management to U.S. carriers, and it could open the way to joint ventures, and enhance the viability of the U.S. carriers.

Technological Developments

The domestic trades are served by various and specialized tanker, liner, and neobulk vessels (container, RO/RO, railcar, and lumber carriers) as well as barges. The need for special product carriers and flexible services will undoubtedly continue. The size of domestic noncontiguous liner ships should also increase as new ships are introduced into these trades. The size of the crews on U.S.-flag liner ships operating in the domestic noncontiguous trades could be reduced as crew size concessions are won by U.S. operators in the foreign trades. However, such reductions may be dependent on replacement of existing vessels.

The ancillary ship-related, container, and terminal technologies will probably be incorporated into the domestic noncontiguous fleet in essentially the same time frame as they are for the U. S.-flag ships operating in the foreign trades.

Liner service in the domestic inter- and intracoastal trades has declined markedly in the last two decades. AMPAC, a recent U.S.-flag intra-west coast service, did not survive. Because of the economic advantages of highway and rail transportation systems, it is unlikely that liner service in the domestic intercostal and intracoasta.1 trades will be introduced or provided in the near future except as an adjunct to other trades (e. g., U.S. Lines' east coast-to-west coast service). There are certain constraints now affecting the domestic maritime industry which, if lifted, could improve its competitiveness. One is MarAd's requirement under title XI regulations that prohibits the use of foreign-manufactured main machinery or major hull components.[12] There is, at present, discussion within MarAd of eliminating that requirement. If this were done, the construction cost of Jones Act ships with title XI guarantees may be reduced substantially.

Significant opportunities for the U.S. domestic fleet in the long run may lie in the need to move all cargo by the most fuel-efficient means. If unreasonable cost disadvantages of shipping versus other transport modes could be eliminated, it seems most likely that many trades would favor shipping because of its inherent energy efficiency.

[12] 46 CFR 298.11 specifies no foreign source materials or components shall be included in the vessel cost figures submitted for a loan guarantee except if the Secretary issues a waiver.

THE FUTURE U.S.-FLAG FLEET

In the past, the U.S. Maritime Administration published annual forecasts of the makeup of the U.S.-flag fleet. '3 This is no longer done. The 1981 forecast showed less than 10-percent decline in the total number of ships in the privately owned fleet from 1981 to 1991 (from 569 to 528 ships). It assumed no major policy changes and no major economic factors affecting trade flows. It also showed replacement in the tanker fleet and substantial (percentage) growth in the now very small bulk fleet (from 18 to 63 ships).

Whether or not this forecast was accurate, many recent conditions have affected the assumptions made about both policy and trade growth. The forecast base is very uncertain in 1983. The liner fleet has growth potential but is very dependent on policy actions which are yet to be clarified. The bulk and tanker fleet faces a much more uncertain economic picture in the near term. Pressures to shift subsidized tankers to the domestic trades and to reduce both subsidies and preference cargoes will affect the bulk carrier and tanker numbers drastically. Some experts believe that without policy changes, all segments of the U.S. fleet will decline markedly over the next 10 years.

The potential future U.S. liner fleet has been a matter of discussion recently by industry spokesmen. One view was offered by C. 1. Hiltzheimer, Chairman of Sea-Land Industries at the Joint Maritime Congress in June 1982.14 Hiltzheimer pointed out that, in order to be competitive, large portions of the U.S. liner fleet will need to be replaced by modern, efficient vessels. Assuming that a cost-competitive, unsubsidized fleet carrying a 40-perent share of U.S. liner trade by 1990 is a feasible goal, he believes it can be achieved by a massive capital improvement program. (Building 100 to 150 new ships and investing $8 billion to $9 billion). He also states that significant Federal policy changes would be required before industry would or could make such investments. Among these policy changes are: assured fair access to cargo, regulatory changes to allow rationalization and improve utilization, and promotional taxation incentives. If such changes were made and if industry invested in fleet modernization, it is claimed that the U.S. liner industry could compete in the world market, capture a reasonable share of U.S. trade, and offer good service to shippers. Such a scenario would show at least a doubling in capacity of the U.S. liner fleet and a transformation from mainly subsidized to mainly unsubsidized operations.

The potential for a U.S.-flag bulk fleet is considered by most to depend more on cargo-reservation policies than on ''fair cargo access' policies. While growth in that fleet could be postulated in the same way as that for the liner fleet, U.S. cost disadvantages are considered much more significant in bulk trades. It appears, however, that some consistency in existing cargo-reservation policies, combined with tax and other similar incentives provided to liner operators, could spur some rejuvenation of the U.S. bulk fleet.

Therefore, it seems clear that Federal policy in the 1980's will determine the vitality of the U.S. shipping industry in the decades to come. If there are no changes in policy, there probably will be a decline in most segments of the industry, while certain positive policy changes could lead to rejuvenation and growth.

Those policies, which would have a positive effect on certain sectors of the U.S. shipping industry, are reviewed in chapters 6 and 7 of this report. Policies to promote growth in U.S. trade and assure

[13] The last one was "Forecast of the Privately Owned U.S. Ftag Fleet, 1981-1991, ' ' by the Maritime Administration, Office of Policy and Plans, December 1981.

[14] C. H iltzheimer, *Improving the operating Efficiency of the U.S. Flag Merchant Marine* (Novato, Calif.: TRANSPORT 2000, 1982).

fair access to all international trade for U.S. carriers would naturally benefit all sectors of the shipping industry. However, such policies would be most useful for continued success of those companies which have already attained high productivity and are now reasonably competitive in world shipping. Such qualities apply to certain of the U.S.-flag liner companies and to the U.S.-controlled, foreign-flag bulk fleet.

Several other Federal policy initiatives are also of major importance to the U.S.-flag liner operators. These include: maintenance of existing Government-impelled cargo preference, modification to the Shipping Act granting wider antitrust immunity in order to achieve benefits of high utilization and economies of scale, and modifications to taxation policies and/or financial incentives which would allow future capitalization on a cost-competitive basis with other shipping nations. Policies to promote cost-competitive industry capitalization are also critical to the U.S. effective control fleet.

For the U.S.-flag bulk fleet (tankers and dry-bulk) in foreign trades, future viability is uncertain unless major Federal support is applied. Since the world bulk business is so poor right now, and U.S. costs are significantly higher, U.S.-flag bulk operators are not competitive with other major shipping nations (nor are they competitive with the foreign-flag U.S.-controlled fleet). Federal support for the dry-bulk fleet to date has taken the form of cargo-preference policies, and current proposals are to expand these to the commercial U.S. bulk trades. Construction and operational subsidies (combined with taxation, loan guarantees, and other incentives) were successful in the 1970's in promoting an expanded U.S.-flag tanker fleet. However, it does not appear that such incentives would provide sufficient support if they were reinstated at the same level today. If it is considered in the national interest to promote through Federal support an expanded U.S.-flag bulk fleet, a thorough analysis of alternative approaches would probably be useful. For the U.S. domestic fleet, continuation of existing Jones Act provisions would probably lead to continued viability of those sectors which are successful today. Pressures to change those provisions will, however, continue from shippers and consumers served by the domestic fleet, who believe that increased competition would lead to more efficient and less expensive service.

Chapter 4

The U.S. Shipbuilding Industry: Status and Trends in Technology and Productivity

Photo credit: Avondale Shipyards, Inc.

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Chapter 4

The U.S. Shipbuilding Industry: Status and Trends in Technology and Productivity

OVERVIEW

This chapter examines the productive capacity of U.S. shipbuilding. It traces the historic development of the industry and describes its present situation. It analyzes the status of technology employed and the level of competitiveness for construction of today's major merchant ships. Finally, it presents possible approaches to maintaining and improving the health of the industry,

Over the past two decades, the United States has only built major merchant ships when Federal subsidies were used to pay a large portion of the cost or when laws, such as the Merchant Marine Act of 1920 ('Jones Act), required that the ship be built in a U.S. yard. The United States has, therefore, been isolated from international competition for these types of vessels.

In many other major maritime countries, shipbuilding is viewed on a global perspective. This is not the same in the United States, where only 1 to 2 percent of the world merchant fleet is now built. The U.S. shipbuilding industry is basically quite different from that of Europe, Japan, and Korea. Those countries have built most of today's modern shipping fleets and compete for orders in a world market. The United States does not.

However, the United States does have a large and diversified shipbuilding industry. Its total employment (175,000 in 1982) is even larger than Japan's. The U.S. industry has some very productive and technologically innovative segments, including those who build barges, tugs, supply boats, and offshore drilling rigs. Moreover, U.S. shipyards are foremost in construction of large, complex, and sophisticated naval warships.

In commercial shipbuilding, the Japanese, and more recently the Koreans, have based their recent success on responsiveness to developments in the international shipping arena. They did this by:

- obtaining the best combination of inputs, including skilled but low-cost labor, a strong work ethic, advanced technological capabilities (universities, technical institutes, etc.), financial means, qualified management, and many new facilities;
- tenaciously pursuing the largest volume ship markets in recent decades, particularly liquid- and dry-bulk vessels. This has allowed them to ' 'go up the learning curve, making personnel and technical improvements, enabling them to build ships much more cheaply than their rivals. A key aspect of their improvement program has been standardization and integration of processes, to achieve efficiency; and
- integrating ownership of major yards with large industrial groups operating allied businesses such as steel, machinery, electrical machinery, and trading.

Part of the reason for Japan's success in shipbuilding is that a large base of demand has come from Japanese ship operators who purchase their ships from Japanese shipyards. Thus, the yards have had consistent, long-term contracts and have often been able to offer incremental prices to buyers from the rest of the world.

While there is no Japanese law that requires ship operators to build in Japan, a review of world ships on order in 1983 shows that all those under construction for Japanese owners are being built in Japanese yards.

Volume is the prime factor in a highly productive shipbuilding industry. Without large numbers of ships to build, it is not possible to hone the productive process to a sufficient degree to reduce costs.

[1]See "Fairplay Shipping Weekly—World Ships on Order, April 1983—Japan has under construction for Japanese owners 4,7 million deadweight tons (dwt), which is more than for any other flag except Liberia, and represents about 9 percent of world orders

This is why the Japanese and Korean strategies of concentrating on building large numbers of relatively simple bulk vessels were so important to their success.

Many other factors have played a role in the high productivity of Japanese and more recently Korean shipbuilding. These yards have developed their technology to an advanced degree, beyond that found elsewhere in the world. The investment-per-worker in Japanese and Korean yards surpasses that of almost all other nations, Their technology is broad-based, and they have adopted technologies that complement each other; i.e., they have purchased machinery and adopted production processes that are carefully interrelated to achieve a smooth and highly efficient work flow.

In comparison to many other major shipbuilding nations, the United States has not installed the level of modern shipbuilding technology necessary for high productivity in the construction of today's major merchant ships.

In contrast to the Japanese and Korean model, some major problems with U.S. shipbuilding technology have been:

- long delays in introducing new technologies;
- a reluctance to adopt foreign technology, and a reluctance to enter into-joint ventures, licensing, purchasing, or other arrangements for the speedy, effective transfer of technology;
- a minimal exchange of technology among U.S. shipyards; and
- minimal evaluation of technologies in other areas (aerospace, electronics, etc.) that have potential applications to shipbuilding.

It is noteworthy that the problem of low output of labor from U.S. yards cannot be traced in any part to worker skill. U.S. shipyard workers are as skilled as their Japanese or Korean counterparts. Rather, the problem is related to work organization and the production tools available. Briefly stated, U.S. yards have never had sufficient volume of merchant ship orders to specialize, to become truly expert, or to develop high efficiency. Flexibility to build many different varieties of ships and other marine equipment has been maintained in U.S. shipyards. Thus, the economies of mass production have seldom been adopted.

The U.S. shipbuilding industry is facing a severe decline in potential new buildings of major merchant ships, primarily caused by the elimination of Federal funds for construction subsidy programs. While the U.S. Navy has embarked on an expanded building progam, it will not require much additional shipyard capacity until the mid-1980's, and only the few yards that specialize in warships will benefit substantially. The trends in the industry are thus toward more U.S. Navy work, more concentration in fewer large firms, and hard times for those firms that have, in the past, depended on commercial shipbuilding subsidies. Although U.S. yards have made recent strides in improving productivity in the construction of merchant vessels, the primary focus of the industry is still on U.S. Navy work where high-technology, custom work is the rule.

Two different approaches to improving U.S. shipbuilding productivity appear possible. One would concentrate primarily on Federal support or assistance to the industry combined with incentives to enhance productivity. Several other maritime countries appear to be adopting such an approach.

Another approach would focus on developing other emerging markets for U.S. shipyards, assuming that there is little chance that the U.S. industry can reduce costs of conventional merchant ships below the level of the low-wage countries. The U.S. shipbuilding industry is geared to custom work and the integration of highly technical with conventional systems. Markets for such skills may develop in fields like Arctic- or deepwater-resource extraction. A challenge for industry and the Federal Government would be to cooperate to identify and develop the most promising markets.

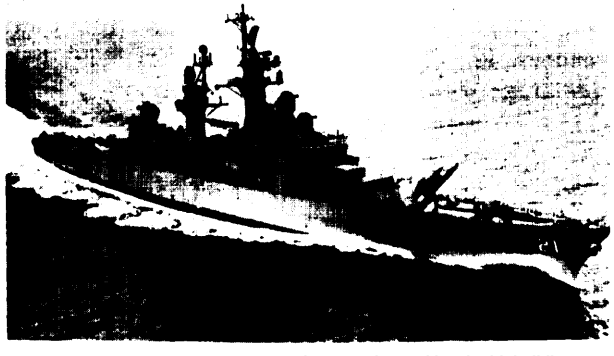


Photo credt: Lockheed Shlpbulldlng Co.

Construction of U.S. Navy warships such as the above is expected to dominate the U.S. shipyard orders over the next several years

CHARACTERISTICS OF THE SHIPBUILDING INDUSTRY

General

World shipbuilding is a cyclical industry with fluctuating demand. It has experienced over nine major cycles, each with more than a 40-percent reduction in demand, since 1896. Three of these cycles have occurred since World War II alone.

From 1930 to 1933, for example, there was a decline of 84 percent in shipbuilding output. Again, at the end of World War II, between 1944 and 1947 a decline of 85 percent was experienced because of the glut of ships built for the war. More recently, a worldwide decline of 60 percent occurred from 1975 to 1979. In addition, smaller fluctuations of 10 to 20 percent every 7 to 10 years have become quite common.

The shipbuilding industry is an assembly industry that is both capital- and labor-intensive. Large capital facilities are required, and major components usually are purchased from man y sources. The assembly process itself, using a mixture of large and small, and single and complex components, is very labor-intensive. As an assembly industry, shipbuilding has major and significant linkages to many other industries, such as iron and steel, machinery, electrical, and electronic manufacturing. Its assembly process can be expanded to include component, and even machinery, manufacture or contracted to include only ship assembly processes. As a result, integrated shipbuilders with close relations to linkage industries can often more effectively weather large cyclical fluctuations than shipbuilders who lack integration with their major supplier industries. The latter is the case with most U.S. shipbuilders.

Investment in shipbuilding equipment on a per-employee basis has mushroomed in recent years. Although many foreign shipbuilders have recently cut back and consolidated facilities, certain foreign shipbuilders are gearing up for a revival of the industry by the introduction of more automation, robotics, modern measurement and control techniques, computerized management methods, and facilities that provide for greater product flexibility. Because shipbuilding is considered an important economic and defense asset, and also because it affects many related or interrelated industries and employment, many governments support their shipbuilding industries directly or indirectly. Furthermore, governments in many countries now take an active part in the ownership of commercial shipyards (i. e., the United Kingdom, Sweden, Italy Spain, Portugal, Netherlands, Taiwan, Malaysia, India, Israel, and the Communist bloc nations). Other types of government shipbuilding support, include:[2]

- export credits ('Japan, Korea, Brazil);
- shipbuilding subsidies (United Kingdom, United States, Brazil);
- new orders financed by the government for expansion of the domestic fleet or investment ('Japan, Taiwan, Korea); and
- exemption of import and other duties (Spain, Korea, India).

These government interventions have made it increasingly difficult to compare shipbuilding productivity between various countries.

Definition of the U.S. Shipbuilding Industry

The majority of the approximately 500 U.S. shipbuilding and repair firms have fewer than 100 employees and correspondingly limited building and repair facilities. Over 200 of the U.S. shipbuilding or ship repair facilities are surveyed annually by the U.S. Maritime Administration (MarAd). Of these, 30 are "major" (i.e., have at least one large building berth) and 26 (as of March 1983) are considered to comprise the ''Active Shipbuilding Industrial Base" (ASIB).

The ASIB list changes (although only slightly in recent years) as yards open, close, or turn to other business. Criteria for inclusion in ASIB include not

[2]See "Maritime Subsidies" (Washington, D. C.: U.S. Department of Transportation, Maritime Administration, February 1983); and ''Financing and Subsidizing the Marine Industries" (Copenhagen, Denmark: MAN-B&W Diesel, November 1982).

only facilities but also active conduct or pursuit of shipbuilding work. ASIB yards must be ''engaged in seeking contracts for construction of naval ships or major oceangoing or Great Lakes merchant ships. *

Table 27 is the list, as of March 26, 1983, of the ASIB. Defense planners consider these ASIB yards to be the core of the Nation's shipbuilding capability and a principal measure of the United States' ability to respond to a national emergency. The U.S. Navy keeps a current tabulation of these yards and notes their capability of building major combatant, amphibious, auxiliary, and merchant ships. At present, 7 of the 26 yards are considered capable of U.S. Navy combatant construction. The U.S. Navy also periodically develops shipbuilding mobilization plans (one is under development in mid-1983) and surveys about 100 other shipyards to determine which could be considered as extensions of the ASIB in a national emergency.

● NlarAd definition, used consistently in publications concerning shipbuilding, e.g., "Relative Cost of Shipbuilding. "

Table 27.—U.S. Shipyards Comprising the Active Shipbuilding industrial Base (ASiB)

Alabama Dry Dook & Shipbuilding Co., Mobile, Aia
The American Ship Building Co., Lorain, Ohio
Avondale Shipyards, Inc., New Orleans, La.
Sath Iron Works Corp., Bath, Maine
B a y Shipbuilding Co., Sturgeon Bay, Wis.
Bethlehem Steel Corp., Sparrows Point Yard, Baltimore, Md.
General Dynamics/Electric Boat Division, Groton, Conn.
General Dynamics/Quincy Shipbuilding Division, Quincy, Mass.
Halter Marine, New Orleans, La
Ingalls Shipbuilding Division of Litton industries, Pascagoula, Miss.
Levingston Shipbuilding Co., Orange, Tex.
Lockheed Shipbuilding & Construction Co., Seattle, Wash.
Marinette Marine Corp., Marinette, Wis.
Maryland Shipbuilding & Drydock Co., Baltimore, Md.
National Steel & Shipbuilding Co., San Diego, Calif.
Newport News Shipbuilding, Newport News, Va.
Norfolk Shipbuilding & Drydock Corp., Norfolk, Va.
Pennsylvania Shipbuilding Co., Chester, Pa.
Peterson Builders, Inc., Sturgeon Bay, Wis.
Tacoma Boatbuilding Co., Inc., Tacoma, Wm.
Tampa Shipyards, Inc., Tampa, Fla. (subsidiary of American S. B., 00.)
Todd Shipyards Corp., Galveston, Tex.
Todd Shipyards Corp., Houston, Tex.
Todd Pacific Shipyards Corp., Los Angeles, Calif.
Todd Pacific Shipyards Corp., San Francisco, Calif.
Todd Pacific Shipyards Corp., Seattle, Wash.

SOURCE: Naval Sea Systems Command, March 19S3.

The 26 shipyards comprising the ASIB represent over one-half of the total U.S. shipyard employment and an even larger proportion of total value of work done. The so-called ' 'second-tier' shipyards also represent a viable U.S. industrial sector. These shipyards mainly build and repair barges, tugboats, towboats, supply boats, crewboats, and offshore drill rigs. The industry group, American Waterways Shipyard Conference, periodically surveys this sector of over 300 shipyards. In 1981, about 75 of these yards reported a total employment of 22,000 and gross revenues of almost $2 billion, 95 percent of which **was** from the private (nongovernment) sector.

The second-tier shipyards have been hit severely by the recent recession resulting in many yard closings and a significant reduction in the labor force (about 50 percent from 1981 to 1983). Even so, some of these U.S. yards still build for and compete in foreign markets.

The shipbuilding supplier base has never been compiled. The Shipbuilders Council of America (SCA) has distributed a questionnaire to its members, asking them to identify all subcontractors or firms supplying at least $300,000 worth of goods or services annually. The resultant tabulation of the supplier base will not be available until late 1983.[3]

The supplier base has a key role in the improvement of U.S. shipbuilding productivity. Shipyards, particularly in the building of sophisticated naval vessels, may funnel up to 60 percent of the total vessel cost to equipment suppliers and program support functions. For some suppliers, the yard is a key customer whose needs take priority; for others the yard is almost a nuisance customer in terms of volume and dollar value of order and technology required. Leadtimes may pose a scheduling constraint, and problems in supporting industries may govern ship delivery schedules.[4]

[3] Telephone conversation with Shipbuilders Council of America, March 1983.

[4] "Building a 600-Ship Navy: Costs, Timing, and Alternative Approaches" (Washington, D. C.: Congressional Budget Office, 1982), p. 37.

The Markets of the U.S. Shipbuilding Industry

The U.S. shipbuilding industry builds or has built for many markets, including U.S.-flag ship operators in both foreign and domestic offshore trades, the offshore oil industry, the U.S. inland water transport industry, fishing and tugboat operators, and the U.S. Government—Navy, Coast Guard, and other seagoing agencies.

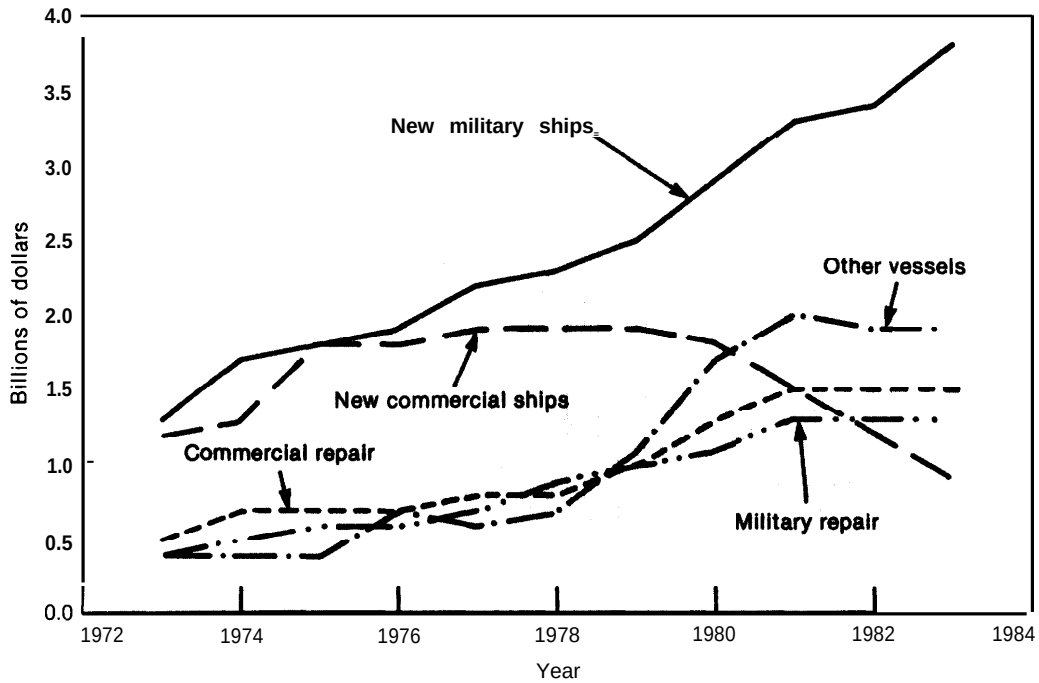
The recent cessation of construction subsidies has probably ended the prospect of orders from U. S.-flag ship operators active in the foreign trades, while the so-called ''captive market' of Jones Act and Government vessels, at present, is inadequate to sustain the U.S. shipbuilding industry at 1982 work levels. U.S. shipbuilders' share of world commercial orders also has averaged less than 5 percent over the past decade.

It is naval building and repair that presently supports the U.S. shipbuilding industry. The naval share of ASIB shipbuilding output has hovered around 60 percent in recent years and is projected to exceed 80 percent by 1987.[5] In the past decade, 40 percent of new contracts and 45 percent of annual deliveries have consisted of naval vessels. The commercial workload also reflected Government support. Of the 229 merchant ships contracted for by U.S. shipyards during 1972-82, 37 percent were built with construction differential subsidy (CDS), and virtually all of the remainder were constructed for the domestic fleet which, by law ('Jones Act), must be built in U.S. shipyards.[6]

Self-propelled new military ships in recent years have comprised between 33 and 40 percent of shipyards' revenues. When the repair of military ships is included, the percentage rises to an average of 47 percent. Approximately 33 percent of all naval repairs, alterations, and conversions are performed in private yards—a proportion that has been steady and probably will continue. Figure 29 illustrates the trends in the value of work performed in all private shipyards between 1972 and 1982, divided

[5] Defense Economic Research Report, Data Resources Inc., June 1982, p. 3.
[6] Shipbuilders Council of America, Washington, D. C., 1982.

Figure 29.—Shipbuilding and Repair, Trends in Value of Work Done



SOURCE. SCA annual report 1982.

into major military and nonmilitary categories. It should be noted that military (U.S. Navy) construction and nonpropelled (barge and rig) construction have shown the most significant growth over this period. The 5-year naval shipbuilding program (fiscal years 1984-88), involving 124 new vessels (51 of which are major combatants), and 21 conversions, promises to increase the significance of naval work for private yards (see table 28).

In contrast to the 124 new naval warships to be contracted for over the next 5 years, the Maritime Administration projects that about 25 new merchant ships (20 tankers, 3 bulk ships, and 2 cargo ships) will be contracted—mostly to replace older vessels in the domestic fleet. In terms of value, the U.S. Navy orders are expected to represent about 90 percent of shipyard revenues.[7]

Naval work is unevenly distributed among the ASIB yards: seven yards are considered "combatant capable' (i. e., capable of building at least conventionally powered combatant vessels), six are considered capable of building ' 'amphibious/auxiliary vessels, and the rest are classified as ' 'capable of building seagoing merchant ships. " Based on the latest 5-year naval shipbuilding plans, it appears that the large concentration of major combatants will place even greater emphasis on those yards capable of complex warship construction.

One effect of the present high proportion of naval work and repair is to focus U.S. yard attention on customized rather than serial design and production. While this disadvantaged the U.S. shipbuilding industry in the 1970's, when series production> of large merchant vessels was at its height, its future impact may not be the same. Economic conditions may bring a return to low-unit demand for more complex ships, with a corollary tendency to maintain labor-intensive production methods in shipyards. Cargo reservation/sharing, on the other hand (if adopted on a broader scale), could produce a growth of conversion or upgrading orders, or even new building contracts.

An outgrowth of U.S. yards' naval experience could be an ability to capture orders for foreign naval vessels. An increasing number of U.S. shipyards are eyeing the international warship market, which has grown rapidly in the last decade. Many countries have begun to replace their aging fleets, and several countries (in ' 'strategically active areas' have begun to build new navies. New generations of weapon systems have caused technical changes that mandate design and construction changes. The development of advanced weapon systems has changed naval tactics and resultant ship design and construction.

[7] Data Resources, Inc., *The Economic Impact of the U.S. Shipbuilding Industry,* August 1982.

Table 28.—Proposed 5-Year Navy Shipbuilding Program (as of April 1933)

	Number of ships planned in each fiscal year				
Type of ship	**1984**	**1985**	**1986**	**1987**	**1988**
Trident missile submarines	1	1	1		1
Nuclear attack submarines	3	4	4	:	5
Nuclear aircraft carrier	—	—	—	—	1
Guided missile cruisers	3	3	3	3	2
Guided missile destroyers	—	I	–	3	5
Destroyer	—	—	—	—	1
Landing ship dock	1	2	2	2	2
Amphibious assault ship	1	—	1	—	1
Landing platform dock	—	—	—	—	1
Mine countermeasures ship	4	4	4	—	—
Mine hunter-sweeper	1	—	4	4	4
Stores and ammo ships and tenders	—	—	2	4	3
Oilers	3	4	4	4	4
Cable **ship**	–	–	I	–	–
Ocean surveillance ships	–	2	2	2	–
Total of new construction	**17**	**21**	**28**	**28**	**30**
Conversions and reactivation	**6**	**5**	**3**	**4**	**3**

SOURCE: Admiral Fowler, Commander, Naval Sea Systema Command, testimony before the House Armed Servicea Committee, Apr. 5, 1983.

In the 1970's, worldwide naval shipbuilding export orders totaled about 460 combatant units, plus some 40 auxiliaries (logistics ships, landing ships, patrol craft). Compared to the 1960's, when export orders totaled only 17 vessels, this is a significant growth market. [a]

Prices of naval vessels have risen sharply to reflect the increased complexity of electronic ship systems, particularly weaponry. While the United States has garnered the majority of worldwide orders for military aircraft, it lags in ship construction. In recent years, European yards have built 80 percent of naval ship export orders, sometimes with heavy government support. The United States may be disadvantaged by lack of suitable designs for export naval vessels. However, in 1982, the orders of 4 U.S. shipyards included 10 foreign military ships with a total value of almost $1 billion. [g]

[8] *Maritime Reporter, Nov.* 15, 1982.

[a] U.S. Navy, ***Annual Report on the Status*** *of the Shipbuilding and Ship Repair* ***Industry*** *of the United States, 1980.*

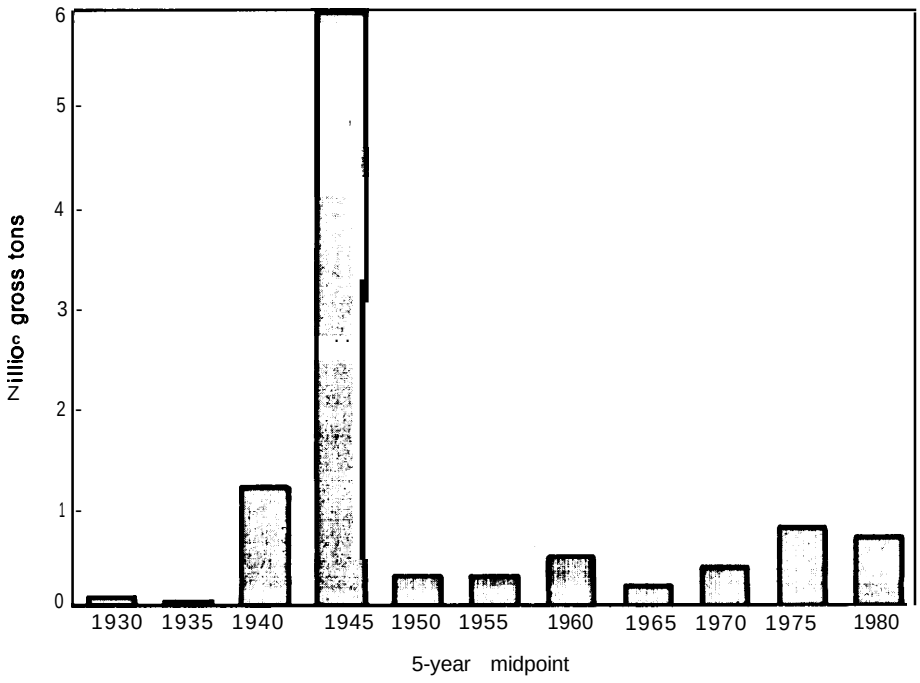
U.S. Shipbuilding Industry Orders

Both the long- and short-term variation in U.S. merchant shipbuilding over the previous 50- and 10-year periods are indicated by figures 30 and 31. Since 1980, a steady decline in orders, particularly for deep-sea vessels, has occurred with only three new merchant ship contracts awarded in **1982.** Since 1960, the trend shown in figure **32** confirms that the **U.S.** shipbuilding industry shared only briefly in the profitability of the worldwide building boom of the 1970's and reverted, in the mid-1970's, to a level of output insignificant in world terms. This is clear from an analysis of the total numbers of merchant ship contracts awarded since the Merchant Shipping Act of 1970. A study by SCA found that the volume of tonnage of commercial building closely correlated with the availability of construction subsidy funds each year and fell far short of the goals of the 1970 Act.

From 1957 through 1982, only 8 to 10 of the ASIB yards shared in naval shipbuilding orders on a regular basis. [10] The indication is that those yards

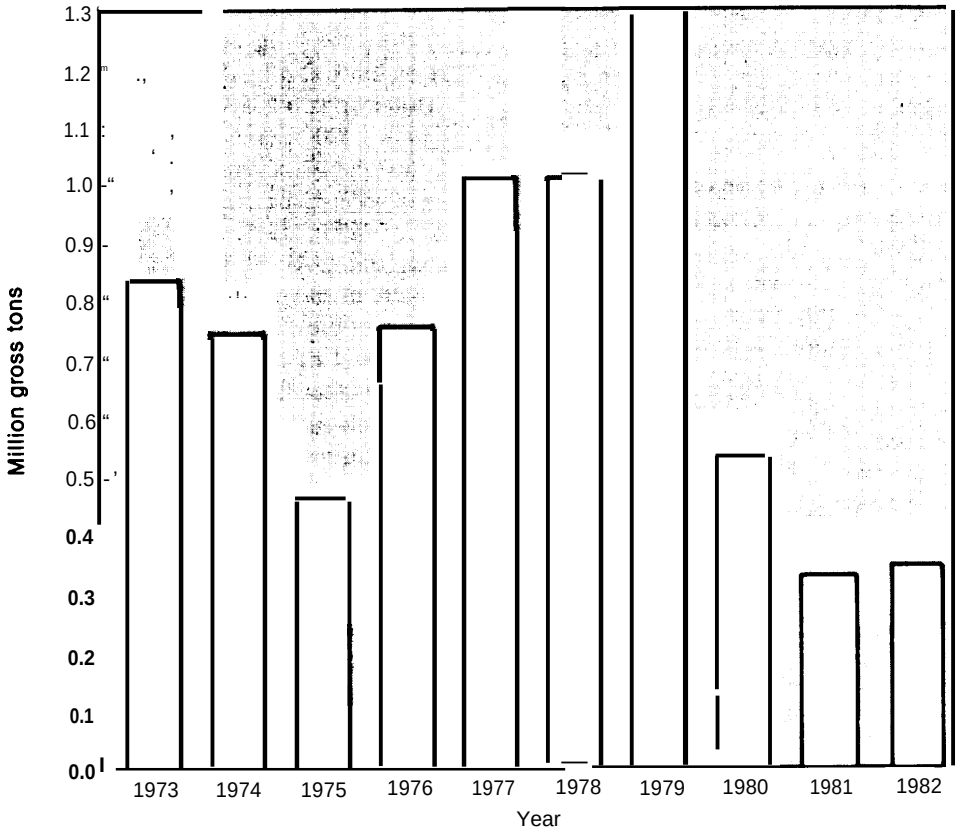
[10] Ibid.

Figure 30.–Merchant Ship Construction in U.S. Yards 5-Year Average, 1930-80



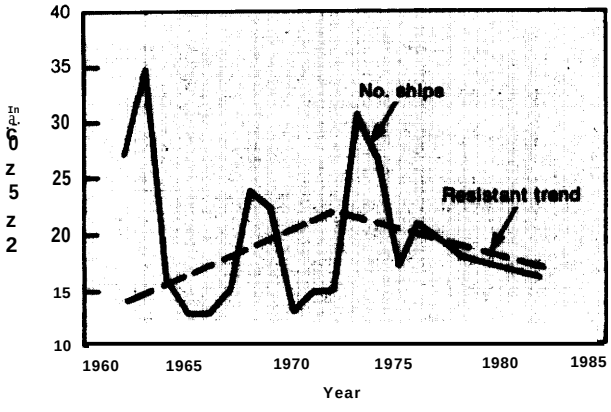
SOURCE: Marine Engieerlng/Log, 1982 annual.

Figure 31.— Merchant Ship Construction in U.S. Yards, 1973=82



SOURCE: Marine Englneerlng/Log, 19S2 annual.

Figure 32.—Historical Trends in Ship Deliveries From U.S. Shipyards



SOURCE: Office of Technology Assessment with data from Shipbuilder's Council of America.

will continue to receive the overwhelming share of new naval ship orders and that, of these, four major private shipbuilders will continue to receive about three-quarters of the total value of naval orders. *

Recent employment trends also indicate a growing concentration of ship construction in the few large yards building complex warships. Table 35 shows production employment of about 79,000 at 14 ASIB yards at the end of 1982. Compared with just 1 year earlier, total production employment increased by 2,000; several of the smaller yards lost

*According to U.S. Navy Annual Report, 75 percent of fiscal year 1983 naval shipbuilding funding of over $18 billion will go to General Dynamics/Electric Boat, Newport News, Bath, and Ingalls.

up to two-thirds of their work force while the larger ones added more than enough to keep the total growing.

The current orders of U.S. yards for naval ships, commercial ships, and drilling rigs is given in table 29. Figure 33 illustrates the locations and orders for the private shipyards engaged in U.S. Navy shipbuilding. Figure 34 illustrates the historical changes in value of commercial and naval shipbuilding work from 1970 to 1982.

Yards not capable of winning U.S. Navy contracts will have to diversify or rely on repair work for their near-term survival. Repair work is presently highly concentrated, with 15 percent of the yards performing 80 percent of the dollar volume of business. This is further confirmation of the existence of an underutilized capacity in the industry.

Table 29.—Orderbook (Vessels Under Contract) in Major U.S. Shipyards (as of March/April 1983)

	Number of ships
*U.S. **Navy new construction:***	
Trident fleet ballistic missile submarines	8
Nuclear attack submarines	20
Nuclear aircraft carriers	3
Guided missile cruisers	6
Patrol frigates	24
Destroyer	1
Dock landing ships	3
Ocean surveillance ships	12
Other auxiliaries and support ships	17
Landing craft	6
Cable ship	1
Mine countermeasure ships	2
Total	103
Commercial merchant ships:	
Containerships	1
Roll-on/roll-off ships	3
Product tankers	8
Bulk carrier	1
Tug/barges	4
Total	17
Other vesse/s:	
U.S. Army dredge	1
Geophysical research vessel	
Incinerator vessels	:
U.S. Coast Guard cutters	9
Offshore drilling rigs	12
Total	25

NOTE: In addition to the above. U.S. Navv reDair and overhaul contracts on over 40 warships total almost $1.7 bil~ion" in value as of March 1983

SOURCE: Marine Engineering/Log, March 19S3. U.S. Navy, April 1983.

In addition to the recent concentration in U.S. Navy markets, another problem for U.S. shipyards has been the fluctuating size and diverse character of the orders. First, the fluctuating orders force management to seek maximum flexibility in their mix of capital and labor. This results in labor-intensive methods, restrictions on the levels and type of capital investment, a high turnover in the labor force, and an adversarial climate of labor relations.

Second, the diverse character of the output of U.S. yards forces frequent changes in workload and resultant labor requirements, which are superimposed on the normal variations in labor requirements during the building cycle. Even yards heavily involved in naval work are subject to these pressures. Changes in naval procurement methods and cycles add further uncertainty. The labor turnover in the shipbuilding industry has been estimated at 40 to 50 percent per year, and up to 95 percent after 5 years. Since shipbuilding processes are assumed by the industry itself to continue to be relatively labor-intensive, 11 the problem of managing the labor force obviously is acute.

These problems are reflected in Pugh-Roberts Associates' findings regarding the factors perceived by the industry to determine competitiveness .12 The survey respondents felt that U.S. shipyard productivity was determined more by its external environment than by its investment and marketing program. A 1980 report by the National Academy of Sciences summarized the problems vividly:13

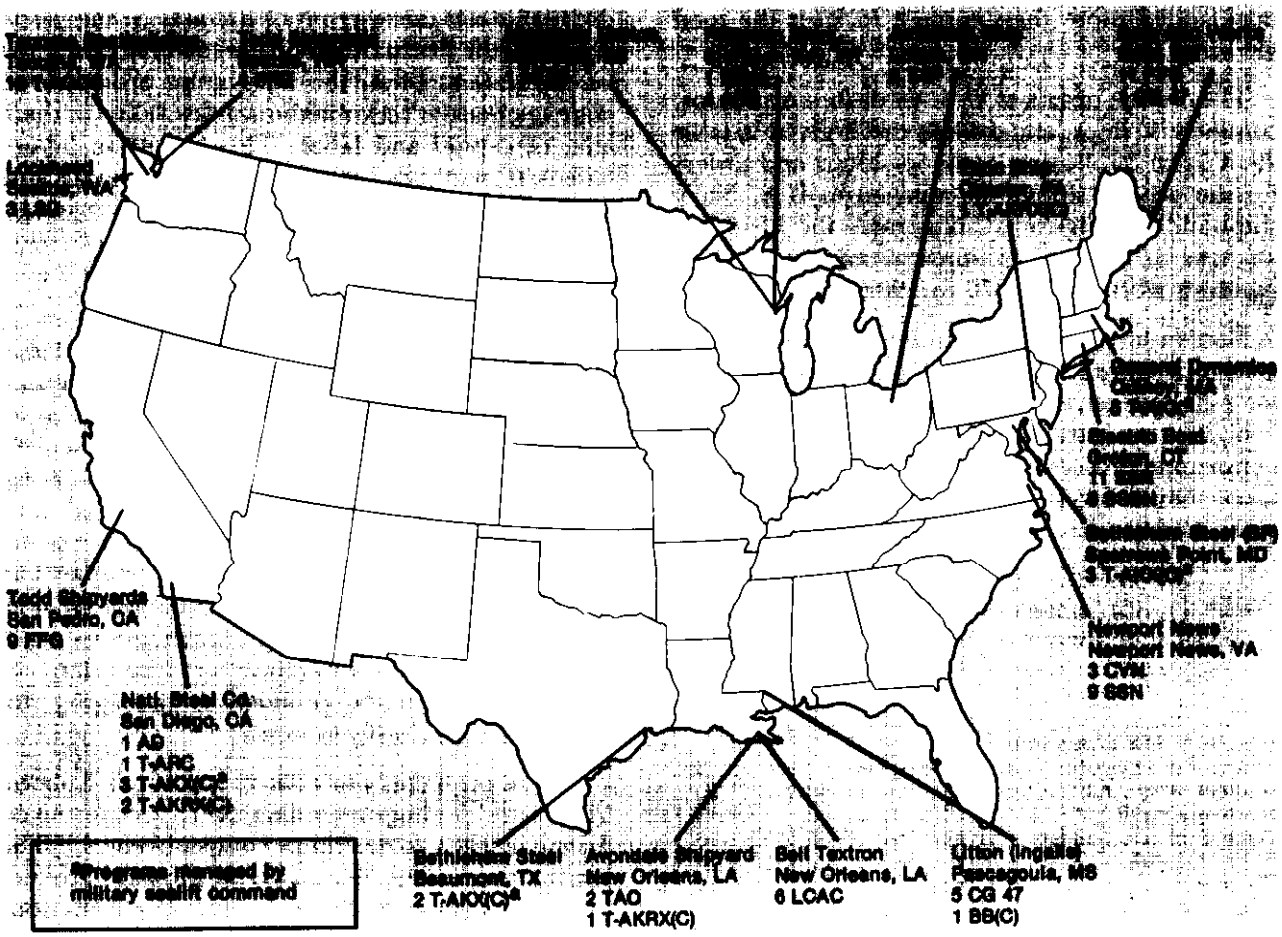
> In summary, the indefinite nature of the market inhibits prudent capital investment, with few exceptions. This ties shipbuilders to a job-shop trade environment that is whipsawed between demands of military programs and those of alternative commercial programs. As shipyard management sees it, this further inhibits capital investment and

[11] Institute for Research and Engineering Automation and Productivity in Shipbuilding, *5-Year National Shipbuilding Productivity Improvement Plan*, Report of the Second Task Group Sessions.

[12] Kenneth G, Cooper and Henry Birdseye Weil, "Ocean Shipping System Dynamics, December 1981 (for MarAd Office of Research and Development) hereafter referred to as Pugh-Roberts Associates' report.

[13] Maritime Transportation Research Board, "personnel Requirements for an Advanced Shipyard Technology' (Washington, D. C.: National Academy of Sciences, 1980), p. 106.

Figure 33.—Major Private Shipyards and Navy Programs (Apr. 1, 1933)



SOURCE: U.S. Navy, April 19S3, updated by the Office of Technology Assessment.

creates hiring and training problems; and that further limits the availability of capital and brings into question the wisdom of investment.

The Capabilities of U.S. Shipyards

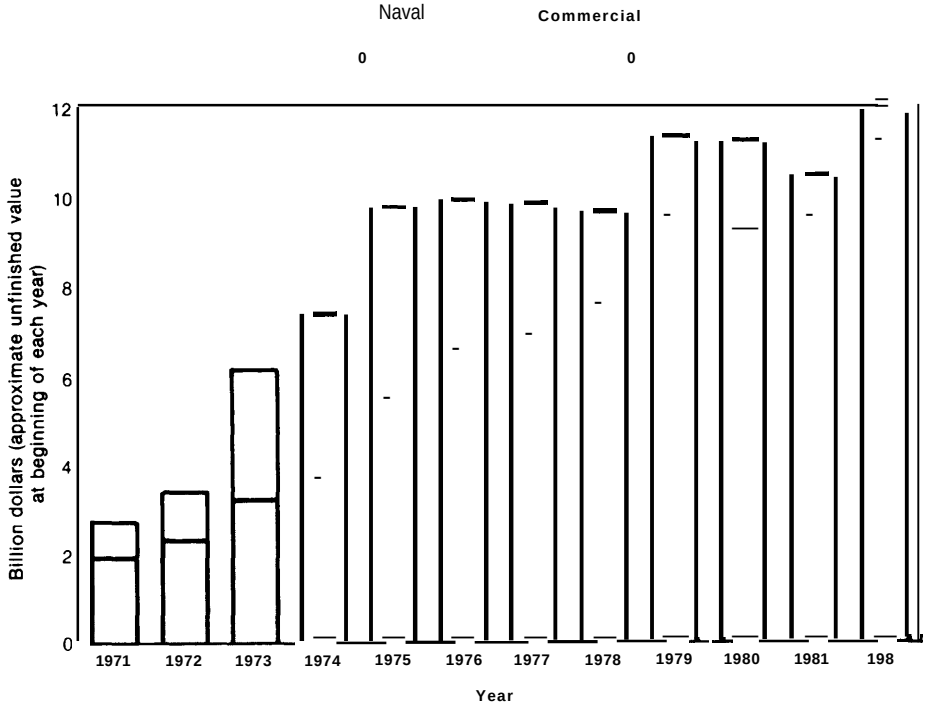
Table 30 summarizes the past experience and current work of the ASIB yards by vessel type. It is immediately apparent that U.S. yards have built a wide variety of ship types in the past, and in many cases are presently making a serious effort to build other types of industrial structures. Diversification is necessary for all yards if they are to keep their work forces intact and their facilities fully occupied. The naval building programs will take some time to gear up and will not help ail ASIB yards .[14] The push toward diversification also reflects the yards' belief that naval work is much less profitable than subsidized commercial work and that naval procurement policies may work to the disadvantage of commercial yards. *

It is also important to recognize that not only did the United States pioneer series production in

[14] "Because of long leadtime associated with the construction of sophisticated warships, the full impact on shipbuilders of the expected U.S. Navy program is at least 3 years away, and ultimately less than two-thirds of the present production base will be potentially utilized. ***SCA Annual Report,*** 1981, p. 1.

"This was cited in many articles in the general and trade press. See, for example, the ***Forbes*** article of 9/28/81, p. 114. Gilbride, of Todd, is quoted as saying: (after Vietnam) "the military was viewed so adversely that we lost a decade of shipbuilding.

Figure 34.—Value of Shipyard Work on Order, U.S. Private Shipyards



SOURCE. Seatrade (U.S. Yearbook, 1982).

Table 30.-U.S. Shipyard Work Experience

	Past	Current
Alabama Dry Dock &Shipbuilding Co., Mobile, Ala.	AE	E
American Shipbuilding Co., Lorain, Ohio	ABC	Repair
Avondale Shipyard, Inc., New Orleans, La.	A B D	A B C
Bath Iron Works Corp., Bath, Maine	A B D	B D F
Bay Shipbuilding Co., Sturgeon Bay, Wis.	B	A
Bethlehem Steel Corp.—Beaumont, Tex.	E	E
Sparrows Point, Md.	A C	A C E
Equitable Equipment, New Orleans, La.	C	A C
General Dynamics/Quincy Shipbuilding Division, Quincy, Mass.	B C	A B F
General Dynamics/Electric Boat Division, Groton, Corm.	D	D
Halter Marine, New Orleans, La.	A	A C
Ingalls Shipbuilding Division of Litton Industries, Pascagoula, Miss.	B D	D E F
Livingston Shipbuilding Co., Orange, Tex.	A B	A B E F
Lockheed Shipbuilding & Construction Co., Seattle, Wash.	A B C	C F
Marinette Marine Corp., Marinette, Wis.	A B	A B
Maryland Shipbuilding & Dry Dock Co., Baltimore, Md.	A B	Repair
National Steel & Shipbuilding Co., San Diego, Calif.	A B C	B C
Newport News Shipbuilding, Newport News, Va.	A B D	A B D F
Norfolk Shipbuilding & Drydock Corp., Norfolk, Va.	B D	A
Pennsylvania Shipbuilding Co., Chester, Pa.	A B	Repair, F
Peterson Builders, Inc., Sturgeon Bay, Wis.	A	A C
Tacoma Boatbuilding Co., Tacoma, Wash.	A B	B C
Tampa Shipyards, Inc., Tampa, Fla.	Repair	Conversion
Todd Shipyards Corp., Galveston, Tex.	A B	A F
Houston, Tex.	A	A F
Todd Pacific Shipyards Corp., Los Angeles, Calif.	A D	D
San Francisco, Calif.	A C	A
Seattle, Wash.	A B D	D

Legerid: A–simple commercial vessels; B–complex vessels; C–simple naval vessels; D–naval combatant vessels; E–rigs; F—other industrial fabrications.

SOURCE: E, G, Frankel Report to the Office of Technology Assessment, 1983.

World War II, but that there has also been recent U.S. experience with merchant and naval series production. Some merchant series (e. g., barge carriers such as LASH) predate the 1970 Act, which was intended to stimulate a major new construction program; others (liquefied gas carriers and tankers) were a response to its provisions.

Some of the major U.S. ship series have been divided among several shipyards, and programs have not necessarily run continuously. Swedish experience, by contrast, typically included continuous runs of 10 to 20 ships of one design. Series production in the United States has tended to focus on tanker construction. Apart from the expected duration of tanker overcapacity, it may be that specialized foreign yards have a strong advantage that may be very difficult to overcome, diminishing the value of some of this U.S. experience.

In merchant vessel construction, U.S. shipyards have the capability of building almost any type of ship in the world today and have built at least a few of each principal type, including supertankers up to 390,000 dwt. For example, the ASIB yards have collective and concurrent shipway capacity for over 60 large containerships 610 ft by 90 ft or twenty-three 100,000-dwt bulk carriers. U.S. shipyards possess 17 shipway equivalents capable of building 1,000 ft and longer vessels and over 60 shipways capable of constructing vessels between 500 and 1,000 ft in length. At present, six of the ASIB yards are capable of building tankers or bulk ships over 100,000 dwt or of building super containerships of up to 1,000 ft in length. Twenty of these yards can build cargo ships up to 475 ft in length.

It should be noted that modern shipbuilding methods minimize time on a building dock. Many of the world's most competitive yards use only one building position. The physical capacity of U.S. yards, therefore, does not pose a constraint on the productivity of the industry, although the age and layout of the yards most certainly do.

The Technology Level of the U.S. Shipbuilding Industry

Three or more decades ago, the major yards constructed the entire ship themselves, with minimal use of purchased components. Where ship components were brought in, the supplier tended to be virtually an extension of the shipbuilding industry. This has changed markedly since World War II. Shipbuilders have attempted to reduce the labor costs of their manufacturing technology through standardization and automation. The use of purchased equipment and subassemblies has increased exponentially, with shipbuilding increasingly becoming an assembly and erection industry.

Modern shipbuilding technology is characterized by modular construction techniques, a high degree of preoutfitting, and integration of design and production considerations. * The technology is based on carefully designed materials-handling systems, and is frequently accompanied by a high degree of specialization of output. Edwin Hood, past President of SCA, remarked recently that there is a marked ''correlation between shipbuilding market opportunities and incremental progress in shipbuilding technology. The rapid advance in shipbuilding of the early 1970's was based on the explosive growth in demand for tanker and containership fleets and has declined markedly in recent years. U.S. shipyards did not capture very much of the huge market for merchant ships in the 1970's and, as a result, did not match the technological advances made by European and Japanese yards, which built for the world market.

A review of the technology of U.S. shipyards including comparisons with high-technology foreign yards was completed in 1978 by Marine Equipment Leasing, Inc. (MEL) for MarAd. MEL used A & P Appledore's methodology for this study, assigning each of several technology elements to one of four levels of sophistication. The study gave rankings to U.S. and foreign shipyards in eight major areas of technological development. MEL's findings were as follows:

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*A ship is divided into convenient sections (or modules), and each section is completely ' 'outfitted' with machinery, piping, wiring, and other equipment and components that make it a finished section (including painting). The modules are then fitted together into larger assemblies that are themselves joined together to build the ship. In this way, work can be accomplished on each module inside a building that has materials-handling gear, easy access, good lighting and ventilation, and a host of automated tools at fixed workstations, rather than aboard a partially finished ship. This work process has been shown to improve shipbuilding productivity markedly.

[5] Technology Survey of Major U.S. Shipyards, " Department of Commerce, Maritime Administration, contract No. DO-ADI-78-OO-3037, prepared by Marine Equipment Leasing, Inc., 1978.

Photo credit: Atlantic Richfield Co.

Modular construction of a 90,000-dwt tanker

- U.S. shipyards generally employed lower levels of technology than foreign shipyards;
- low technology was found in some critical areas in U.S. shipyards; these were primarily management- and systems-oriented; and
- U.S. shipyards were found to be excellent in some areas, particularly those related to steel work and production control.

Between 1978 and 1981, a further $851 million was invested by U.S. shipyards to enlarge their facilities to handle supertankers, to complete specific building programs, and to extend subassembly fabrication capabilities.[16] This has not necessarily reduced the labor intensity of the shipbuilding process. To do that, further investment would probably be required.

At present, the technological status of U.S. shipyards is generally lower than that of comparable Japanese and Korean shipyards in terms of technological investment, research and development (R&D) investment, use of labor, tooling, degree of automation and use of robotics, and application of modern automated management and control techniques, as well as in the methods of processing, joining, and assembly.

The curious fact is that many of the technologies used in Japanese and Korean shipyards are the result of basic research performed in the United States. The United States lags in the application of its own research and the effective introduction of innovations based on scientific and technological discoveries. In the Orient, basic scientific and technological developments are often reviewed for applicability to improving shipbuilding technology, productivity, and cost, yet no such process is evident in the United States. When it occurs, it appears to be more through chance than by design. Thus, U.S. technological shortcomings are usually not due to a lack of basic scientific or technological development but to a lack of effective organization of or commitment to applications research. One reason may be that in the United States no effective mechanisms exist for collaboration in both basic and applications research or for dissemination of the results of such research.

Many believe that U.S. shipyards made a strategic error, following the example of modern foreign yards in the 1970's and investing primarily in advance steel preparation, fabrication, and assembly methods. These areas are traditionally labor-intensive, and the payoff is most pronounced in the serial construction of large, simple ships such as tankers and bulk carriers. However, this has never been a significant market for U.S. shipbuilders. Another more practical reason for such investments was that many U.S. yards have serious space limitations in existing facilities and could not justify the much larger capital requirements to move to a new site.

The U.S. shipbuilding industry's market, product mix, labor costs, and labor-management environment are quite different from those of other major shipbuilding countries such as Japan, Korea,

[16] Annual Survey of Manufactures, 1978-1980; MarAd 1981 figures.

and Spain, most of whom introduced these modern steel-fabrication and building facilities in time for use in the massive tanker/bulk carrier-building programs of the early 1970's. U.S. shipyards introduced many of these technological advances only during the last 8 to 10 years, at a time when large tanker/bulk carrier orders started to decline, when U.S. shipbuilding participation in the world market was negligible, and when U.S. Government support for upgrading and rebuilding the domestic fleet started to wane. At the same time, U.S. shipbuilding labor productivity continued to decline. It was not recognized that the decision by foreign yards to invest in steel fabrication and related technology was primarily driven not by a desire for improved labor productivity—the main U.S. objective—but by the goal to speed the shipbuilding process. They thereby achieved a greater utilization of capital-intensive facilities, such as building docks and heavy-lift cranes, as well as a decrease in production times and the associated costs of holding construction materials.

It should be noted that the difference in the cost of interest charges on material and work in progess for a ship built in 2 years instead of 6 months, is 4 to 1. With interest charges for construction loans at 12 percent, the difference in final cost of interest would be at least 9 percent. Even considering only simple interest and constant dollars, a ship built in 6 months at a cost of $100 million, including $3 million in carrying charges, would cost $109 million to $110 million if built in 2 years, excluding the additional cost of use (or lost opportunity) of shipyard facilities.

Large Japanese and Korean shipyards also assume that opportunity costs of major shipyard facilities add to the actual differential costs for time extensions in the construction of ships. Such costs have been estimated to add about 25 percent to costs of ships built in 2 years v. 6 months, assuming that about 50 percent of the building time is spent in the building dock or on a building way/platform. Therefore, introduction of modern steel fabrication and assembly technology is advantageous in Japan primarily when it leads to a substantial reduction in construction time. Of course, without substantial orders, opportunity costs are of little concern to most U.S. shipyards.

The technology level in major U.S. shipyards in steel fabrication is nearly on par with that of modern shipyards in Europe, but lags behind those in the Orient. This is due in part to a difference in technological approach to subassembly, such as flat-panel v. curved-panel fabrication. The U.S. (and European) approach was to use largely automated flat-stiffened panel-fabrication lines; while Japanese and Korean shipyards use a so-called eggcrate approach, which is more flexible, less automated, and combines the use of several parallel semiautomated fabrication lines. Welding robots are extensively used now in the Orient, while U.S. yards use less fully automatic processes in assembly fitting and erection. Other differences can be seen in the size of blocks and modules and the degree of block and module outfitting, both of which are appreciably greater in the Orient.

U.S. shipyards lag in subassembly and assembly fabrication, and in the installation of preassembled outfit systems in modules. Automated pipeshops, large block-machinery module-assembly plants, etc.; are in common use in modern shipyards in Japan and Korea. U.S. yards have, with some exceptions, made few modifications to the traditional labor-intensive approach to ship outfitting. One reason may be that until recently few ships designed for construction in U.S. yards were configured for efficient, large-scale preoutfitting or system outfitting. In part this may be due to the fact that many ships constructed in U.S. yards were designed with more attention to Government specification than to cost-effective commercial production techniques.

Most foreign yards build mainly from their own designs, which obviously permits consideration of-the most efficient fabrication, assembly, and outfitting approach in the design of the ships. It also permits design for more balanced utilization of the different facilities and other resources of the yard.

Another area of U.S. technological lag is in materials handling. While many large U.S. yards have invested in large erection-crane capacity, rarely is consideration given to improvements in methods and capacities for subassembly and assembly handling and manipulation. This is due often to the fact that many U.S. yards use old converted buildings with limited headroom, support capacity, and other constraints,

Materials handling is only one operational aspect of shipbuilding which is constrained by the layout and various other physical characteristics of U.S. shipyards. The age of all but one major shipyard exceeds 65 years, and more than a third are well over 100 years old. They have reached their present configuration, layout, and facilities as the result of many changes and additions over the years. Most of those were compromises to permit the needed addition or expansion to be accommodated in the old yard.

Unfortunately, the area, water depth, access, flow, and other shipbuilding requirements have changed radically with ship size, type, and technology, as well as with developments in shipbuilding techniques. A modified 65-year-old yard can never achieve the efficiency of a modern yard configured and designed to build modern ships using modern shipbuilding techniques.

With a few exceptions, U.S. yards generally do not use modern, integrated computer-aided design/manufacturing systems (CAD/CAM) in which design and manufacturing processes are integrated (i.e., manufacturing inputs and controls, including materials and tooling specifications, are developed as an integral part of the design process). In welding, U.S. use of automatic numerically controlled cutting has lagged behind foreign applications by several years. Except for one experimental machine, welding robotics are not used in U.S. yards at present, nor is laser cutting. Lasers are used in many foreign yards for alignment, forming and cutting control. marking, and interference control. It is interesting to note that most foreign shipbuilding applications of laser techniques are based on U.S. scientific developments.

In summary, major drawbacks in U.S. shipbuilding technology development include:

- the time lag between identification of a technological need and its development;
- the reluctance (and consequent time loss) to adopt foreign technology, including joint venturing, licensing, purchasing, or other arrangements used for the speedy, effective transfer of technology;
- lack of effective exchange of technology among U.S. shipyards;
- lack of transfer of technology from other areas (aerospace, electronics) for use in ship design and construction; and
- lack of recognition of technological voids in U.S. shipbuilding.

It is interesting to note that the most advanced and most competitive shipbuilding industries devote a tremendous effort to inter- and intra-industry technology exchange as well as to the identification of technological voids and the acquisition of new technology. All major Korean and Japanese shipyards have large numbers of licensing, technology transfer, and similar agreements and continuously exchange information with their own competitors within and without their country. Table 31 illustrates the range of projects and sources of technology transferred to four major Korean shipyards from 1971 to 1982.

It should be noted that in the past 2 years, several U.S. shipyards have made substantial efforts to learn from and adopt some of the Japanese shipbuilding techniques that have led to high productivity. These yards have surveyed the Japanese shipbuilding industry, employed Japanese consultants, and participated in MarAd shipbuilding research programs that covered such subjects as accuracy control, block construction, and zone outfitting. Several yards have begun to integrate these techniques into their building programs and practices with an apparent improvement in productivity. It also appears that the U.S. Navy building program, in turn, may benefit from these advancements. *

* Ch. 5 describes the MarAd shipbuilding R&D program status and plans. For a review of recent advancements in adopting productivity-improving technologies see, "Shipbuilding Productivity-Something is Being Done," by L. Chirillo, January 1983. For a private industry anatysis of foreign shipbuilding technology that could offer benefits to U.S. shipyards, see Lockheed Shipbuilding and Construction Co. Reports—(a) "A Survey of Modular Construction and Preoutfitting Practices in the United States and Europe," 1982; and (b) "A Survey in Japan and Korea, 1982. For an overview of shipbuilding productivity improvements that could benefit the U.S. Navy building program, see the National Academy of Sciences, Marine Board report "Productivity Improvement in U.S. Naval Shipbuilding," January 1983.

Table 31.-Examples of Projects That Transferred Technologies to Korean Shipyards, 1971=82

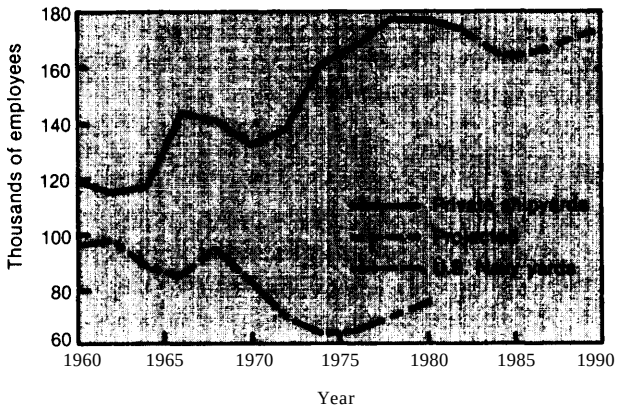
Project type and year	Transferee country and company	Transferee (Korean shipyard)
Tanker design-1971	United Kingdom-A &P Appledore	Hyundai
Tanker design-1971/72	West Germany-KDW	Korea S.B.
Tanker design-1975/77	Norway-DNV	Korea S.B.
Tanker design-1979	Switzerland-Maierform	Hyundai
Tanker design-1979	Denmark-B&W	Sore-Sung
Tanker design-1981	Japan-Hitachi	DaeWoo
Tanker design-1981	Norway-SRS	DaeWoo
Cargo ship design 1974	United Kingdom-Govan	Hyundai
Cargo ship design 1975	Canada-GAMAT	Hyundai &Korea S.B.
Cargo sh(p design 1977	West GermanY-Eurolo~	Hyundai
Ore/bulk design 1977	West Germany-CR Cu~hing	Hyundai
Ore/bulk design 1981/82	Denmark-B&W	Sore-Sung
Ore/bulk design 1981	United Kingdom-Y-ARD	DaeWoo
Ore/bulk design 1981	Norway-SRS	DaeWoo
Ore/bulk design 1976/77	Norway-SRS	Korea S.B.
Containership design 1977	United Kingdom-Y-ARD	Hyundai
Containership design 1978	Switzerland-Maierform	Hyundai
LNG/LPG design 1975/77/78/82	France-Gas-Transport	Hyundai &Korea S.B.
LNG/LPG design 1974	United States-MMC	Korea S.B.
Drilirigdesign 1979	United States	Hyundai
Drill rigdesign 1981	Norway-AKER	Hyundai
Drill rig design 1981	United States-Carrel/Ingails/Santa Fe	DaeWoo
Derrick/platform 1978	Sweden-Ventel	Hyundai
Derrick/platform 1979	Japan-McGregor	Hyundai
Derrick/platform 1980	United States-FOS	Hyundai
Derrick/platform 1981	United States-FOS	Hyundai
Computer programs 1973/76/81	Sweden-Swedeish	Korea S.B.
Computer programs 1975	Sweden-VOC	Hyundai
Computer programs 1976/81	Norway-SRS	Korea S.B.
Computer programs 1977	Spain-SENER	Hyundai
Computer programs 1977	Japan-Hitachi	Hyundai
Computer programs 1980/81	Norway-SRS	Hyundai/Dae Woo/Sore-Sung
Computer programs 1980	United Kingdom-A &P Appledore	DaeWoo
Computer programs 1980	Japan-IKENAI	Sore-Sung

SOURCE: "Status of the Korean Shlpbuildlng industry;'ChungMong Joon, Intwnational Forum onIndustrial Plannlng and Trade Policies, June 1902.

The Labor Force of the U.S. Shipbuilding Industry

Total private shipyard employment increased from about 120,000 in 1960 to almost 180,000 in 1980 as shown in figure 35. During the same period, employment in naval shipyards decreased from almost 100,000 to about 75,000. Annual fluctuations of 20 to 30 percent in the totals mask even larger fluctuations in the skilled labor force of the ASIB yards. Up to 75 percent of the work force has been laid off in the period since 1960 inmost of the major ASIB yards. Since these account for over 75 percent of total private shipyard employmerit, we can conclude that the majority of the work force has first-hand experience- of the cyclical

Figure 35.—Private and U.S. Navai Shipyard Employment Leveis, 1960-80, and Projected Through 1990



SOURCE:U.S. Navy.

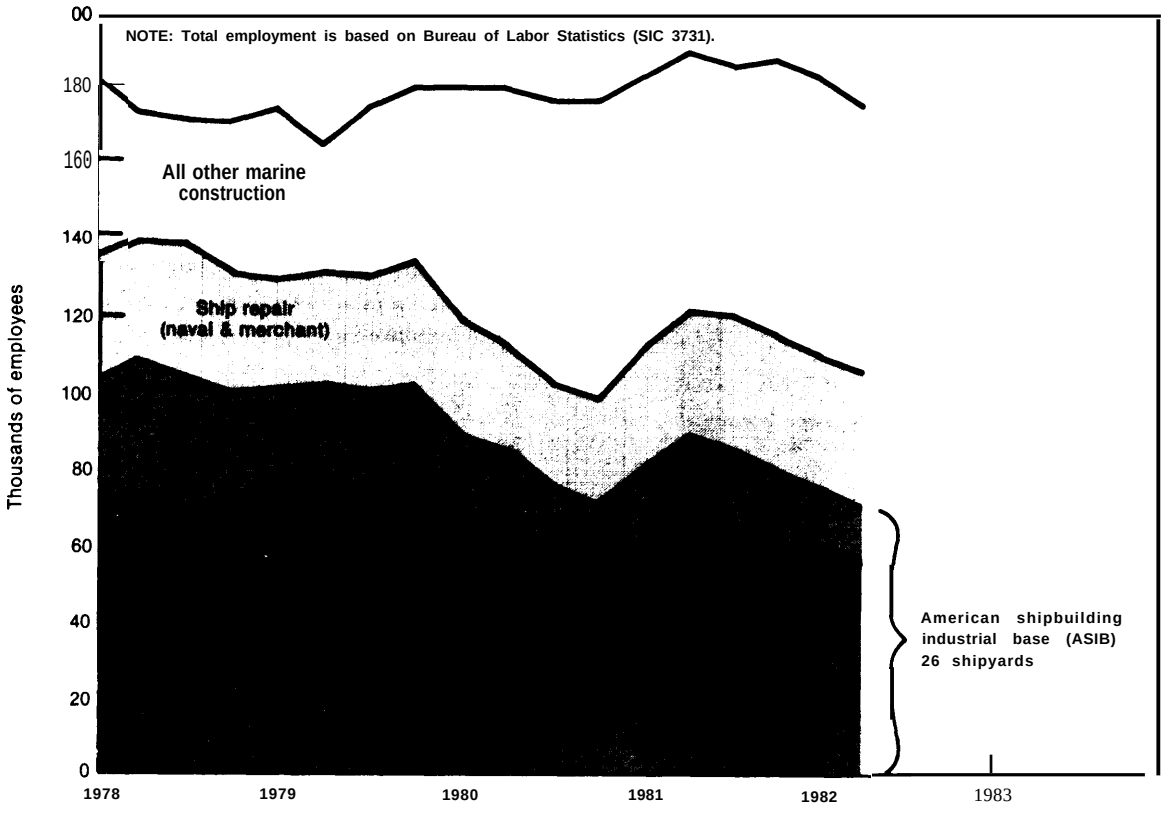
''casualized' nature of shipbuilding employment (i.e., workers with little or no previous experience are regularly hired for only short periods of time).

Figure 36 illustrates employment levels in private U.S. shipyards over the past 5 years. It can be seen that employment in the ASIB yards (new construction only) decreased from about 100,000 in 1978 to about 70,000 in 1982. It is, therefore, this segment of the total industry that has experienced the most significant recent decline, and it is this same segment that represents the U.S. potential for participation in the construction of major merchant ships. It should also be noted that over the same 5-year period, the ''other marine construction' shipyard segment experienced a compensating growth in employment so that total employment from 1978 to 1982 remained about level. This ''other' group includes the builders of tugs, barges, service vessels, drilling rigs, and numerous other small craft. Some of this group have substantial capabilities and could be future candidates for inclusion in a listing of ASIB-capable facilities, especially as technology changes are made.

The proportion of **production** employees in the total work force in the ASIB yards—a commonly used capacity measure—has been reasonably constant—75 to 80 percent in the last decade. The 2- to 5-percent fluctuations that have been experienced do not appear to be systematically related to trends in production techniques, although technological advances increase the requirement for planners, quality assurance personnel, and other specialists. It is much more likely that the fluctuation reflects cyclical layoff of production workers.

Current employment may be compared to an optimum employment to assess the utilization of human resources of an industry with some accu-

Figure 36.—Shipbuiiding and Repairing Employment in Private U.S. Shipyards, 1978-82



SOURCE: Shipbuilders Council of America.

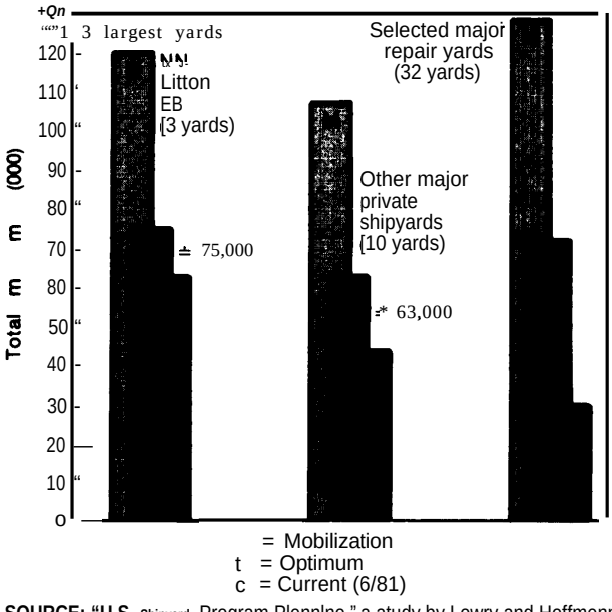
racy, depending on how well optimum employment can be estimated. Figure 37 shows the 1981 employment levels plotted against optimum levels cited in the Lowry study .17 Utilization for the various groups ranges from 83 percent (for the three largest building yards, Newport News, Litton, Electric Boat), to 68 percent (for other major building yards) to 49 percent (selected major repair shipyards). These levels are not changed significantly from 1979. It should be noted that the data are only reliable enough to form ‘ ‘very approximate estimates of industry utilization . . . ‘‘ls

Projections of the shipyard work force are necessarily uncertain; however, a recent U.S. Navy projection for private shipyards through 1990 is shown in figure 38. The expectation is that overall employment will be sustained at approximately present levels for the near term with some modest growth past 1986 if the present building program proceeds as scheduled.

“’U.S. Shipyard Program Planning” (Washington, D. C.: Lowry & **Hoffmann Associates,** Inc., September 1980).

“Ibid.

Figure 37.—Mobilization and Optimum Employment Estimates and Current Employment Leveis in the Major Private Shipyards



SOURCE: “U.S. Shipyard Program Plennlno,” a atudy by Lowry and Hoffmenn, A8aoelates, Inc., for Navel **Sea Systems** Command, Septembr 1980.

Demographic Characteristics of the Shipyard Work Force

The shipyard labor force is fairly mobile, partly as a result of the known instability of employment in the industry. The turnover rate has been higher than in most other basic industries, but has declined recently to roughly the same level as durable-goods manufacturing. The decrease in turnover undoubtedly reflects many factors, including lower levels of hiring in recent years, lack of employment opportunities outside the industry, and a reversal in the aging trend of the work force. Like the marine operating industries, shipbuilding has a high turnover among new (less than 1 year’s service) entrants, who seldom reenter the industry. Many firms have used high turnover rates as a reason to minimize worker training. However, such actions could be an additional factor in employee turnover.

The shipbuilding labor force is overwhelmingly male,[19] and there are distinct groups in private and naval shipyards. Civil service naval shipyard workers are older and generally have a higher educational level than private shipyard employees, or indeed than employees in most comparable industries. * Although a high proportion (40 percent) of naval shipyard workers are over 45-years-old, the educational distinction is likely to be perpetuated by Civil Service entry requirements and craft orientation of U.S. naval yards. Entry-level educational requirements in private yards have never been demanding and are unlikely to become so, given the shift toward a fabrication-and-erection technology and the availability of specialized vendor personnel.

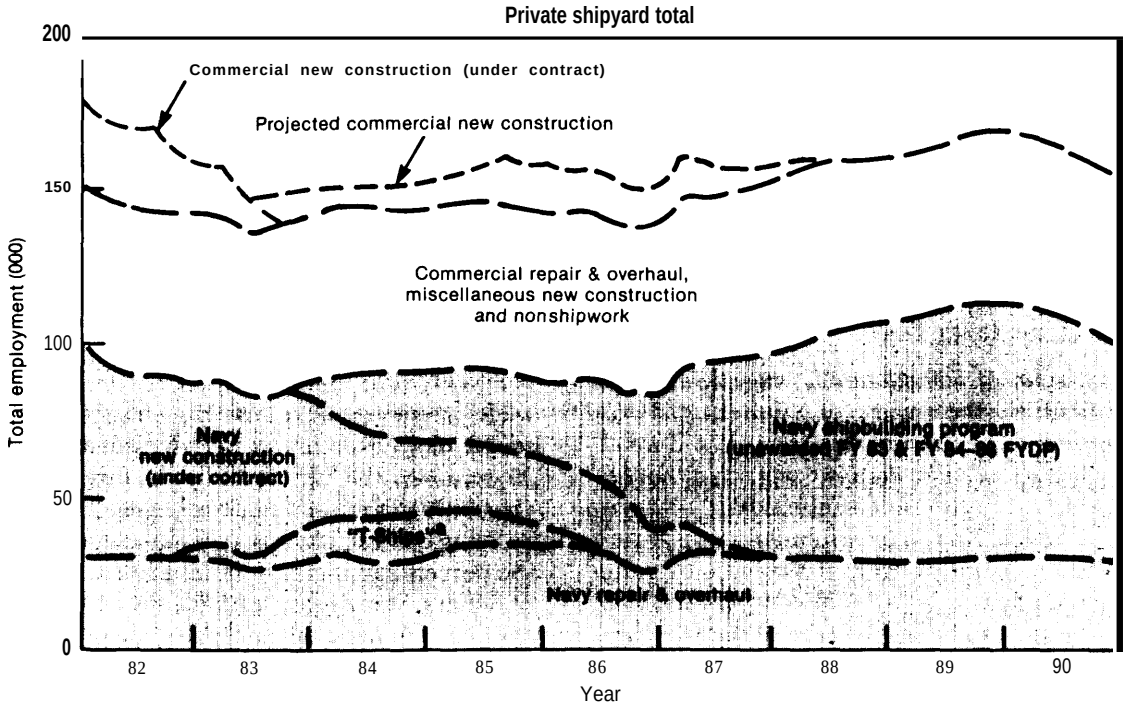
Shipyard Workers’ Hours and Earnings

The earnings of shipyard workers compare favorably with those of operatives in durable-goods manufacturing. They compare less well (on an hourly basis) with construction workers, a comparable group in many significant respects. Conversations with the Offices of Maritime Labor and

[19] **Maritime Transportation** Research Board, op. **cit.,p.56.**

“Forty percent of apprentices have at least 2 years of college. **Hartigan,** Director of Shipyard Training, Naval Sea Systems **Command—** cited in **Gaffney,** “Worker Participation and Organizational Change in Shipbuilding: An International Review, September 1982, **p.6.**

Figure 38.—Shipbuilding Industry Workload Forecast



[a]Includes awarded/unawarded "T-Ships" TAKRX, TAKX, TAKX(C), T-5, TAH, TAGS, TAGM.

NOTE: The above portrays the U.S. Navy's forecast of employment in the private sector shipyards through 1990. Included In the workload curve Is the current firm work and projected work of commercial, Navy, and other nonshlp work. The projected new construction work Is derived from the unawarded Fiscal Year S3, the U.S. Navy's Fiscal Year & 5-Year Shipbuilding Program, and MarAd estimates of commercial new construction requirements.

SOURCE: U.S. Navy, ASN (S&L) RPE 19S3.

Training (MarAd) and Maritime Affairs and Shipbuilding Technology (NAVSEA) indicate that the shipyard workers consider that their pay is lower than that obtained in comparable skilled jobs and involve far more risk and discomfort. Despite a trend toward covered worksites, the level of amenities in many shipyards remains low.

The 10-year growth in earnings for shipbuilding workers v. durable-goods workers is 8.4 and 8.1 percent, respectively, v. 7.2 percent in the total private sector. Average hours have fluctuated, but U.S. shipbuilding as a whole has been characterized traditionally by a comparatively short (less than 40-hour) week. The 8.4-percent growth in shipyard workers' earnings can be contrasted with the 8.2-percent growth of the Consumer Price Index (CPI) over the same period.

Wages are almost universally time-rated in shipbuilding, and, as table 32 shows, only a minority of yards have a range of pay rates for various jobs.

Table 32.—Method of Wage Payment

	Percent
Time-rated pay systems	
Formal plans	%
Single rate	69
Range of rates	28
Individual rates	1
Incentive pay systems	2
Individual piecework	1
Group piecework	1
Individual bonuses	—
Group bonuses	—
	100
Note: Scheduled weekly hours:	
40.0	94
44.0	4
45.0	1
47.5	1
	100

SOURCE: *Industry* Wage Survey, U.S. Bureau of Labor Statlstlcs, 1977.

These pay ranges, even where they exist, generally are considered by workers to be too narrow to reflect the range of skill levels, resulting in a

disincentive effect. The use of an individual, time-rated pay system, rather than a group result-oriented incentive system, may perpetuate current problems; i.e., the ''greatest complaint of production workers about working conditions (involves) inadequate scheduling, planning coordination, and communications among crafts, shifts, and working groups in the shipyard. Improvement of incentive systems or a complete change in the basis of administration and payment may focus workers' concerns on productivity and ease the transitional character of the labor force.

Comparisons of international wage levels are made difficult by the variety of payment systems and the limitations of statistical reports. The Bureau of Labor Statistics (BLS) data in table 33, although biased by the strengthening of the dollar vis-a-vis national currencies in major shipbuilding countries such as Japan, is interesting in that it shows the U.S. "percentage of additional compensation to hourly earnings' to be the average of the 16 countries' figures but growing at a rate of 6.9 percent per year, six times faster than the Japanese rate. Greek, Korean, and Taiwanese benefits have not increased at all in the last 4 years; Italian and Spanish benefits have declined by about 3 percent per year; and the Association of Western European Shipbuilders (AWES) countries' benefits have grown by only 1 percent per year on average.

Table 33 also shows absolute U.S. wage rates to be among the highest. The United States ranks fifth among the 16 shipbuilding countries listed, with estimated hourly compensation 32 percent higher than the average and growing at over 10 percent per year. The indexed comparison makes U.S. wage rates even more striking—and highlights one source of the Korean competitive advantage. Table 34 removes the upward bias in foreign rates by calculating labor and material components of shipbuilding cost increases in national currencies. While the percentage increase in labor prices, expressed in dollars, was higher abroad, the same increases, calculated in national currencies, show the U.S. rate of increase to be higher than that in any country except the United Kingdom.

● "The second greatest source of complaints involved inadequate machines, equipment, and materials. Unsatisfactory aspects of the physical working environment proved the next major source of worker irritation. Work safety was the physical factor most often mentioned. Maritime Transportation Research Board, op. cit., p. 96, citing G. A. Muench, *Study for the Improvement of Motivation in the Shipbuilding Industry,* Phase I, San Jose, Calif., June 1976.

Organization of Shipyard Labor

The U.S. shipyard industry is over 90 percent unionized. Avondale Shipyard is the one exception among the ASIB yards. The shipbuilding unions

Table 33.—Estimated Hourly Compensation of Shipbuilding Production Workers in 16 Countries

	Percent of additional compensation to hourly earnings				Estimated compensation per hour worked in U.S. dollars				Estimated compensation index U.S. = 100			
	1977	1978	1979	1980	1977	1978	1979	1980	1977	1978	1979	1980
West Germany	69,1	73.2	73.5	76.8	8.88	11.16	12.83	14.25	110	124	128	119
Sweden	54.2	56.9	62.4	63.0	9.76	10.47	12.21	13.22	121	116	121	111
Netherlands	71.1	73.0	75.8	75.2	8.63	10.50	12.02	12.69	107	116	119	106
Norway	38.2	40.2	40.0	40.0	9.20	10.27	10.91	11.97	114	114	108	100
United States	34.9	37.5	38.8	45.6	8.08	9.03	10.06	11.94	100	100	100	100
Denmark	18.7	19.1	19.1	20.1	8.01	9.45	10.68	11.33	99	105	106	95
Canada	20.3	24.7	26.8	27.8	8.48	8.89	9.81	10.76	—	—	—	—
France	65.6	65.9	68.5	69.9	6.44	8.70	9.35	10.73	80	96	93	90
Italy	101.9	90.7	91.2	89.7	5,55	6.61	7.77	9.10	69	73	77	76
Finland	51.5	57.5	52.5	54,6	6.42	6.89	8.17	8.75	79	76	81	73
United Kingdom	25.6	28.9	30,4	33.0	3.64	4.60	5.76	7.58	45	51	57	63
Spain	45.0	40.0	40.0	40.0	4.41	5.05	6.61	7.13	—	—	—	—
Japan	14.9	17.9	18.5	15.6	5.11	6.70	6.46	6.77	63	74	64	57
Greece	30.0	30.0	30.0	30.0	2.58	3.33	3.84	4.29	—	—	—	—
Taiwan	17.5	17.5	17.5	17.5	.91	1.16	1.44	1.66	11		14	16
South Korea	17.5	17.5	17.5	17.5	1.40	1.83	1.87	1.72	17	4;	19	14

NOTE: Hourly compensation is converted to U.S. dollars using the average daily exchange rate for the reference period. Changes In hourty compensation In U.S. dollars are, therefore, affected by changes in currency exchange rates as well as by changes in compensation.

SOURCE: US. Department of Labor, Bureau of Labor Statistics, Office of Productivity and Technology, Divlslon of Foreign Labor Statistics and Trade.

Table 34.–Shipbuilding Cost Increases, 1975-80

	U.S. dollars—hourly labor cost			Percent change from 1975-80 national currencies	
	1975	1980	Percent of change	Labor	Material
United States	$5.47	$8.59	57%	57 "/0	52%
Japan.	3.57	5.76	61	26	29
West Germany	4.34	8.26	90	38	23
Netherlands	4.21	7.43	76	37	89
Sweden	5.62	7.81	39	41	55
United Kingdom	3.12	5.86	88	81	48

SOURCE: BLS/SEA 017.

are characteristically craft unions, and, consequently, multiunion yards are the industry norm. Their influence has been considered largely prejudicial to maximizing productivity: the craft orientation has produced numerous demarcation disputes. More important, it prevents flexible use of labor, complicates planning and scheduling, and discourages career changes.

It is notable that technological development in "Organization and Operating Systems, " where U.S. yards otherwise compare well with foreign yards, has lagged substantially in a subset entitled "Organization of Work. " This pertains to flexibility in assigning and supervising craftsmen's work, and the gap was the second largest found by the MEL study .20

There have been several attempts to upgrade practice in this area, While the first programs were tried in naval shipyards, the interest in human resource management has spread to civilian shipyards, where there are a number of successes, including Lockheed Shipbuilding Co. well-established Quality Circles program and Bethlehem Shipbuilding Co. comparatively new program at the Sparrows Point, Md., plant. These programs address flexible organization as one of many aims, in conjunction with revised work practices. However, the overall craft form of U. S. shipyard organization is still the most common.

Table *35* lists the number of production workers and the union affiliations and memberships in most of the largest ASIB yards. Data from the 1980 census on the makeup of the shipbuilding work force will not be published until late 1983—if then—but the dominance of craftsmen as a worker category is expected to persist. The 1970 breakdown, below, appears to remain broadly accurate.

Worker category	***All industry***	***Shipbuilding***
Laborers, service workers . . .	21.0 percent	6.9 percent
Operatives	23.5 percent	24.8 percent
Craftsmen, foremen, etc.	18.5 percent	52.6 percent
Manager, administrators, technical professions	30.9 percent	15.7 percent

These proportions indicate the predominantly blue-collar character of the existing labor force and suggest the rather flat organizational structure of shipyards. Craft dominance of the shipyard labor force means that technological change must be negotiated, which is time-consuming and can be extremely difficult.

[20] 'Technology Survey of Major U.S. Shipyards, op. cit.,

Table 35.-Unions In U.S. Shipbuilding Yards

Yard	Total production workers as of November 1982	Union
Avondaie Shipyards, Inc.	5,547	Nonunion
Bath Iron Works Corp.	7,293	IUMSWA
Bethlehem Steel Corp., Sparrows Point	496	IUMSWA
Bethlehem Steel Corp., Beaumont	482	Metal Trades
General Dynamics/Quincy Shipbuilding Division	1,491	IUMSWA
General Dynamics/Electric Boat Division	21,130	Metal Trades
Ingails Shipbuilding Division of Litton industries	8,705	Metai Trades
Lockheed Shipbuilding & Construction Co.	2,611	Metai Trades
Nationai Steel & Shipbuilding Co.	3,781	iron Workers
Newport News Shipbuilding Co.	19,668	Usw
Todd Pacific Shipyards, Los Angeles	3,691	iUMSWA
Todd Pacific Shipyards, Seattle	3,337	Metai Trades
Bay Shipbuilding Co.	519	Boilermakers
Livingston Shipbuilding Co.	462	Metal Trades
Total	79,213	
(Total of 27 ASIB Yards = 90,492)		
Totals		
iUMSWA (industrial Union of Marine and Shipbuilding Workers)	12,971	
Metal Trades Council, AFUCiO	36,727	
USW (United Steelworkers of America)	19,668	
iron Workers (international Association of Bridge, Structural, and Ornamental ironworkers)	3,781	
Boilermakers (international Brotherhood of Boilermakers, iron Shipbuilders, Blacksmiths, Forgers, and Heipers)	519	
Nonunion	5,547	

SOURCE: Off Ice of Maritime Labor end Training Report, Feb. 10, 19S3 (Form MA-S1).

SHIPBUILDING PRODUCTIVITY

Shipbuilding productivity is the eficiency with which the industry transforms its raw and semifinished inputs into ships, using the classical factors of production—land, labor, and capital. The physical sites, fixed capital, and labor force of U.S. shipyards have a major impact on their productivity. It is accepted generally that the productivity of U.S. yards is in many cases constrained by their sites and by the yards' inability to effect comprehensive replacement of often obsolete physical facilities. However, in many cases, phased facilities development plans are in place and low-cost, high-return pilot human resources programs are being applied. The productivity of U.S. shipyards is definitely increasing. The rate of increase, however, must be improved in order to compete internationally.

The Determinants of Productivity

Shipbuilding productivity is clearly a function of the interaction of:

- the length of the shipbuilding cycle;
- c the number of man-hours required; and
- the extent of nonproductive peripheral costs.

The following sections discuss each factor as related to U.S. v. foreign experience.

The Length of the Shipbuilding Cycle

Between 1975 and 1980, over 60 commercial and 80 naval ships were under construction in U.S. yards at any one time. However, only about 20 commercial and 15 naval ships actually are deliv-

ered per year. This ship-under-construction-to-delivery ratio, furthermore, has not changed appreciably over the past three decades. It indicates that a commercial ship may take 3 years to construct, while a naval ship averages 5 to 6 years. This conclusion admittedly is simplified because many other factors contribute to the large discrepancies between the number of ships under construction and those delivered during any period of time. However, ship flowrates (a ratio of deliveries to ships under construction) in the United States historically have been about one-half those of European shipyards and less than one-third those of Japan.[21] This means that the average modern merchant ship spends over twice as much time in a U.S. shipyard as a comparable ship in modern foreign shipyard. Considering the capital invested per ship, it is evident that the additional construction residence time adds at least 5 to 6 percent to the cost of the ship. If this figure is augmented to reflect the complementary cost of inventory—which amounts to 4 to 6 months of supplies for the average U.S. shipyard compared to 1 to 8 weeks in an equivalent foreign yard—the total capital cost of excess ship and material inventory time increases U.S. shipbuilding costs by 8 to 9 percent. Similar comparisons of the cost of construction of naval ships are not possible; combatant and warships vary extensively in detail.

Because there has not been extensive U.S. experience with continuous series production, learning curves for the U. S, shipbuilding industry have not been established. Results from naval building programs are misleading because of the extent of changes expressly allowed in the production of the series and the frequent splitting of lead ship and series production between distant yards. It appears that the industry is capable of realizing substantial time savings in series production, with associated reductions in inventory costs. This requires customer acceptance of standardized designs, as noted earlier, but the extent of customization by U.S. shipyards is incompatible with maximum production efficiency.

[21] Shipbuilders Council of America, Association of Western European Shipbuilders, and Zosen, annual reports, 1980, 1981, 1982.

The Number of Man-Hours Required

In a recent study by the Maritime Transportation Research Board of the National Academy of Sciences it was noted that, despite increasing mechanization,

> . . . direct labor costs in U.S. shipyards are between 40 and 50 percent of the finished product cost, depending on type of ship . . . (the) ratio (between labor and material costs) has remained relatively constant since 1961, increases in labor efficiency being largely offset by rising wages.
>
> High as these figures are, they tend to underemphasize the total labor component in shipbuilding. For a ship, labor costs constitute 70 to 85 percent of the value added. . . . In the 15-year period from 1958 to 1972, the share of added value received by labor in U.S. shipbuilding averaged 77 percent, never falling below 71 percent and rising as high as 84 percent. . . . The labor-intensiveness of the industry is underscored by noting that, among 22 industries, U.S. shipbuilding ranks 15th in assets per employee and 3rd in sales per invested dollar.[22]

A basic source of data on the scope of productivity improvement through reduction of man-hours is the MarAd-sponsored IHI-Livingston project. This has been characterized as a ‘‘unique contract for transfer of Japanese technology, ” but the project also established valid cost data on the comparative man-hour requirements and average length of shipbuilding cycle. It showed that the length of the U.S. shipbuilding cycle, in theory, could be reduced by 50 percent, from 24 months to 12. Similarly, the man-hour requirement could be reduced by 60 to 70 percent However, there are social and institutional barriers to the measures that would be required to effect these changes; these will be discussed as they relate to specific productivity -enhancing measures.

The Extent of Nonproductive Peripheral Costs

Workplace Safety and Health Costs .—Zosen’s annual statistical summary of Japanese shipyards’ safety record is frequently compared with the U.S. shipyards’ record. 23 The U.S. accident-frequency-rate per thousand workers per year is 269; the same Japanese rate is 2. While these statistics may not

[22] Maritime Transportation Research Board, op. cit.
[23] BLS and Zosen figures, 1979 and 1980.

be comparable directly due to differences in accident-reporting practices between the United States and Japan, it appears that the accident rate in U.S. yards is considerably higher. Since benefit payments under the 1972 amendments to the Longshoremen's and Harbor Worker's Compensation Act (LHWCA) have increased by an estimated 600 percent, this is one obvious area of concern .24 The five shipyards responding to an SCA 1978 study estimated these costs at 2.4 to 4.7 percent of the price of the hypothetical ship and suggested that the foreign equivalent requirements were ' 'less stringent and (had) a lesser cost impact than those of the United States. '[25]

"Buy America" Policy .—The U.S. supplier base is comparatively independent of the shipyards, and many shipbuilders argue that it does not make economic sense to hinder the shipbuilding industry's development to provide marginal support to the supplier base. Existing ' 'buy America' policies (i. e., requirements that 50 percent of machinery and materials for subsidized ships be of U.S. manufacture) are difficult to supervise and define, With more and more U.S. firms taking advantage of lower foreign labor rates—and higher standards of productivity and industrial discipline —it probably will become harder to follow this policy and more disruptive of production. This is particularly true given the trend toward increased buying of components in lieu of fabrication by the yard itself.

Productivity Trends in the U.S. Shipbuilding Industry

Many measures of production have been used in the shipbuilding industry. Each has shortcomings, and the assessment of shipbuilding productivity remains difficult, particularly in the United States. Comparing labor and production is particularly difficult because collected production figures often relate only to larger vessels or larger yards, but labor statistics typically are inclusive of the entire industry. Other problems with productivity measures include:

- lack of accepted skills classification schemes;
- a multiplicity y of ways of quantifying ship production;
- difficulty in quantifying compensation and fringe benefits on a comparable basis for international comparisons;
- differing proportions of subcontracting in the shipbuilding process, both intra- and internationally; and
- too high a level of aggregation in statistics, e.g. , assimilation of repair to shipbuilding.

Although there are many possible measures of output/productivity, the two most satisfactory measures of output are compensated gross registered tonnage **(CGRT)** and value-added.

CGRT, unlike gross tonnage, lightweight tonnage, or deadweight tonnage, attempts to allow for the differing levels of complexity of ships, which is particularly desirable where naval vessels figure in many yards' workload. However, the adjustment coefficients are approximate, judgmental, and vary over time and between studies. The present coefficients used by West European shipyards, for example, will be revised shortly to reflect changes in the Organization for Economic Cooperation and Development (OECD) system for calculating gross tonnage. The OECD system is being aligned with the 1969 International Convention on Tonnage Measurement of Ships, which changes gross and net tonnages for several vessel types. Table 36 shows the trend in the labor required to produce

Table 36.—CGRT Measure of Productivity Gains in Private U.S. ASIB Shipyards

Year	CGRT (000s)	Employment[a] (000s)	CRGTI employee/year	Manhours/ CGRT
1980 . . .	393.3	40.9	9.6	200
1979 . . .	545.3	39.9	13.7	140
1978 . . .	289.5	39.6	7.3	263
1977 . . .	446.6	40.0	11.2	172
1976 . . .	373.0	38.7	9.6	196
1975 . . .	276.7	35.4	7.8	243
1970 . . .	199.6	30.4	6.6	292
Growth in productivity per year			3.5°/0	

[a]Derived number: proportion of total labor force in private yards (70 Percent) x proportion of private yard labor in ASIB yards (88 percent) x proportion directly engaged in shipbuilding (50 percent), i.e., 23 percent of total employees are shipbuilding production workers in ASIB yards.

NOTE: The CGRT output understates U.S. yards' potential productivity, given a stable workload, because it does not really reduce varying ship types to equivalent tonnage. Only the direction of the trend and its average magnitude are significant.

SOURCE: E. G. Frankel Report to the Office of Technology Assessment, 1983

[24] ''Longshoremen's and Harbor Workers' Compensation Act Needs Amending' (Washington, D. C.: General Accounting Office', 1982).

[25] 'Study of Cost of Federal Government Regulation on Shipbuilding Prices' (Washington, DC.: Shipbuilders Council of America, 1978), p. 4,

one **CGRT** of output in U.S. shipyards. This measure indicates that the output per employee has increased by 45 percent in the past 11 years, a gain of approximately 3.5 percent per year.

Value-added is the difference between total revenues and the cost of purchased intermediate goods and services and, as such, may be affected by market imperfections. Value measures of productivity also are less useful in international comparisons and where different technologies, or levels of technology, may be employed. Value-added is superior to sales, however, because the latter reflects widely disparate levels of Government support to shipbuilding. Table 37 measures the ratio of value-added to the capital and labor inputs and shows that the U.S. shipbuilding industry has made a 12-percent absolute gain in productivity in the past decade, a rate of 1 percent per year.

The ratios of CGRT and value-added to input measures such as man-hours or dollar value of assets may be crude absolute measures of productivity, but they do indicate its trend. From 1960 to 1980, the value-added-per-employee productivity measure for U.S. yards increased by about 27 percent while the payroll-per-employee measure increased 15 percent (in current dollars).

These real but modest productivity gains of the U.S. shipbuilding industry have lagged the gains of its Japanese, Korean, and European counterparts. In 1973, the Commission on American Shipbuilding compared some historic statistics on the productivity of major shipbuilding nations over a 6-year period and found U.S. productivity to be only 50 percent of Swedish and 43 percent of Japanese. U.S. man-hours per delivered-ton averaged 30 percent higher than Japanese and Northern European yards. These figures have increased at a rate that reflects the small productivity gain computed above; but in 1980, A & P Appledore concluded that U.S. shipbuilding productivity is still generally only half that of Scandinavia and Japan.

It is difficult to compare U.S. and Japanese and Korean shipbuilding productivity because the type, size, series, and complexity of ships built vary so much. Japan and Korea largely have built series of standard tankers, bulk carriers, and other types of ships, usually designed by the yard itself for construction by the yard. U.S. yards, by comparison, built small numbers of often custom-designed and comparatively complex ships. Few of these ships are built in series of three or more.

Comparing the productivity of U.S. shipyards with those of Japan and Korea, it is possible only to evaluate their respective performance in the building of comparable vessels such as medium-sized tankers or dry-bulk carriers. The limited information available shows that:

- U.S. shipyards require 38 to 65 percent more man-hours to build the same or similar ship; and
- labor productivity in terms of output-per-man-hour for basic measurable jobs such as stick welding, is comparable and, in fact, often shows U.S. workers to be more productive.

While U.S. shipyard workers appear to perform equally well in the performance of comparable jobs under identical conditions using similar equipment, the percentage of time in which U.S. workers perform actual work is appreciably lower than that of their counterparts in Korea and Japan.

The lower comparative productivity of U.S. shipyards is considered to be explicable largely in terms

Table 37.—Value-Added Measure of Productivity Gains in U.S. Shipyards (millions of current dollars)

Year	Value added +	(Payroll +	Depreciation) =	Productivity ratio (PR)	Index of PR
1980 . . .	5,338	3,360.4	163.3	1.51	1.12
1979 . . .	4,587	2,927.6	152.7	1.49	1.10
1978 . . .	4,107	2,647.5	138.7	1.47	1.09
1977 . . .	3,823	2,494.0	139.9	1.45	1.08
1976 . . .	3,287	2,219.5	1 lo.5a	1.41	1.04
1975 . . .	2,923	1,995.6	96.5[a]	1.40	1.03
1970 . . .	1,610	1,161.2	36.0[a]	1.35	1.00

[a]Estimated as 0.033 percent of gross fixed assets: depreciation figures not collected before 1977 Census of Manufactures.

SOURCE: J.A.Gribbin.

of: 1) the military market demand for excessive customization, 2) restricted opportunity for learning from series construction, 3) older facilities and specific technological weaknesses, 4) materials availability and origin constraints, and finally, 5) a fluctuating and less effectively utilized work force, with skill deficiencies arising from insufficient training and inflexible union practices, which do not facilitate redirection of careers and expansion of skills. The Appledore study attributed 30 to 35 percent of the productivity difference to the latter cause alone-foreign yards are said to have "superior organization and systems and a more effective work force. '[26]

Improving U.S. Shipbuilding Productivity

Many U.S. shipyard facilities were laid out during World War II and have not been redeveloped since. To enhance productivity in these yards, greater attention is needed to integrate production planning and engineering functions. Many believe that the scope for improving the productivity of U.S. shipyards is significant and that, in many cases, only limited capital improvements are needed. While the prevailing U.S. wage rates probably will make it impossible for U.S. shipbuilding costs to be as low as foreign competitors such as Korea, it would appear possible to get much closer than today's price differentials indicate. In a report to OTA by E. G. Frankel, Inc., the following actions were suggested :27

- impose serial construction of ships in sets of not less than 12, all built in one yard;
- allow material to be bought without reference to national origin, with no import restrictions, and no duty on imported materials used in the construction of foreign-going ships;
- reduce inventory size and cost to no more than 1- to 2-month supply needs;
- Utilize lower U.S. capital costs when available;
- employ modern production, production engineering, planning, and management methods; and
- incorporate latest methods of design and production through effective research-and analysis.

Many of these factors have been applied in U.S. shipyards specializing in the construction of offshore vessels, barges, tugs, and workboats with marked success in achieving high productivity.

To make substantial productivity improvements, most U.S. shipyards would need to concentrate on production-oriented designs accompanied by industrial engineering applications such as simplified materials flow, mechanization, use of three-dimensional subassemblies, and preoutfitting. Productivity-enhancing measures also would include introduction of integrated computer systems for outfitting, manufacturing, and assembly. Perhaps most importantly, improving productivity would require modernization of management, planning processes, and organization of work.

The flexibility required by U.S. yards to respond to changing product and output demands in the past has led to the following problems:

- delay, deferral, or elimination of introduction of new technology;
- concentration on investment in basic processes such as steel preprocessing, fabrication, and subassembly, activities that are not among the most labor-intensive in any yard;
- large fluctuations in shipyard manning with huge manpower turnovers of as much as 67 percent per year among blue-collar workers;
- large expenditures for training, retraining, and lost posthiring and prefiring time;
- lack of medium- and long-term (strategic) planning and management preoccupation with short-run, even daily operational problems that should be delegated to production management;
- use of outside ship designers with the result that designs usually have to be modified to accommodate the particular production/assembly needs of the yard. This results not only in added costs, but also lost time and compromised designs;

[26] A & P Appledore, *Development of a Standardized U.S.-Flag@-Bulk Carrier: Innovative Analysis of Cost-Cutting Opportunities* (Washington, D. C.: Maritime Administration, U.S. Department of Commerce, 1980).

[27] " Status and Trends of U.S. Shipbuilding Technology and Productive Capacity, " written for the Office of Technology Assessment by E. G. Frankel, Inc., December 1982.

- lack of effective marketing strategies;
- lack of standardization in procedures, as well as product parts and manufacturing and assembly standards;
- insufficient R&D in methods, production aids, basic processes, materials research, etc.; and
- lack of coordination among the industry.

It is difficult to determine if this last factor is due to concern with regard to antitrust actions or simple competitive posture. Yet countries like Japan and Korea, where yards compete much more for the same markets, have found more effective ways to cooperate and coordinate their R&D in basic processes, procedures, and standards. They rely on the maintenance of competitive positions through management efficiency, labor-management collaboration, marketing, and product design. This approach appears to result in efficient, effective technology development.

American shipbuilders have attempted to improve the industry's productivity through:

- improvements in facilities and equipment;
- introduction of CAD/CAM; and
- increasing adoption of national shipbuilding standards.

While facility and equipment improvements were introduced starting in 1966, practical adoption of CAD/CAM (described in ch. 5) was begun only in 1972-74, and shipbuilding standards are under development only now. U.S. shipbuilding lags behind foreign shipbuilding in shipbuilding standards and even more so in standards for suppliers and equipment manufacturers. Shipbuilding productivity is greatly affected by CAD/CAM and standardization. Japanese shipbuilders, for example, use more than twice the amount of automatic welding as U.S. shipbuilders. In Japan, computers are used increasingly not only to assist in welding automation but also in welding quality control, This in turn has led to a large increase in the use of welding robots. In U.S. shipyards, only one welding robot is in use as a pilot operation.

Standards

While 13 U.S. national shipbuilding standards have now been published, and 100 are in various stages of development, Japan has established 7,750 industrial standards with 518 shipbuilding standards that cover all types of components, equipments, materials, fabrication methods, and more. It must be recognized, though, that Japanese industrial and shipbuilding standards are enforced by an industrial standardization law enacted in 1949. U.S. shipbuilding-standard development and adoption are completely voluntary. At present, a panel of the American Society of Testing Materials is developing U.S. shipbuilding standards.

Shipbuilding Management

American shipbuilding management and planning has become a topic of increasing discussion in recent years, and various proposals for change have been advanced. Many of these propose adoption of certain techniques and approaches successfully used in other major shipbuilding countries such as Japan and Korea, where shipbuilding management is based on organizational, decision-making, and operating structures and procedures founded on quite different cultural backgrounds, human relations, and traditions than those found in the United States. While some of the techniques and approaches found successful in those countries may be transferable, it must be recognized that the environment in the United States cannot be changed in the short run. This makes successful application of some of these methods difficult.

Factors that make Japanese and Korean shipbuilding competitive include the use of cost controls in engineering, quality circles, labor incentives, high-productivity manufacturing processes, standardized ship design and production, labor flexibility, good supplier and customer relations, and effective production-planning management and control. There are some factors that are distinctly unique, such as the lack of adversarial relations between shipbuilder and client, and management and labor. There is a general agreement in these countries that adversarial relations and potential litigation hinder efficiency and timely, low-cost delivery. Similarly, most supplier, client, and labor issues with shipbuilding management are resolved by various informal approaches resulting in little if any delay. This is quite different from the generally formal approach used in the United States, where procedure, documentation, and even conflict resolution methods are often defined.

SUMMARY

Federal assistance to U.S. shipyards through construction subsidies over the past two decades appears to have discouraged independent attempts to reach and maintain commercial viability. At present there is uncertainty about the implementation and scope of overall maritime policy and naval procurement policy. Since subsidies for commercial construction have been terminated, one policy alternative would be to replace subsidies with a form of support that directly enhances productivity and competitiveness, and at the same time put naval procurement on a less cyclical basis. In addition, the Federal Government could enhance industry efforts to improve productivity by coordinating those efforts or funding their coordination.

Some of the more innovative technical approaches to improving productivity employ a man-machine system perspective. It is considered more cost effective to reduce the labor component of shipbuilding by using electronic assistance in easily mechanized areas such as precision control, than by making larger—often inflexible-investments in capital equipment that attempt to emulate human flexibility and pattern-recognition capabilities. In addition, current social philosophies and the trend toward increasing stability in the industry work force require from employers a complementary effort to stabilize employment opportunities and improve the quality of industrial life. There is great scope for productivity improvement through better use of human resources.

Possible directions for productivity improvements in U.S. shipbuilding have been discussed throughout this chapter. It should be recognized, though, that technological improvements will not necessarily pay off unless accompanied by improvements in the structure, organization, and management approach used in the industry. Product development, client relationships, and marketing are other important areas where improvements are needed if the industry is to achieve a more competitive position in world shipbuilding.

Many of the deficiencies and opportunities identified in this report have been identified previously, particularly in the MEL survey (1978) and the MTRB's *Shipbuilding Research and Development: A Recommended Program (1973).* Comparatively few of their suggestions were implemented. Some in the industry have claimed that the reason is institutional barriers to transfer of foreign technologies for productivity improvement. Others claim that the reason for lack of progress is the tendency of the industry to identify a Government-sponsored ''stable increasing (sic) ship construction program' '[28] as the solution to the problem of lack of international competitiveness, rather than to develop a program based on the industry's own resources and planning.

A larger volume of business could allow U.S. shipbuilders to realize economies of scale and increase productivity through higher utilization of facilities, but only at realistic prices. Perceptive marketing might enable U.S. yards to overcome their cost disadvantage to some degree, particularly if a new product were developed and offered. While volume is important, it appears that facilities, management, and labor are the principal areas where improvement can be most readily effected by joint actions of industry and the Federal Government. These are discussed below.

The Physical Facilities Problem

The work and material flow is severely compromised in a converted old yard, as is the method of fabrication, assembly, weight handling, and ship erection.

Most major shipbuilding countries have found that it is cheaper and more effective to replace old shipyards with new yards specially designed and located for the production of modern ships. It is interesting to note that the United States and Britain resorted to the modernization of existing yards on a piecemeal basis, while most other major shipbuilding countries replaced many of their yards with completely new yards because they found that in the long run it was a cheaper and better approach. The primary reasons for this difference appears to be that U.S. shipbuilding management generally

[28] Maritime Transportation Research Board, "Shipbuilding Research and Development: A Recommended Program' (Washington, D. C.: National Academy of Sciences, 1973), p. vii.

plans only for the short term, while Korean, Japanese, etc. , shipbuilding management is organized to plan for the medium to long term.

Possible policy approaches are to:

- make investment funds available to yards for development and implementation of viable long-term plans;
- guarantee loans for technology transfer by purchase, where other means—e. g., joint venturing—are demonstrably infeasible; and
- devise a capacity reduction plan that could convert some shipyards to other uses and ease the closure of worst affected yards.

The Management Problem

It has been argued that the dominance of subsidized and naval shipbuilding has stifled U.S. managerial innovations. In fact, subsidy has failed to develop the U.S. shipbuilding industry and may well be a cause of the failure to resolve fundamental problems, such as the excessive customization of vessel designs. Many believe that the shipbuilding industry needs to extend its investment horizons, especially since most U.S. yards are subsidiaries of financially robust companies and have provided poor return on investment for years.

Management must develop mechanisms for identification of technological voids and evaluation of solutions. This requires diagnostic skills and an alertness to developments in other industries, reinforcing the perceived need for a higher ratio of technically skilled managers at all levels in the industry and higher qualifications for these professionals.

Possible policy approaches are to:

- facilitate intra-industry information exchange, technology transfer, and problem diagnoses by sponsoring regular conferences, reporting, and other means;
- review the content and administration of joint Federal/industry R&D and fund only high priority work;
- improve the Federal R&D structure and encourage the industry to implement its efforts;
- support a Government/industry management training center;
- ensure that any Government support stabilizes the workload, which in turn allows the retention and training of the work force and the development of better operational planning techniques; and
- provide Federal support to development of industry standards, even to the extent of legally mandating their adoption.

The Labor Force Problem

The casualized employment system in U.S. shipbuilding is one of the largest barriers to improved productivity. Since many of the theoretical foundations that underpin high foreign productivity are of U. S. origins, there is logically substantial scope for a program of institutional changes. This area is one where the rate of progress is difficult to predict but could be surprisingly fast.

Possible policy approaches are to:

- disseminate information on the use of ‘ ‘social technologies, such as quality circles and (semi-) autonomous working groups in U.S. yards, both for their beneficial effects on productivity and for their effect in creating openness to new technologies;
- implement technology transfer in areas of production skills and management methods by training and fellowship programs and translation and dissemination of foreign references;
- develop a cross-trained labor force to provide better responses to fluctuations in the need for various craftsmen (multiskilling);
- require shipyards to attack excessive turnover directly and set up interim programs for limited ‘ ‘outplacement’ of redundant employees; and
- support an industrywide training program.

The above approaches are some detailed actions that could be used to enhance U.S. shipbuilding productivity. OTA analysis suggests that U.S. shipyards can improve their competitive position in the world but only with a concerted effort on the part of both industry and the Federal Government. However, productivity improvements alone will probably never close the very large foreign merchant ship price differentials that are partly the

result of lower wage rates and the direct and indirect subsidies of other governments. Federal policy, therefore, must acknowledge that the future viability of U.S. commercial shipbuilding will depend on some form of Federal support. Such support may be minimal where the United States has some market or technological advantage (e. g., LNG ships, offshore drill rigs a few years ago, or possibly Arctic tankers in the future) but will need to be substantial where other nations now have technology, experience, and market advantages (e. g., large tankers and bulk carriers).

At present, the U.S. Navy is supporting the U.S. shipbuilding industry with massive orders. It would be useful for policymakers now to look beyond the U.S. Navy building program and devise a plan for U.S. shipyards at least 5 years hence. The existing U.S. Navy program can be helpful for encouraging productivity improvement in the near term. After the U.S. Navy program slows, either new markets must be developed or Federal support must be increased or U.S. shipyards will probably contract to a much smaller base.

Chapter 5

Status and Trends in Ship Design and Operating Technology

Photo credit: Maritim9 Institute of Technology

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Chapter 5

Status and Trends in Ship Design and Operating Technology

OVERVIEW

This chapter discusses technologies in ship design and operations and identifies those that offer significant opportunities to U.S. shipping and shipbuilding enterprises. Trends in the design, construction, and operation of merchant ships of the world's leading commercial maritime nations are reviewed and analyzed. The information base included surveys conducted by the U.S. Maritime Administration (MarAd),[1,2] the Ship Technical and Operations Committee of the Society of Naval Architects and Marine Engineers (SNAME),[3] and a study of "Productivity Improvements in U.S. Naval Shipbuilding' conducted by the Marine Board of the National Research Council.[4]

This chapter also discusses current federally sponsored marine research and development (R&D) and strategies for upgrading technologies of both ship production and ship operations.

The ebb of the economic cycle of any industry is the time when technological improvements are needed most to rejuvenate the industry and to support its continued operation at a profitable level when it has recovered from its slump. Unfortunately for the maritime industry and for many others, the reverse is most frequently experienced. R&D funds are withdrawn, and the training of people in new technologies is reduced to the point that when recovery comes, the industry is far behind its competitors in vying for business and in reestablishing itself. Investments in R&D are vital to U.S. maritime capabilities in the future.

Although the Merchant Marine Act of 1936 laid the groundwork for a modern merchant marine, the ship types in the resultant merchant fleet after World War II did not give a competitive edge over foreign fleets. Compounding the problem, postwar reliance on World War 11 ships, and various conversions of these vessels, produced an aging fleet with few modern, high-capacity, efficient ships necessary for competitive operations.[5]

Following the Merchant Marine Act of 1970, a large peacetime shipbuilding program was started and resulted in a number of technologically advanced ships, designed for specific missions and cargoes. Now, in 1983, the U.S. merchant shipbuilding and ship-operating industries are at a low point. Only a few new merchant ships are under construction in the United States. Much of the U.S.-flag fleet is aging and does not meet the technological level of our foreign competitors.

The impetus given by the Merchant Marine Act of 1936 in the form of construction and operating differential subsidies is no longer a popular strategy for increasing the strength of the U.S. merchant marine. Furthermore, the technological innovations that gave strength to the shipbuilding program that followed the 1970 Act now have been dissipated.

1 "Research and Development Program Briefing, Maritime Administration, U.S. Department of Transportation, Jan. 27, 1983.

2 "Merchant Vessel Propulsion Service Margins," Maritime Administration, U.S. Department of Transportation, contract No. MA-80-SAC-01067, prepared by The Baham Corp., Columbia, Md., January 1983.

3 "Assessment of Maritime Trade and Technology," questionnaire for SNAME Ship Technical Operations Committee, for the U.S. Congress, Office of Technology Assessment, October 1982.

4 "Productivity Improvements in U.S. Naval Shipbuilding, prepared by the Committee on Navy Shipbuilding Technology, Commission on Engineering and Technical Systems, National Research Council, National Academy Press, Washington, D. C., 1982.

5 "Evolution of Vessels Engaged in the Waterborne Commerce of the United States," by Robert Taggart, RT-41802, prepared for the Corps of Engineers, Historical Division, January 1983.

STATUS AND TRENDS IN SHIP DESIGN

In the past two decades there have been numerous changes in the makeup of the world fleet. Tankers have increased in size four to five times, to 250,000 to 500,000 deadweight tons (dwt); dry-bulk carriers have increased over twentyfold in total tonnage, and unitized cargo ships of all kinds have been introduced. Until the oil embargo of 1973, ship operators continued to increase speed and propulsion power to improve service. However, current trends have been to reduce or hold service speed constant to control operating costs. The major effort today to increase transport efficiency and competitive position is via increased hull size and faster turnaround time in port.

The healthiest sector of world shipping today is composed of those fleets engaged in the liner trades. A forecast presented by Kruse projects an increase of double to quadruple the number of twenty-foot-equivalent units (teu) between 1980 and 2000.[6] Liner shipping would continue to be dominated by the demand for containerized cargo. There would also be a continued shift from breakbulk cargo into unitized cargo trade. Shipments in the form of neobulk, roll-on/roll-off (RO/RO), and lift-on/lift-off (LO/LO) cargo will continue to grow in volume. Shipping between developed ports will utilize large, highly efficient carriers. High-value and perishable cargo must be shipped at normal to high optimum-carrier-service speeds. Low-value cargo will be shipped on an unscheduled basis. Medium to small multipurpose freight carriers capable of handling both breakbulk and unitized cargo will serve lesser developed ports. These ships gradually will displace tramp breakbulk freighters.

As discussed in chapter 2, worldwide liquid- and dry-bulk trades probably will remain essentially level or increase only a moderate amount in the near term. Bulk shipping will be heavily affected by changes in world energy consumption patterns. A transition period in which petroleum consumption is declining gradually in favor of coal and other alternative sources will ensure a continuing soft market for crude-oil tankers. Major scrapping within the world supertanker fleet already has begun and will continue into the late 1980's. Coal exports, particularly from the United States, will continue to grow well beyond the next two decades. Likewise, bulk shipping of grain will be a product sector with continuing strength due to an increasing world population. This trade is particularly significant for U.S. interests.

[6] Hans Jakob Kruse, "The Future of the Liner Industry," *Shipping 2000*, Conference Proceedings (London: British Shippers Council, June 19, 1979), p. 49.

Technological Innovation *in Liner Trades*

Perhaps the most important strategy for maritime industry improvement is to provide means to recognize potentially profitable technological innovations, to test and evaluate them, and to promote their incorporation in ship production or operation.

The evolution of containerization illustrates a successful maritime innovation. The present integrated, intermodal container system began with an experiment conducted by a land transportation company, McLean Trucking Co., which acquired Pan American Steamship Co. and was later renamed Sea-Land. The innovation to be tested was the shipboard carriage of trailers between U.S. gulf coast ports and New York. From this beginning, the present container system has evolved through actual trials under field conditions.

The first step, in 1956, consisted of carrying the trailers on specially constructed spar decks of tankers operating between New York and Houston. Having demonstrated the feasibility of the shipboard storage and carriage of trailers, the company designed a RO/RO trailer ship, an idea that was abandoned at the contract plan stage in favor of the more technically feasible and economical LO/LO principle. Six general cargo ships were converted to full containerships, equipped with shipboard cranes for loading and discharging. The ships carried 226 35-ft containers. The technical and economic attractiveness of the system was demonstrated under these field operations. After this successful demonstration, the company instituted an intercostal service in 1966, and by 1976 had entered foreign trade with the system. Today, Sea-Land Industries, Inc., is one of the world's largest containership operators,

Photo credit: Sea-Land Industries

While containerization permits a vessel to be in and out of port in 1 day—as opposed to a week or more for breakbulk shipping—it is also a capital-intensive industry

The importance of the implementation stage also is evident in the adoption of containerization by Matson Navigation Co. This company, which operated a service between the U.S. west coast and Hawaii, was having economic problems and decided that port productivity was a factor that required improvement. To find a solution, Matson, in a move uncharacteristic of the industry, established an inhouse research department to analyze its shipping operation and suggest improvements. Using systems analysis techniques, including a computer simulation model, this department was able to analyze a number of possible changes. These studies pointed to containerization as the best option to consider for further development and trial demonstration.

Like Sea-Land, Matson introduced the new system cautiously by carrying containers on the decks of conventional freighters. The success of these demonstrations led to conversion of a C-3 type ship to a full containership. During the planning and development as well as the implementation stage, Matson not only developed new technology-e. g., special terminal cranes—in support of the innovation, but also addressed the problems of labor and customer acceptance. Therefore, as the trial implementation progressed, the feasibility of containerization was demonstrated both in terms of technical design and in terms of meeting labor and marketing requirements. The Matson project showed that field demonstration of the feasibility of an innovation can be strengthened by a formal evaluation strategy.[7]

Handling freight via breakbulk methods has given way to unitized cargo shipping. This includes palletized cargo, containers, barges, and trailers. The major advantage is that most high-volume cargo is now shipped in standard sizes. Shipping in standard container sizes has allowed development of specialized cargo-handling equipment. Ports worldwide now have invested large sums in adapting dedicated berthing areas to loading and unloading of standard 20- and 40-ft containers.

In the design of the latest generation of containerships, the trend is toward multipurpose service on major high-density Atlantic and Pacific routes. On some mid- to short-haul routes this trend is rapidly displacing the breakbulk freighter service. The consensus of opinion seems to indicate that the additional flexibility gained by this type of vessel offsets the higher cost of construction and lost deck space. This type of vessel can moor in almost any conventional berth by use of angled and skewed ramps. Specialized handling systems are not required for RO/RO cargo. Two contrasting design philosophies have developed among experienced shippers. The first is that each ship should be fitted with the necessary crane capacity to unload itself. The second is that all self-unloading will be via forklift trucks, even for containers. The choice of design will be dictated by the particular trades of each shipper.

Cargoes requiring refrigeration, such as food products including meat, fruit, and fish, have been transported in "reefer" ships in refrigerated holds or compartments. In recent years individually refrigerated containers have steadily displaced cargo carried on specialized ships. One of the new developments that will cause a significant shift of high-

7"Innovation in the Maritime Industry, " Maritime Transportation Research Board, Commission on Sociotechnical Systems, National Research Council, National Academy of Sciences, Washington, D. C.} 1979.

value perishable cargo from the air-freight market to containerized cargo is the development of controlled atmosphere containers. Perishable produce now shipped via air can be shipped in modified 40-ft refrigerated containers at one-fourth the cost, with far superior quality produce delivered to the customer. These containers use inert nitrogen gas to lower the oxygen level inside the container.

Technological Innovation in the Bulk Trades

The major bulk trades include crude and refined oil products, liquefied petroleum gas (LPG) and liquefied natural gas (LNG), iron ore, bauxite and other ores, coking and steam coal, grains for human and animal consumption, and neobulk cargo such as logs and other forest products. While most predictions for crude-oil shipping over the next two decades are modest, the demand for other types of bulk carriers should not be as bleak.

Although the United States pioneered the use of specialized ships such as barge-carrying ships, we have fallen behind the foreign competition in capitalizing on these technological innovations. The tug-barge concept was considered to be only an attempt to get around manning requirements that never achieved any economic success. The rest of the world forged ahead of the United States in the construction and utilization of large crude-oil carriers, and only in the development of the LNG systems and product carriers have we attained parity with or superiority over other nations in liquid-bulk carrier-design innovations. It is foreseen that marine transportation systems of the future will utilize many more ships that are specifically designed for particular cargoes and trade routes.

If the latter situation does come to pass, it may or may not be good news for the U.S. maritime industry. In the past, the United States has demonstrated proven capabilities in optimizing ship designs to match specific operational requirements. However, we have not moved rapidly into such markets and, in some cases, the operational requirement evaporated by the time the production began. An example of this was the U.S. building program for supertankers that only began after the rest of the world had built tankers far in excess of demand. Current projections for new very large crude carriers (VLCCS) indicate no requirements until the mid-1980's depending on the rate of scrapping. New designs of crude carriers will not likely exceed deadweight tonnages of 250,000,

Most recent industry announcements indicate that a prolonged period of consolidation and scrapping of excess tonnage in crude tankers will be required to restore freight rates to values with which carriers can survive. A recent commentary in The Motor Ship notes that "recent levels of scrapping may be historically high, but in the context of the problem, it is miniscule: it would take 5 years of scrapping at double the current rates before a balance of tonnage is achieved.

Operators will be looking for conservative gains such as propulsion fuel economy and the ability to burn heavy fuels. Two-stroke diesel engines will remain dominant as long as there are no precipitous losses of oil supplies. Major emphasis will be placed on increasing docking cycles to 5- or 6-year intervals when feasible. There will be a need for improvement in hull coatings and protection systems beyond current levels to accomplish this. Bulk trades will be the most likely for introduction of steam plant innovations. Slower optimum service speeds than the traditional 15 to 16 knots will predominate. Most tanker operators have been running crude carriers at reduced service speed to offset in part excess capacity.

The demand for barge carriers such as LASH and Seabee may continue to increase at a steady pace. These two designs were U.S. innovations. There are two major reasons for building barge-carrier systems. The first is that barges can be loaded and unloaded at inland ports and floated by tug to a rendezvous with the mothership. Loading and discharge of lighters (barges) on the mothership is rapid. The second advantage accrues to barge carriers when serving developing countries with limited capacity to handle containerized cargo. Barge carriers are self-sufficient and do not need elaborate shore-support facilities. The primary reason that they have not fulfilled expectations is that they are expensive large vessels that require a continuous supply of cargo to be profitable. Large deck openings or catamaran hulls are costly to construct

"Viewpoint," *The Motor Ship,* vol. 63, No. 748, November 1982, p. 5.

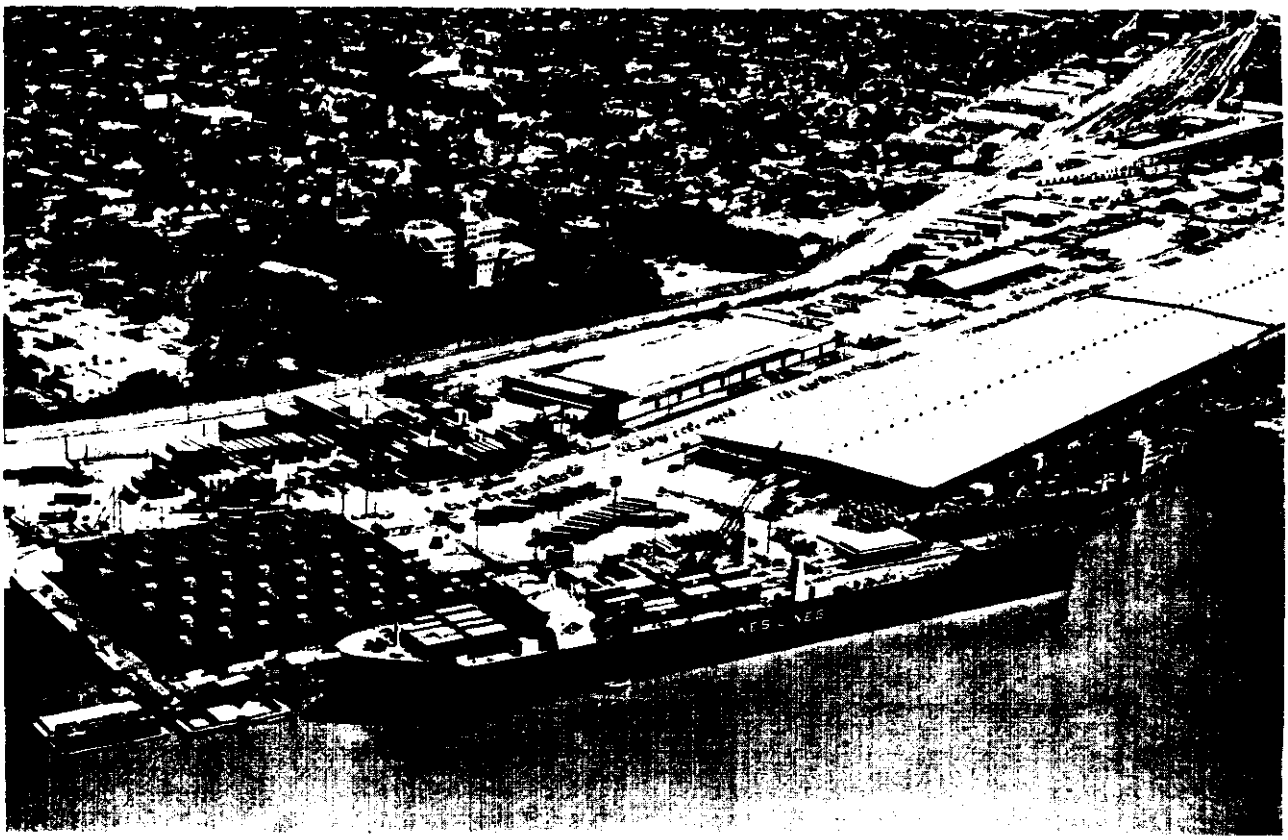

Photo credit: Por7 of New Orteans

A "Seabee"-type barge carrier unloading in the Port of New Orleans

and some designs have very elaborate stern or bow openings. Barges, unlike containers, have not been standardized from one carrier to another. Also, storage and handling of unmanned barges in port causes problems.

Arctic Transportation

The severe environmental conditions in the Arctic require innovative technology for developing resource recovery systems. Arctic energy and mineral resources are believed to exist in abundance; however, exploration, production, and transportation will continue to be expensive relative to other alternatives in the near term. In addition to oil and gas, the Arctic contains large reserves of coal and deposits of copper, lead, and zinc.

The Federal role in Arctic research has been one of cooperation with industry. Petroleum industry projects have included the use of Government laboratories and expert personnel. Some programs have been jointly managed and funded. Continuing study is needed on the engineering properties of sea ice. The dynamics of sea ice interactions with ships and marine structures during wave-driven storm conditions are critical, as is the collection of ice/keel and ice/scour data and analysis of ice/sea-floor-interaction dynamics. The effects of the force of large ice features, such as pressure ridges, on test structures need to be better understood through field studies. [8]

Future expansion of Arctic oil and gas production activities will require new technology. Various transportation methods have been proposed, including icebreaking tankers, submarine tankers, LNG barges and ships, and air-cushion vehicles for logistics support. The United States has a techno-

9 'Research Needs for Arctic and Sub-Arctic Region, Staff paper, Office of Technology Assessment, U.S. Congress, June 15, 1982, p. 21.

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Photo credit: University of Alaska

Future transportation in arctic conditions may require icebreaker support such as shown here

logical lead in some of the above areas but is considered to be behind the U. S. S. R., the Scandinavian countries, and Canada in icebreaking design. Among present plans are shipments of Canadian crude to Japan passing through the Bering Strait on icebreaking tankers. However, navigation in the Beaufort and Chukchi Seas now depends completely on ice conditions.[10]

In addition to the potential for future offshore oil and gas discoveries that would lead to increased shipping needs in the Arctic, there are proven reserves of land minerals in Alaska, including coal and iron ore that could be developed soon. Northwestern Alaska has large coal deposits that could be extracted and shipped if new port facilities were built. New ports have been planned near Nome. Since the entire transport network for any major Alaskan mineral development would need to be constructed, considerable shipping needs are evident.

The presently producing North Slope oilfields in Alaska also contain considerable quantities of gas that have never been produced. Industry plans of 5 years ago were to build a gas pipeline from the North Slope through Canada to the U.S. Midwest. Those plans have never been carried out, mainly because of the huge capital requirements of such a pipeline. Other methods of transporting the North Slope gas have been considered—including constructing a fleet of LNG tankers for the purpose. It appears now that some shipping scheme is still a viable option. Improved shipping technology as well as lower costs would be major factors in such a decision.

There have been numerous studies of the feasibility of submarine tankers for carrying crude oil or LNG. Conceptual designs of both nuclear and conventionally powered versions have been proposed. At present, no sea tests have been conducted. The General Dynamics Corp., Electric Boat Division, has proposed versions of submarine tankers that they claim could be economically competitive with surface icebreaking tankers or pipeline systems, 11

[10] Ibid., p. 77.

[11] "Submarine LNG Carrier Proposed by General Dynamics for Arctic Regions," *Maritime Reporter,* Mar. 1, 1982, p. 12.

The Beaufort Sea is usually frozen 8 months of the year and in the process of freezing or thawing for another 3 months. Oceangoing barges without icebreakers can be used for resupply only once a year. To extend this window, the use of icebreaking air-cushion barges has been tested by VECO-International and Global Marine Development, Inc. The development and successful testing of a 100-ton cargo-capacity barge was financed by Sohio Alaska Petroleum Corp. and Shell Oil Co. at Prudhoe Bay. 12

One important consideration that affects any oil and gas development in the Arctic is that of pollution prevention and control. There is limited knowledge about the environmental effects of oil spills in Arctic regions, but most indications are that they would be more severe and persistent than in warmer ocean waters. In any case, special care in design and operation of both production and transportation systems seems to be warranted to avoid pollution problems. New systems also will be required for oilspill cleanup if that becomes necessary.

Arctic shipping—especially from the Alaskan North Slope or the Beaufort Sea—is subject to a number of political considerations as well. For example, shipping through either the Bering Straits or the Northwest Passage is subject to international agreements for both rights of passage and pollution prevention. Agreements with both the U.S.S.R. and Canada regarding the extent of any offshore resource jurisdictions are also a factor. Any major development also will need to be considered in light of possible impacts on Arctic environments and the native people of the region,

Advanced Hull Forms

Monohull displacement ships make up the total of the existing merchant fleet, and most design concepts are still based on traditional hull forms operating in the 15- to 30-knot speed range. There are very few exceptions. Advanced or higher speed hulls eventually may find their niche in commercial service but probably not under present economic conditions nor for employment in any major commercial cargo service. Advanced hull development has occurred only in the market categories of offshore supply and passenger/ferry vessels. These hull form concepts include:

- hydrofoil-supported vehicles;
- air-cushion vehicles (ACVS);
- surface effects ships (SESS); and
- catamarans and small-waterplane-area twin-hull (SWATH) vessels.

Both surface-piercing hydrofoils and ACVS have been built for the small passenger vessel and ferry markets during the past several decades, but these vessels cannot compete with displacement hulls in cargo-carrying capacity. Their poor seaworthiness at high speeds also has limited their use to relatively confined waters.

Totally submerged hydrofoils and SESS overcome the seaworthiness problem to some extent since they have the potential of providing high-speed performance in relatively rough seas. Several offshore supply vessels have been built in the United States using the SES principle.

Catamarans are being used as pusher tugs at sea, and SWATH vessels have seen some commercial application in servicing ocean drilling and work platforms in heavy seas. However, these vessels have limitations when extended to other uses, and the SWATH vessels especially have been hampered by high construction costs.

A related hull development is the semisubmersible hull used primarily for drilling rigs and ocean construction platforms. Here, an abovewater column-supported platform is carried by totally submerged twin hulls. This configuration has marked advantages in maintaining station in heavy seas, but its transit and variable load-carrying abilities are limited.

In general, advanced-hull forms undoubtedly will continue to be investigated for certain commercial applications but, in each case, cargo-carrying capacity and economic feasibility will be the major determinant of commercial viability.

Trends in Propulsion Technology

The propulsion plants in service today for merchant ships have been subject to continuous development during the past decades. This development

[12] "Air Cushion Vehicle Successfully Tested for Arctic Icebreaking," *Maritime Reporter*, Mar. 1, 1982, p, 12.

has been generated principally by concern for future fuel availability and the economic burden of increasing fuel costs on shipowners.

Most of the U.S.-flag fleet has steam-powered machinery. The traditional steam-turbine powerplant represents the culmination of many extended development programs in both the electrical utility and the maritime industries. The development has reached a level of diminishing returns with respect to cycle efficiency. The maritime industry, however, has not followed electric utility practice to the same level of development because it has not been justified economically for a powerplant at typical marine ratings. Secondly, electric utility units operate for very long periods at constant speed; consequently, the refinement of those units is not practical for a marine engine which operates at variable speeds, reverses rotation, and has to be on-line within a few hours. The expected improvements in marine steam-turbine powerplants will come in four general areas: further refinements in the steam cycle, use of boiler reheat cycles, change to coal-firing, and more efficient auxiliary drives.

Diesel propulsion is used extensively in the world fleet-diesels power over 90 percent of the world's merchant ships. Recent interest by U.S. operators and Government agencies in diesel propulsion has led to the licensing and construction of slow-speed diesel engines in this country. The American President Lines (APL) new C-9 class containership, the *President Lincoln*, represents the first diesel-powered containership to be constructed in the United States. APL has constructed three C-9S. With a gross registered tonnage (grt) of 40,500 each, they are the largest in this country. The total container capacity is 2,500 teu which includes accommodation of 400 refrigerated 40-ft containers. The slow-speed two-stroke engines are Sulzer Brothers Ltd., designed and licensed for construction by Allis Chalmers Co. in the United States. They are the first such engines constructed in this country in the past 30 years. Changes in MarAd regulatory requirements were necessary to allow construction of the engines with a high percentage of foreign manufacturer components.

Diesel engines are the most efficient prime mover available in mass production in the size ranges required for main propulsion plants. The diesel industry has a long history of improvements in the performance and power ratings of their engines. In recent years, the ability to burn heavy fuels was developed for the low-speed engines which gave them an economic advantage over steam turbine plants. This experience has been extended to the medium-speed diesels although typically with somewhat lighter fuel characteristics. Since the fuel crisis of the mid- 1970's, the efforts to use less expensive fuels and to recover waste heat to the greatest extent have been intensified.

Diesel engine manufacturers have worked toward raising the mean-effective-cylinder pressure (mep), together with improved designs for turbocharging, to improve both the efficiency of the engine and the power rating of each cylinder. Parallel efforts have been made to protect the engine from the products of combustion with heavy, dirty, and corrosive fuels. Very recently, several major engine builders and research organizations have experimented with firing pulverized coal as an injected slurry. The results of tests to date have been encouraging. Typical slurries have been 68 percent oil and 32 percent coal by weight and 66 percent water with 34 percent coal by weight. Synthetic fuels, derived from coal, also can be used as diesel fuels.

Alternate Fuels

Currently, the merchant fleet consumption of bunker fuels amounts to 3 percent of the world petroleum supply.[13] Bunker fuel sold in **1981** totaled 730 million barrels at an average cost of $32 each. Current prices are dropping rapidly along with crude reductions below $30 per barrel. Marine consumers represent a large single user of petroleum products but not enough to affect the mix of fuel products produced by the world's refineries. In general, the mix of distillate and residual products refined by the oil industry is dictated by consumer and industrial demand for gasoline and light distillate-fuel oils. The marine, utility, and asphalt industries consume the remaining residual-oil products. The properties of residual oils have been deteriorating in recent years due to the improved efficiency of new refineries. A greater percentage

[13] L. Bergeson, et al., "Wind Propulsion for Ships of the American Merchant Marine," Wind Ship Development Corp., U.S. Maritime Administration Report No. MA-RD-940-81034, NTIS No. PB-81-162455, March 1981.

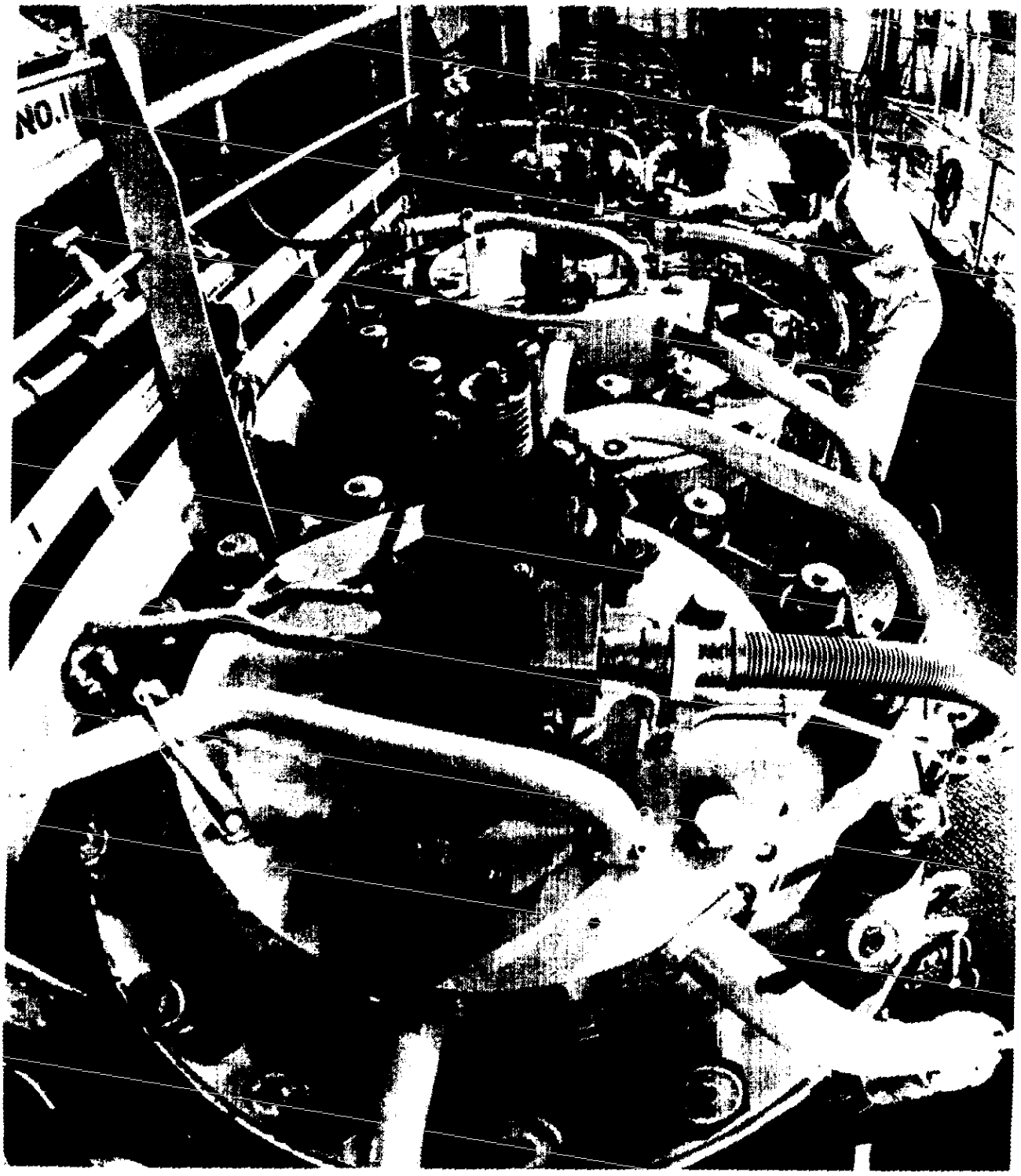


Photo credit: Sea-Land Industries

The engine room of a modern U.S.-flag diesel containership

of distillate-oil products is now produced from each barrel of crude oil.

Since the oil embargo of 1973 there has been a gradual shift from oil firing back to coal in land-based steam utility boilers. This increased utilization of coal will increase demand for worldwide coal transportaton. Coal remains an outstanding resource, with about six times the proven world reserves of crude oil. As a result, an increase in coal shipping seems assured during the next century. If U.S. coal exports grow as most experts project, new bulk carriers will enter that trade. These ships also could burn their cargo as fuel. Advanced technology for handling and burning coal now is being developed. For example, research in fluidized bed combustion and the use of micro-coal slurries for firing piston engines is well underway.

Coal-fired ships only recently are being reintroduced in a few bulk trades. General Dynamics Corp. shipyard at Quincy, Mass., delivered a 36,000-ton coal-fired coastal collier in July 1983 for New England Electric. This ship is the first coal-burning vessel built in the United States in over 30 years and is projected to offer considerable savings to the utilities that transport coal from Norfolk to New England powerplants. Mitsubishi's Nagasaki shipyard completed the first of a series of two coal-fired bulk-carriers in September 1982 for Australian National Line (ANL). Two additional coal-fired bulk-carriers will be constructed in Italy for TNT Bulk Ships, another Australian operator. All four ships are chartered to carry bauxite ore, The ships' main boilers are twin, U.S.-designed, Combustion Engineering Co. boilers licensed for construction by Mitsubishi. All coal-handling operations from transfer to ash disposal as well as boiler combustion control are automated or remotely controlled in accordance with recommendations issued by Lloyds Register of Shipping. ANL currently es-

Photo credit: General Dynamics, Inc.

In 1983 this U.S.-flag coastal coal-carrier was built to use its own cargo as fuel

timates an annual savings of $1.3 million from operation of these vessels. The company indicates coal prices would have to double relative to heavy fuel oil for operating cost parity. In addition, two former LNG tankers were converted to grain carriers with coal-fired boilers at a Korean shipyard for U.S. owners.

Nuclear-fueled steam plants have been installed in oceangoing vessels for several decades. The largest number of nuclear vessels are naval submarines. A small number of nuclear-powered merchant vessels have put to sea during the past several decades. The technology of these vessels has improved gradually. Most experts agree that, based on the price of oil, they are not yet economically competitive with their fossil fuel-fired counterparts. Other obstacles have hampered the development of nuclear ships, including the issue of disposition of spent nuclear fuel. In addition, there is significant popular opposition to the entry of nuclear-powered ships into major world ports.

Research has been intensive during the past decade in alternative fuel sources due to the expected crude oil shortfalls. A range of synthetically produced fuels from coal have long-term development potential. Likewise, natural gas vented from oilfields has not been competitive due to uneconomical transportation costs. Reserves of shale and tar sands represent about 13 percent of all fuels but are considerably more expensive to extract. As supplies of crude oil tighten and the price rises, producing competitive alternate fuels will become more feasible. The recent drop in crude oil prices may cause interest in alternative fuel for marine propulsion to wane.

Advanced Powerplants

The declining availability of liquid fossil fuels may provide long-term incentives for changing to new advanced powerplants. A recent MarAd study identified several advanced powerplants with development potential for marine applications. 14 Each was found to be potentially compatible with future marine plant requirements and to be economically competitive with the best existing technology. A crucial factor was freedom from the use of crude oil-derived fossil fuels. After screening several dozen options, the following plant types were selected for ‘ ‘long-term’ development potential:

- machinery plants under development that burn solid (coke and coal) slurry fuels include two-stroke marine diesels, fluidized-bed boilers for steam plants, Stirling cycle reciprocating engines, closed Brayton cycle gas turbines;
- lightweight nuclear powerplants in the near term using light-water reactors and high-temperature gas-cooled reactors beyond; and
- fuel cells.

The suitability of those advanced powerplants is directly related to the type of ship considered for their application. Representative hull forms were tested for applicability. The advanced powerplants that show a potential advantage were compared against one another and against the projected development of present-day powerplants. The results of the study indicated that fuel consumption rates of advanced plants are not likely to be significantly better than the current performance of low- and medium-speed diesel engines. Their only advantage is the ability to burn alternative fuels.

Propulsor Technology

While a few other special-purpose propulsor devices are used occasionally on merchant vessels, the screw propeller is accepted universally as the most efficient and cost-effective propulsor that can be used with any type of powerplant. Over several hundred years of development, the capabilities and limitations of the screw propeller have been thoroughly analyzed and are well understood. When the ship hull is defined, the powerplant selected, and the operating conditions are known, the optimum propeller for the ship can be designed.

This is not to say that all ships are operated at their maximum propulsion efficiency. Constraints imposed by hull form, powerplant characteristics, variable trim or displacement, or variation in speed requirements may compromise the propeller design to the point where its efficiency is much lower than what might otherwise be realized. An explanation of the effect of some of these factors on propulsor performance, and the means of circumventing some of the problems, are described below.

[14] ‘Merchant Vessel Advanced Power Systems, Maritime Administration, U S Department of Transportation, contract No. MA-80 - SAC-01072, prepared by The Baham Corp., Columbia, Md., January 1982.

To carry the maximum cargo within a given length, beam, and draft, it is often the practice to design a ship hull that has very full stern lines. These in turn interfere with the flow to the propeller and create a very high wake. This means that the inflow to the propeller is restricted, reducing propulsive efficiency. The situation can be improved by converting to large-diameter propellers that capture more of the flow around the hull or by using wake-adapting nozzles or ducts that selectively accelerate the flow from the ship sides and bottom into the propeller where it can be utilized more efficiently.

The characteristics of marine powerplants have much to do with propulsive efficiency. Steam reciprocating engines and steam turbines are uniquely applicable to the torque demands of a screw propeller at a given RPM. In other words, there is a relatively flexible relationship between the torque and RPM of a steam engine that can adapt it to the torque-RPM demands of a screw propeller. This gives the propeller designer a bit more leeway in keeping the design in an efficient range. However, as cited earlier, the higher fuel consumption and costs of steam-powered propulsion systems tend to more than offset this design advantage.

A diesel drive, on the other hand, requires a much more precise matching of the propeller power demand with the engine output capability. Care must be exercised that the propelter torque demand does not exceed the engine torque supply before the engine gets up to speed. Thus, the designer's tendency is to design the propeller on the low-torque side of the maximum efficiency curve to stay out of trouble; as a result, the propeller may not be of optimum efficiency.

As a general rule, the efficiency of a screw propeller can be improved by increasing the propeller diameter and decreasing the propeller RPM, Obvious limitations on diameter are the cross-section dimensions of the ship's hull, the need for adequate tip clearance, and the desire not to have the propeller swing below the keel line. The low-RPM limitation is a function of minimum speed of main propulsion engines and the size of reduction gears required. As engine RPM decreases and reduction gear size increases, there is a point of diminishing cost effectiveness in improving propeller efficiency with large-diameter, slow-turning propellers. The overall weight of the propulsion system is also a serious consideration in selecting propellers.

There are also several alternatives to increasing the diameter of a propeller. Various forms of ducted propellers can be used since, with a flow-accelerating nozzle surrounding the propeller, the thrust load is divided between the propeller and the nozzle with the nozzle delivering up to one-half of the total thrust under certain conditions. Also, a propeller in a nozzle can turn at a higher RPM than an equivalent open screw, alleviating the problem of lowering the rotational speed to impractical rates.

Another alternative that can be used to reduce propeller blade loading is to employ tandem or contrarotating propellers. In these units, the forward propeller gives an initial acceleration to the flow, and the after propeller provides additional acceleration with the result that neither propeller is as heavily loaded as would be a single propeller under the same circumstances. The after contrarotating propeller also can recover additional energy from the tangential outflow of the forward propeller, giving this system a higher propeller efficiency than the tandem propeller for corresponding size and hydrodynamic conditions.

Each of these additional techniques for improving propulsive efficiency has certain drawbacks. Propellers in nozzles are subject to problems, and the cost of' acquisition, installation, and adequate support of a duct with the required small tip clearance is high. However, some of these drawbacks are ameliorated in the Mitsui integrated-ducted propeller where the nozzle is placed aft of the propeller. Tandem propellers involve the additional cost of the second propeller. Moreover, the extra aperture length and shaft support augment the design difficulties and installation and repair problems. Despite the fact that contrarotating propellers have been used since the 1830's and are known to give a significant increase in propeller efficiency, the mechanical difficulties of turning propellers on concentric shafts in opposite directions and the associated high installation and maintenance cost have deterred ship operators.

One promising method of increasing propulsive efficiency is the use of vanes forward and after the propeller to convert the tangential flow generated by the propeller into forward thrust. This technique

was patented by the Goldschmidt Corp. in the 1930's and called the "contrapropeller" or "contrarudder.

The contrarudder principle was used in the early Maritime Commission ships (during World War II) and, on a model test of a C3 cargo-ship hull, a propulsive efficiency increase of 15 percent was demonstrated over that obtainable with the then customary flat-plate rudder. Such significant improvements cannot be anticipated with modern rudder-foil configurations, but Mitsubishi has reported power savings of up to 7 percent with similar modifications to the stern and rudder that now are being called ' 'reaction fins. This appears to be a promising propulsor system modification that can attain demonstrated fuel savings at a modest initial investment and no additional operating costs.

Sail Propulsion

Ocean winds have been a traditional source for ship propulsion for the past several millenia. Historically, trade routes and shipping patterns were designed to be compatible with seasonal wind and current patterns. With the advent of mechanical propulsion, there developed a tendency to ignore weather in setting routes and schedules. But, over the past 25 years, ship operators have come to recognize the savings made possible by routing their vessels to avoid adverse weather and to use favorable currents. Advances in satellite weather observation and computerized prediction techniques have made weather routing practical.

In the past few years, proposals have been made to employ wind energy as the means for propelling small- to moderate-sized oceangoing ships, either as the sole means of propulsion or as a supplementary form of thrust to reduce the required main engine output. The most suitable applications appear to be for smaller vessels, particularly those operating on an open schedule. Economic assessments of modern sail installations have been made both as a retrofit to an existing ship and on a new ship designed for sails. The proposals presented to date are quite varied, and several small ships have been fitted out with modern sails for evaluation in service. Most proposed applications are for small motorships of 500 to 4,000 dwt. To minimize the hazards to personnel, and the manning and maintenance costs of traditional rigging, these proposals generally are based on power-operated devices with remote controls for setting and furling sails,

It appears that modern sail arrangements are feasible for some types of cargo ships as a supplementary means of propulsion. Evaluations would have to be done on the type of sail, the vessel, and the operating route. A study was conducted by MarAd and published under the title "Wind Propulsion for Ships of the American Merchant Marine. The results of the MarAd study, conducted by Wind Ship Corp., indicate the cost of sail-assisted motorships to be competitive with conventional motorships and predicted that they would consume 18 to 25 percent less fuel. The Japanese built a 1,600-dwt sail-assisted motorship in 1980 and have been operating it as a pilot project since then. They claim similar fuel savings as Wind Ship Corp. Wind Ship also operated a converted small freighter in Caribbean trades which has a sail added for supplementary propulsion and fuel reduction. These projects, while limited in scope and at an early stage, do provide valuable data about the feasibility of future applications of sail power for merchant shipping.

TECHNOLOGICAL INNOVATION IN SHIP OPERATIONS

There is a strong perception on the part of many in the maritime industry that the noncompetitive nature of the U.S. merchant marine is due to a gradual increase in the cost of U.S. ship operations relative to foreign ship operations. Likewise, this noncompetitiveness is often associated with the be-

lief that technological innovation has not resulted in implementation of new concepts into the U. S.-flag fleet.

To address this question, OTA sent a questionnaire to members of SNAME'S Ship Technical Operations Committee.[15] The following summarizes the opinion of those responding to each of the four questions. * While the responses differed on many points, there were important areas of agreement.

Question 1:

How do the U.S.-flag, U.S.-owned and foreign-owned, foreign-flag fleets compare in technological advancement, including automation, fuel efficiency, propulsion, cargo specialization, or others that you consider important?

Two-thirds expressed the concern that the overall technological advancement of U.S.-flag fleets lagged behind foreign competitors. Two made the point that recent U.S. construction has tended to incorporate a significant amount of new technology. One insisted that U.S. innovation is on a par with the rest of the world, and that "the popularly perceived deficiencies in U.S.-flag, U.S.-owned fleets are not technological in nature, but institutional and economic.

All agreed that with respect to fuel efficiency and the introduction of diesel engines, the United States has lagged considerably. Various reasons were given including lack of available diesel engine industry "infrastructure, low fuel cost (prior to the 1973 embargo) for steamplants, and insufficient research facilities and expenditures.

Automation in U.S.-flag fleets generally was conceded to be inferior to foreign-flag, foreign-owned fleets. Most U.S.-flag ships are not certified for unattended engineroom operation. The reasons put forward were basically that it is difficult to automate steam-propulsion systems and that operators have no incentive to do so because prevailing labor agreements do not allow removing watchstanders.

Cargo specialization is another area in which U.S.-flag ships generally lag foreign competitors. Those innovations that have been developed in this country have long since been replicated by foreign competitors. A telling example was cited in the case of containerized liner cargo. A U.S. operator pioneered the concept over two decades ago. The U.S. liner operators are generally conceded to be the healthiest segment of industry. However, today the U.S. liner fleet is less containerized overall than its major European and Far East competitors. The United States has not participated in cargo specialization developments, particularly in the bulk and specialty trades. The one exception mentioned is in the area of product tankers. The extensive importation and coastwise shipping of refined crude oil products have resulted in refined practices being developed for these ships by U.S. fleet operators.

Question 2:

What new technologies are most likely to be incorporated in the fleets over the next 20 years and will have a major impact on how future ships are designed, built, and operated?

The overwhelming opinion of the respondents was that technological resources in the shipping industry would concentrate on reducing operating costs with the cost of manning and fuel of most concern. The largest number of respondents, identified the need for automation technology to be implemented to reduce manning requirements on U.S.-flag ships. Crew costs are high on U.S. ships because crew sizes are larger than competitors and cost per man is among the highest in the world. They cited several areas where microprocessor technology could be applied with a minimum of development effort. These included reducing onboard administrative burden, satellite navigation, weather routing, and cargo management. With automation

[15] "Assessment of Maritime Trade and Technology, questionnaire for SNAME Ship Technical Operations Committee, for the U.S. Congress, Office of Technology Assessment, October 1982.

*Responses to footnote 15: Matson Navigation Co., A. J. Haskell, Jan. 27, 1983; Reomar, Inc., N. M. Miller, Feb. 11, 1983; Sun Refining & Marketing Co., Joseph D. Mazzei, Feb. 11, 1983; Society of Naval Architects and Marine Engineers, James J. Sweeney, Chairman, SNAME Panel O-21, Feb. 14, 1983; Energy Transportation Corp., E. G. Tornay, Feb. 14, 1983; Exxon Shipping Co., T. W, Gillette, Feb. 25, 1983; Mobil Oil Corp., J. V. Caffrey, Mar, 3, 1983; Chevron Shipping Co., W. H. Banks, Mar, 3, 1983; E. V. Lewis (formerly Webb Institute Director of Research), Mar. 12, 1983; Marine Transport Lines, Inc., Donald V. Horn, Mar. 2, 1983; U.S. Lines, Inc., William B. Bru, Apr. 21, 1983; Delta Line, Richard F. Andino, Apr. 4, 1983; Cushing & Co., C. R. Cushing, Jan, 11, 1983,

technology currently available and implementation of new training, maintenance, and administrative procedures, crew size could be reduced to 20. With the technology that will be introduced in the next decade, it will be possible to reduce crew size to 10 on diesel-powered ships, and, in the long term, no personnel will be required onboard for normal operations. However, several respondents noted that even if these latter options could be negotiated with labor unions and regulatory bodies concerned with vessel safety, it would not necessarily be the most economical way to operate. An optimum balance must be derived that takes into account not only the technological implications but also the economics of ship acquisition, manpower costs, and safety considerations.

Eight respondents noted that phasing-out steam turbine, high-speed diesel, and gas turbine propulsion in favor of medium- and low-speed diesel engines for most ship designs is a likely trend. As long as oil remains the primary marine fuel, diesel engines will predominate as the most efficient propulsion system. Decreased availability of oil and high prices relative to other energy sources will favor development of other engines. The only near-term alternative for large ships is steamplants using coal-fired boilers. Coal is not readily available at all major ports. Thus, its use is likely to be limited by fuel supplies. Five respondents predicted the return of coal-fired ships, particularly for bulkships hauling coal. Twenty-five percent of the respondents identified nuclear propulsion as the most likely long-term development beyond the next two decades.

As mentioned earlier, fuel consumption is one of the major cost factors that shipping companies will target for reduction. More than half of the respondents identified improved hull-form design and acceptance of ablative (self-polishing) antifouling hull coatings as a continuing trend. Optimum speed of inservice vessels, particularly for bulk trades, will continue to reduce. There will be a continued trend to larger hull sizes for most high-volume trades except tankers, which have peaked in tonnage. Cargo specialization such as containerization, RO/RO ships, and automobile carriers will cross-over increasingly into the bulk trades. Although LNG technology was introduced prematurely, it most likely will be viable over the long term. Icebreaking tankers will be required for arctic shipment of crude oil. Finally, 25 percent of the respondents identified cargo-handling and port-facility improvements for reduction of loading time as an area of continuing improvement.

There were a number of additional elements of ship operations identified by less than half of the questionnaire respondents that affect operating costs. They include the hydrodynamic efficiency of the propeller, power losses associated with appendages, and the mechanical efficiency of the main propulsion system as well as hotel services for the crew. About 25 percent of the respondents identified these areas for selected improvements.

Question 3:

What technological innovations in operation of ships and shipping systems are most important for future U.S. shipping? (i. e., where U.S. shipping conditions are unique or where opportunities exist for the United States to take the lead).

There were five respondents who expressed the opinion that the U.S. Government and shipping industry should concentrate on crew organization, training, laws, and regulations that affect operating cost. Specific recommendations included making substantial changes in maritime law and manning regulations to delete the three-watch requirement and allow cross-training of trades, particularly deck and machinery. In the area of industry practices, it was mentioned that rationalization of galley/messing practices that would lead to use of a *single* messspace, preplanned meals, or perhaps self-service would yield savings.

Twenty-five percent of the respondents indicated they felt the area of greatest ‘ ‘business opportunity’ for U.S. technology was the application of computers to every facet of the shipping industry. Rapid assimilation of computers into shipping operations would give U.S. companies a competitive edge,

Similarly, 25 percent of the respondents identified opportunities in the specialty trades that would have a high payoff for U.S. companies. In the liner trades, encouragement of laws and regulations favoring intermodal shipping would be most beneficial in giving U.S. companies a boost. In the bulk trades, “neobulk’ shipping of commodities such

Photo credit: Atlent/c Rlchfleld, Inc.

Computers such as this one for satellite communications are commonly used aboard modern merchant ships for automation of many tasks

as vehicles, forest products, and refrigerated cargo represents a large area of trade in which U.S. shipping companies have almost no presence. Export of perishables and grain should be high on the opportunity list. One respondent suggested that the presence of a U.S. cruise ship operator in the Caribbean trade would be desirable.

Question 4:

What Federal policies and programs have a significant effect in encouraging or inhibiting technological innovations in U. S. shipping?

The opinion of half the respondents was that, in general, substantive, long-term changes are required in U.S. maritime policies affecting the shipping industry. However, there was no agreement on what these policy changes should be. Policies that tend to reduce the size of the U.S.-flag fleet also will tend to retard innovation. Long-term stability also was mentioned as being needed for reducing the risk for new investment. The current rapidly changing policy environment creates uncertainty.

Four respondents indicated that ship construction and operating subsidies have impeded innovation and investment in U.S. shipping during the past several decades. Either removal or restructuring the subsidy programs to encourage investment of new ships was recommended.

Three respondents noted the following areas of concern:

- "buy America" provisions for building and repairing ships are considered excessive Government intervention;
- U.S. Coast Guard (USCG) regulations are unnecessarily restrictive, particularly where they exceed international standards;
- labor policy should be directed toward reduction of U.S. manning and watchstanding requirements; and
- MarAd R&D programs should be directed toward industry cooperative efforts with "front-line' shipping organizations rather than consulting firms and academic institutions. In general, the level of research activity should be increased.

MARITIME R&D

The majority of direct Federal Maritime R&D support his been provided by MarAd, augmented by support from USCG for work falling within its jurisdiction. U.S. Navy R&D frequently benefits the maritime industry as a whole, and thus the U.S. Navy program is watched carefully for fallout that will benefit the merchant marine. As one example of cooperative effort that has been in effect since World War II, the NAS Ship Structures Committee is supported jointly by MarAd, USCG, the

Naval Sea Systems Command, the Military Sealift Command (MSC), and the American Bureau of Shipping (ABS).

MarAd R&D Program

Most federally sponsored R&D that is applicable to merchant ship design, construction, and operation is that currently funded by the MarAd R&D program.

The relative costs of the various aspects of MarAd R&D are indicated in table 38, listing fiscal year 1982 procurements as percentages of the $14.45 million total.

These funds include both cost-shared projects and projects that are interagency reimbursable. It can be seen that shipbuilding research, cargo-handling, and CAORF* account for two-thirds of the total budget with all other areas of R&D making up the remainder. A brief examination of the R&D results is contained in the paragraphs below.

[16] 'Research and Development Program Briefing, " Maritime Administration, U.S. Department of Transportation, Jan. 27, 1983.

*CAORF is a ship's bridge, harbor, and navigation systems computer-assisted simulator, located at MarAd's Kings Point, N.Y. facility. It is used to study ship control, navigation, and maneuvering and new devices for safe operations. It also is used for operational training.

Table 38.—Relative Costs of Maritime Administration R&D (fiscal year 1982)

Research area	Percent total
Shipbuilding research	26.09
Ship machinery	6.25
Fleet management	5.83
Ship performance and safety	3.07
Cargo-handling	12.58
University research	1.72
Structures (ship structure committee)	0.24
Arctic technology	2.50
Marine science	1.95
Navigation/communication	6.54
Advanced ship systems	1.69
Computer assisted operations research facility (CAORF)	28.59
Port and intermodal development	1.81
Market analysis	1.16

SOURCE: US. Maritime Administration, 1983

The National Shipbuilding Research Program

The shipbuilding productivity aspect of the MarAd program is essentially the National Shipbuilding Research Program (NSRP) being carried out with joint sponsorship of SNAME and a number of shipyards and other members of the maritime industry. This program is considered effective by most participants, and the joint industry/Government cost-sharing approach has been cited as a mechanism that assures resources are applied to the most pressing problems.

The program currently is conducted on a cost-sharing basis with four major shipyards: Todd Pacific Shipyard, Avondale Shipyards, Inc., Bath Iron Works, and Newport News Shipbuilding. Todd is working on improved outfit and production aids. Avondale is working on improved surface preparation and coating and the feasibility of incorporating process lanes in U.S. shipyards. Bath is developing shipbuilding standards and improved production methods, and Newport News is working on design/production integration methods and on welding productivity and quality. This program was instituted in 1973 by the Ship Production Committee (SPC) of SNAME, the cooperating shipyards, and MarAd. Some important advances in ship production technology have resulted.

One element of the program involved setting up the Institute for Research and Engineering Automation and Productivity in Shipbuilding (IREAPS). IREAPS is a not-for-profit organization of shipbuilders and other members of the maritime industry set up to facilitate contracting procedures and the dissemination of information resulting from NSRP.

The SPC and IREAPS have prepared "The Five-Year National Shipbuilding Productivity Improvement Plan (1983 -1988 [17] This plan was prepared under the guidance of a steering commit-

[17] "The Five-Year-National Shipbuilding Productivity Improvement Plan (1983 -1988)," prepared by the Ship Production Committee and the Institute for Research and Engineering for Automation and Productivity in Shipbuilding, March 1983.

tee composed of nationally recognized experts in the field of shipbuilding, including members from both Government and industry. Seven task groups participated in the preparation of this plan. The plan contains a large variety of proposals for shipbuilding research projects. The authors claim that it details a strategy for restoring the U.S. shipbuilding industry to a position of worldwide leadership, the structure of an implementing organization, a methodology for project development and screening, a means of measuring project performance, suggested sources of funds and a funding plan, and a procedure for plan review and adjustment.

The plan appears to provide a reasonable approach to many aspects of productivity research. Such research could contribute to a more productive and profitable shipbuilding industry in the United States.

Cargo Handling

The MarAd cargo-handling program is devoted mostly to the development, testing, and evaluation of techniques and equipment for handling and stowing military equipment aboard containerships. Fifty-one percent of the financing is provided by the U.S. Navy. Results so far have been the design and fabrication of very large transport units for a project called "Sea Sheds' that will permit containerships to carry a full range of military vehicles and equipment. Crane installations aboard containerships for handling Sea Sheds also are being studied. A significant portion of this work is financed by the U.S. Navy, and it is directed toward U.S. Navy problems.

CAORF

The operation of MarAd's CAORF, which is principally the bridge simulator with associated equipment, consumes a larger percentage of the MarAd R&D budget than the expenditures figure indicates. Of the 1982 total of $4.13 million spent on CAORF, $2.61 million was for operation, maintenance, and engineering support; only $142,000 was expended directly for outside agency project work. The remainder presumably was used for MarAd project work, although the output from this remaining $1.38 million expenditure is not readily identifiable in MarAd program summaries. The output of this facility has not been evaluated adequately. Its cost appears to exceed the importance of this type of research relative to the overall MarAd program.

CAORF has absorbed a major part of MarAd R&D program funds over the last several years. Despite the fact that the construction of this facility was based on conducting research work, its primary use has been for training that might have been accomplished more economically by other means.

U.S. Navy R&D Related to the Merchant Marine

There are a number of areas where the work being done by the U.S. Navy is directly applicable to merchant work. It is assumed that U.S. Navy R&D will continue to be funded adequately. So long as there are no security problems involved, it is important that those efforts that produce results of value to the maritime industry are made available to the industry.

Ship hydrodynamics encompasses hull-form configuration for minimum resistance and maximum seaworthiness, frictional resistance of the hull, propulsion system performance, interaction between propeller and hull, performance of maneuvering system elements (including rudders and maneuvering propulsion devices), performance of bilge keels and other antiroll devices, and hydrodynamically induced noise and vibration. The U.S. Navy has active R&D in all of these areas, including both in-house R&D and contract work under the General Hydromechanics Research Program. 18 The results of these programs are generally applicable to merchant ships and, except for a few programs related to hydrodynamic noise, most results are available directly to the maritime industry through reports.

The only hydrodynamic research probably required on merchant ships that is not covered by U.S. Navy programs is that related to inshore maneuvering and docking in rivers and harbors, particularly of large-beam, shallow-draft vessels. However, there is research on ship mooring loadings sponsored primarily by the Naval Facilities Engi-

[18] "General Hydromechanics Research Program," fiscal year 1983, Ship Performance Department, David W. Taylor Naval Ship Research and Development Center.

neering Command, and the results of work in this field are equally applicable to both naval vessels and merchant ships, In fact, the U.S. Navy has a specific interest in merchant ships that are moored for long periods at advanced base locations as part of the Rapid Deployment Forces supply system. 19

Navy structures research that is related to merchant ships is carried out primarily by the NAS Structures Committee, which the U.S. Navy sponsors through both the Naval Sea Systems Command and the MSC. Other research on ship structures carried out by the U.S. Navy in its own laboratories and under contract is devoted generally to studies of special materials or to structures subjected to high-submergence pressures. This latter work is not of any particular interest in merchant ship construction.

Shipbuilding productivity is of as much interest in the construction of naval vessels as in the construction of merchant vessels. The U.S. Navy has supported the joint SNAME/MarAd/Industry programs and also has encouraged private shipyards to incorporate high-productivity techniques in naval construction. Several technological advances in this area have been attained on military construction projects. 20 Many yards have adopted computer-aided design and manufacturing (CAD/CAM) systems in some portion of their operations. Several yards have begun implementing zone construction and outfitting techniques, in some cases utilizing Japanese consultants to evaluate the most suitable process. Since the U.S. Navy is now, and for the near future will continue to be, the principal customer for U.S. shipyards, productivity improvements here are most important to reduce the cost of military ships.

Computer-Aided Design and Manufacture

The term CAD/CAM is commonly used to refer broadly to the use of computers in industrial design and manufacturing. Currently the most sophisticated systems are "integrated information systems' that encompass product definition as well as engineering and manufacturing configuration control. It is recognized now that a key factor in the successful utilization of CAD/CAM technology is developing a product definition database with the ability to communicate with other information systems. During the past decade, MarAd and the U.S. Navy have been promoting the transfer of this technology into the shipbuilding industry. Directly and indirectly as a result of these efforts, a variety of incompatible software systems have been instituted and now must be integrated.

A recent study conducted for the U.S. Navy by the National Research Council (NRC) found that new applications of CAD/CAM in the last decade have resulted in applications over a broad range of industries internationally. Over 25,000 workstations are in use worldwide in all industries today. The Navy Shipbuilding Technology Committee of NRC concluded that less than 500 CAD/CAM workstations are in use by the U.S. Navy and shipbuilders in the United States currently. The major findings of the committee were:

- Navy and MarAd support for NSRP should be continued;
- the productivity of the U.S. shipbuilding industry for commercial vessels is one-half that of foreign competitors. Naval vessel construction productivity was not evaluated; and
- CAD/CAM applications in U.S. shipyards have resulted in reductions in fitting and welding costs to date. The U.S. Navy is in a good position to resolve CAD/CAM issues to foster its rapid application in shipbuilding in conjunction with the industry.

The NRC study specifically recommends CAD/CAM technology as a method for improving the relative productivity of shipbuilding design and production. Computer hardware and software companies in the United States have developed state-of-the-art CAD systems that have an important share of the world market. U.S. commercial yards utilize this technology to some extent. NRC esti-

[19] "Forces and Moments on Ships To Be Moored at Diego Garcia" prepared by Robert Taggart, RT-4 1401, submitted to Chesapeake Division, Ocean Engineering and Construction Project Office, Naval Facilities Engineering Command, July 1980.

[20] "Shipbuilding Productivity: Something is Being Done, discussion by Peter E. Jaquith, Bath Iron Works, panel discussion at the joint ASNE, Flagship/SNAME, Chesapeake Section meeting on Jan. 18, 1983

[21] "Productivity Improvements in U.S Naval Shipbuilding," Committee on Navy Shipbuilding Technology, Marine Board Commission on Engineering and Technical Systems, National Research Council, National Academy Press, Washington, D, C,, 1982.

mates that 1 to 5 percent of shipbuilder design and drafting tasks are conducted with CAD assistance. Additional tasks can be incorporated in the future when database information necessary to utilize the CAD system potential becomes available.

The U.S. Navy, both inhouse and through design agents, creates thousands of drawings and design reports when designing a ship and establishing its specifications. These are then passed to the contracted shipbuilder in paper form as a design information package. The same hull geometry is redrawn and manipulated by many engineers and designers in different organizations prior to shipbuilder preparation of production plans. The shipbuilder then manually reviews the design paperwork to complete material and equipment ordering, develop schedules, and other activities. To date, computers have been used for such design calculations as preparing hydrostatic curves, powering and stability analysis, longitudinal strength calculations, structural design, and structural finite-element analysis.

The use of integrated CAD/CAM has not been implemented fully in the world shipbuilding industry. However, according to a report prepared by A & P Appledore, Ltd., for this study, the European, Japanese, and Korean yards are considerably more advanced than U.S. shipyards at the present time.[22] The Appledore report concludes "a necessary adjunct of installing CAD/CAM is that all design and drawing offices and the loft (shipyard layout functions) must be brought together." While shipbuilding shares many design and construction requirements with other production industries, it has three unique features. They are:

- the use of a single set of technical and production resources with overlapping contract cycles. The products of a typical production line often are quite different from one project to the next. Completely standard ships and series production are more the exception than the rule;
- the large variety of hull-surface geometries that must be matched with hull-volume and payload constraints; and
- the amount of data required to generate an accurate definition of the spatial geometry of the hull and its stiffening structure and foundations is very large compared to other industries.

The potential benefit of CAD/CAM technology to the shipbuilding industry is improving productivity by reducing the direct labor contribution and facilitating coordination of management and engineering functions during the shipyard production phases. Reliance on the traditional paper mode of product description produces a slow rate of information flow. Tighter schedules and increased control of production results from increased information flow. Real productivity improvements can be realized from more efficient planning, scheduling, and sequencing of the work processes of manufacturing, inspection, and testing of the ships' subassemblies.

CAM packages have been developed in a number of countries (including most West European shipbuilding countries, Japan, and the People's Republic of China), but with initial use in their domestic yards only.

Now, however, a number of them are being exported. AUTOKON (from Norway) and FORAN (from Spain) have the highest export sales. Japan has actively promoted the export of their shipbuilding technology abroad. A Japanese shipbuilder, Ishi Kawajima, Harima Heavy Industries Co. (IHI), is under contract to Avondale Shipyard and Bath Iron Works. Several U.S. yards have acquired versions of the Norwegian AUTOKON system as well as a number of additional systems. Examples of systems used by U.S. yards are:

Avondale:
- CADAM (drafting system) by Lockheed Corp.
- AUTOKON by SRS, Norway
- SPADES by Gali Associates, United States

Newport News:
- CADMAN by Lockheed Corp.
- AIDS (topological model) by Italcantieri, Italy
- AUTOKON by SRS, Norway
- AD 2000 (drafting system), by Newport News

Electric Boat:
- AUTOKC)N by SRS, Norway
- AIDS by Italcantieri
- CADDS 4 (drafting system) by Computer vision

Each shipyard now must integrate the variety of software they own; however, no U.S. shipyard has

[22] "Technical and Capability Developments in Shipbuilding, prepared for the Office of Technology Assessment by A & P Appledore Ltd., Document No. OTA: OOO1, November 1982.

accomplished the necessary integration. Appledore, in its report to OTA, identified the importance of focusing on a broader range of database and software capabilities to obtain the full potential savings from CAD/CAM implementation. Increased productivity accrues from creation of one common database and then using it in several different shipbuilding applications such as lofting, weight estimating, vibration analysis, hull geometry, lines definition, material requirernents, and production management. Major U.S. companies in other industries such as General Electric Corp., Boeing Corp., and General Motors Inc. are committed to moving from product definition on paper to product definition in electronic form. Today the most sophisticated systems are part of integrated information systems that encompass product definition, engineering configuration control, manufacturing, purchasing, materials planning, quality assurance, and customer acceptance testing.[23] A system for shipbuilding would include the following typical modules:

- geometric design and manufacturing:
  - steelwork geometry and hull-form generator,
  - piping and electrical cable-routing system,
  - accommodation design system;
- design analysis:
  - naval architectural design analysis,
  - finite-structural-element model-analysis package; and
- management information and control:
  - material/drawing/work information database,
  - contract management package (network analysis)
  - purchasing and expediting system,
  - man-hour recording and job scheduling system,
  - material control system, and
  - estimating and forecasting system

Technological Innovation

Technological innovations in ship production and ship operation do not necessarily stem from R&D programs such as those cited earlier. These innovations often are the result of an operator or design office observing a requirement or a potential market and evolving a design, selecting from available R&D results, to meet the need. This results in an innovation moving from the drawing board to shipyard production and into operation. Classic examples of this are the containership, LASH, Seabee, and the various seagoing tug-barge systems. Incorporation of technological innovations applies to subsystems as well as to total ship systems, e.g., the Ebel mechanical guy or split-vang cargo-handling gear, dockside container-handling systems, and bow thrusters for inshore maneuvering control .24 There seems to be no apparent reason why this trend will not continue to apply in the future as it has in the past.

This is not to say that R&D programs are not important but that they should be recognized for what they are. As an example, laser photogrammetry is a development resulting from the combination of research on lasers and research in the science of obtaining reliable three-dimensionial measurements from photographs. When laser photogram - metry is applied to the fabrication and precise mating of two hull sections in a shipyard, this becomes an innovation in ship production technology.

Federal Role in R&D

There is obviously some overall national need for maritime R&D. An important part of such research should be a continuing assessment of those areas where technological innovation can be applied to acquiring a greater share of the world maritime transportation market and a greater share of the world shipbuilding orders. Additionally, the R&D should include an ongoing evaluation of the work going on in marine and other fields (both U.S. and foreign) that can contribute to applicable technological innovation. This should be supplemented by programs to incorporate these innovations into design, production, and training programs that would lead to building and manning ships, as well as selling ships to other maritime powers to assure the United States an improved posture in world shipbuilding and ship operations. Both long-term

[23] 'Productivity Improvements in U.S. Naval Shipbuilding, " op. cit. , p. 47,

[24] "Inno\ation in the Maritime Industry, op. cit.

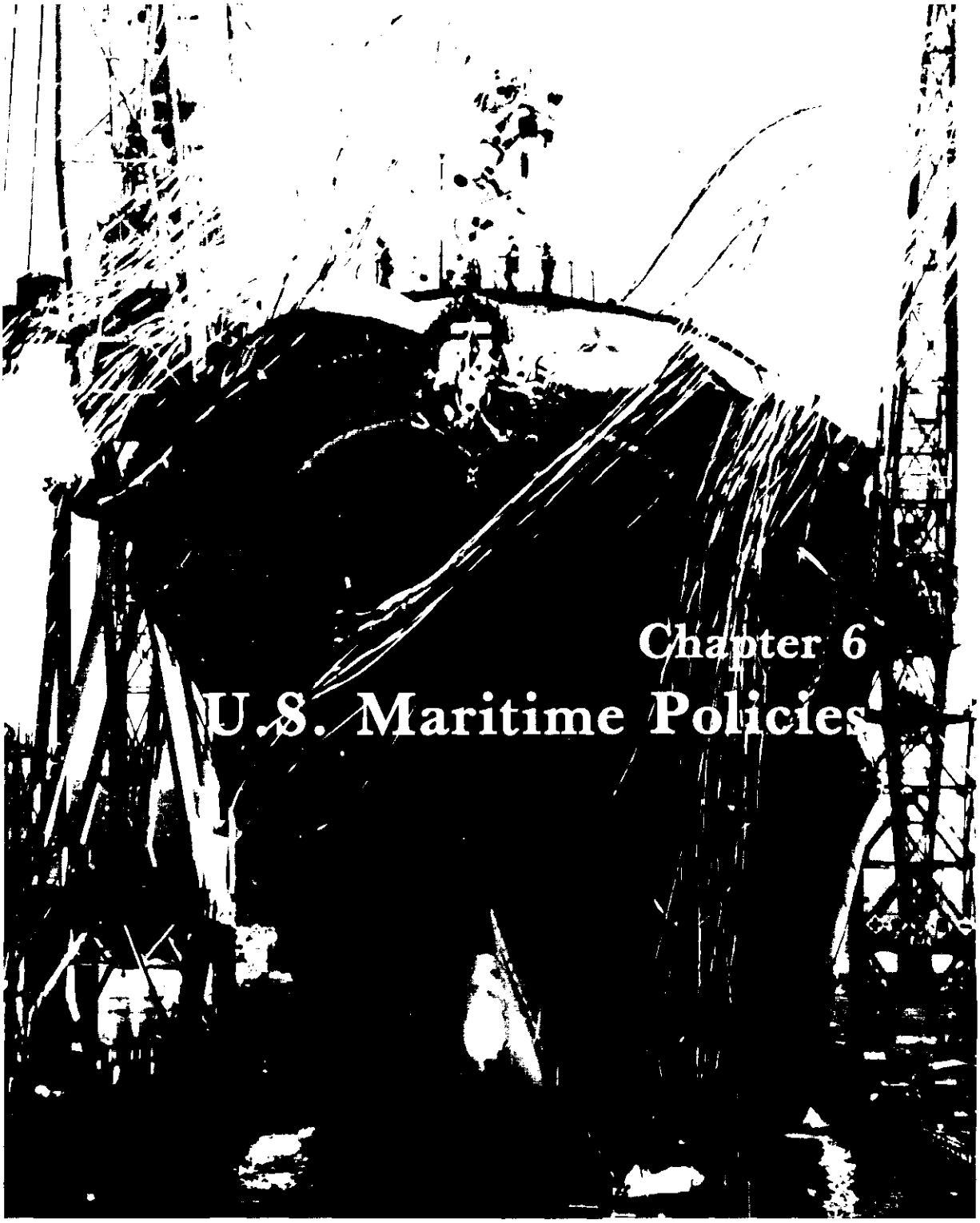
financial support and a research plan are needed to assure effective utilization of resources.

There are several basic problems associated with existing Federal maritime R&D programs. First, since there is no comprehensive policy defining the Federal role in maritime affairs, there also is no clear policy regarding the Federal role in maritime R&D. While the Federal approach to industry promotion has changed drastically in recent years, there appears to be little attention given to the resulting effect on R&D. The program now under the authority of MarAd has no clear focus nor set of long-range goals. This program is much too small to be expected to address in depth the broad range of technical problems in the maritime transportation business. Furthermore, there is no rationale for selection of a few projects as worthy of Federal support while others are left for industry or some other research enterprise. For example, the MarAd program is skewed toward supporting an expensive computer-aided ship-maneuvering-simulation facility that has several counterparts in industry. And, shipbuilding productivity research, while a good program, is difficult to justify as a MarAd effort when U.S. shipyards are building only military ships, and a major MarAd policy initiative is to promote foreign building of U.S. merchant ships.

For the future, it would be useful to define the Federal role in maritime R&D before additional funds are allocated and before a program is designed. As discussed in this chapter, near-term needs for energy-saving and automation technology are being addressed by numerous industries and private research groups worldwide. A broad range of new maritime technologies have been developed in a number of other countries and are readily adaptable. The U.S. Navy and other Federal agencies spend considerable funds on basic and applied maritime research problems, and applicable data can be transferred.

The future Federal role in maritime R&D should be based on a few overall principles:

- the Federal role in R&D should be a subset of an overall maritime policy;
- the Federal research effort should consider and exclude what U.S. industry can better do itself. There may be considerations of indirect incentives for industry R&D;
- the Federal effort should include methods of coordination and transfer of technology within the industry and from military, foreign, and other sources; and
- the Federal effort should focus on long-range problems and high-risk areas that are not addressed adequately by industry or elsewhere, the solution of which could contribute to overall national goals.



Chapter 6
U.S. Maritime Policies

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Chapter 6
U.S. Maritime Policies

OVERVIEW

An array of Federal policies and programs has been established in the past with the goal of aiding, assisting, or promoting the U.S. maritime industry. It is widely held that most of these policies are ineffective under current conditions and that major changes are needed. Some significant changes, most notably in funding cuts of subsidy programs and relaxing of some "buy America' provisions, have been instituted by the present administration over the past 2 years. Also, a regulatory measure to provide increased antitrust immunity and greater flexibility for U.S. liner operators to compete with foreign shipping is working its way through Congress. *

However, many argue that the United States has no overall, coordinated, consistent, and effective maritime policy that is based on today's challenges and problems of future survival for the U.S. maritime industry, nor is it directed toward assuring that future national needs are met. Clearly, existing maritime policies are a patchwork. The Federal role in maintaining an industrial base, assuring competition, and coordinating national and international initiatives, is poorly defined. The administration has spent 2 years in an attempt to articulate a new maritime promotional program. The result has been announcements of a variety of program elements with a promise of more to come. 1 Several of these elements were incorporated in a draft bill to amend the Merchant Marine Act of 1936 and were submitted to the Senate on April 8, 1983.[2] The legislative package is being considered in H.R. 3156 in the House and in S. 1038 in the Senate,

This chapter will describe briefly the development of the more significant maritime policies that exist or are part of major current debates. It will also discuss some important future considerations covered in previous chapters and will compare existing maritime policies with other transportation policies. Separate sections will discuss subsidy policy, maritime regulatory policy, taxation policies, and cabotage policies.

"The Shipping Act of 1983 passed the Senate as of Apr. 4, 1983.

[1]See "Initial Elements of Maritime Policy Announced by DOT, " May 1982; and ' 'Lewis Announces Additional Elements in Administration Maritime Policy, August 1982.

[2]Letter from Secretary of Transportation to President of the Senate, Apr. 8, 1983.

DEVELOPMENT OF MARITIME POLICY

General History

It is possible to trace maritime policy development from the beginning of the Nation. For example, in his second annual address to Congress on December 8, 1790, President George Washington said:

> I recommend it to your serious reflection how far and in what mode, it maybe expedient to guard against embarrassments from these contingencies, by such encouragements to our own Navigation as will render our commerce and agriculture less dependent on foreign bottoms. . . .

One of the first acts of the First Congress of the United States dealt with the promotion of industry, trade, and shipping. Between 1789 and 1828, over 50 additional statutes and commercial treaties were approved to protect and promote American shipping. Since that time, Federal assistance in support of the Nation's maritime industry has been a constant of Government policy, including the Tariff Act of 1789, the Cabotage Law of 1817, the

Reciprocity Act of 1828, Government mail contracts in 1845, the Subsidy Act of 1891, the Military Transportation Act of 1904, the Shipping Act of 1916, the Merchant Marine Act of 1920, the Merchant Marine Act of 1928, the Intercostal Shipping Act of 1933, Public Resolution 15 in 1934, the Merchant Marine Act of 1936, Public Laws 480 and 664 in 1954, the Merchant Marine Act of 1970, and the Trade Act of 1974.[3]

Since the 1930's, U.S. maritime policy and the development of U.S. maritime industries have been influenced heavily by the philosophies of Admiral Alfred T. Mahan, which were published in 1918 in his book, *The Influence of Sea Power Upon History, 1660-J783.* In essence, Mahan held that national power was dependent on sea power and that sea power consisted of merchant ships, naval vessels, and the necessary supporting bases and industries.

Prior to the passage of the Merchant Marine Act of 1936, the U.S. merchant marine was at a low ebb. Inconsistent Government policies had discouraged capital investment, and a subsidy system tied to mail contracts proved to be ineffective. The Merchant Marine Act of 1936 was modeled after the Mahan philosophy and provided for Government subsidies to U.S. maritime industries.

Following 1936, the role of the maritime industries was perceived as vital and heroic during World War II and the Korean and Vietnamese conflicts. The performance of the maritime industries in World War II enabled America to sustain a two-front war across both the Atlantic and Pacific Oceans. Due primarily to the running start afforded by the Merchant Marine Act of 1936, the country produced 5,500 merchant ships for the war effort. Both the shipbuilding and operating industries cooperated in the construction and operation of the wartime merchant fleet. The merchant marine was the only civilian industry directly exposed to the combat of war. The extent of the involvement is evidenced by the fact that by 1943 there were a total of 130 ship-operating organizations, called general agents, serving the U.S. Government. * The U.S. Army utilized 330 ports of debarkation for over 7 million troops and 268 million tons of cargo.[5] With only 14 percent of the world's merchant tonnage at the start of World War II, the U.S. fleet grew to 60 percent of the world tonnage after the war. The experience of World War II is relevant because it has a profound and continuing influence on the policy and performance of our maritime industries.

In all statements of policy or purpose of past major maritime legislation, the *national defense* is mentioned first. This is not surprising when the timing of the acts is considered. The Shipping Act of 1916 followed the outbreak of World War I in Europe in the summer of 1914. At the time, the United States was dependent on foreign-flag vessels for 90 percent of its foreign trade. As foreign vessels disappeared from the sea lanes, U.S. cargoes were left rotting on the piers. In August 1914, Congress acted to allow the registration of foreign-built ships. By 1916 the experience was fresh in the minds of both the public and the legislators. The motives underlying the legislation of 1916 were stated in historical texts as "fear of trusts and monopolies; realization of inadequacy of the U.S. fleet for commerce, particularly in times of emergency. . . ."[6]

The Merchant Marine Act of 1920 was enacted basically to dispose of Government-owned ships constructed for World War 1, most of which were delivered after the war was over. Here again, this policy was conceived and enacted in a war environment.

The Act of 1936 was passed at a time when Europe was on the brink of war, and the United States saw the need to prepare. The Act of 1936 resulted after 15 months of debate and the compromise of many disparate points of view. Although the pending war was the primary motivation behind passage of the act, it included promotional features which encouraged investment in both the operating and building industries.

In retrospect, the Act of 1936 was most appropriate for the times. The policy it espoused served the Nation well in the ensuing 10 years. It was undoubtedly the headstart afforded by the Act of 1936 that allowed the United States to respond so rapidly

[3]Irwin M. Heine, "The United States Merchant Marine: A National Asset' (Washington, D. C.: National Maritime Council, July 1976).

[4]McDowell & Gibbs, Ocean *Transportation (New* York: McGraw-Hill, 1954), p. 452.

[5]Ibid., p. 445.

[6]Ibid., p. 412.

to the merchant ship demands of World War II. The Act of 1936 was a useful policy for its time, but many believe that its time is past.

Policies for the Future

In the future, the most effective U.S. maritime policies will be those that can respond to changing conditions of the industry and competition, changing conditions of trade and technology, and changing conditions in the international arena.

Virtually all maritime nations provide direct or indirect aid to their merchant fleets and shipbuilding industries. Assistance may include operating subsidies, construction subsidies, trade-in allowances, official low-interest loans, interest subsidies, official loan guarantees, accelerated depreciation, tax-free reserve funds, duty-free imports of required materials, cargo preference, and cabotage. In addition, social, economic, and political assistance may be provided. Examples include schools for training merchant seamen, hospital and medical care for seamen, social security family payments, and laws requiring that materials and component parts for ships be acquired from domestic sources.

A recent report prepared by the Maritime Administration (MarAd)[7] describes maritime policies of 48 nations. It contains examples of many approaches to industry assistance, reflecting the concern of other nations for the support of their merchant marine. It should be recognized that the international competitive nature of shipping and shipbuilding makes it imperative to consider relative influences of many other governments on the viability of the U.S. maritime industry.

Industrial Changes

Some recent analyses have concluded that major changes have taken place in industrial America. Plants and factories that closed because of reduced consumer demand are being replaced by modern, more automated facilities or, in many cases, the work has been exported to low-cost foreign countries. Several recent studies claim that the United States is in a transition period from an industrial society to an information-based society and that the production of industrial hardware is irretrievably moving out of the country toward those countries with low wage rates.

The same studies project that the U.S. economy is moving away from self-sufficiency and that all the industrialized countries, including Japan and Germany, are deindustrializing. There appears to be some evidence of this in the maritime field with Korea emerging as the second largest shipbuilder in the world and with significant amounts of its business diverted from Japan.

The predictions about U.S. deindustrialization could significantly affect the maritime industries. An example is the well-known disadvantage of high-cost labor in both our ship-operating and shipbuilding industries. Despite a myriad of studies with proposed solutions, the problem remains as chronic today as when it was first perceived. Therefore, some believe that the tide of inevitable change in our maritime industries will be met from the bottom up by entrepreneurs and scientists with creative new solutions.

It appears that if U.S. ship operators are to compete in the future, it will require new breakthroughs in vessel design and system operation that increase efficiency and system capabilities. Shipyards, as well, will become competitive only through innovative approaches, products, or marketing. Future policies— if they are to benefit the Nation—must allow and encourage a high degree of innovation.

National Defense

The future of the maritime industry is important to the national defense. The Department of Defense (DOD), with assistance from MarAd, is in the process of defining specific national defense needs for ships and shipbuilding. Two separate studies were initiated early in 1983. One addresses the possible wartime demands for and existing capabilities of the U.S. shipyard mobilization base, and the other examines similar demands and capabilities of the U.S. sealift (merchant shipping) base. Neither was released as of September 1983, but initial findings of the shipyard study were discussed in a paper in May 1983.[8] Policy proposals in that paper

[7] U. S. Maritime Adm inistrat ion, "Maritime Subsidies, February 1983.

[8] R. V. Buck, ' 'Maritime Policy Formulation: Preservation and Enhancement of the Maritime Industrial Base, " presented to the Senior Officers' Forum, Naval Amphibious School, May 1983.

varied from support for broadly based cargo preference to preserving the Jones Act to suggestions for more study.

The second study—examining sealift needs and capabilities— is based on a projected scenario specifying military requirements to deploy and support forces under wartime conditions. The requirements do not include support to U.S. mainland industry or civilian activities. The study assumes that ships of several fleets-Military Sealift Command (MSC) fleet, U.S.-flag active commercial fleet, U.S. defense reserve fleet, fleets of U.S. allies, and the U.S. Effective Control fleet-all would be available under appropriate time constraints. The general conclusion of the sealift study, as discussed informally, is that the collection of all shipping assets that probably would be available to the United States in a national emergency are "marginally inadequate.

Following the release of both of these reports, DOD intends to conduct a separate analysis of specific national objectives to support a certain level and type of a shipbuilding and sealift base to meet the defense needs described. The method of support of those objectives are key elements in any future U.S. maritime policy. The release of both reports is scheduled for late 1983. They should serve to clarify defense needs and identify approaches to meet those needs.

Although there is continuing discussion of the need for an active shipbuilding base and a strong merchant marine to serve the national defense, the concepts most often discussed are those of World War II and before. In a future war, there may be very different needs. Major conflicts today might result in the use of nuclear weapons; limited conflicts would require an existing force. This latter capability, insofar as it involves merchant vessels, probably can be met through continuous purchases of new and existing vessels for both operations and reserve. Whatever scenarios are postulated, policies must include a realistic appraisal of shipping and shipyard capabilities, a commitment of resources to maintain acceptable levels, and careful and continuous evaluation and support of the necessary reserves.

[9]Meeting with staff of the Secretary of Defense, Office of Program Analysis and Evaluation, July 27, 1983.

Although the Merchant Marine Act of 1936 cited a "Declaration of Policy, the exact meaning never has been defined in terms of specific national goals for maintaining a merchant fleet adequate to serve in a national emergency. Many believe that relatively few ships under U.S. registry today have the genuine capability to meet military needs. Containerships rarely are equipped with cranes to handle their cargo. There are few heavy-lift, breakbulk, or roll-on/roll-off (RO/RO) ships under U.S. registry, though these types are very useful for carrying military cargo. Industry spokesmen have suggested that defense features should be incorporated and continually maintained on the U.S.-flag fleet and that DOD should bear the cost of these features.

One of the most expensive national defense features (for large merchant ships) is the requirement that they be able to maintain cruise speed with a U.S. Navy task force deployed in time of war. In light of current design trends, it appears that the ability to maintain such cruise speed at adequate range will not always be present in ships constructed to be competitive on the open commercial market.

Such considerations of defense requirements needs to be more completely defined to devise national and international policies to satisfy those needs.

The U.S.S.R. Comparison

The Soviets have a large, modern, and diversified oceangoing merchant fleet consisting of 1,727 ships totaling about 19 million deadweight tons (dwt) (as of April 1983). While the number of ships is over three times the U.S.-flag fleet, the total tonnage is nearly the same. The Soviets, however, appear to have been much more successful than the United States in developing and maintaining a strong merchant fleet that has substantial military support capabilities. In addition, the Soviets recently have expanded their capabilities of serving commercial worldwide trade and, by offering low rates, have made substantial advances as cross-traders.

After the Cuban missile crisis in 1962, the U.S.S.R. carried out a series of fleet expansion and

[10]See "Recent Figures and Movements of Soviet Merchant Marine, a research department report by Mitsui OSK Lines, Ltd., November 1982.

modernization plans. As a result, the Soviet merchant fleet showed a fivefold increase to 1981. The growth in size of the fleet has slowed in recent years, but there appears to be a trend toward modernizing and diversifying—especially with additions of new flexible types of ships—RO/ROs, barge carriers, heavy-lift ships, and containerships—all of which have significant military adaptability as well.

The Soviets have been quick to recognize the military significance of these new commercial-type ships. Their fleet contains 50 RO/ROs totaling 510,000 dwt (the third largest RO/RO fleet in the world) plus a number of smaller vehicle/train ferries. The RO/ROs have stern ramps and decks strengthened to carry tanks. The newest designs, some of which are now under construction, have service speeds of 20 knots and ranges of up to 20,000 nautical miles. This compares to the U.S. fleet of 25 RO/ROs, totaling 380,000 dwt.

The Soviets possess five heavy-lift ships and five barge carriers of two types, both constructed in Finland. The lighter-aboard-ship (LASH) type carry 26 barges. The smaller type can carry either barges or patrol craft, and have heavy-lift capability. They are equipped with 350-ton-capacity gantry cranes. Also, construction of a new nuclear-powered LASH is almost completed. The Soviet containership fleet consists of about 125 vessels. Nearly all of their containerships have the ability to offload without port assistance.

The Soviet's new Five-Year Plan (1981-85) includes construction of many modern specialized ships replacing the older, smaller, general cargo ships. The trend is toward a smaller number of larger, more specialized ships with only modest growth in total fleet tonnage. To be completed by 1985 are about 250 vessels, including 50 containerships, 64 RO/RO ships, heavy-lift and barge car-

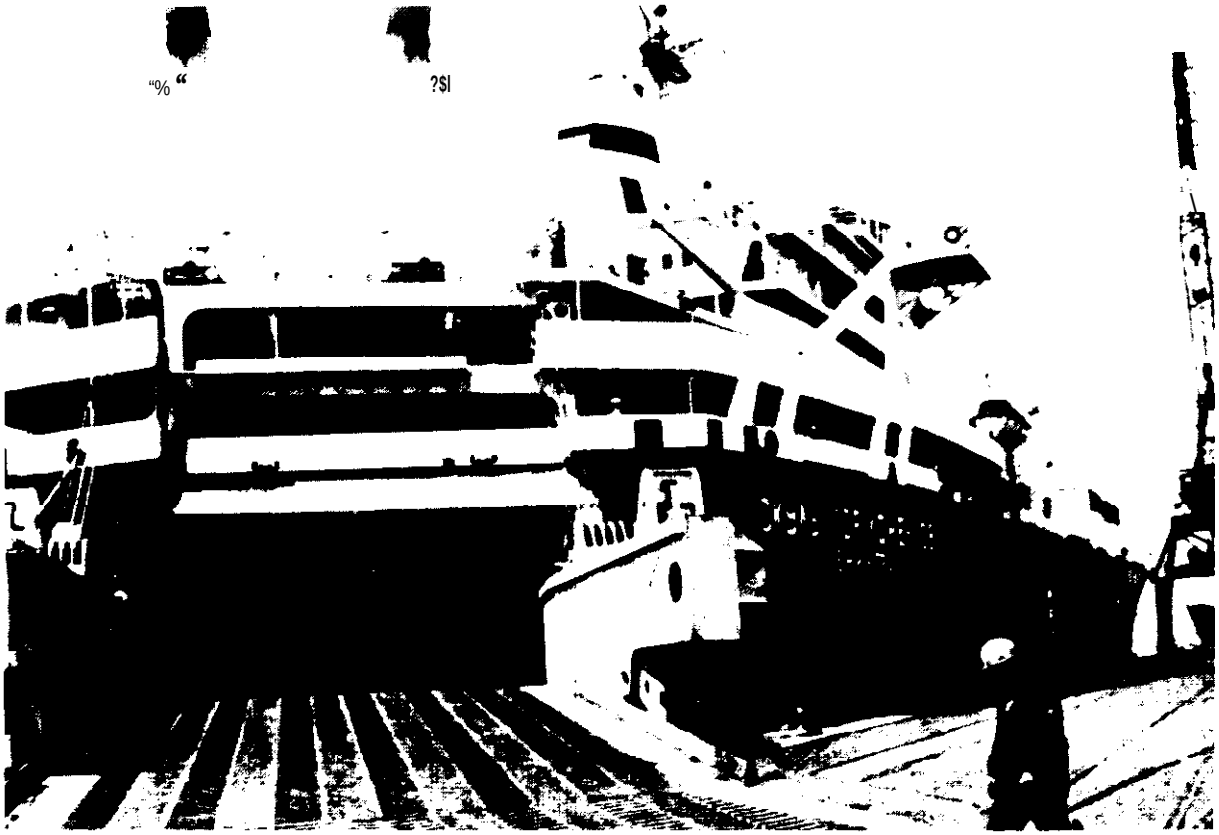

Photo credit: U.S. Navy

The Russian fleet of RO/RO ships is one of the largest in the world

riers (including nuclear-powered icebreaking designs), and over 1 million dwt of tankers.

Table 39 shows a comparison of the U.S. and U.S.S.R. merchant fleets as of April 1983. Of course, the Soviet merchant fleet is operated by the State under a system different from that of a free economy. This means that commercial operators from the United States and the rest of the free world cannot compete on an equal footing. Most of the Soviet merchant fleet is maintained within the U. S.S. R Navy's budget, and crewmen of merchant and naval ships are regularly exchanged to train seamen in line with naval strategic objectives.

The Soviet fleet does not operate on a commercial basis but exists to fulfill specific national goals of: contributing to military strategies, expanding influence over developing nations, strengthening maritime transport capacity for its own trades, and earning foreign currency through cross-trades. Many of these are similar to U.S. goals, but the U.S. Government is far less involved in any commercial activities. Therefore, the competitive position of U.S. operators may be influenced substantially by future Soviet actions, especially as they advance more and more into commercial shipping.

Table 39.—Comparison of U.S. and U.S.S.R. Merchant Fbets (vessels 1,000 gross registered tons and upward)

Type ship	U.S. active (numbeddwt)	U.S.S.R. (numbeddwt)
Cargo	271/4,948,000	1,355/11,647,000
Tanker	272/16,167,000	308/7,884,000
Passenger	11/62,000	64/142,000
When built:		
Cargo:		
1982 and prior	86	255
1983 through 1972	115	706
1973 through 1983	70	394
Tanker:		
1962 and prior	140	58
1983 through 1972	45	159
1973 through 1983	87	91
Passenger:		
1982 and prior	7	29
1983 through 1972	4	15
1973 through 1983	0	20
Speed by type: *14 knots or more:*		
Cargo	261	884
Tanker	259	197
Passenger	11	60

NOTE: The US. fleet includes only the privately owned, active oceangoing fleet (no reserve fleet). The Russian fleet includes only active oceangoing ships.

SOURCE: U.S. Navy, April 1983

U.S. maritime policy must be developed with a clear understanding of Soviet capabilities and participation in world maritime trade.

Comparison With Other Transportation Policy

Ocean transportation is a unique transportation industry, particularly in the foreign trades. Although some parallels can be found between foreign and domestic transportation, as well as international air and ocean transportation, in most cases the circumstances differ greatly, and meaningful comparisons are possible only in the academic environment.

To understand the differences, similarities, and bases for transportation regulation, it is first necessary to examine the history. The regulation of transportation in the United States can be traced directly to the late 1800's when American railroads were pushing into the last of the western frontiers. Between 1865 and 1870, there was an unprecedented burst of construction, centering on the Midwestern and western grain States. Competing lines were run adjacent to each other, and railroads were actively recruiting homesteaders to settle the surrounding land in hopes of creating business to pay for their investments. However, by the mid-1870's, the expectations of the new homesteaders had not been realized, and the railroads rapidly fell into disfavor. As one text noted, railroads "were no longer the pioneers of dawning civilization or the harbingers of increased prosperity; they were the tools of extortion in the hands of capitalists. 11

Antagonism toward the railroads and big business eventually culminated in the Act to Regulate Commerce (1887). This act—now the Interstate Commerce Act (ICA)—has served as the foundation of U.S. transportation regulation from 1887 until the present. The areas of rate regulation included in the Act of 1887 focused on such railroad abuses as unreasonable rate levels, service discrimination, rebates, and combines that destroyed competition. The act created the Interstate Commerce Commission (ICC). Part I of the 1877 Act applied to railroads; part II, added in 1935, applied to

11 Fair and Williams, *The Economics of Transportation* (New York: Harper, 1959), p. 429.

motor carriers; part III, related to water carriers, was added in 1940; and part IV, treating freight forwarders, was enacted in 1942. Air carriers were the only domestic mode of interstate commerce to remain outside the act.

A rise in freight rates at the turn of the century, plus continued abuses by powerful business interests, spawned a new round of regulatory bills. In 1903, the Elkins Act sought to improve the enforcement against rebating. The Hepburn Act of 1906 also focused on rebating and allowed the ICC to set maximum rates. Also, it prohibited carriers from carrying articles they produced. The Panama Canal Act of 1912 forbade railroads to own, lease, operate, control, or have any interest in water carriers operating by way of the canal.

It was against this background of active domestic regulation of transportation that the Nation began to focus on waterway transport. At the turn of the century, there were two aspects of ocean transportation that differed substantially from today. First, there was an active intercostal and coastal liner trade that was in competition with the railroads, and second, the United States, prior to World War I, was an extremely insular country, with little interest in foreign trade.

The Shipping Act of 1916, the primary regulatory law affecting ocean transport, was prompted by two specific conditions—the shipping shortage caused by the initiation of hostilities in Europe in 1914 and the country's general economic philosophy toward free and open competition. One part of the Shipping Act of 1916 applies to domestic transportation, the other to foreign transportation.

For domestic trades, the act applied similar principles of regulation to domestic water carriers as were applied to railroads competing for the same traffic. In the domestic sphere, the 1916 Act followed the lead of the ICA by setting maximum rates and prohibiting rebates, This authority over coastal and intercostal water carriers was shifted to the ICC by the Transportation Act of 1940 (part 111 of the ICC Act).

For international water transportation, the Shipping Act of 1916 applied some uniquely American regulatory principles to an international marketplace, However, the so-called Alexander Committee prepared an Investigation of Shipping Conditions under H. Res. 587 that preceded passage of the Shipping Act of 1916 and concluded that conferences and cooperative industry agreements should be allowed. The following statement was offered in the Alexander report:

> To terminate existing agreements would necessarily bring about one of two results: the lines would either engage in rate wars which would mean the elimination of the weak and the survival of the strong, or to avoid a costly struggle, they would consolidate through common ownership. Neither result can be prevented by legislation, and either would mean a monopoly fully as effective, and it is believed more so, than can exist by virtue of an agreement. Moreover, steamship agreements and conferences are not confined to the lines engaging in the foreign trade of the United States. They are as universally used in the foreign trade of other countries as in our own.

Based on the Alexander report, U.S. ocean carriers were allowed antitrust exemption in the 1916 Act under the provisions of section 15. The U.S. Shipping Board, predecessor to the Federal Maritime Commission (FMC), was given the power to grant antitrust immunity to shipping conferences and to approve, cancel, and modify proposed agreements.

The 1916 Act required all carriers by water in foreign commerce to file rates on all commodities except those carried in bulk. The remainder of the act gave considerable attention to the prohibition of rebating and discrimination.

Any comparison of regulatory and promotional policies among various transport industries must be based on the recognition that both are in transition. The domestic air, rail, and motor industries have been deregulated, including prohibitions concerning common ownership of various modes. Both the domestic offshore and foreign merchant fleets are the subject of pending legislation and administrative review.

The term ' 'deregulation, however, has different meanings and connotations when applied to different industries. For example, domestic air, rail, and trucking deregulation recently has been enacted as quid pro quo for the reduction of antitrust immunity while, in foreign ocean shipping, the legislative concept currently under consideration proposes lesser regulatory controls plus greater antitrust immunity.

Domestic waterway transportation has been regulated historically by the same principles as domestic rail and motor carrier transportation. There are some differences and anomalies:

- Where rail and motor carriers have been regulated by one agency, domestic water carriers have been controlled by two agencies—the ICC for Great Lakes, inland, and coastal; and the FMC for noncontiguous areas. For all practical purposes, there has been very limited ICC-regulated service because of the demise of the coastal and intercostal liner carriage and the lack of Great Lakes package services. Inland waterway service generally has consisted of bulk carriage, which is exempt. In recent years, increasing levels of Alaska trailer and container traffic have moved under ICC tariff as substitute water-for-motor carriage. Recent court decisions also have permitted ICC regulation of rail/water and motor/water intermodal carriage in the offshore trades (e. g., Puerto Rico),
- Regulation of domestic water carriers, where it has been exercised, has been primarily in maximum rate regulation, financial responsibility of passenger carriers, and in collective agreements, However, there are no conferences in the domestic trades. Historically, other domestic modes have been subjected to a higher degree of rate regulation, plus entry and abandonment regulation.
- Domestic water carriers are required by the Jones Act to employ U.S.-built vessels, manned by U.S. citizen crews, and owned by U.S. citizens. This restriction does not apply to the same extent to domestic rail, motor, and air carriage.
- In terms of promotion, domestic water carriers have had the benefit of Government aid in harbor improvement and aids to navigation. Subsidized vessels, however, are not allowed to serve the domestic trade except on waiver. Motor and rail carriers also have received significant Government aid in the form of highway construction and maintenance and in original land grants to railroads.
- The comparison of domestic water carriers with domestic air carriers is less relevant because the latter is engaged primarily in passenger transportation, while domestic water carriers engage almost exclusively in cargo bulk transportation. Historically, domestic air carriers have been more closely regulated than domestic water carriers, although the regulation of' air carriers has been greatly reduced.

Regulation and promotion of the shipbuilding industry can be compared with the aerospace and transportation equipment industries. Generally, there are few differences in terms of regulation, albeit different agencies are involved in approving the safety of the products they produce. In the promotional area, both the aerospace and shipbuilding industries benefit from military spending. The shipbuilding industry is unique in that it has been subsidized in the past through a construction differential subsidy (CDS) awarded to operators to cover differences in cost between U.S. yards and competitive foreign yards. The U.S. shipbuilding industry also is afforded a captive market by the Jones Act and benefits from other "buy America' policies not prevalent in the other transportation equipment industries.

In the international sphere, U.S. ocean carriers are subject to the provisions of the Shipping Act of 1916 and regulated by FMC. In comparison with domestic surface carriers, the U.S. international-ocean-carrier industry operates in an international market with unlimited entry, numerous state-owned or state-subsidized carriers, and a long history of accepted traditions and business customs.

The U.S. international air carriers are similar to U.S. international ocean carriers in that they operate in an international market, but they are dissimilar in that their major concentration is in passenger services as opposed to cargo services. In addition, international air carriers operate within a regime of bilateral agreements setting the rules for air commerce, while in shipping there are few intergovernmentally agreed on rules of competition.

In comparing domestic-surface-carrier regulation with U.S. international-ocean-carrier regulation, the differences have been primarily in the regulation of the entry of carriers and in rate regulation, with the domestic regulations being the more stringent. FMC has no authority to set or approve rates of ocean carriers in foreign trade but does require the filing of tariffs. Relative to the international-air-carrier and domestic-surface-transportation in-

dustries, the U.S. international-ocean-carrier industry has been comparatively unregulated.

U.S. Transportation Regulatory Concepts v. an International Market

The principal point in comparing domestic and international regulation is that the regulatory remedy for a domestic industry where all players can be regulated equally is completely different from the international arena where most of the players do not recognize American rules and usually cannot be forced to comply. The area of antitrust prohibitions and rebates has been the most troublesome. Even though the legislative history of the Act of 1916 shows that the framers of the act recognized the unique nature of international shipping and gave authority to the regulatory agency (i.e., FMC) to grant antitrust exemptions, the Justice Department frequently has fought the granting of such exemptions. Foreign carriers serving the U.S. trades are more likely to receive immunity to collaborate and rationalize their services than U.S. carriers. Attempts to do so by U.S. carriers have been met with stringent and frequent Justice Department protests and Government-initiated and financed litigation, as in the case of the attempted U.S. Lines/R. J. Reynolds merger. Deferred rebating, a common practice in ocean shipping worldwide, is prohibited in the U.S. trades and stringently enforced.

Prior to 1977, a number of U.S. and foreign companies allegedly engaged in illegal rebating activities within the established liner conferences of the time. FMC investigated these activities and, between 1977 and 1980, settled claims against 27 liner operators (21 foreign and 6 U. S.) and against almost 100 shippers. The amount of the individual claims ranged from about $5,000 to $4 million and totaled $15.6 million. The claims settled with the 6 U.S. liner operators totaled $7.4 million and with the 21 foreign liner operators totaled $5.1 million. 12 Many believe that this example illustrates the disparity of treatment of U.S. v. foreign operators under U.S. law. Certainly, in this case, foreign operators dominated the trade (by factors of two to three times) and were suspected of a major share of illegal rebating. Yet claims settled were much less. The contention is that U.S. laws cannot be evenly enforced in such an international business, and U.S. operators have a resulting economic disadvantage.

[12]Data on claims settled as of Dec. 31, 1980, obtained from the Federal Maritime Commission, General Counsel's Office.

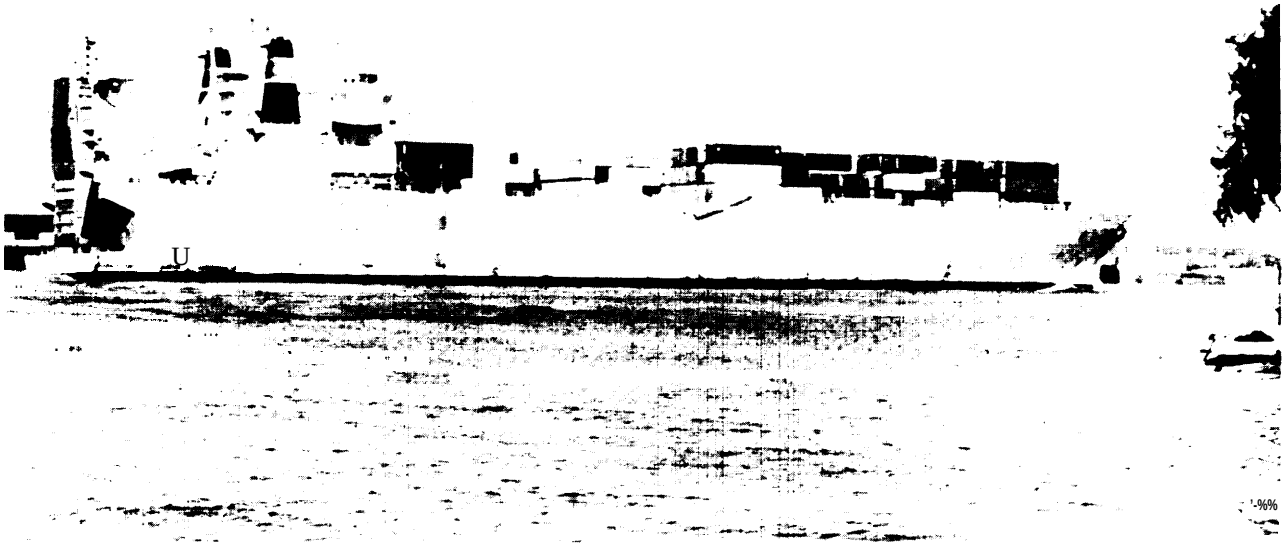

Photo credit: Pori of New Orleans

A Greek-flag liner ship entering the Port of New Orleans

The other anomaly involving the application of U.S. regulatory concepts is the existence and use of the Canadian and Mexican gateways. For instance, ocean carriers serving Montreal need not file tariffs with FMC for U.S. origin or destination cargoes and can form intercarrier agreements as necessary to serve the U.S. trade without disclosing relationships or receiving FMC approval. Foreign-flag carriers serving the United States through the Canadian gateway have maximum flexibility and have been able to charge differential rates, including marginal (noncompensatory) rates, to shippers in order to fill their ships. This same flexibility is not available to U.S.-flag carriers competing out of U.S. ports. In the United States, rates can be dropped immediately on filing, but rates cannot be increased without a 30-day filing notice.

Comparison of International Ocean and Air Regulation and Promotion

In comparing U, S.-flag international-ocean-carrier regulation and promotion with international-aviation carriage, there are essentially four areas that can be examined:

- rates and fares;
- mergers and acquisitions;
- entry requirements; and
- promotion.

Rates and Fares.—Both the Civil Aeronautics Board (CAB) and FMC require rate filing for scheduled service, and both recognize conference-type ratemaking, although CAB is backing away from routine acceptance of International Air Transport Association (IATA) airline agreements. By law, both agencies may grant antitrust immunity to ratemaking groups and in practice have granted this immunity after a hearing and full disclosure. CAB has authority to suspend or reject rates that are unreasonable, although the President may override the CAB decision. CAB seldom suspends rates in international service. Also, there are provisions in most bilateral air agreements that allow the designated authority to reject rates. FMC can find that rates are too high or too low and thus impede the foreign commerce of the United States, and it can order the carrier to discontinue charging that rate. However, it has rarely exercised this power over rates in foreign trade. Under the Controlled Carrier Act (CCA), FMC can suspend rates that it finds unreasonably low, and in fact has done so in several instances involving the Far-Eastern Shipping Co., a Soviet-owned cross-trading ship-operating company. Both agencies (CAB and FMC) regulate against rebates, and law dictates that both air and ocean carriers must adhere to published tariffs. According to case law, ocean-carrier rates must cover fully distributed costs.

Mergers.—CAB is required to approve airline mergers of U.S. airlines, but may be overruled by the President where international routes are concerned. FMC may not approve U.S. ocean-carrier mergers that are subject to antitrust laws.

Entry.—There is a basic difference in entry regulation in that U.S. ports are open to all ships of all nations (with the exception of some security considerations at some ports) that adhere to our laws. Air carriers, on the other hand, are subject to bilateral agreements limiting the number of flights and carriers that can enter a country's air space and that are granted landing rights.

Promotion.—Promotion includes subsidy and other measures to assist L[T]. S. carriers. Although CAB is authorized to provide direct subsidy to U.S. air carriers, as a matter of practice it does not, other than premiums on mail rates. The authorized air-carrier subsidy may be paid regardless of where the aircraft were built. On the other hand, most U. S.-flag ocean carriers are paid an operating differential subsidy (ODS) directly by the Maritime Subsidy Board (as specified in the Merchant Marine Act of 1936) only on ships built in the United States. The subsidy is technically a contract in which the carrier agrees to serve an assigned (i. e., ' 'essential' trade route and observe other specific operating constraints. However, MarAd is moving to phase out ODS by not granting new contracts and encouraging early termination of existing contracts.

As mentionied previously CDS has been paid to U.S. ocean-carrier operators to cover cost differentials for vessels built in U.S. shipyards. At the current time, no new construction subsidy awards are being made. There is no construction subsidy counterpart in the aviation industry.

Bilateral agreements reserving cargo also are considered forms of promotion. Aviation bilateral

agreements usually limit competition to carriers of the two countries and selected third-flag carriers but do not allocate market share. Equivalent competitive opportunities are afforded. In the maritime sphere, bilateral agreements tend to specify cargo shares to be carried by each trading partner. Bilateral agreements are the rule in international air transport and are the exception in U.S. ocean trade.

U.S. Government-impelled cargo-reservation policies for U.S.-flag ships could also be compared to Federal aviation policy, which requires all Government personnel to use U.S. airlines whenever possible on international travel.

U.S. Coast Guard Safety Regulations

The U.S. Coast Guard (USCG) plays an important role in promoting safety in marine transportation and has specific regulatory responsibilities in commercial vessel safety. Some of these safety requirements have been criticized by the maritime industry as putting undue burdens and excessive costs on U.S.-flag operators that foreign-flag operators do not have to comply with. Industry examples of these requirements are different for new vessels built in U.S. shipyards than conversion of foreign-flag vessels to U.S.-flag.

The most frequent complaint by the industry regarding new vessels is the increase in costs of both materials and labor associated with the application for USCG approval. USCG has not required that many materials be different from that desired by an owner or required by a classification society or Industrial Standard. However, the material control costs have increased because USCG requirements duplicated functions (i. e., certification and factory inspections) provided by classification societies or Industrial Standards, The net effect is that ' 'off-the-shelf' components have cost more merely because suppliers must provide evidence of USCG approval.

Other examples by the industry of burdensome safety regulations relate to indirect restrictions on their choice of suppliers. Although not specifically prohibited, less expensive foreign components may not be accepted when USCG does not recognize affidavits from foreign manufacturers. Compliance with USCG regulations has been shown to add approximately 3 to 4 percent to the construction cost of a new vessel. 13

The cost impact associated with USCG regulations on the conversion of a foreign-flag vessel to U.S. flag appears to be even greater. Typical industry claims are that some expenses are required solely to comply with USCG regulations and not because of the quality or suitability of the existing vessel. Examples of reflagging requirements are the replacement of all joiner work with approved materials (to meet stringent fire-protection standards); the replacement of lifeboats and lifesaving gear; and the replacement of electrical wiring. In many cases, new drawings requiring a lengthy approval process must be prepared to obtain USCG approval. Shipbuilders have estimated that USCG requirements can add approximately 4 to 5 percent to the cost of conversion of a relatively new foreign-flag vessel to U.S. flag.

In recent years, USCG has responded to concerns that their vessel-safety requirements are too burdensome compared with other major maritime nations. For example, USCG now accepts the American Bureau of Shipping (ABS) and other international classification societies' plan review, material certificates, and onsite inspections for both new and reflagged ships. 14

USCG believes that the commercial vessel-safety requirements for U.S. ships are coming more in line with international standards, such as those of the International Maritime Organization (IMO). IMO, formerly known as the Inter-Governmental Maritime Consultative Organization (IMCO), was established in 1958 through the United Nations to coordinate international maritime safety requirements. USCG has actively participated in IMO since its existence and believes that its efforts in the international arena have resulted in bringing the safety requirements of most other major maritime nations up to those imposed by USCG. The Coast Guard notes that some safety requirements in the past resulted in overregulating, but those have been replaced and, in some instances, other shipping na-

[13] E. K, p$_{es}$ti$_{mon}$ti, American President Lines, Ltd. , personal communication, Mar. 21, 1983.

[14] National Advisory Committee on Oceans and Atmosphere (NACOA), ***Marine Transportation in the United States,*** January 1983,

tions (i. e., Norway) now have more stringent requirements than the United States.

A 1979 study for MarAd entitled "Cost Impact of U.S. Government Regulations on U.S.-Flag Ocean Carriers, found USCG requirement costs to be smaller than generally perceived. In fact, the annual operating costs shown due to Coast Guard regulations were a small fraction of the vessels' total operating costs. The report analyzed the increased costs of two different types of vessels and found the increase to be less than 0.5 percent of the total cost. Since the analysis was written in 1979, IMO has imposed additional safety standards that may minimize the cost differences further.

It appears that what was once perceived as a major competitive detriment for U.S.-flag carriers is being resolved. However, most of the safety requirements imposed by the U.S. Coast Guard are based on statutory law, and if any changes to the existing requirements are needed, they must be made through legislation.

SUBSIDY POLICY

The Merchant Marine Act of 1936 has been the base on which the succeeding 45 years of U.S. Government maritime subsidy policy was built. Section 101 of the 1936 Act contains the following declaration of national policy:

> It is necessary for the national defense and development of its foreign and domestic commerce that the United States shall have a merchant marine (a) sufficient to carry its domestic waterborne commerce and a substantial portion of the waterborne export and import foreign commerce of the United States and to provide shipping service essential for maintaining the flow of such domestic and foreign waterborne commerce at all times, (b) capable of serving as a naval and military auxiliary in time of war or national emergency, (c) owned and operated under the U.S.-flag by citizens of the United States insofar as maybe practicable, (d) composed of the best-equipped, safest, and most suitable types of vessels, constructed in the United States and manned with a trained and efficient citizen personnel, and (e) supplemented by efficient facilities for shipbuilding and ship repair.

To implement this policy, direct construction and operating subsidy programs, based on U.S./foreign cost differentials, were established through the CDS and ODS programs. Direct cash payments from the Federal Government were to be provided to qualified applicants to defray the higher costs of shipbuilding and operation in the United States. The law required that subsidized vessels be manned 100 percent by U.S. citizens, while on nonsubsidized vessels the licensed crew had to be 100 percent U.S. citizens, and the nonlicensed crew 75 percent U.S. citizens.

An integral part of the ODS program was the concept of essential trade routes. Subsidy was provided only for vessels operating on assigned routes and observing assigned minimum and maximum sailings in services determined to be essential to the promotion of U.S. foreign commerce, regardless of whether these routes were profitable to the lines.

The 1936 Act also included a variety of other eligibility, monitoring, and reporting requirements as a condition for receiving subsidy. These consisted mainly of requirements of corporate financial disclosure, as well as domestic trading activities, foreign shipownership, and other facts relevant to subsidy eligibility. Another provision precluded payment of subsidy in support of any service in competition with another U.S. carrier except in cases where service inadequacy could be demonstrated.

In addition to the direct subsidy aids provided under the CDS and ODS programs, the act also included two indirect assistance programs. First, earnings placed in Capital Reserve Funds (annual contributions were required) for new vessel construction were relieved of income tax liability and could therefore be used to reduce taxation. Second, the Government's lending program for ship construction, which had previously existed, was reactivated. Today, the mechanism used is not direct Government lending but Government guarantee

of commercially placed loans. This authority, contained in title XI, was added in 1938.

A variety of defense and security provisions also were incorporated. Subsidized vessel designs were to be submitted to the U.S. Navy. Any noncommercial design features recommended by the U.S. Navy were to be paid for by the U.S. Government. Subsidized ships were subject to Government repurchase, and provision was made for Government requisition of privately owned merchant ships under emergency conditions. Finally, MarAd was required to undertake an annual survey of U.S. shipbuilding capacity with the U.S. Navy to assure the adequacy of the shipbuilding mobilization base.

In the late 1960's, a comprehensive overhaul of the Merchant Marine Act was planned, and on October 21, 1970, the President signed into law amendments to the 1936 Act, known as the Merchant Marine Act of 1970. In general, it was a reaffirmation of the national policy of Federal support for the merchant marine. The fundamental policies remained the same, although several program adjustments were made in the interest of increasing effectiveness of the program. A specific pledge of Government support for a 10-year, 300-ship construction program was made.

Authorization was made for payment of CDS directly to yards, rather than to ship purchasers only. 15 This was intended to encourage greater shipyard participation in vessel design. It was hoped that this would lead to greater shipyard productivity.

Negotiated contracts between shipyard and purchaser were allowed for the first time. Previously, competitive bidding was required. It was hoped that shipbuilding costs would be reduced by eliminating expenses associated with bid preparation and that yards would be encouraged to develop standard market designs.

Declining CDS rates (i. e., subsidy as a percentage of total cost) were imposed as objectives for all CDS awards. The goals were a 45-percent CDS rate in fiscal year 1971 with a reduction in the ceiling of 2 percentage points a year until a level of 35 percent was reached in fiscal year 1976. These rates were required for negotiated contracts, while the Secretary of Commerce could waive them in competitively bid contracts.

A major innovation was the attempt to encourage the construction and operation of bulk carriers. Although CDS construction of bulkships had been authorized since 1952, no bulk vessels had been built with subsidy as of 1970. The major change was that bulkships could be granted ODS. Also, subsidy-eligibility restrictions pertaining to U.S. owners who also owned foreign-flag vessels were liberalized to allow bulk operators to replace foreign tonnage with new U.S. ships within a specified period. Also, restrictions on foreign-to-foreign trading were liberalized for subsidized bulkships because of the differences between liner and bulk operations.

The 1970 Act also revised the wage-subsidy provision of the 1936 Act to minimize operating subsidy and encourage collective bargaining. A wage index was developed, and wage increases in excess of those allowed by the index were not subsidizable.

The 1970 Act extended eligibility to establish tax-deferred Capital Construction Funds (CCF) to most U.S. operators, including nonsubsidized carriers. Previously, only ODS recipients had been eligible. Although operators could make use of CCFs, tax-deferred funds could be withdrawn only for construction or reconstruction of vessels in U.S. shipyards for deployment in U.S. foreign commerce, the Great Lakes trades, noncontiguous domestic trades, or fisheries.

The only other major provision was raising the title XI guarantee ceiling from $1 billion to $3 billion. Subsequently, it has been raised several times, most recently to $12 billion.

The 1970 Act was not successful in achieving fleet growth. Rather than 300 ships built under the CDS program as envisioned in 1970, **80** were built, with another 56 converted or reconstructed with CDS funding.

CDS and ODS were intended to close the gap between U.S. and foreign costs. In the recent past, they have not been able to accomplish this. After a propitious start in the early 1970's, when CDS rates on average did fall to the 35 percent goal, rates began to rise again (reflecting both the U.S. inflation rate and the depressed state of the industry

[15] *U.S. Ocean Policy in the 1970's: Status and Issues* (Washington, D.C.: U.S. Department of Commerce, October 1978), p. V-38.

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worldwide). As pointed out previously, even a 50-percent rate—the highest level allowed by law—is insufficient to close the current differential. (A rate closer to 65 to 70 percent would be required based on some recently quoted foreign construction prices.)

On the operating cost side, the wage index system, implemented by the 1970 Act in an effort to reduce costs and encourage efficiency, has meant that wage differentials are not covered totally. Further, maintenance and repairs have not been routinely included in recent ODS contracts. Finally, fuel cost, which increased dramatically in the late 1970's to the point where it is a large percentage of total operating cost, is not a subsidizable expense.

Thus, despite substantial expenditures, CDS and ODS have not made the U.S. foreign-trade fleet competitive. Table 40 shows outlays for the two programs over time.

Shortly after the present administration took office, an interagency task force was set up to examine current maritime policies and to make specific recommendations for changes. The first major step was the curtailment initially and then the cutoff of CDS funding. For fiscal year 1982, no CDS funds were requested ($49.5 million in carryover funds were made available), compared with an average annual request of $132 million in the previous 4 years. It was announced that this was intended as a phasing out of the CDS program and that in the future no funding would be made available. Temporary authority (for 1 year) was granted for the building of subsidized vessels abroad.

On May 20, 1982, Secretary of Transportation Drew Lewis announced the initial elements of a new program. He stated the administration's intent to honor existing ODS contracts, and other matters (see app. A). At this time he also announced that the administration would seek support of an extension of temporary authority for subsidized U. S.-flag operators to construct or acquire vessels outside the United States and still receive ODS.

In August 1982, the Secretary of Transportation again stated that the Government would honor existing ODS contracts, but that no new contracts

Table 40.–Maritime Subsidy Outlays–1936-60

Fiscal year	CDS	Reconstruction subsidy	Total	ODS	Total ODS and CDS
1936-55	$ 248,320,942[a]	*$ 3,286,688*	*$ 251,607,830*	$ 341,109,987	$ 592,717,817
195W0	129,806,005	*34,881,409*	*164,687,414*	644,115,146	808,802,560
1961	100,145,654	*1,215,432*	101,361,086	150,142,575	251,503,661
1962	134,552,647	*4,160,591*	138,713,238	181,918,756	320,631,994
1963	89,235,895	*4,181,314*	93,417,209	220,676,665	314,093,894
1964	76,608,323	1,665,087	78,273,410	203,036,844	281,310,254
1965	86,096,872	*38,138*	86,135,010	213,334,409	299,469,419
1966	69,446,510	*2,571,566*	72,018,076	186,628,357	258,646,433
1967	80,155,452	*932,114*	81,087,566	175,631,860	256,719,426
1968	95,989,586	*96,707*	96,086,293	200,129,670	296,215,963
1969	93,952,649	*57,329*	94,010,178	194,702,569	288,712,747
1970	73,528,904	*21,723,343*	95,252,247	205,731,711	300,983,958
1971	107,637,353	*27,450,968*	135,088,321	268,021,097	403,109,418
1972	111,950,403	*29,748,076*	141,698,479	235,666,821	377,365,300
1973	168,183,937	*17,384,604*	185,568,541	226,710,926	412,279,467
1974	185,060,501	*13,844,951*	198,905,452	257,919,080	456,814,532
1975	237,895,092	*1,900,571*	239,795,663	243,152,340	482,948,003
1976[b]	233,826,424	*9,886,024*	243,712,448	386,433,994	630,146,442
1977	203,479,571	*15,052,072*	218,531,643	343,875,521	562,407,164
1978	148,690,842	*7,318,705*	156,009,547	303,193,575	459,203,122
1979	198,518,437	*2,258,492*	200,776,929	300,521,683	501,298,612
1980	262,727,122	*2,352,744*	265,079,866	341,368,236	606.448,102
Total	$3,135,809,321	*$202,007,125*	$3,337,816,446[c]	$5,824,021,842	$9,161 ;838;288

[a]Includes $131.5 million CDS adjustments covering the World War II period, $105.8 million equivalent to CDS allowances which were made in connection with the Mariner Ship Construction Program, and $10.8 million for CDS in fiscal years 1954 and 1955.
[b]Includes totals for fiscal year 1978 and the transition quarter ending Sept. 30, 1976.
[c]Includes approximately $26 million in CDS outlays repaid to the Federal Government as of Sept. 30, 1980. Nearly $25.3 million of this total rePresents subsidy granted In tha construction of the tanker *Stuyvesant*.

SOURCE: *U.S. Maritime Administration 7960 Annual Report* (Washington, D. C.: Maritime Administration, U.S. Department of Commerce, July 1961), p. 61.

would be signed, and that the fiscal year 1982-83 moratorium on new CDS contracts would be continued.

Maritime subsidy policy clearly has been changed drastically through budgetary reductions and temporary legislative authority over the past 2 years. Strong industry opposition, especially by the shipbuilders, has occurred while U.S. liner operators, who could benefit from build-foreign provisions, have applauded the changes. Legislation has been introduced to restore construction subsidy funds for support of the U.S. shipbuilding industry, and the debate undoubtedly will continue.

In 1982, one subsidized operator, U.S. Lines, and the U.S. Government negotiated the termination of an ODS contract on some ships in return for a short-term ODS contract on other ships. Since then, other ODS operators have expressed interest in so-called "subsidy buy-outs' or the termination of their ODS contracts in return for a lump sum payment. One application was filed but later rejected by MarAd in early 1983. While the present administration has considered such a buy-out program as one method to use to phase out operational subsidies, and DOT has considered the development of guidelines, no policy on this subject had been announced as of September 1983.

It appears that after 45 years, the U.S. maritime subsidy program will soon end. Many argue that new policies are needed to take its place, but none that has been proposed has broad support. Prospects for shipbuilders and ship operators who have depended on the subsidy program are unclear, Most industry spokesmen would like to see future maritime policies include some new forms of industry support, such as indirect incentives designed to promote U.S.-flag shipping and U.S. shipbuilding. Unsubsidized U.S. competition with the rest of the world in a free and open market system is a worthy goal but does not appear feasible for our maritime industries under any likely future scenario, particularly in light of both direct and indirect subsidies provided foreign builders and operators by their governments.

Ship Financing Guarantees

The Federal Ship Financing Guarantee program was established in 1938 pursuant to title XI of the Merchant Marine Act of 1936. It provides for a full faith and credit loan guarantee by the U.S. Government. Prior to the 1970's, the program grew only moderately, and at the end of fiscal year 1970 there were only $1 billion in contracts in force.

The program was overhauled in 1972 and is now a financing guarantee program (rather than a mortgage insurance program) under which the Government guarantees shipbuilding obligations sold to investors. Such guarantees may be provided by the Federal Government covering up to 75 percent of the construction cost of vessels built with CDS assistance, and 87.5 percent of the construction cost of nonsubsidized vessels. Vessels to be used in both the foreign and domestic trades are eligible for title XI aid. They must be U.S.-flag and built in U.S. shipyards. Cargo, passenger, and **cornbkation** ships, tankers, tugs, towboats, barges, dredges, fishing vessels, floating drydocks, and oceanographic research and pollution-abatement vessels are all eligible. In addition, mobile offshore drilling rigs have been interpreted by MarAd as eligible, although recently the administration has sought to curb use of the authority for rigs.

The importance of the program can be seen by the amount of commercial shipbuilding using the program (see table 41). The percentage of commercial shipbuilding and conversion work financed through title XI increased from 16 percent in 1970 to 63 percent in 1981.

Table 41 .—U.S. Shipyard Orders, 1970-81, Financed Under Title Xl Program

	Title Xl orders	
Year	Amount ($ millions)	Percent of total private
1970	$ 193	16.1
1971	358	29.5
1972	849	55.1
1973	1,241	35.7
1974	1,539	34.3
1975	971	19.3
1976	1,045	25.4
1977	1,198	31.9
1978	552	18.8
1979	1,087	37.0
1980[a]	1,338	42.9
1981[a]	1,350	62.8
Totals . .	$11,721	32.6

[a]Estimated.

SOURCE Compiled by the U S. Maritime Administration, Office of Policy and Plans, from MarAd Title XI data and the Shipbuilders Council of America, *Artnua/ ffeporl,* 1981

Substantial growth in the program has occurred during the past decade. From 1938 to 1970, $1 billion in guarantees was issued, while between 1970 and 1982, $10 billion was issued. Among the factors that influenced this expansion were the Merchant Marine Act of 1970, which stimulated tanker and liquefied natural gas (LNG) tanker construction; Alaskan oil trade, which also stimulated tanker construction; and 1972 amendments to title XI, which stimulated inland tug-barge construction.

As of July 1983 the following guarantees were outstanding:

Oceangoing merchant ships	$4.8 billion
Offshore oil rigs	1.4 billion
Inland river vessels	1.6 billion
Miscellaneous	0.2 billion
Total	$8.0 billion

For most of its history, title XI has been noncontroversial. It has been self-supporting through fees paid by participants. These fees are placed in the Federal Ship Financing Fund, from which all MarAd operating costs associated with the administration of the. program and guarantees, in the event of default, are honored. The program has experienced only 17 defaults since its inception, resulting in a combined pay-out from the fund of $248.2 million. Of this amount, $50 million was associated with the 1978 bankruptcy of a subsidized liner operator. Of the $248.2 million, it is anticipated that $155 million ultimately will be recovered by the Government.

Recently, the pace of defaults has increased. Thus far, five companies have defaulted in fiscal year 1983, resulting in Fund losses of $55.7 million. Advances of $31 million also have been made to 17 companies. As of July 1983, the Ship Financing Fund had assets of $190 million. It is anticipated that there could be another $60 million in defaults this year (before any recovery by the Government, which would reduce the exposure substantially). Overall, the risk to the Government could total $500 million to $600 million ultimately if all companies currently in shaky financial position were to default.

These facts have caused concern within the administration, and all advances from the Fund must be approved by the Office of Management and Budget.

One current legislative initiative that would reform the title XI program is H.R. 3399 recently introduced by Congressman Biaggi. Under the bill, an Industrial Redevelopment Bank would be established. The Bank would handle financing, cofinancing, or refinancing of vessel construction or reconstruction. It would subsume the title XI loan guarantee program but would have considerably broader authority than now exists. The Bank could either invest directly in the form of equity participation or guaranteed loans, or indirectly through long-term guarantees of obligations secured by ship mortgages, leases, or stock pledges.

In addition to financing vessel acquisition, the Bank would have authority to contract directly for the construction or reconstruction of vessels in U.S. yards. This authority is pursuant to the provisions of Title VII of the Merchant Marine Act—the ‘ ‘build and charter’ authority.

Provisions of the bill would encourage construction of generic vessels in series production and increased shipyard efficiency. A primary element of the Bank’s responsibility would be to allow for the domestic production of replacement vessels in the U.S. liner fleet that would be suitable for national defense support. Some provision would be available for foreign construction of subsidized vessels, but such permission would be restricted in order to protect the shipyard mobilization base. The Bank would have authority to set up R&D consortia with private sector participants who would be eligible for substantial tax benefits.

The Bank would be provided with a $2-billion line of credit ($1 billion in direct guaranteed loans and $1 billion in revolving authority in the form of interim construction financing); it also would have $2 billion in investment guarantee authority through the restructuring of existing credit programs.

Eventually, the responsibilities of the Bank would be turned over to the private sector. Initially, Federal seed money would be provided. A sunset provision in the bill would, after 10 years, either dissolve the Bank or sell it to financial institutions, export trading companies, or union pension funds. This proposal probably will be debated in the coming months as a promising alternative to direct subsidy programs.

MARITIME REGULATORY POLICY

It may be possible to enhance competition in certain segments of the industry if the"U. S. Government focuses attention on enabling the U.S. shipping industry to operate in a regulatory framework similar to that of foreign operators. Along those lines, a bill to amend the Shipping Act of 1916 (regulating liner operations) has been passed by the Senate and was pending in the House as of September 1983. As passed by the Senate and introduced in the House, this bill contains almost the same provisions as similar proposed legislation which has been debated in Congress for at least 4 years. 16 The bill's passage is also supported by the administration.

FMC is the Government agency charged with oversight of U.S. shipping regulations. The basis for U.S. regulatory policy on shipping is the Shipping Act of 1916 as amended. The act imposes strict requirements on the competitive practices of all ocean common carriers in both foreign and domestic commerce while permitting approved antitrust immunities to shipping conferences. Prior Government acquiescence is required for all anticompetitive conference agreements, such as rate-setting, pooling agreements, or interconference agreements. Conferences in U.S. trades are required to be open to any carrier that wishes to join.

A number of practices are prohibited. One concerns the giving of deferred rebates, a practice whereby ship operators agree to return a portion of the total freight paid for services in an earlier period to a "loyal' shipper who has shipped all of his cargoes with the carrier or conference in question. This practice is common in foreign conferences. A second prohibited practice is the use of "fighting ships, whereby a carrier or conference sets one or more ships, operating at extremely low or predatory rates, in head-to-head competition with a competitor in order to drive the competitor out of the trade. Losses on the operation of fighting ships are shared by all members of the conference. A third practice outlawed is discrimination against shippers as punishment for nonpatronage. Section 14 of the Shipping Act included a more general prohibition against unjust or unfair discrimination among shippers. All common carriers must offer their services on equal terms to all shippers.

The Shipping Act was revised substantially in 1961 with the passage of Public Law 87-346. Section 14 was amended to allow approved loyalty agreements in the form of dual-rate contracts, with the following limitations: penalties that could be imposed on shippers for contract violation were limited to single damages, and the maximum exclusive patronage discount was set at 15 percent.

Section 15 also was amended to restrict the conferences' ability to control membership. Previously, any conference agreement could be disapproved if it was considered unjustly discriminatory or unfair among carriers. Public Law 87-346 specified that agreements could be approved only if they allowed open access to all carriers which could and would provide regular liner service on a given trade.

Carrier agreements also could be disapproved if found to be "contrary to the public interest. " Subsequent case law, affirmed by the courts, required carriers to "bring forth such facts as would demonstrate' that the agreement was required by a serious transportation need, necessary to secure important public benefits, or in furtherance of a valid regulatory purpose of the Shipping Act. The principle, known as the Svenska test, after the FMC case of that name, is considered by carriers as a major impediment to conference approval, primarily because it is difficult to define the concept of "public interest"-therefore, application (i. e., approval of agreements by FMC) is uneven and unpredictable. Pending legislation (the Shipping Act of 1983) would eliminate this "public interest' standard in most versions, but the House Judiciary Committee has favored retaining the standard.

Conferences in the U.S. trades are substantially weaker than their foreign counterparts. Members must receive FMC approval to organize pools, rationalize service, and limit sailings. They cannot limit membership, and they cannot encourage shipper loyalty through such mechanisms as deferred rebates. Independent operators can easily enter U.S. liner trades. A conference's inability to control access to the trades, whether within or outside

[16]See ' 'The Difficulty of Introducing Meaningful U.S. Maritime Legislation, by Paul Richardson, October 1980.

the conference structure, means that attempts to rationalize service—even if approved by FMC—are likely to be unsuccessful. The U.S. trades suffer from chronic overcapacity. Rate wars have occurred in both the North Atlantic and Pacific trades recently. These are devastating to the weaker, high-cost conference members (which tend to be U.S. flag).

U.S. carriers also face a more significant problem than do foreign carriers in the same trades because, while theoretically all of the restrictions apply equally to all conference members, it is easier for FMC and the Department of Justice to monitor the actions of U. S. carriers, whose financial statements and business practices are open to close scrutiny.

The open conference system, as it exists in U.S. trades, is an anomaly in world shipping. The industry is constrained by Government regulation which forces on it some, but not all, aspects of competition. Conferences set rates and schedule services. But any joint planning must be approved by FMC, and direct negotiation with shippers' groups does not have antitrust immunity. Overtonnaging has detrimental effects, such as an increase in unit costs resulting in higher rates.

There are two economic alternatives to the current situation. Debate on the merits of each has continued for years, both inside and outside the Federal Government. One is price competition. Under ideal conditions, price competition would reduce prices, remove excess capacity, and create a healthier business climate for firms remaining in the industry. Each firm would determine its profit-maximizing level of output and produce accordingly. Because demand would not be sufficient to support all carriers currently operating, carriers would have to reduce prices and operate at higher capacity levels to minimize or eliminate short-run losses. Inefficient and financially weak firms would be forced out of the industry.

A study by the Department of Justice in 1977[17] concluded that the Nation would benefit from a more competitive environment in ocean-liner shipping markets and recommended repeal of, or amendment to, the 1916 Shipping Act to increase competition. This philosophy also has been espoused by some opponents to the present proposed legislation who claim that the 1983 Shipping Act Amendments are inconsistent with the trend toward deregulation.

It is not clear that shipping competition could be achieved easily. Significant barriers do exist and would continue. These include the major capital requirement to enter shipping, high fixed costs, worldwide cargo-reservation schemes, and product differentiation. On a practical level, achievement of such competition could result in decimation of the U.S.-flag fleet because many foreign carriers continue to receive direct and indirect subsidies as well as antitrust immunities which could carry over into their U.S. operations.

At the other regulatory policy extreme is the closed conference system combined with the elimination of independent carriers, thus effectively closing the trades. The economic argument for permitting closed conferences is that they could rationalize trade, reducing the misallocation of resources and ending costly service competition. Excess tonnage would be reduced. The result, however, likely would be higher freight rates. The degree to which a conference would face outside competition would determine how much control it would have over rates. Given a choice between reducing costs to increase profits and raising rates to accomplish the same goal, there might not be sufficient incentive to do the former. Shippers, and ultimately consumers, would be the probable victims under such a system. A survey of shippers taken by the General Accounting Office (GAO) indicated that shippers believe the highest liner rates and greatest decline in service quality would result under a closed conference system (the other choices were open competition, restricted conference, and "other' ').

Changes in U.S. regulation of ocean-liner operations in the U.S. foreign trades are being considered in the proposed Shipping Act of 1983, which would

[17] 'The Regulated Ocean Shipping Industry, " a report of the U.S. Department of Justice, January 1977.

[18] Testimony on S. 47 by Allen Ferguson, Chairman of the National Institute of Economics and Law, before the Senate Commerce Committee, 1983.

[19] *Changes in Federal Maritime Regulation &n Increase Efficiency and Reduce Costs in the Ocean Liner Shipping Industry,* Report—GAO/PAD-82-l 1 (Washington, D. C.: U.S. Government Accounting Office, July 1982), pp. 20-21.

replace the existing regulatory framework under the Shipping Act of 1916. The proposed legislation retains the open conference system for U.S. trades but clarifies and strengthens the carriers' immunity from U.S. domestic antitrust laws.

U.S. liner operators in international trades contend they have been at a disadvantage relative to their foreign competitors due to U.S. regulation of the industry. While in theory all operators in the U.S. foreign trades are subject to regulation under the Shipping Act 1916, foreign operators in many instances are, in effect, beyond the reach of U.S. regulatory and judicial control. The intent of the proposed Shipping Act of 1983 is to provide a more equitable regulatory environment for the U.S. operators by limiting their exposure to U.S. antitrust laws.

The legislation now being considered in Congress is based on a compromise achieved during the 97th Congress between the interests of ocean carriers and shippers. Under the compromise, carriers would be assured that agreements to form conferences, set rates, and rationalize service within the conference framework, which were effective under the new act, would be immune from U.S. domestic antitrust laws. To balance the strengthened conferences that would result, provisions were included to stimulate competition, such as the mandatory right of conference members to set rates independently under certain conditions and the authorization of loyalty and service contracts which could provide lower rates and improved service for certain shippers. While the proposed legislation explicitly expands the scope of agreements that may be formed only by including intermodal activities, the removal of the threat of penalty under antitrust laws would, in effect, give the carriers freedom to form stronger agreements,

In the compromise package, the greater certainty of antitrust immunity was to be provided primarily through two major regulatory changes. The first would be the removal of general competitive standards of review historically used by FMC in approving liner conference agreements. Instead, prohibited acts would be clearly specified. Potential violations of the act would be limited to those listed prohibitions, and agreements would not be exposed to subjective interpretations of broad ' 'public interest criteria.

As of September 1983, amendments to the proposed legislation by the House Judiciary Committee would weaken the antitrust immunity envisioned in the original compromise proposal by retaining a general standard of review to be used by FMC in addition to the specified prohibited actions.

The second element of certainty would be the consolidation of jurisdiction over ocean-liner shipping activities in FMC, subject solely to the Shipping Act. Agreements that become effective under the act would not be subject to review or penalties by other Government agencies, notably the Department of Justice, Similarly, agreements or conduct which were found to be in violation of the act would be subject to suspension, modification, or penalties only by order of FMC.

Additional substantive changes made by the House Judiciary Committee include the expiration of the antitrust immunity conferred by the bill 2 years after the study commission (on Deregulation of International Ocean Shipping, to be established by the bill) files its report, or December 31, 1988, whichever is earlier, and the elimination of filing and FMC enforcement of tariffs. Most carriers, shippers, and FMC have supported the existing tariff filing requirements, claiming that they enhanced stability and facilitated enforcement of anti-rebating laws. However, others, including the present administration, some large shippers, and the Federal Trade Commission (FTC) oppose tariff filing and enforcement on the grounds that it is unnecessary Government intervention in the marketplace and hampers competitive flexibility in setting rates. Under the Judiciary Committee amendment, carriers still would be required to publish their tariffs in a manner easily accessible to shippers and other interested persons.

The final passage of the Shipping Act of 1983, with or without recent House Judiciary amendments, is not certain. It appears, however, that an acceptable compromise is close.

U.S. SHIPPING TAXATION POLICIES

An important aspect of U.S. shipping competitiveness versus foreign-flag fleets is this Nation's taxation policies. The following discussion will address the tax rules that apply to the taxation of the shipping income of U.S. domestic and U.S.-owned foreign corporations. The United States generally subjects to tax the worldwide income of a U.S. domestic shipping company even if the income is substantially foreign source income (determined under complex sourcing rules based on property and time spent inside and outside the United States). In most cases, the United States will allow a credit against U.S. tax liability for foreign taxes paid on foreign source shipping income. In general, shipping is treated similarly to other industries, although a few tax benefits are unique to the shipping industry. These tax benefits allow U.S. citizens owning or leasing eligible vessels that are U.S. built to obtain tax benefits through the maintenance of CCF and Construction Reserve Funds (CRF) to be used to construct qualified vessels. These tax-deferral provisions, authorized by the Merchant Marine Act of 1936 as amended are considered by many to be the most important provisions of the act.[20]

If the goal of the U.S. maritime policy is to promote U.S.-flag shipping and to assure fairness for the Nation's shipping industry, then tax policies must be designed to ensure tax parity with other nations. If direct Government subsidies to U. S.-flag ship operators are discontinued, as the present administration proposes, then tax parity with foreign operators takes on added significance. A major reason for the existence of huge fleets owned by U.S. interests and registered in countries such as Liberia and Panama is that those countries offer an exemption of shipping income from taxation.[21] Similarly, other major maritime countries such as Greece and Japan, which are not considered flags of convenience, offer significant tax advantages to shipping when compared to their domestic industries. In fact, many nations consider their international shipping as offshore enterprises and provide special tax concessions.

In 1962, Congress specifically exempted U. S.-controlled shipping income when it enacted the so-called "subpart F' provisions amending the Internal Revenue Code. These provisions required that certain types of tax-haven income of foreign subsidiaries of U.S. companies be taxed currently, rather than when the income is distributed to the U.S. parent. The shipping income exclusion from "subpart F' was primarily for national defense reasons. It was believed by Congress that the shipping exclusion would encourage a U. S.-owned (controlled) maritime fleet.

In 1975, to achieve some parity in the taxation of shipping income of U.S. domestic and U. S.-owned foreign corporations, Congress generally ended the "subpart F' exclusion for shipping income except to the extent the shipping income of the foreign subsidiary was timely reinvested into the shipping business. Congress believed that the reinvestment rule was appropriate because of the competitive nature of foreign-flag shipping operations and in order to continue to encourage a significant U.S.-owned (controlled) maritime fleet.

In May 1983, the Internal Revenue Service (IRS) issued final regulations for American stockholders of foreign-based companies that generate shipping income. These regulations amend the Income Tax Regulations and implement the 1975 Tax Reduction Act and 1976 Tax Reform Act. These regulations were first proposed in August 1976. The new regulations state that if less than 90 percent of the earned income is classified as "subpart F' income, all of it is subject to taxation .22 The previous regulation stated that if more than 70 percent of the income was "subpart F, all of it was considered exempt.

Thus, today, U.S.-owned foreign shipping corporations, such as those "U.S. effective-controlled" fleets under Liberian or Panamanian flag, have available to them a vehicle for deferring taxes on income but only if it is reinvested in shipping

*"James Gallagher, "Maritime Tax: The Capital Construction Fund of the Merchant Marine Act of 1970, ***Journal of Maritime Laws and Commerce,*** p. 105.

[21]The Council of American-Flag Ship Operators, "Analysis of proposal to Impose Tax on CCF, " March 1982.

[22]See ***Federal Register,*** May 19, 1983, p. 22512.

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and only if at least 90 percent of the corporation's income is from shipping. Some bulk operators of such foreign-flag fleets have claimed that the intent of the 1975 Act—to encourage investment in U.S.-owned ships—has not been realized because investment decisions are based not on deferred taxes but on much more significant market and price factors. Other operators—particularly in the liner trades—believe that such tax benefits are important to the future viability of the industry. These arguments require careful analysis if the overall subjects of tax parity and tax incentives for the ship-operating industry are addressed by Congress.

Certain forms of tax deferrals also have been put into effect as a means of encouraging investment in the U.S.-owned, U.S.-flag fleet. In 1970, Congress adopted a tax measure for the U.S.-flag fleet which instituted the CCF program. This program generally allows U.S. shipping companies to enter into agreements with MarAd to establish CCFS for the replacement or addition of vessels for use in the U.S.-flag merchant marine. U.S. owners or charterers of U.S.-constructed U.S.-flag vessels operated in the U.S. foreign or domestic commerce can defer taxation of the net earnings derived from such vessels by depositing the earnings into the CCF to provide for replacement or additional vessels to be operated in the U.S. foreign, Great Lakes, or noncontiguous domestic trade. Vessels operated in coastwise or intercostal trade are not qualified. Federal income tax on such earnings (as well as investment income of the CCF) is deferred until the funds are withdrawn from the CCF for a purpose not permitted under the agreement with MarAd. Deposits of tax depreciation of vessels and net proceeds from the sale of vessels also may be made. Theoretically, the tax deferral can continue on income deposited in the CCF as long as the fundholder continues to acquire, construct, or recon-

struct qualified vessels. The tax basis (cost) of a vessel generally is reduced to the extent the vessel is purchased by a qualified withdrawal from a CCF.

The CCF program is authorized by section 607 of the Merchant Marine Act, as amended in 1970. Prior to the 1970 amendment, only subsidized ship operators were eligible for tax-deferred funds, referred to as Capital Reserve Funds and Special Reserve Funds. Today, both subsidized and nonsubsidized operators are eligible for the CCF program, and the old Capital Reserve Fund has been phased out. The CCF program is believed by U.S.-flag operators to be the key element that could place U.S.-flag ships on a tax parity with that of U. S.-owned, foreign-flag ships under "subpart F' of the Internal Revenue Code and foreign-flag, foreign-owned competitors.[23] presently, however, U.S.-flag, foreign-built ships are neither "qualified" for CCF withdrawals nor "eligible" to make CCF deposits.

The CRF is another tax benefit to U.S. shipowners. The CRF is authorized under section 511 of the Merchant Marine Act as amended and allows U.S. shipowners operating vessels in foreign or domestic commerce of the United States to defer the gain attributable to the sale or insurance proceeds from the loss of a vessel. The moneys deposited in the fund must be used to construct, reconstruct, or acquire vessels of U.S. registry built in the United States. Although any gains on these transactions are not recognized for income tax purposes if the deposits are properly expended for a vessel, the basis for determining depreciation of the vessel is reduced by the amount of any such gains. The ability to defer gain on certain transactions through deposits to the CRF applies only to vessel owners.

A comparison of other nations' shipping tax policies is also relevant to gaining an understanding of U.S. shipping tax parity. In Greece, for instance, no tax is levied on shipping income, only a tonnage tax similar to those imposed by Liberia and Panama. In Britain, shipowners are able to shelter current income from taxes by the use of free depreciation (1 year), or by registering in a British colony such as Bermuda or Hong Kong. In Norway, the tax on current income is reduced substantially by a combination of accelerated depreciation and the use of tax-deferred replacement and repair funds. In France, tax deferral results from a combination of accelerated depreciation and the absence of any tax on operations carried on outside the country. Worldwide, most countries impose very little tax, if any, on shipping income.[24]

Recently, DOT outlined proposed changes to the Merchant Marine Act of 1936, necessary to implement a number of the administration's maritime policy initiatives. One major change proposes that existing and newly deposited tax-deferred moneys in the CCF program could be used to acquire, construct, or reconstruct U.S.-flag, foreign-built vessels. This proposal was also proposed and rejected by the 97th Congress in the conference report on the Maritime Administration authorization bill of 1982. This recent proposal will now be considered by Congress in the form of a legislative package.

Another recent proposal also supported by DOT and a similar proposal submitted as H.R. 2381 by Congressman Gene Snyder calls for a repeal of the 50-percent ad valorem duty on foreign parts and repairs made to U.S.-flag vessels abroad. H.R. 2381 differs from the DOT proposal by requiring the 50-percent duty be deleted only for ships that remain away from U.S. ports for 2 or more years. This proposal, as well as the use of CCF moneys to construct or acquire foreign vessels is, as expected, being opposed by U.S. shipbuilders. In a statement on behalf of the Shipbuilders Council of America, President Lee Rice explained, "the efficacy of maritime programs to provide military capability required by this Nation is being eroded by the programs put forth by the administration to allow tax-deferred CCF moneys to be used for foreign building and by the elimination of the Ad Valorem Tariff on foreign repairs. " However, for the U.S.-flag vessel operator, these proposals are warmly welcomed, especially in light of the absence of future CDS funds.

Other tax issues affecting the U.S. merchant marine are taxation of vessel lease and lease/purchase and purchase/lease-back agreements. These agreements have become more common as the cap-

[23] *Maritime Subsidies* (Washington, D. C.: U.S. Department of Transportation, Maritime Administration, February 1983), p. 158.

[24] *The Journal of Commerce,* Aug. 10, 1979, p. 1.

ital requirements involved in ship purchasing have soared. Essentially, a financial institution or other organization with ample capital reserves and significant income needing tax shelter becomes the owner of record for a new ship. The vessel is then bareboat chartered to the company or person who actually wants the ship. The operator makes lease payments to the financial institution, which takes advantage of all the tax benefits available, such as interest deductions, and depreciation.

Recently, the U.S. Navy, through MSC, has inaugurated a program to acquire merchant vessels through leasing. These ships, 13 special-purpose RO/ROs under the T-AKX program and 5 product carriers under the T-5 program, will be time-chartered to MSC for a 5-year period with an option for renewal, to a total of 20 to 25 years. The vessel owner of record receives tax benefits through the accelerated cost recovery (ACRS) and investment tax credits (ITC) provisions, while the U.S. Navy receives a favorable long-term lease of the vessels. The issue of whether the Government, through leasing programs such as the U.S. Navy's, is actually losing revenue through less taxes has not been resolved.

More recently, a bill, H.R. 3110, was introduced to revise these tax benefits. The bill, titled the "Governmental Leasing Tax of 1983, " would deny certain tax benefits for property used by governments and other tax-exempt entities. Under the bill, the ITC would be denied (as is generally the rule under present law) and ACRS depreciation also would be denied for property used by tax-exempt entities. Therefore, the legislation extends to agreements by foreign governments and corporations to lease American capital goods. This aspect is of concern to the U.S.-flag operators who have often built and charted vessels to foreign governments and corporations, utilizing these tax benefits. In the past, these tax benefits have been of great importance to the U.S. bulk fleet, and certain industry spokesmen have urged that the tax concepts in the bill be analyzed further.

Another issue is taxation of offshore wages of crew and staff. In many countries (e. g., Norway), these are treated as personal income derived under a foreign jurisdiction and are not taxed. The resulting savings in crew and staff wage costs (as well as fringe benefits, which are usually a proportion of gross wages) can be as much as 50 percent.

Accelerated depreciation of ships and equipment, and particularly containers, is also an important tax concession granted by many countries. U.S. tax policies for depreciation of ships are based on a 14,5- to 21.5-year depreciation rate for U.S.-flag ships that entered service prior to 1981, and a 5-year depreciation rate for U.S.-flag ships entering service in 1981 and after. Also, the 10-percent ITC is generally permitted with respect to the cost basis of a new investment in a U.S.-flag vessel operated in the U.S. domestic or foreign commerce. In the case of a vessel purchased with CCF funds, Congress has specifically authorized that one-half of the ITC be allowed (notwithstanding the CCF cost-basis reduction rule mentioned earlier). Availability of the other half is subject to dispute by the IRS, which has won and, more often, lost court cases on the issue.

In summary, the major tax provision that provides tax parity to U.S.-flag ship operators is the use of the CCF. Due to the absence of a shipyard CDS program in the United States, it is unlikely that the CCF will be useful in the future unless amended to permit construction of U.S.-flag ships in shipyards abroad. Further study in innovative tax policies is clearly needed to ensure that the existing tax parity of U.S.-flag ship operators with other competitive shipping nations is not eroded.

CABOTAGE POLICIES

The Merchant Marine Act of 1920, and more specifically section 27 of the Act, is commonly referred to as the "Jones Act. " Basically, section 27 requires that all U.S. domestic trade be carried on

vessels that are under U.S. registry, built in the United States, and manned by U.S. citizens. Specifically, section 27 states:

> No merchandise shall be transported by water, or by land and water, . . . between points in the Us. . . . in any other vessel than a vessel built in and documented under the laws of the U.S. and owned by . , . citizens of the U.S. . . .

Cargo reservation for American domestic shipping was first outlined in 1817 by the First Continental Congress. The First Continental Congress approved the Cabotage Law of 1817 to prevent foreign-flag carriers from entering the American domestic market. This policy has continued unbroken to the present. Over the years, many suggestions to change this policy have been proposed, but they have been largely unsuccessful .25

The preamble of the Merchant Marine Act of 1920 states the intent of Congress at that time:

> It is necessary for the national defense and for the proper growth of its foreign and domestic commerce that the United States shall have a merchant marine of the best equipped and most suitable types of vessels sufficient to carry the greater portion of its commerce and serve as a naval or military auxiliary in time of war or national emergency, ultimately to be owned and operated privately by citizens of the United States; and it is to be the policy of the United States to do whatever may be necessary to develop and encourage the maintenance of such a merchant *marine* . . . .

The Jones Act "Fleet"

The Jones Act "fleet," as it has come to be known, consists of those vessels eligible to engage in domestic trade, whether it be inland waters, coastwise, noncontiguous, or intercostal. Eligible vessels are those built in the United States under American ownership, registered in the United States, and receiving no CDS or ODS from MarAd.

Currently, Jones Act vessels account for slightly under 50 percent of the total number of vessels in the U.S.-flag fleet and approximately 60 percent of the total U.S. deadweight tonnage. As detailed in chapter 3, 94 percent of the tonnage in the active Jones Act fleet is in tankers. Tankers used in the transport of Alaskan oil alone constitute almost 30 percent of the active domestic fleet and nearly one-half of the total domestic fleet's deadweight tonnage.

There is no conference system operating in the domestic trade; operations are either independent or on ships owned by corporations for their own business use. The domestic fleet provides liner as well as tramp service and includes bulk carriers, tankers, conventional and containerships, and tug-barge systems.[26]

Advent of Alaskan Oil

Shifting trade patterns and a new area for shipping investments followed the production of large oilfields on the North Slope of Alaska in the mid-1970's. As detailed in chapter 3, by 1978 production from the North Slope reached 1.1 million barrels of oil per day and exceeded the west coast's demand for it. Substantial new tanker tonnage was needed to move the oil to the gulf and east coast markets. During the 1970's, 19 newJones Act tankers with deadweights in excess of 100,000 tons were built to serve the Alaskan trade. Today, Alaskan oil production has reached 1.6 million barrels per day with projections that production will peak by 1988 and decline through 2000.

It is generally accepted that without future U.S. oil and gas discoveries, a substantial surplus of tankers will exist by 1995. Lease sales followed by exploration drilling in promising Alaska and California areas are scheduled for the next few years and should determine potential production levels. If new oil discoveries in these areas are made, the large market for domestic tankers would improve.

Exceptions, Waivers, and Suspensions Allowed Under the Jones Act

Over the years, circumstances have resulted in exceptions and waivers to the Jones Act. Trade with the U.S. island possessions of Guam, Tutuila, Wake, Midway, and Kingman Reef may be carried on foreign-built, U.S.-flag vessels. The U.S. Virgin Islands are exempt from all Jones Act *re*quirements as amended in the Merchant Marine

ZSNACOA, op. cit., p. 35.

[26]Ibid.

Act of 1936. This has been an especially important exemption for the Virgin Islands since the discovery of Alaskan oil. Alaskan crude oil is now shipped to refineries in the Virgin Islands on foreign-flag ships and then to the U.S. mainland, again mostly on foreign-flag vessels, even though U.S.-flag tug-barge units are also employed moving refined products to the U.S. mainland.

Other important exceptions to the act specifically apply to Alaska. These exceptions, currently receiving wide attention, are the third and fourth provisos to section 27. They are discussed in greater detail later in this chapter.

Individual waivers to the Jones Act also have been provided through private bills passed by Congress. In 1978 and 1981, Congress passed bills that permitted two passenger ships built in the United States, the *Independence* and the *Constitution,* to reflag as American ships and reenter the domestic market after having served for awhile under foreign flag.

Suspensions allowed under the Jones Act, although not common, do exist. One suspension, section 506 of the 1936 Act, gives the Secretary of Transportation the power to suspend the Jones Act to allow subsidized U.S.-flag ships, intended for foreign trade, to enter the domestic market for up to 6 months in any 12-month period. In 1980, seven subsidized U.S.-flag tankers received waivers to enter the Alaskan oil trade for up to 6 months. The operators were required to pay back a prorated share of their CDS based on the amount of time spent in the Alaskan trade. Another suspension allows the Secretary of the Treasury to grant a statutory or discretionary waiver for foreign-flag vessels on the basis of national defense needs. The 1936 Act also permits liner vessels receiving ODS to carry domestic cargoes in the Hawaii, Guam, and Puerto Rico trades with very modest payback of the subsidy.

Construction Differential Subsidy Payback

A very controversial provision of the Merchant Marine Act of 1936 allows MarAd to permit subsidized vessels built for foreign trades to enter domestic trades permanently, in exchange for the repayment of a vessel's CDS plus accumulated interest. A 1977 MarAd decision permitted the Seatrain Shipbuilding Corp. to repay the CDS on a new tanker, the *Stuyvesant,* and to enter the domestic oil trade permanently. At the time, the worldwide tanker market had collapsed and there was a need for domestic tankers to transport Alaskan oil. Faced with a possible default by Seatrain on loans with title XI guarantees (amounting to about $120 million)[27] on two new supertankers, and no likely foreign market for the vessels, MarAd agreed to allow the CDS repayment on one of them, the *Stuyvesant.*

The tanker operators already in service in Alaska sued to prevent this transfer. Under a 1980 Supreme Court ruling *(Seatrain Shipbuilding Corp., et al. v. Shell Oil Co., et al.),* MarAd's decision was upheld. The Court held that the broad authority of the act gave the Secretary the power to further the general goals of the act, making such transfers legal.

The Justice Department's antitrust division, in a review of the case, recently urged Transportation Secretary Dole to adopt changes in maritime subsidy rules and allow the total payback of construction subsidies so that a large group of these vessels could enter domestic trades.

Although a decision by DOT on whether to implement the rule to allow subsidy paybacks is not expected until late 1983, the controversy between both sides grows larger every day. The issues of the controversy have been debated not only among industry groups but within DOT itself. The issues debated include: projections of future Alaskan oil production; levels of risk to the Government from possible title XI loan defaults; levels of direct and indirect subsidies to different sectors; levels of actual shipping costs, as well as hypothetical charter rates; and effects of surplus capacity in various trades.

At present, according to MarAd, there is growing overtonnaging in the domestic tanker fleet. Of 40 Jones Act tankers presently laid up, 28 are expected to be scrapped, and 26 of those employed now are likely scrap candidates because of new tanker-safety requirements. When this occurs, the remaining Jones Act fleet in the Alaskan trade will

[27]See *Federal Register,* Jan. 31, 1983, ''DOT, CDS Repayment Notice of Proposed Rulemaking.

consist of a smaller number of larger and newer ships than is evident from today's data.[28] Therefore, allowing subsidized vessels to enter the domestic trade will have the greatest impact on the remaining portion of the Jones Act fleet, which is independently owned and consists of comparatively large, newer vessels. New tankers could be required in the domestic fleet beyond 1990 if substantial future Alaskan oil prospects are proven. On the other hand, an administration-backed proposal to allow Alaska to export oil would substantially lower even that demand for new Jones Act tankers.

Current Jones Act tanker operators claim they have made huge ship investments on the basis of Jones Act guarantees which would be negated if foreign-trade-subsidized owners were permitted to enter domestic trades. If the larger subsidized tankers are permitted to enter the Alaskan trade, serious overtonnaging would continue at least through the decade. Current Jones Act operators have estimated that one-quarter of the domestic independent tanker fleet is now surplus and that if CDS paybacks are allowed, the entire independent fleet in the Alaskan trade would become surplus.

Some subsidized operators, however, claim that their new, more efficient, tankers would decrease the cost of shipping Alaskan oil to U.S. refineries. They believe that by leaving their subsidized tankers in an idle market the Government may face substantial defaults of federally guaranteed loans. 29 It was because of a pending default on the *Stuyvesant's* mortgage in 1977 that MarAd allowed that tanker to enter the domestic trade. Current Jones Act tanker operators claim, however, that the Government would face even greater prospects of title XI loan defaults if the subsidized tankers enter the trade.

Such a suspension of the Jones Act for subsidized tankers could bring about a short-term lowering of shipping rates. However, overcapacity would be inevitable and would result in a loss of business to owners who built more costly ships for the domestic trade because Federal policies required that appreach. This would result in fewer U.S.-flag ships being operated.

[28] U.S. Maritime Administration comments on "Draft Regulatory Impact Analysis for CDS Repayment Regulation," June 10, 1983.

[29] Comments submitted by Apex Marine Corp. to the Department of Transportation on proposed rulemaking for CDS repayment, May 2, 1983.

Other Proposed Changes to the Jones Act

The advent of Alaskan oil and the passage of a Federal law barring the sale of Alaskan oil in foreign markets are significant factors concerning the status of the U.S. domestic fleet. Many recent proposals to amend the act apply specifically to Alaska. The State of Alaska has a great deal at stake if certain amendments to the act are adopted.

As mentioned earlier, two exceptions to the act, the third and fourth provisos, applying specifically to Alaska, are currently receiving attention. The third proviso was adopted 60 years ago to facilitate the movement of U.S. freight around the Great Lakes area. This provision permits the use of a foreign-flag vessel during a domestic movement if somewhere along the route a Canadian railroad is used. The proviso has been rarely used, and two recent attempts to do so were unsuccessful.

The Alaska Navigation Co. had proposed to take advantage of the third proviso rule. They had hoped to operate two West German-flag ships manned by West German crews between Vancouver, British Columbia, and Seward, Alaska. This application was later withdrawn. The Fairbanks Trucking Service also filed an application which was later rejected by ICC because of deregulation of part of the domestic route. A bill, H.R. 1076, repealing the provision, passed the House in June 1983. Such a repeal would protect U.S.-flag liner operators in the Alaskan trade from foreign-flag competition.

The fourth proviso states that section 27 shall not become effective on the Yukon River until the Alaska Railroad is completed and the Shipping Board finds that proper facilities are provided for transportation by U.S. citizens. In 1977, the Treasury determined that the railroad was completed, but it is up to the Secretary of Transportation to make the finding that would make the proviso inoperative. As of September 1983, the Secretary of Transportation had not made that finding; therefore, in theory, the fourth proviso still exists.

Future proposals to modify the Jones Act will depend on many factors and will be debated widely. In view of strong support for policies inherent in

the act, efforts to have it rescinded in the near future may be difficult. In the long run, however, debates about costs and benefits of very restrictive provisions in the Jones Act could serve to clarify the national interest. One change that has been discussed but has not reached any legislative proposal is that of reducing or rescinding ' 'buy America' requirements. Some in the shipping industry believe that if owners were allowed to build or purchase their domestic trade ships from foreign sources, enough savings could be realized to either reduce freight rates or permit substantial gains for U.S. operators in new markets. U.S. shipyards have strongly opposed such views, but if current policies support unrealistically high capital costs, as claimed, they should be carefully evaluated.

' 'Buy America" provisions in several U.S. maritime laws and regulations are shown in table 42. It can be seen that the existing requirements for title XI-built vessels (where foreign-built machinery is prohibited) are somewhat more restrictive than for Jones Act ships built without title XI. However, also as shown, MarAd has proposed changes to some of the title XI prohibitions.

Alternative suggestions to modify Jones Act "buy America" provisions have taken a number of approaches. It would be necessary to accommodate conflicting goals of supporting a U.S. shipyard base while lowering ship capital costs closer to world market levels. It may be possible to do this by providing some level of construction subsidy in combination with incentives for shipyards to improve productivity and freedom to purchase equipment and components from lowest price suppliers worldwide without duty. Some have also proposed applying CCF to Jones Act construction .30 Another consideration in any proposed changes to Jones Act

[30] See C. Hiltzheimer, statement before House Merchant Marine Subcommittee, hearings on H.R. 3156, July 21, 1983.

Table 42.—"Buy America" Comparisons

Integral components of the hull and superstructure (steel, etc.)	Main machinery	Other machinery outfit, etc. (permitted to be foreign)	Percent of vessel cost to be domestic	Definition of vessel cost	Waiver provisions
MarAd Titie IF					
Foreign prohibited	Foreign[d] prohibited	None	100 "/0	Material, labor, overhead	Yes, except for steel and integral components of hull and superstructure
MarAd Titie XP					
Foreign prohibited	Foreign prohibited	None	loo "/o[e]	Material, labor, overhead	Yes 1) nonavailability 2) unreasonable delivery
USCG (Jones Act vessels~					
Unimproved foreign steel plates or shapes permitted	Foreign permitted	Up to 50°/0 of the cost of foreign items other than integral components of the hull and superstructure	Subject to other limitations	Direct material only. No labor or overhead	None
MarAd Titie Xi (proposed)					
Foreign prohibited	Foreign permitted	Up to 50°/0 of vessel component material cost	Subject to other limitations	Direct material only. No labor or overhead	None

[a] § 5135 of the Merchant Marine Act, 45 U.S.C. § 1155 (construction differential subsidies).
[b] Not required by statute, but imposed by regulation (46 CFR 298.11)
[c] § 27 of the Merchant Marine Act, *1920, 46* US C. *863,* and Vessel Documentation Act 46 CFR 67.09.
[d] A partial waiver has been granted for slow. speed diesels built under license in the United States which incorporate a significant number Of foreign Components
[e] Vessels covered b, title XI financing may incorporate foreign components and materials, However, the value of these components and materials will nOt be included in the determination of actual-cost title XI financing guarantees.

SOURCE J Hotaling, Division of Engineering, Maritime Administration, personal communication, August 1963,

provisions is that existing ship operators have made investment decisions based on assurances that current policy would continue. Modification of those policies could unfairly affect their ability to continue a viable business. However, if changes were made gradually over some reasonable period of time, the industry may be able to plan and adjust without undue hardship. This consideration argues for selective changes such as allowing a limited number of U.S.-subsidized ships or foreign-purchased or foreign-built ships to enter certain trades over set intervals-particularly where demand for shipping is rising.

One trade where Jones Act restrictions have been claimed to be economically detrimental is the Alaskan trade. In a 1982 study for the Alaska Statehood Commission, effects on the Alaskan economy of using foreign-flag v. U.S.-flag ships in the Alaskan trade were analyzed. The report estimated that differentials for U.S.-flag v. foreign-flag total shipping costs would range from about 10 percent (in the liner trade with the west coast) to 40 percent (in oil product shipments from west coast refineries). While the study did not analyze possible savings from using foreign-built or purchased U.S.-flag ships v. U.S.-built, U.S.-flag ships, the figures indicate a much lower range of savings for this case (roughly 2 to 10 percent). Whatever the savings, the net effect on the national economy and the maritime industries is much more difficult to evaluate but must be considered when Jones Act modifications are considered.

[31] Simat, Hellieson, & Eichner, Inc., "The Jones Act and Its Impact on the State of Alaska, Vol. II: Final Report, " prepared for the Alaska Statehood Commission, July 1982.

SUMMARY

Four key elements of U.S. maritime policy which are subject to current debate have been analyzed above. These are:

- subsidy policy,
- regulatory policy,
- taxation policy, and
- domestic trade restrictions (Jones Act).

In addition, this chapter presented an overall discussion of how present U.S. policies developed over the years, what changes are currently proposed and how future policies should respond to changing future conditions.

Direct-subsidy policies of the past (the CDS and ODS programs) have been aimed at industry promotion and made the assumption that different sectors of the industry (i. e., shipbuilding, liner operators, bulk operators) could be helped by the same medicine. This has not proved to be the case, and the current administration appears to be directing its attention toward support of the liner operators without concurrent attention to shipbuilders or other segments of the industry. Promotion of certain U.S. liner interests is possible with indirect incentives, and this type of approach appears to be consistent with other administration policies.

Indirect subsidies such as loan guarantees to U.S. operators (the title XI program) appear to have been more successful in promoting investment in modern vessel technologies, produced at competitive prices and covering broad sectors of the maritime industry. Future policies concerning industry support, if in the national interest, should therefore include consideration of which maritime sectors can benefit from each type of promotional effort and how Federal support can encourage high productivity and efficiency.

The resolution of the regulatory policy debate appears to be near with congressional consideration of the Shipping Act of 1983. Passage of some form of regulatory changes are clearly in the interest of the major U.S. liner operators, Proper consideration of U.S. shipper interests and the broader goals of enhancing U.S. trade in the future are equally important, U.S. participation in world mar-

itime trade and shipping likely will depend on how well our regulatory policy both protects the national interests and allows for effective competition internationally.

Taxation policies for U.S. shipping interests also are based on sometimes conflicting goals of providing equivalent advantages to industries that must compete in the international market and of assuring fairness and equity among U, S. businesses. Past taxation policies (e. g., the CCF) have sought to encourage investments in new ships and to strengthen the U.S. merchant marine's competitive position. Future taxation policies require careful analysis of the many approaches available and in use to ensure that targeted industry sectors will receive the benefits.

In the future, certain domestic shipping (Jones Act) policies undoubtedly will be challenged by those who consider that present costs of U.S. domestic shipping should be reduced to the benefit of consumers. Whatever changes are proposed (i. e., allowing foreign construction of. Jones Act ships), certain industry sectors will be affected adversely. Policy makers will need to weigh costs and benefits carefully over the long range, clearly including the national interest involved with maintaining certain parts of the industrial base, such as the shipbuilding base.

Finally, future policy formulation needs a more comprehensive approach. Industry incentives may be possible to devise for most maritime segments without tying subsidies for one to subsidies for another, as in the past. For example, certain taxation incentives and foreign purchase allowances could be devised to apply to shipbuilders and ship operators without necessarily making one dependent on another. Also, incentives probably should be tied to support for the most productive elements of the industry and to the elimination of inefficiencies. Also, the incentives discussed in this chapter shouid be integrated with other policies, including international trade and cargo policies discussed in chapter 7.

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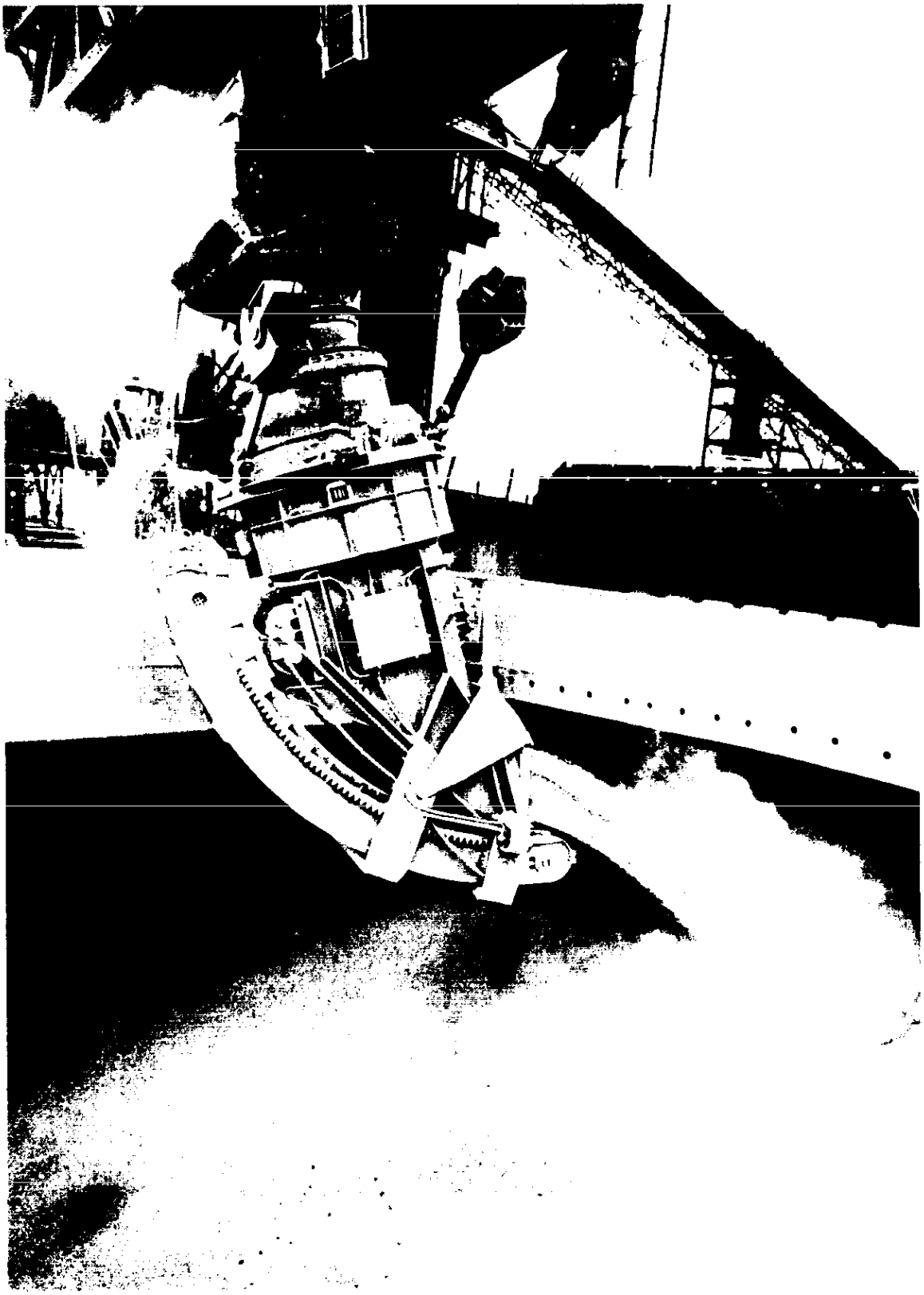

Photo credit: U.S. Department of Agriculture

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Chapter 7

International Trade and Cargo Policies

OVERVIEW

Trade and cargo policies related to international shipping are often considered separately, both within U.S. Federal agencies and among international organizations. However, general trade rules affect the level and nature of world trade which in turn influences the prospects for the shipping industry. This chapter discusses the status and trends of those policies that may have an impact on future international trade and the participation of the U.S. shipping industry in that trade.

Common perceptions often overlook the fact that shipping is a derived demand and an integral component of international trade. When the volume of world commerce goes up, the demand for shipping services increases and the need for efficient, high-volume shipping increases. Unfortunately, many people in the industry regard shipping as an end in itself rather than a means to an end.

International shipping financiers Paul Slater (Chairman, Pelican Finance Corp.) and John Clarke (Citibank N. A.) are quoted, respectively, in the March 1983 *Seatrade.* Paul Slater observed:

> The shipping industry has lost sight of the realities of its own existence—it exists to serve world trade. . . . In the future, owners would have to look at trades, not just ships.

John Clarke of Citibank echoed this:

> The key to success is cargoes, rather than ships. There must be more emphasis on putting deals together with shippers, and the packages must be more creative.

It is, therefore, highly relevant to examine maritime issues within the framework of trade and cargo policies in both the national and international forums.

The international organization most concerned with trade policies among major trading countries is known as the General Agreements on Trade and Tariffs (GATT). The United States was one of the world leaders in the development of GATT through the endorsement of free and open trade principles. The U.S. Congress has, at the same time, introduced trade laws that are intended to guard against unfair trading practices of other nations. The status of GATT and the U.S. policies toward GATT are discussed in this chapter.

The principal organization that has concerned itself with multilateral agreements on maritime cargo policies is the United Nations Conference on Trade and Development (UNCTAD). In response to initiatives of the developing countries, UNCTAD promulgated a multilateral "Code of Conduct for Liner Conferences" which is a cargo-sharing agreement. This code has been ratified by the requisite number of countries to enable it to go into effect in October 1983. The United States has, however, refused to ratify the UNCTAD Code. Like many other nations, the United States does have cargo reservation policies encompassing Government-financed and Government-impelled cargoes. It also has several bilateral cargo treaties in force—specifically with the Peoples Republic of China (P. R.C.), Brazil, and Argentina—which were negotiated following unilateral actions by the other nations.

The current debate between those advocating completely free trade or free access to cargoes and those advocating degrees of government intervention to protect domestic industries undoubtedly will continue. For example, the national value of a domestic industry can sometimes convince governments to provide certain levels of protection. Even though industries and governments publicly state their opposition toward protectionism, they often do not apply those principles to themselves. In addition, reaction to other governments' policies often will bring restrictions on trade. The growing involvement of governments and international organizations in trade and shipping policies and growing protectionism worldwide requires the United States to develop clear trade policies that serve the national interest and can remain consistent over the long term (10 years or more) that many international issues require for resolution.

TRADE POLICIES

International Trade Policy, 1945-75

The importance of international trade for the U.S. economy has increased markedly in the past two decades. Although the U.S. ratio of exports to gross national product (GNP) is still below that of other industrial countries,[1] it stood in 1980 at 8.5 percent, almost double that of 1970. Imports also doubled between 1970 and 1980, rising to 9.5 percent of GNP.

The increased interdependence of the U.S. economy with the international economy is graphically reflected in the fact that over 5 million workers are dependent on foreign trade for their livelihood, and that 80 percent of all new manufacturing jobs created in the late-1970's were linked to exports. In addition, 1 out of every 3 acres planted by American farmers produces crops for exports.[2] This interdependence is expected to continue to grow, with some estimates putting U.S. exports at 15 percent of GNP in 1990.

For the industrialized countries of the Organization for Economic Cooperation and Development (OECD) as a whole, exports accounted for 16 percent of GNP in 1980, up from 9 percent in 1962. The developing countries, especially the newly industrializing countries,[3] also increased their participation in international trade in the past 10 years, with their share of the value of free world exports increasing from 20 to 30 percent between 1970 and 1980. South Korea, for example, increased its exports of goods and services from 3 percent of GNP in 1960 to 34 percent in 1977, while Taiwan went from 11 to 59 percent in the same period.[4]

Much of the economic growth in the postwar period has been the result of international trade. Recent studies have demonstrated that when economies of OECD countries grow by more than 1.5 to 2 percent per year—the situation during the postwar period until recently—nonoil imports tended to grow three times as fast.[5] The same studies show a similar negative relationship, with zero growth in OECD economic activity resulting in a 5 percent drop in nonoil imports.[6]

The present constriction of economic activity and international trade is especially significant because it may very well represent a watershed for the international trading system. The commitment of the industrialized countries, and especially the United States, to free and open trade, is being brought into question as economic activity stagnates and unemployment continues at historically high rates. This is a departure from the 25-year period between 1950 and 19.75 during which the industrialized countries experienced historically high average economic growth rates of over 4 percent and average annual growth rates of over 8 percent in merchandise trade.

Much of the post-World War 11 growth rate has been attributed to the progressive reduction of trade barriers in successive rounds of trade negotiations since 1948 under GATT'. The first five rounds were concerned solely with tariff reductions, while the last two have sought to reduce both tariff and nontariff barriers to trade. After the seventh and latest round of Multilateral Trade Negotiations (MTN), the Tokyo Round (1974-79), average tariff rates are only 4.4 percent in the United States, 4.7 percent in the European Economic Community (EEC) and 2.8 percent in Japan.[7] The Tokyo Round also resulted in the establishment of codes of behavior for such nontariff barriers as customs valuation and subsidies.

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[1] In 1980, for example, Japan exported 12.2 percent of its GNP, while West Germany's export share was 21.8 percent. U.S. Trade Representative, ***Twenty-Sixth Annual Report of the President of the United States on the Trade Agreements Program, 1981-82*** (Washington, D. C.: Office of U.S. Trade Representative, 1983), p. 2.

[2] Ibid., p. 1.

[3] In 1979, OECD included Brazil, Greece, Hong Kong, South Korea, Mexico, Portugal, Singapore, Spain, Taiwan, and Yugoslavia in its seminal analysis on the subject. ***The Impact of the Newly Industrializing Countries on Production and Trade in Manufactures: Report by the Secretary General*** (Paris: Office of U.S. Trade Representative, 1979).

[4] Figures cited in U.S. Trade Representative, ***Twenty-Sixth Report,*** op. cit., pp. 2-3.

[5] C. Fred Bergsten and William R. Cline, ***Trade Policy in the 1980's*** (Washington, D. C.: Institute for International Economics, 1983), p. 14.

[6] Ibid.

[7] ***The Tokyo Round of Multilateral Trade Negotiations: 11 Supplementary Report*** (Geneva: General Agreements on Trade and Tariffs, 1980), p. 33, cited in Bergsten and Cline, ***Trade Policy in the 1980's,*** op. cit., p. 15.

Although the United States was the main force behind these trade liberalization efforts, in 1946 the U.S. Congress refused to agree to the establishment of a much stronger multilateral body, the International Trade Organization (ITO). ITO, which was armed with strong enforcement powers and slated by some to become the economic arm of the United Nations, had an ambitious charter that was intended to prevent trade wars similar to those of the 1930's, which many believe worsened the depression and created the economic conditions that helped bring about World War II. ITO was considered to be overly ambitious and tco ' 'entangling" by Congress. The industrialized countries, however, agreed to the establishment of GATT, which provides rules of conduct for international trade and relies on negotiation and international cooperation, rather than supranational enforcement, to effect the reciprocal reduction of trade barriers, and ensure respect for international trade rules with respect to trade in goods.

GATT is thus a loosely structured international organization which serves as the principal forum in which countries can discuss trade problems and cooperate to reduce trade barriers. * Its body of rules is based on the most-favored-nation principle that governs U.S. conduct in international trade.

Throughout the 1950's and 1960's, one political objective of U.S. foreign policy was the economic reconstruction of Europe and Japan. The benefits of Marshall Plan assistance were accelerated through the progressive dismantling of international trade barriers and capital controls. By the late 1960's and early 1970's, the economic reconstruction of Europe and Japan was completed, and these countries were in position to begin to share with the United States responsibility for the management of the international economic system. Tensions arose in part, however, over the unwillingness of Japan and Europe to assume fully the shared responsibility that their new economic strength warranted. Persistent requests by succeeding American administrations to lower trade barriers further and improve capital flows went unheeded. To improve the political climate and economic coordination among the seven leading industrial countries (the United States, West Germany, France, the United Kingdom, Italy, Canada, and Japan) annual economic summits at the heads of state level were instituted in 1975. The major factors that have led to a changed attitude toward free trade that carries through to today were the economic events of the mid- 1970's—resulting principally from the oil price increases of 1973-74.

Present International Trade Policy

Some analysts call the present phenomenon "New Protectionism, while others call it ' 'managed trade. With tariffs no longer providing any effective protection, countries have begun to influence the direction and volume of their trade through the use of voluntary export restraints and orderly marketing agreements to limit exports, and through the subsidization of exports and other forms of governmental intervention designed to capture export markets unfairly. While the initial trade response to the inflation of 1973 was trade liberalization, exemplified by the elimination of U. S. quotas on steel, oil, meat, and sugar imports, by 1977 protectionism was once again on the rise.

Although each successive year has brought new protectionist measures in all the industrialized countries, these measures have not resulted in any further reduction in world trade beyond that which most attribute to the world economic recession. These protectionist tendencies, which have sought to avoid the painful restructuring of uncompetitive industry or agriculture by insulating the domestic

*"As of September 1982, GATT consisted of 87 member countries ("Contracting Parties") and 30 other countries, to whose territories GATT had been applied and which, as independent states, maintain a de facto application of GATT rules. These countries represent four-fifths of the world's trade. Of the Eastern bloc countries, only Czechoslovakia, Poland, Romania, and Yugoslavia belong. In addition to being the forum for periodic multilateral trade negotiations, GATT has, as part of its normal business, annual sessions of the Contracting Parties to establish overall objectives and guidelines for the organization's work program, and periodic meetings of the Council, to which all Contracting Parties belong, to discuss and try to settle trade concerns and disputes. The GATT Secretariat, which is headquartered in Geneva, Switzerland, consists of 200 personnel headed by a Director General and prepares documentation requested by the members. ***International Trade, 1981/82*** (Geneva: General Agreements on Trade and Tariffs, 1982) and U.S. Senate Committee on Finance, ***Report to Accompany H.R. 4537, Trade Agreements Act of 1979,*** Report No. 96-249, 96th Cong. 1st sess., 1979, p. 2.

[8]Bergsten and Cline, ***Trade Policy in the 1980's,*** op. cit. , p. 15.

"'The Drift to Managed Trade, " ***Financial Times,*** Feb. 15, 1983, p. 12.

economy from international competition, generally have been balanced by counter pressures, such as inflationary concerns, the growing importance of exports to all countries, and the need to mute trade disputes for foreign policy reasons, all of which favor free trade.

The United States and its major trading partners, faced with the same economic conditions of high unemployment, economic slowdown, and growing export dependency, are caught up in similar balancing acts between these protectionist and liberalizing tendencies. Recently, for example, the trade officials of Japan, Europe, the United States, and Canada reiterated, upon completing the third quadrilateral meeting of high-level trade officials, their determination to fight jointly against rising protectionism.[10] At the same time, each of these countries has continued to "manage" its trade. For example, the Europeans recently forced the Japanese to agree to limit their exports of videotape recorders to Europe in 1983, after the French required that all such recorders pass customs in the small town of Poitiers. Europe's Common Agricultural Policy, aimed at protecting the politically important farmers, has set domestic prices on the basis of the costs of the least efllcient producer, and the resultant excess production is exported with subsidies. As a result, although EEC had been a net importer of grains, sugar, dairy products, and beef in the early 1970's, it is now a net exporter.

The opening of Japan's domestic market to foreign agricultural products such as citrus and beef, and high-technology items such as computers, automobiles, and telecommunications equipment, which Japan exports, has been the main agenda item for U.S. and European trade negotiators. Japan has a network of nontariff barriers such as administrative guidance and burdensome customs evaluation procedures (which the French sought to emulate at Poitiers). Trade liberalization in Japan has evolved so slowly that only the January 1983 visit of the Japanese Prime Minister to the United States persuaded U.S. policymakers to delay any new import restraints. One analyst, however, argues that the current undervaluation of the Japanese yen resulting from exchange rate misalinements "is a more potent cause of trade friction than overt and covert protection in Japan."[11]

The United States is not immune from criticism about its protectionist measures. Steel, automobiles, and textiles all enter the United States under some form of voluntary restraint arrangement. On the whole, however, these arrangements are not as restrictive as the European program, although one observer wryly noted that it was the United States that, in fact, originated many of the restrictive practices it finds fault with in its trading partners. It was the United States that first insisted on a GATT waiver for protection of certain agricultural products—which set a precedent for similar European requests—and it was the United States which pushed in the early 1960's for the first international textile arrangement. The developing countries have also implemented protectionist policies. Many of these nations, as they attempted to improve their international trading posture, found it difficult to break into markets that historically had been dominated by developed countries. Their inability to be competitive has lead to a number of direct and indirect protectionist schemes.

U.S. Trade Policy

Since 1976, the merchandise trade balance has been in deficit, and the economic rebound in the United States is expected to lead to a record 1983 trade deficit. Although the current account, which includes trade in services and investment remittances as well as trade in goods, may be a better measure of U.S. competitiveness, the trade deficits—due to a large degree to imports of autos, steel, and textiles—have provided the fuel for inward-looking trade policies. Nevertheless, the United States continues to exert strong leadership within and without GATT in favor of free trade. It continues to use GATT as its principal forum for the resolution of trade disputes. GATT, as a body, does not have any enforcement mechanism, and major trading countries have ignored unfavorable rulings of GATT panels of experts. GATT's utility in the resolution of trade disputes is therefore dependent

[10] "Industrial Powers Agree to Fight Protectionism," *Journal of Commerce,* Feb. 14, 1983.

[11] Gary R. Saxonhouse, "The Micro and Macroeconomics of Foreign Sales to Japan, cited in Bergsten and Cline, *Trade Policy in the 1980's,* op. cit., p. 28.

on either the willingness of its members to acquiesce to its jurisdiction, or on political deals made outside the institution.

The rise in the number of interest groups seeking import protection is attributable to the increased interdependence between the U.S. and world economies, and to the inability of certain industries to compete favorably with foreign industries. The resultant high unemployment in labor-intensive industries such as autos, textiles, and steel, together with a growing frustration with what appears to be the slow pace of trade liberalization in Europe and Japan, have punched large holes in the broad postwar consensus in support of free trade. This breakdown is particularly manifested in the recent introduction of new legislative proposals addressing trade policies. These proposals share certain common characteristics: they are designed to increase employment in the United States either by placing restrictions on foreign imports or by improving the ability of U. S. exports to compete in foreign markets. They all involve some form of governmental intervention, which would result in increased budgetary costs and market inefficiencies.

During the 97th Congress, several bills calling for trade reciprocity were introduced. These bills sought to give the President retaliatory powers to deny access to the U.S. market of products from countries that did not grant similar U.S. products "substantially equivalent' access to their markets. Although the conventional usage in trade policy of the term ''reciprocity' has connoted for the last 60 years unconditional most-favored-nation treatment, the present usage implies a willingness to discriminate among suppliers by providing import protection against a single country. Furthermore, while ' 'reciprocity' traditionally involved a balancing of benefits and access across the total trade spectrum, with the direction of trade based on the laws of comparative advantage, the new usage would judge whether trade in individual product sectors was balanced.

Other proposals have sought to increase U.S. employment by curbing imports and would require foreign automobile manufacturers to incorporate prescribed amounts of U.S. labor and U.S.-manufactured components into cars sold in the United States. The "local content" bill had its most recent origin in 1980 as layoffs in the auto industry started to mount in the face of increased Japanese automobile imports.

President Reagan opposed this bill, saying that it would destroy more jobs than it would save and that it would invite retaliation. He did not mention that such "local content' regulations are one of the main nontariff barriers that U.S. exporters face in other countries, especially in the developing countries. As a possible reaction to congressional concerns, the Japanese recently have agreed to continue for another year their ' 'voluntary export curbs, which limit their auto exports to the United States and thus enable U.S. automakers to increase their market share.

Improving the competitiveness of U.S. exports is the rationale behind certain proposals before Congress this year to renew the charter of the Export-Import Bank. The Eximbank, as it is known, aids in financing exports of U.S. goods and services through the provision of direct loans, loan guarantees, and insurance. While the Bank must base its rate structure on its average cost of money, it also must meet the policy mandate that its financing be provided at rates and on terms that are competitive with financing provided by the United States' principal foreign competition. In recent years, however, high interest rates and the increasing tendency of foreign governments to subsidize export financing heavily have placed U.S. exporters at a competitive disadvantage. This has put pressure on Eximbank to provide subsidized financing to counter the export financing subsidies of the other countries.

While the administration would prefer to have Congress renew Eximbank's charter without any changes, Senator John Heinz is sponsoring a bill to establish a special fund, "a war chest, that would give Eximbank increased authority to provide subsidized loans to U.S. exporters to counter ' 'predatory' export credit practices of other nations. However, the recent drop in interest rates may remove the need for heavily subsidized export credits[12] and thus make the debate over a ' 'war chest academic.

[12] One observer dates the first subsidized Eximbank loan to as recently as June 1979, when Eximbank's funding costs moved above the average interest rate charged on its loans. Patricia E. Barrett, "Eximbank Must Be Seen in Global Perspective, '*Journal of Commerce*, Jan. 26, 1983.

Export Trading Companies

As world trade has become more important to the American economy, both business and government have looked for ways to boost U.S. exports. One frequently noted fact is that only a very small percentage of all U.S. companies are even involved in foreign trade. Studies by the Department of Commerce and others estimate that more than 20,000 small- to medium-sized U.S. firms make products that would be highly competitive overseas. 13 But their small size, low amounts of capital, and lack of foreign experience have left them either unable or unwilling to take on the risks and costs involved in operating abroad. The Export Trading Company Act of 1982 (ETCA) is designed to help deal with this problem.

Trading companies have long existed in the United States and elsewhere. But prior to the new law, most American trading companies fell into two categories—companies set up by major corporations for the purpose of handling their own export trade or narrowly focused companies engaged primarily in arranging export services. 14

But the 1982 law envisions something more—knowledgeable and well-financed companies that can provide a wide range of services to U.S. firms. This model, as in so many other cases, has been the Japanese. Their very successful trading companies—the *Sogoshoshas*— link goods to foreign markets. Possessing both a large overseas commercial network and special financing by banks that belong to the same *Kiretsu*, or business combine, as the trading company itself, this type of organization can provide a wide range of services to a company that wants to export. These services include the development of foreign markets, market intelligence and research, financing, transportation services, and generally handling a variety of the uncertainties and risks associated with exporting.

ETCA was passed to encourage the formation of this kind of broad, multiservice company. It does so by changing the law in two areas: banking and antitrust.

[13]See for instance, Senate Report 92-27, May 18, 1981, pp. 2-3.

I+ Betty Jo Christian, "Export Trading Companies: New Vehicle for Growth for American Business," *How* to Use *Export* Trading Companies *to Penetrate Foreign Markets,* a symposium presented by the Baruch College of the City University of New York, Dec. 9, 1982, p. 8.

The act allows banks, within certain limitations, to buy into existing trading companies or to establish their own trading company subsidiaries. It is believed that this new provision will help create the kind of unique relationship that exists between Japanese banks and trading companies and will, in particular, bring in the capital needed to finance exports. Banks are also seen as having the necessary knowledge, expertise, and overseas network to provide comprehensive export services.

Another provision of the new legislation clarified the Webb-Pomerence Act of 1918. That law exempts U.S. exporters, under certain conditions, from U.S. antitrust laws. The 1982 act does not, in fact, change any U.S. antitrust law. Instead, it establishes a ' 'certification system' by which firms seeking to form an export trading company can get a formal Government opinion on whether their action does or does not violate existing antitrust policy. The system thus provides preclearance and a guarantee against possible antitrust actions by the Government. Given that present uncertainties about antitrust policy seem to deter many American businessmen, the act's authors hope that the certification process will lead to more cooperation among firms.

Under the new act, just about anybody can form an export trading company, Banks can, as noted above. Large corporations that already have experience overseas can offer their services to other American firms, Transportation companies and even port authorities and State development boards can start them.

Ship operators in particular may want to consider forming export trading subsidiaries. Given their great experience in foreign trade and their extensive overseas networks, many ship operators are in an ideal position to offer expanded services to U.S. exporters. Some observers also hope that the 1982 law will provide more antitrust immunity than the 1916 Shipping Act, although changes in the 1916 law might further the process. In particular, allowing service contracts between a shipper and an ocean common carrier or conference might help create longer term, more flexible cargo arrangements. 15

[15]William J. Coffey, "Export Trading Companies and Ocean Carriers," *How to Use Export Trading Companies,* symposium, Dec. 9, 1982, p. 31.

Since ETCA is so new, it is too early to assess its impact. Much will depend on how Federal antitrust officials implement the new legislation, and in particular how broadly and quickly they grant antitrust certificates. Much also depends on the attitudes of American banks; they historically have been very risk-averse and may not wish to get into the export trading business. Yet in any event, the 1982 law is a major change in American public policy towards exports and the role of American companies, including American shipping companies, in the export business.

Reorganization of Federal Trade Agencies

In addition to substantive legislation, there has been continuing interest in reorganizing the various Federal trade agencies. Proposals range from establishing a Department of Trade, which would bring together the Off Ice of U.S. Trade Representative (OUSTR), Eximbank, and other agencies under a new Cabinet-level department, to more modest proposals that would fold either OUSTR into the Commerce Department or merge the International Trade Administration (ITA) of Commerce into OUSTR. Although these sweeping proposals deal with the management of trade policy, they are principally motivated by concern for the continued deterioration of the U.S. trade position, the loss of both American and foreign markets to foreign competition, and the perceived unwillingness of our trading partners to open their markets to our exports. As Senator Roth recently said in support of his reorganization bill, "[1] would assign the new Secretary of Trade the responsibility of retaliating against 'illegal' quotas or other unfair practices used by trading partners. "1[6]

At the end of April 1983, the Reagan administration presented a trade reorganization plan of its own—a proposal to create a new Department of International Trade and Industry (DITI). The current administration, like others, claims that trade responsibilities within the Government should be met by one voice on this increasingly important issue.

It is true that Federal trade programs are spread out over a wide range of departments and agencies. They include:

- U.S. Trade Representative (USTR), a Cabinet-level official in the White House who represents the United States in both GATT and bilateral trade negotiations;
- Department of State, which has fewer trade responsibilities than it once did but which still is involved in trade negotiations;
- Department of Commerce, which administers export controls and assists American exporters through its Foreign Commercial Service and other programs;
- International Trade Commission (ITC), an independent Federal agency that investigates charges that other governments have engaged in such unfair trade practices as dumping and improper subsidies;
- Department of Agriculture (USDA), which maintains the Foreign Agricultural Service (FAS) and has the main responsibility for agricultural trade policy;
- Department of the Treasury, which helps set international economic and monetary policy;
- National Security Council (NSC) and Department of Defense (DOD), both of which play an active role in export control policies;
- Maritime Administration (MarAd) and Federal Maritime Commission (FMC), both of which are concerned with the international role of the U.S. shipping and shipbuilding industries; and
- other agencies that provide assistance to exporters: including the Eximbank, the Small Business Administration (SBA), the Overseas Private Investment Corporation (OPIC), and USDA's Commodity Credit Corporation (CCC).

The DITI proposal would combine some but not all of these programs into the new department. Under the proposal, the Department of Commerce would be abolished. Many of its present parts would be included in the new department—ITA; the eco-

[16] 'Trade Bill Praised by Commerce Official, " *Journal of Commerce*, Feb. 2, 1983.

[17] For details see Raymond Ahearn and David Driscoll, ***Executive Branch Organization to Formulate and Implement U.S. Foreign Trade and Investment Policy,*** Congressional Research Service Report No. 81-143 E, Aug. 25, 1981.

nomic affairs programs (Bureau of Economic Analysis, Bureau of Industrial Economics, and technology policy, but not the Census Bureau); the Patent and Trademark Office; the Travel and Tourism Administration; and the National Telecommunications and Information Administration. Other parts of Commerce would either be made independent or integrated into other agencies. 18

Also included in DITI would be OUSTR, the Eximbank, and OPIC. A new Cabinet-level council, headed by the President, would be established in the White House to coordinate overall Government trade policy. The council would have a small White House staff and be similar to NSC.[19]

The main argument for the new department is that the executive branch too often simply reacts to events—either in Congress or abroad—and fails to plan ahead or speak with one voice. In particular, the administration says, the separation of OUSTR and the Commerce Department splits policymaking from policy implementation and confuses everyone; no one knows whether the Trade Representative or the Secretary of Commerce speaks for the United States. In the words of the administration, DITI would ' 'bring together the analysis, negotiation, regulation, and implementation aspects of trade policy. ''20 Commerce Secretary Baldrige, the plan's main proponent, says that such consolidation is important as trade becomes increasingly necessary to the U.S. economy.

The DITI proposal does not lack critics, however. The Senate Finance Committee and House Ways and Means Committee are worried about losing jurisdiction over OUSTR. Other critics specify three main objectives. First, this proposal will not actually solve the fragmentation problem. It will combine OUSTR and Commerce, but USDA will still handle agricultural trade, and State and Defense will continue their roles. If fragmentation is the problem, DITI is not a full solution. Second, DITI may in fact add to fragmentation. Today, OUSTR serves not only as our negotiator but also as interagency coordinator. However, DITI, like the present Commerce Department, is likely to be more an advocate of U.S. business interests than an impartial balancer of competing trade views. Thus, the interagency function will fall to the new White House trade council, a group likely to lack the expertise and stature of OUSTR. In fact, an earlier trade reorganization debate in 1979 led to strengthening OUSTR, because of problems of interagency coordination, and a perceived need to improve our competence in negotiations. Third, critics ask what is the ' 'real' purpose of the reorganization. They are afraid that the new reorganization will weaken the efficiency and independence of OUSTR and shift policymaking power to the more protectionist-minded Commerce Department. Secretary Baldrige disagrees, saying that the new DITI could be pro-free trade or pro-protection, depending on who is put in charge. But the critics note that the Commerce Department's main constituency are the very businesses that now seek relief from imports.[21]

As with other reorganization plans, political power is a factor. Questions arise as to who will benefit and lose politically if the reorganization proposal is adopted. In the case of DITI, business interests that seek further protection probably would gain in policymaking influence. Consumers who benefit from the free importation of low-price foreign goods might lose. Service industries, like shipping, might not be affected because the Commerce Department has always been more oriented toward manufacturers than service industries.

President Reagan would like to see Congress adopt the DITI proposal this year. At the present, its prospects are unclear. In the final analysis, though, the debate over DITI is best seen as part of the larger U.S. debate over trade policy in general. With many American industries facing increasingly stiff foreign competition, the United States now faces two key questions. First, what is our goal-genuinely freer trade, including more open foreign markets; more protection for ailing U.S. industries; or freer trade plus some concerted U.S. industrial policy to make American companies more competitive? And, second, if our goal is freer

18' 'Statement by the President, June 1, 1983. See also: "Department of International Trade and Industry: Joint Statement by Ambassador Brock, Secretary Baldrige, and Senator Roth, " and "Department of International Trade and Industry: Factsheet.

[19]Ibid.

[20]Ibid.

[21]For a summary of the criticisms of the administration proposal see "Trade," *The Economist,* Apr. 30-May 6, 1983, pp. 28-33.

trade, what tactics should we use in seeking it—continued patience in negotiations or retaliation against those whose markets are more closed than ours? Until we know what kind of trade policy we advocate, debates over trade organization are likely to remain intense and frequent.

These reorganization proposals are not new; the same arguments were used in 1979-80 when a similar debate culminated in a compromise reorganization of the trade agencies and functions. The compromise gave OUSTR, who is the President's trade adviser and chief international negotiator, wider trade policy leadership, while the Commerce Department was given the day-to-day operational responsibility for the Government trade functions. However, this reorganization did little to improve the weak trade promotion activities of the U.S. Government, which involve a host of other considerations.

The Enforcement of Fair Trade Laws

While changes in U.S. trade laws may provide a long-run approach to improving the enforcement of U.S. trade rights, the administration also enforces its rights by permitting aggrieved U.S. parties to seek relief on a case-by-case basis under the U.S. Fair Trade Laws. The Countervailing and Anti-Dumping Statutes protect U.S. manufacturers from foreign subsidies and sales at less-than-fair-value in the U.S. market. Cases involving items such as steel, bicycles, metal castings, certain chemicals, and textile products have been processed in 1982 by the Commerce Department; and the United States has concluded an agreement with EEC within the past year in response to findings of export subsidies under the U.S. countervailing duty law, setting limits on exports Of major Steel products to the U.S. market.

The United States also has decided to use U.S. export subsidies as a trade weapon for the first time. As a challenge to EEC agricultural policies that have turned Europe from a net wheat importer, through heavy subsidization, to a net exporter, USDA has subsidized the sale of 1 million metric tons (tonnes) of wheat flour to Egypt, which previously had been supplied principally by the French. There are also indications that U.S. exports of butter and poultry products maybe similarly subsidized.

The most sweeping powers to retaliate against the unfair trade practices of foreign governments are found in section 301 of the Trade Act of 1974, as amended. Under section 301, the President can take "all appropriate and feasible action' within his power—including quotas, or any other trade restrictions—to obtain the elimination of any acts, policies, or practices deemed to be unjustifiable, unreasonable, or discriminatory and which burden or restrict U.S. commerce. This provision of law, although on the books since 1974, was hardly used during the Tokyo Round of Trade Negotiations and only since its completion has OUSTR undertaken a significant number of investigations. During fiscal year 1982, OUSTR initiated 10 section 301 investigations, which constituted nearly one-third of the total investigations initiated under the provisions of the section since 1975.[22]

Four section 301 cases concern European agricultural subsidies, one concerns Argentina's export restrictions on cattlehides, and five concern domestic subsidy practices of five countries producing specialty steel. In this context, OUSTR has been actively utilizing the international dispute settlement procedures of GATT and the Subsidies Code. U.S. Government officials have expressed some disappointment, however, at the fact that with deadlines missed and one consultation request even refused, these procedures have not always worked to U.S. satisfaction. Nevertheless, OUSTR is continuing this approach and has not yet sought other forms of retaliatory relief.[23] The U.S. Government subsidization of the wheat sale to Egypt has escalated tensions with EEC and may have actually overshadowed the significance of the 301 proceedings in GATT. Nevertheless, since EEC has also brought the U.S. subsidy case to GATT, some resolution within the terms of the Subsidies Code is expected to occur, a fact which, in its own right, has precedential significance for GATT.

[22] Office of U.S. Trade Representative, ***Report of the OUSTR to the Congress on the Status of Section 301 Cases,*** unpublished, July 29, 1982.

[23] 1 bid., p. 2.

The present administration appears to be following the approach of exhausting the international dispute settlement procedures before considering any retaliation. This is a very delicate maneuver. The international settlement approach has not yet served to eliminate any foreign unfair trade practices and will not be continued ad infinitum without some successful resolution of cases. The complaining industries and Congress are closely watching the administration's enforcement of these section 301 cases. The administration will need to receive concessions from U.S. trading partners to avoid the necessity of actually retaliating under section 301. There is already some question in Congress about the need for changes in section 301 "to expand the scope of this law, authorize the use of a broader range of retaliatory devices, such as countersubsidy programs or regulatory action, and revise administrative procedures, including time limits. "[24]

[24] "The Honorable Sam M. Gibbons (D-Fla.), Chairman, Subcommittee on Trade, Committee on Ways and Means, U.S. House of Representatives, Announces Hearings on Trade Remedy Laws, " House Ways and Means Subcommittee on Trade, Feb. 15, 1983, p. 2.

MARITIME CARGO POLICY

Introduction

Shipping policies tend to mirror trade policies. As might be expected, increasing protectionism in trade has spawned a variety of restrictive and protectionist policies in the maritime area—unilateral, bilateral, and multilateral.

Historically, all maritime nations have protected their national maritime interests through the implementation of some forms of cargo policy, generally by reserving some or all of the carriage of certain commodities for their own national carriers. In the case of established maritime countries, this is sometimes achieved through closed conferences, which are able to assure national lines of full or "fair" participation in their trade. In the case of lesser developed countries, more overt government intervention is usually involved.

The practice of cargo preference can be direct or indirect. In some cases, a country mandates that a certain percentage of its imports or exports must be carried on its national-flag vessels. Provision may be made for bilateral or multilateral cargo-sharing, often on a 50/50 or 40/40/20 basis, with the larger shares reserved for the national flag lines of the trading partners. (These agreements will be discussed later in this paper.) Indirect cargo preference can be accomplished by a government mandate requiring imports to be purchased on an f.o b.-basis and exports on a c. if. -basis. In addition, various tax deductions and other fiscal incentives are frequently granted to importers and exporters that utilize their national-flag carriers.

Cargo Preference in the United States

The United States has enacted several cargo preference laws which concern the movement of Government-impelled and Government-financed cargoes. These are the Cargo Preference Act of 1954, Public Resolution (Public Res.) 17 and the Military Transport Act of 1904. An economically significant U.S. cargo policy is cabotage, which is provided for in the Merchant Marine Act of 1920, commonly called the Jones Act. Although not usually categorized as cargo preference, this act requires that all domestic waterborne trade be carried on U.S.-built, U.S.-flag vessels. Chapter 6 explores the Jones Act and its impacts.

The Cargo Preference Act of 1954 mandates that at least 50 percent of any U.S. Government-impelled cargoes must be carried on privately owned U.S.-flag vessels. It applies to Government cargoes shipped for U.S. Government account (e.g., military support cargoes) and to any cargoes shipped under Government grant or subsidized loan such as cargoes shipped by the U.S. Agency for International Development (AID).

Public Res. 17 requires that 100 percent of any cargoes financed by loans made by the U.S. Government to foster exports must be carried on U. S.-flag ships. This primarily concerns commodities backed by Eximbank loans. There is provision for waiver of the law by MarAd so that up to 50 percent of such shipments may be carried on the flag vessels of the recipient nation.

The Military Transport Act of 1904 requires that all supplies shipped for use of the U.S. Armed Forces must move on U.S.-flag ships, This law interacts with the Cargo Preference Act with the result that one-half of all such military shipments must move on privately owned U.S. vessels. This means that the Military Sealift Command (MSC), the primary vessel charterer for the military, can ship only 50 percent or less of its cargoes on Government-owned or controlled vessels.

Currently, only Government-impelled cargoes are covered by cargo preference laws. A bill, H.R. 2692, introduced by Congressman Walter B. Jones in April 1983, seeks to clarify and consolidate the existing U.S. cargo preference laws. Over the past decade, a number of other bills have been introduced in Congress proposing extension of cargo reservation to certain commercial cargoes, notably bulk commodities. Among such legislative initiatives were measures that called for cargo preference on 50 percent of all U.S. oil imports (1972), 30 percent of U.S. oil imports (1974), 9.5 percent of U.S. oil imports (1977), 40 percent of dry-bulk imports (1981, 1982), and 20 percent of dry-bulk exports and imports (1982, 1983). Only one—the 1977 oil cargo preference bill—passed both Houses of Congress. It was pocket-vetoed by President Ford. A bill calling for 20 percent of dry-bulk exports and imports to be carried on U.S.-built, U.S.-flag vessels by 1998, was introduced by Congresswoman Lindy Boggs in February 1983 and is pending. Related bills have been introduced in the Senate. The reason for these attempts is not difficult to discern. As discussed in chapter 3, the U.S.-flag foreign trade liquid- and dry-bulk fleets are very small. Less than 3 percent of U.S. oil imports is carried on U.S.-flag ships, and less than 1 percent of U.S. dry-bulk trade.

There also have been attempts to limit or reduce the impact of current cargo preference legislation. A bill was introduced in the 97th Congress that would have exempted dry-bulk cargoes from the provisions of the Cargo Preference Act of 1954 and Public Res. 17; another bill called for preference cargoes to be shipped only on vessels delivering cargo at the lowest landed cost; a third bill dealing with interest rate "buy downs' on loans for agricultural purchases by foreigners stated that the cargo preference laws would not apply. In the current Congress, Senator Boshwitz has introduced legislation that would exempt from cargo preference agricultural commodities shipped under the blended credit program. Congresswoman Virginia Smith introduced another bill in the current session that would exempt shipments of agricultural products from the cargo preference laws.

The debate about cargo preference has continued over the past decade. Opponents argue that significant economic cost and inefficiency result from cargo preference requirements. In general, U. S.-flag ships—especially bulk ships—cost substantially more to build and operate than equivalent foreign-flag ships (see ch. 3). In addition, since the U. S.-flag bulk fleet is small and has limited capabilities, a number of preference cargoes (especially under the Food for Peace Program) must move on U.S. liner ships which are even more expensive than foreign-flag bulk carriers. Since agricultural commodities are sold on the basis of landed cost, usually at world spot prices, higher transportation costs would either reduce income to the U.S. farmers or, where AID pays the bill, reduce the amount of the product that is exported. Thus, in effect, income is diverted from the U.S. agricultural sector to the shipping industry.[25] Other criticisms of cargo preference are that overtonnaging in a given trade can result, and that direct cost to the Government occurs when an agency must pay higher U.S. rates. Less export cargo can then be shipped for a given budgetary allotment.

Proponents of cargo preference hold that while U.S.-flag bulk rates are higher than foreign rates, this is not true in the liner industry, where rates are set by conferences and are the same for all flag carriers. Of course, agreed upon rates don't apply when rates are ''open' as may often be the case for agricultural commodities. Virtually all Eximbank cargoes are liner shipments moving at conference rates. The primary and compelling argument for cargo preference is that it is one of the prices paid to assure that the United States has a national-flag merchant fleet. The fleet is needed for strategic military reasons and must be supported either directly or indirectly by the Government

[25] See ' 'Cargo Preference Requirements Add to Costs of Title 11 Food For Peace Programs, GAO Report-GAO/PAD-82-3 1, August 1982,

because it is unable to compete on a purely commercial basis. Proponents further argue that one should not calculate the cost of cargo preference itself, only that cost as compared to the cost of other promotional schemes that would have to be instituted in its absence. They also claim that cargo preference requires no direct Government outlays. (This is not entirely true, however, in cases where Federal agencies' budgets must bear the cost of U.S.-flag shipping.)

The importance of cargo preference to the U.S. maritime industry is significant. In 1980, revenue from the carriage of preference cargoes totaled $1.1 billion for all U.S. operators. Liner operators received 16 percent of all revenues under the programs. However, the overall figures do not reflect the impact of preference carriage on individual operators. For some liner operators, it amounts to 30 to 40 percent of total revenue. About $536 million in revenue was generated from shipments of bulk preference cargoes in 1980, about 10 percent of total revenue. The U.S. dry-bulk fleet-though very small—is particularly dependent on preference carriage and might cease to exist in foreign trades without it. However, preference laws to date have not resulted in improvements in the quality or size of this fleet, largely because of the uncertainty associated with cargo preference trades. U.S. ship operators will not make long-term investments in modern, efficient vessels without a more consistent and coordinated approach toward cargo preference policies by all Federal agencies involved.

A number of studies have been conducted to measure the costs of various cargo preference measures. A recent analysis of the cost of existing cargo preference laws was prepared by MarAd on April 11, 1983. MarAd used cost estimates generated by AID, (Because Eximbank cargoes are 95 to 98 percent liner and move at conference rates, no differential for these cargoes was calculated.) For AID cargoes, the total 1982 differential was $138 million. The program which consistently had significant volumes of cargo moving at differential rates was the Food for Peace (Public Law 480, Title I) program. U.S.-flag vessels had a 50. l-percent share of carriage at a rate differential per ton averaging $52.57, The total cost of moving these cargoes on U.S.-flag ships instead of on foreign-flag ships was $97.7 million.

Various estimates of the costs of cargo preference proposals have been generated during debate on the proposals. However, it is difficult to measure the potential impact of the proposals because the cost estimates vary widely, depending on the source. For example, estimates of the cost of preference under the 1977 oil preference legislation, which called for 9.5 percent of U.S. imports to be carried on U.S.-flag, ranged from O. 1 cent per gallon at the pump to 1 cent. General Accounting Office (GAO) estimates were 0.15 cent to 0.23 cent,[26] or from 3.7 to 6.2 percent in the landed price of Saudi oil.[27] Critics claimed that the impact was understated because GAO assumed only a 10 percent rate premium for U.S.-flag carriage.

In congressional testimony on H.R. 4627 (dry-bulk preference bill), a proponent of the legislation claimed that 20 percent U.S.-flag carriage of U.S. coal exports would raise its cost by only 40 cents per ton or 0.6 percent. An opponent testified that 40 percent carriage of U.S. dry-bulk trade would cost $28 to $45 per ton more (depending on the commodity), an increase of 70 percent over foreign carriage.

In the final analysis, there really is no argument about whether the present U.S.-flag bulk service costs are higher than foreign-flag or that, without subsidies, many of the U.S.-flag liner operators have higher costs compared with their foreign counterparts. The question is whether national priorities require the existence of a merchant fleet which cannot compete in a free market under present conditions. * If so, it must be determined whether cargo preference is the most desirable way to provide a needed subsidy.

While most maritime nations practice cargo preference, the terms of their laws and regulations vary widely. In some cases, only government impelled cargoes are covered—as is the case with

[26] "Costs of Cargo Preference, " GAO, Report of the Comptroller General of the United States, Sept. 9, 1977.

[27] Reuben Kyle III and Laurence Phillips, "Maritime protectionism: A New Call for Cargo Preference, Department of Transportation, undated.

● See chapter 6 for a discussion of possible approaches to making the U.S. fleet competitive. The approaches include allowing foreign purchase of ships, utilizing tax incentives more freely, reducing crew size, allowing foreign nationals in crews, and other practices to equalize U. S.- v. foreign-flag rules of conduct.

the United States. In others, 100 percent of all cargoes are included. However, such stringent reservation is usually practiced only in theory. A number of countries have in place bilateral maritime agreements with trading partners. These are usually directed toward the liner trades only. These typically divide cargo on a 50/50 or 40/40/20 basis, and the United States is a party to several bilateral cargo-sharing agreements (most notably with Brazil and Argentina).

Appendix B summarizes the cargo preference practices of many foreign nations. The list was compiled by MarAd in early 1982, and revised by OTA in early 1983. Table 43 summarizes some cargo preference practices of the leading U.S. trading partners. It can be seen from both table 43 and appendix B that those countries that trade most actively with the United States have a wide range of cargo-reservation approaches. Some are comparatively unrestrictive in reserving cargo for their national fleets while others are most restrictive. It should be noted that most of these nations are either signatories of the UNCTAD Liner Code or have indicated that they intend to sign it in the near future. The variety of international trade philosophies thus represented requires careful analysis and a flexible response from U.S. policy makers.

Bilateral Cargo-Sharing

A number of bilateral cargo-sharing agreements have been negotiated between countries that are substantial world traders. These countries regard such agreements as a mechanism to achieve greater participation in the carriage of their own trade. For example, in 1981, developing countries accounted for 12.5 percent of world shipping tonnage, while they generated over 40 percent of waterborne cargoes traded (exports and imports together). In trades between less developed countries (LDCS) and the United States, the United States currently carries about a 30-percent share on average (although in some trades the total is over 40 percent), while the LDCS' average share is 21 percent. It should be noted that while the primary impetus for negotiation of bilateral agreements has come from developing countries, the developed countries of the West have found this mechanism useful in regulating their trades with Communist countries. Communist nations frequently use their merchant fleets as

Table 43.—Cargo-Preference Policies of 15 Largest U.S. Trading Partners

	Bilateral with United States	Members of GATT	Signatories of UNCTAD Code (April 1983)	National cargo preference laws
Japan	No	Yes	No	Government/industry cooperation in all shipping
United Kingdom	No	Yes	No	Minimal—except military cargo
Saudi Arabia	No	No	No	5 percent oil exports reserved for Saudi flag; other preferences in effect
West Germany	No	Yes	Yes	Minimal—except for bilateral
France	No	Yes	No	Substantial cargo reservation for energy imports and bilateral
Venezuela	No	No	Yes	Legislation for 50-percent reservation to Venezuela flag
Nigeria	No	Yes	Yes	Bilateral under negotiation
Netherlands	No	Yes	Yes	Minimal
Italy	No	Yes	No	Minimal—some bilateral
South Korea	No	Yes	Yes	Substantial reservation laws
Brazil	Yes	Yes	No	Substantial reservation laws
Hong Kong	No	—	—	(U.K. Territo~)
Belguim	No	Yes	No	Minimal
Australia	No	Yes	No	Minimal
Indonesia	No	Yes	Yes	Substantial Government rules favoring Indonesian flag

NOTE Countries are listed in order of the value of their trade (from 1982 International Monetary Fund Yearbook) with the United States. Canada and Mexico are excluded because their trade is mostly nonmaritime. See app. B for country detail.

SOURCE Off Ice of Technology Assessment

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political tools rather than as commercial entities, making it difficult or impossible for private operators to compete with them on a commercial basis. Thus, a bilateral agreement maybe the best or only way a Western country can protect its privately owned fleet in trading with an Eastern bloc country.

Table 44 shows the U.S. share of bilateral liner cargoes carried by country. To date, the U.S. policy on bilateral cargo agreements has been to negotiate only where necessary to protect our interests (e. g., where a country has already taken unilateral action to reserve cargoes for its own ships, and U. S.-flag ships could be excluded from the trade if no action were taken). The agreements now existing between the United States and other countries were negotiated on a government-to-government basis. In some cases the carriers in the trade have been empowered to negotiate specific pooling arrangements following general conditions in the government agreements.

Currently, the United States has bilateral agreements with three of its trading partners: the P. R. C., Argentina, and Brazil. A bilateral agreement with the U.S.S.R. expired in 1981 and has not been renewed.

Both the expired L[T]. S.-U. S.S. R. agreement (signed in 1975) and the accord with the P.R.C. (signed in 1980) gave each country's merchant ships access to the other's major ports and the opportuni-

Table 44.–U.S. Waterborne Foreign Trade Liner Service, Origin/Destination Country, Calendar Year 1981

	Total		U, S.-flag share			
Country	Tonnage	$ value (million)	Tonnage	Percent	$ value (million)	Percent
Japan	8,321,052	$28,804	1,803,050	22	$7,376	26
Taiwan	3,605,829	10,255	869,257	24	3,544	34
West Germany	3,258,880	9,088	742,466	23	1,916	21
South Korea	2,655,178	6,725	681,646	26	2,161	32
United Kingdom	2,337,773	6,881	826,127	35	1,970	29
Italy	2,142,515	4,035	562,374	26	1,172	29
Brazil	1,936,655	4,220	884,833	46	1,864	44
Netherlands	1,807,944	3,293	496,243	27	1,077	33
France	1,764,379	5,188	549,673	31	1,408	27
Australia	1,737,599	4,464	464,665	27	1,041	23
Hong Kong	1,568,489	5,938	508,447	32	3,212	54
Saudi Arabia	1,476,931	4,289	108,870	7	337	8
Belgium	1,234,514	3,182	350,170	28	1,020	32
Venezuela	1,214,544	3,056	344,185	28	880	29
South Africa	1,193,400	2,276	224,246	19	512	22
Indonesia	1,161,050	1,666	446,045	38	485	29
India	1,003,018	1,323	616,410	62	800	60
Nigeria	1,001,449	966	34,759	4	87	9
Philippines	944,816	1,744	276,141	29	556	32
Spain	923,238	1,884	328,746	36	811	43
Egypt	830,145	882	450,770	54	452	51
People' sRepublic of China	814,835	1,940	182,473	22	513	26
Singapore	668,740	2,618	154,427	23	528	20
Argentina	668,411	1,630	298,814	45	694	42
Ecuador	586,823	798	175,067	30	301	38
Chile	571,663	1,239	157,808	28	333	27
Peru	557,563	1,053	196,843	35	417	40
Thailand	555,060	1,154	124,703	22	198	17
Israel	534,354	902	253,010	48	368	41
Sweden	524,778	1,830	95,941	18	245	13
New Zealand	501,914	1,140	134,383	27	272	24
Malaysia	496,979	1,063	145,960	29	242	23
Colombia	496,163	1,099	167,573	34	361	33
Guatemala	395,778	551	71,733	18	165	30
Canada (Total)	392,953	347	120,400	31	75	22
(Translates)	183,941	124	72,391	39	49	39
Dominican Republic	351,213	524	126,093	36	193	37
Denmark	337,929	820	63,987	19	199	24

Table 44.—U.S. Waterborne Foreign Trade Liner Service, Origin/Destination Country, Calendar Year 1981 (Continued)

Country	Total		U.S.-flag share			
	Tonnage	$ value (million)	Tonnage	Percent	$ value (million)	Percent
Poland	330,337	426	38,145	12	93	22
Switzerland	309,315	1,414	82,436	27	402	28
Turkey	294,775	509	52,246	18	136	27
Yugoslavia	292,404	483	17,057	6	65	13
Honduras	286,603	361	32,635	11	64	18
Panama	272,417	598	115,246		380	64
Surinam	256,154	128	267	; ;	1	1
Norway	234,987	555	49,806		105	19
Pakistan	234,263	315	105,956	45	198	63
Portugal	229,419	351	49,602	22	94	27
Mexico	227,933	768	21,511	9	49	6
Jamaica	213,419	309	76,391	36	135	44
Ivory Coast	211,727	371	66,787	32	132	36
Finland	206,249	551	44,624	22	115	21
U.S.S.R	204,335	164	24,628	12	47	29
United Arab Emirates	202,193	771	20,286	10	80	10
Trinidad/Tobago	195,835	351	7,045	4	16	4
Costa Rica	172,597	281	69,158	40	134	48
Bangladesh	170,271	144	68,669	40	61	42
Netherland Antilles	169,653	351	6,658	4	18	5
Kuwait	164,859	638	3,802	2	18	3
Greece	154,255	382	56,850	37	114	30
Morocco	149,794	140	75,247	50	49	35
El Salvador	146,091	260	42,563	29	54	21
Romania	144,091	283	108,465	75	222	78
Ireland.	136,305	523	48,518	36	158	30
Iraq	128,847	574	20,543	16	76	
Bahamas	118,930	615	546	1	1	; ;
Sri Lanka	118,367	166	95,705	81	139	84
Labia	115,913	620	2,226	2	4	1
Sudan	108,901	188	89,635	82	123	65
Haiti	103,540	236	46,127	45	96	41
Austria	102,140	321	12,635			
Iceland	96,861	216	74	; ;	; ?	; ;
Zaire	96,843	193	35,180	36	79	41
Kenya	92,025	102	79,419	86	78	76
Bolivia.	91,231	269	25,054	28	66	24
Nicaragua	86,467	156	11,018	13	17	11
Zambia	79,826	134	34,147	43	38	28
Algeria	79,540	263	16,747	21	40	15
Ghana	77,703	119	21,697	28	24	20
Lebanon	73,421	159	1,361	2	3	2
Rhodesia	72,362	83	9,846		18	22
Somalia	71,650	29	68,330	; :	24	83
Cameroon.	67,899	103	16,740	25	21	6
Virgin Islands (British)	67,466	101	10,275	15	14	14
Bermuda	66,339	116	1,118	2	1	1
Uruguay	65,420	144	32,860	50	86	60
East Germany	62,278	53	3,742	6	8	15
Uganda	60,936	104	45,846	86	78	75
Liberia	59,268	95	36,753	62	46	48
French Pacific Islands	58,836	69	6,297	11	4	6
Tunisia	54,247	79	5,554	10	16	20
Bahrain	54,996	129	597	1	2	2
Jordan	53,367	150	13,243	25	65	43
Hungary	53,153	142	11.370	21	34	24

aL~~~ than O.s L)'Srcent.

[b]Less than $500.

NOTE: &additional countries have trade with the United Statesof less than 50,000 tonnes each.

SOURCE: U.S. Maritime Administration, Officeof Policy and Plans.

ty to carry at least a third of the bilateral ocean trade between the two nations. Although generally similar, the two agreements differ on several points. In the agreement with the U. S. S. R., certain ports (40 U.S. and 20 U. S. S. R.) of each are open on a 4-day advance notice basis. Access to other ports requires 14 days notice. Implementation of the cargo-sharing agreement was spelled out in great detail because it was felt that the Soviet ability to control its own cargoes required specific commitments on their part to guarantee U.S.-flag vessel participation in the trade.

In the U. S.-P. R.C. pact, the United States has allowed 55 U.S. ports to be open to P. R. C.-flag ships on 4 days notice, while the Chinese have opened 20 of their ports to U.S. ships on a 7-day notification. The United States retains the right to close any port for national security reasons. The agreement is generally more flexible than the Soviet's agreement was. This agreement also specifically recognizes the right of either party to implement legislation to regulate the activities of cross-traders in their own foreign trades. The Chinese agreement expires in September 1983, and its renewal is currently under negotiation. It appears from the U.S. standpoint that more specific terms (similar to the expired U.S.S.R. agreement) would be preferable in any future U. S.-P. R.C. pact and U.S. negotiators are making efforts toward that end.

The U.S. bilateral agreements with the governments of Argentina and Brazil are also similar in that they set very general terms for cargo-sharing and then specify that the two sets of national-flag carriers implement the pact and negotiate specific shares of total cargo which lines serving the trades are entitled to carry.

The 1978 agreement with Argentina consists merely of an exchange of letters implementing a memorandum of understanding between the governments. It provides that the national-flag carriers of each country carry a 40-percent share of the bilateral trade with the balance of 20 percent available to cross traders. Actual shares are to be arrived at by commercial negotiations among all the lines serving the trade, with arrangements subject to approval by the two governments. In implementing such agreements, the governments have agreed to grant equal access to carriers of the other party to government-impelled cargoes. In effect, the specifics of the agreement are contained in pooling arrangements among the carriers of United States and Argentina. They are up for renewal at the end of 1983.

The 1970 agreement with Brazil (a memorandum of consultation between the governments and subsequent exchange of letters since) provides that through the mechanism of commercially negotiated revenue pools, the national-flag carriers of each of the parties are granted equal access to the government-controlled cargoes of the other. The United States has agreed to a blanket waiver to the requirements of Public Res. 17. This waiver permits Brazilian-flag carriers to carry up to 50 percent of all export-import cargo moving in the trade. Brazilian-flag carriers are also entitled, under the agreement, to participate in the carriage of reserved liner cargo moving under the Cargo Preference Act of 1954.

The Brazilian Government has granted a blanket waiver in favor of U. S. -flag carriers for participation in the carriage of all Brazilian Government-controlled cargo. The result is that the carriers of each country are entitled to carry up to 50 percent of the government-controlled cargo of the other. Equal access to government-controlled cargo is granted only where pooling agreements exist. Non-government controlled cargoes are not covered by the agreement, but are subject to allocation by commercial negotiation, subject to the approval of government authorities. The Brazilian agreement is also up for renewal at the end of 1983.

One result of both the Brazil and Argentina cargo-allocation practices (i.e., a 40/40/20 split in cargo shares) is that Brazilian and Argentinean carriers have insisted in specifying the carriers who are allocated the 20 percent "cross-trades' share. In effect, half of that 20 percent has thus been allocated to Brazil for Argentina trades and to Argentina for Brazil trades. This has worked toward the disadvantage of U.S. carriers, In addition, many U.S. shippers claim that poor service and high rates are prevalent in these trades and are a result of the inefficiencies promoted by the pooling agreements.

Up to 25 countries have indicated interest in negotiating bilateral agreements with the United

States—including South Korea, Bangladesh, Guatemala, Ecuador, Dominican Republic, Algeria, Mexico, Philippines, Ivory Coast, Nigeria, Ghana, Taiwan, India, Pakistan, Indonesia, Sri Lanka, Turkey, Spain, Australia, New Zealand, Venezuela, Colombia, Peru, Chile, and South Africa.

Table 45 shows the potential gain or loss in carriage that U.S. liner operators would incur under bilateral agreements with the above countries, assuming cargo allocation on a 40/40/20 basis (based on 1981 trade data).

The State Department stated that as of July 1983 the Philippines and Venezuela are most actively urging the United States to negotiate bilateral.

Discussions between the United States and Venezuela were held in 1983, and the U.S. Government made a proposal similar to that offered to the Philippines. These talks were suspended in mid-1983 and, because of Venezuela's economic problems, there does not appear to be much urgency to resume negotiations.

A Philippine Government order in July 1982 mandated that a pooling agreement be negotiated by Philippine- and U.S.-flag carriers within 30 days, Without such agreement, the Philippine decree stated that Philippine carriers are entitled to carry 40 percent of the cargoes in the Philippine-U.S. trades, while the vessels of all other nations, including the United States, may compete for the other 60 percent. In August 1982, the Philippine Government agreed to delay implementation. The U.S. Government has begun negotiations with the Philippines and has made a counter offer of a limited cargo-sharing agreement covering government cargoes. As of mid- 1983, the direction or outcome of these negotiations was unclear.

The Government of Indonesia, through a decree—Presidential Instruction 18-82, April 12, 1982—reserves all export and import government-owned cargoes for national-flag vessels. The decree affects over 60 percent of Indonesia's foreign trade, including 40 percent of westbound and 50 percent of eastbound U.S.-Indonesia trade.

A second decree provides that the shipment of nonoil and nongas exports will be primarily through four Indonesian ports and that the freight rates for international shipping must be equal to or lower than the rates prevailing for the nearest foreign port (i.e., Singapore, whose rates are very low), Its pur-

Table 45.—Potential U.S. Liner Trade Gain Under Bilateral Agreement (based on 1981 trade data)

Country	Total trade (tonnes)	U.S. share (tonnes)	Current U.S.-flag share (“/0)	Gain (loss) at 40°/0 share (tonnes)
Korea	2,655,178	681,646	25.7	380,425
Taiwan	3,605,829	869,257	24.1	573,075
Philippines	944,816	276,141	29,2	101,785
Indonesia	1,161,050	446,045	38.4	18,375
Australia	1,737,599	464,665	26.7	230,375
New Zealand	501,914	134,383	26.8	66,383
Bangladesh	170,271	68,669	40.3	(561)
India	1,003,018	616,410	61.5	(215,203)
Pakistan	234,263	105,956	45.2	(12,251)
Sri Lanka	118,367	95,705	80.9	(48,358)
Mexico	227,933	21,511	9.4	69,662
Guatemala	395,778	71,733	18.1	86,578
Ecuador	586,823	175,067	29.8	59,662
Dominican Republic	351,213	126,093	35.9	14,392
Venezuela	1,214,544	344,185	28.3	141,633
Colombia	496,163	167,573	33.8	30,892
Chile	571,663	157,808	27.6	70,857
Peru	557,563	196,843	35.3	26,182
South Africa	1,193,400	224,246	18.8	253,114
Ivory Coast	211,727	66,787	31.5	17,904
Nigeria	1,001,449	34,759	3.5	365,821
Ghana	77,703	21,697	27.9	9,384
Algeria	79,540	16,747	21.1	15,069
Turkey	294,775	52,246	17.7	65,664
SDain	923,238	328.746	35.6	40,549

SOURCE: Office of Technology Assessment

pose is to facilitate the export of Indonesian products. These decrees have not been fully implemented, but the Indonesian Government has indicated its intent that they will be. At issue currently is a shipment of U.S. products financed with Eximbank loans. MarAd is currently weighing whether to grant a waiver to Public Res. 17. Such a waiver is opposed by the Eximbank on the grounds that Indonesian shipping practices are discriminatory. Actual negotiations for a bilateral agreement have not taken place, but the State Department believes that Indonesia wants a 40/40/20 cargo split in its U.S. trades.

South Korea has in the past tried to negotiate a bilateral agreement with the United States. In 1979, South Korea unilaterally declared that Korean-flag vessels would have the first right of refusal for all cargoes in their trade except where a foreign carrier obtained a special waiver. The waiver provision involves two steps—first, an application is made to the Korean Shipping Association and second, to the government. This unilateral cargo-reservation scheme raised protests, especially from the U.S. State Department, and was later modified so that all countries (including the United States) with most-favored-nation status could obtain automatic waivers. Many believe these moves on the part of South Korea are a preamble to more pressure for a U.S. bilateral agreement. South Korea has signed an UNCTAD-Code-type of cargo-sharing agreement with Taiwan and has pressured some European countries to sign similar cargo-sharing agreements.

In addition, some U.S. carriers reportedly have not been permitted to bid for carriage of some bulk cargoes—notably rice—purchased by the Government. An increasingly protectionist posture by South Korea is causing concern both in the United States and in Europe that their vessels will be largely excluded from the South Korean trades.

Nigeria was one of the first countries to sign the UNCTAD Liner Code and has indicated its desire that all shipping lines trading with Nigeria enter into bilateral 40/40/20 cargo-sharing agreements. Nigeria has presented this point of view to the governments of France, Germany, Austria, Denmark, Canada, and the United States. To date, no action with any of the countries listed has taken place.

Recent statements by U.S. Government spokesmen indicate that the present administration will continue to disapprove bilateral treaties in general. Ambassador Brock recently reiterated the administration's policy of free trade unfettered by protectionism. There are instances, however, where this policy has been modified to accommodate certain industries. Federal Maritime Commission (FMC) Chairman Alan Green has said:

> No matter what laudable social and political objectives are pursued in establishing an arrangement that reduces competition in a trade, the bottom line is that U.S. foreign commerce can be harmed. Put simply, these situations can reduce U.S. foreign trade. . . . Furthermore, by sheltering the trade from the constructive forces of competition, we risk promoting inefficiency and unresponsiveness in the face of a dynamic and evolving trade environment.

The Bilateral Debate

Bilateral shipping agreements have been claimed by some as preferable alternatives to such multilateral arrangements as the UNCTAD Liner Code, particularly in the case where the U.S. Government has the opportunity to negotiate with another government on equal terms and with an equal voice. Whether some kind of bilateral can be beneficial and to whom has been the subject of considerable international debate. The United States has clearly stated its opposition to the UNCTAD Code, but has not established conditions under which bilateral agreements would be acceptable or unacceptable.

Several studies have attempted to evaluate the net effects of existing bilateral agreements between the United States and some trading partners. A 1977 study by Manalytics, Inc. for MarAd investigated the impacts of the 1970 U.S.-Brazil bilateral (through analyses and a shipper survey) and drew conclusions about ' 'bilateralism" in general from this case analysis. The conclusions were that bilateral agreements had not adversely affected trade flow, costs, or service, but had benefited U.S. carriers and would be a viable option for the United States in the future. Z[8]

Critics of this view (including shippers in the trade) have claimed that the trades reviewed have

[2]* Manalytics, Inc., "The Impact of Bilateral Shipping Agreements in the U.S. Liner Trades, prepared for the Maritime Administration, U.S. Department of Commerce, May 1979.

suffered from lack of competition and, in fact, are characterized by high prices and poor service. A 1983 study by Kearney Management Consultants for an association of Danish, British, Norwegian, and Swedish shipowners compared U.S.-Brazil trades with conventional conference trades and, not surprisingly, concluded the reverse of the 1977 Manalytics study, citing that shipping rates were often much higher in the U.S.-Brazil trade than in other U.S. trades and that shippers surveyed considered the service to be worse than other trades.[29] One problem with analyses of the U.S.-Brazil trades is that this one case may or may not be typical of future bilateral arrangements. The question of bilateral has been raised by other OECD countries who have acceded to the multilateral UNCTAD Code but with reservations that are intended to keep a portion of the cargo flow open to international shipping competition. The claim against Brazil-type bilateral is that they would allow no outside access (thus competition) to cargoes covered; however, an opposing view is that bilateral could specifically include cross-carriage, encourage independents, and provide mechanisms to reward improved service.

The United States can attempt to influence many of these international decisions about cargo reservation but probably cannot stop the trend toward more intergovernmental agreements by countries concerned with how their trading operates. With so many countries (including South Korea, the Philippines, and Venezuela) seeking bilateral cargo-sharing agreements with the United States, it would seem advisable for the United States to establish very specific guidelines for negotiating bilateral treaties, including a minimum degree of competitive access to cargo in the trade, limits on government intervention, cross-trader access, standards of service and price, and reciprocity whenever foreign shipping practices put U.S. operators or shippers under unfair conditions.

Countertrade

"Countertrade, also known as barter, has recently developed into a common practice which sometimes could be considered a form of bilateral trade arrangement. Countertrade includes a range of commercial and financial practices in which the exporter is required to buy some product in return from the purchaser. It is an increasingly used practice and one that does restrict U.S. access to world markets. 30 31

While countertrade occasionally occurs just between companies, almost all of it involves governments. For instance, the importing country's government may require a product manufacturer to buy certain goods or commodities in return. Even more common are state-to-state agreements, in which the governments arrange a direct exchange of goods between them. Communist countries almost always use this approach, and increasingly so do other countries, especially LDCS. LDCS have sought to improve their economies through rapid industrialization planned and implemented by the central government. Since many of the developing sectors need imports, central governments have become very involved in international trade. Moreover, Communist and LDC governments also use countertrade arrangements for a financial reason: often capital-poor, countertrade permits these countries to trade without using scarce capital. Goods are simply exchanged for other goods.

The two most common forms of countertrade are compensation arrangements and counterpurchase arrangements. The former-the most rapidly growing type of countertrade—requires exporters of high-technology machinery, industrial facilities, and technical know-how to accept payment in the form of the goods produced with their equipment or technical expertise. Such arrangements are also known as buy-back agreements, or industrial cooperation agreements. (The latter term is used to describe trade deals between Communist and Western countries.) Compensation agreements are most common among nonmarket economies and are of growing importance in trade with Communist countries .32

[29] Kearney Management Consultants, ' 'The Impact of Bilateral Shipping Agreements: An Analysis of Service, Rates and Shipper Responses, " January 1983.

[30] U.S. International Trade Commission, ***Analysis of Recent Trends in U.S. Countertrade*** (Washington, D. C.: USITC, March 1982), p. 1.

[31] R. Michael Gadbaw, ***The Implications of Countertrade Under the General Agreement on Tariffs and Trade,*** unpublished paper prepared for the Interface IV Conference, Philadelphia, Pa., Oct. 15-16, 1982, p. 3.

[32] U.s. Department of Labor, Office of Foreign Economic Research, ***Report of the President on U.S. Competitiveness,*** September 1980, pp. v-43 to v-45.

One of the biggest compensation arrangements is Occidental Petroleum Corp. $20 billion countertrade package with the U.S.S.R. Under one contract, Occidental is buying Soviet ammonia from plants it helped to set up in that country. Under a parallel agreement, it is shipping phosphate fertilizers to the Soviets from the United States .33

An older form of countertrade is the counterpurchase agreement. This requires exporters of machinery, expertise, and advanced manufactures to accept payment in unrelated products. While counterpurchases are nominally cash transactions, the two parties in effect exchange goods of equivalent value. CounterPurchase agreements are also known as countersales, offset trading, parallel trading, reciprocal trading, or counterdeliveries. 34 Recently, an Italian shipyard has become involved in this form of countertrade. Iraq is buying frigates worth $1.5 billion from Italy's state-owned Italcantieri. In payment, Italy's state oil company is taking Iraqi crude. 35

Economic conditions over the past 10 years have given strong impetus to the growth of countertrade. The sharp rise of oil prices after 1973 came at a time when many developing countries were in the midst of ambitious economic development plans, and the price rise worsened the already tight foreign exchange requirements involved in purchasing Western technology and manufactured products. Furthermore, these Western products became more expensive as inflation in the industrialized countries increased significantly during the latter half of the 1970's. The external debt of these countries, based on the loans that had financed many of these purchases, also contributed to a "cash crunch' in the developing countries. The external debt of the LDCS more than tripled between 1974 and 1980—from $142 billion to an estimated $416 billion.[3G]

All of these factors led "cash-short" developing countries to resort more and more to countertrade as a way to finance new purchases. In fact, there is some evidence that they were pushed in that direction by Western banks, which began to advise their clients to use countertrade as a way of increasing the prospects for the eventual repayment of some loans.

While there is much anecdotal information about countertrade, there is relatively little hard data on the actual value of trade affected by countertrade. One Commerce official believes that it may equal 20 percent of world trade.[37] 38 In its recent study, the International Trade Commission (ITC) estimated that total U.S. imports resulting from countertrading arrangements were approximately $279 million in 1980, which represented more than a threefold increase over the 1974 estimate of $98 million. (It should be noted, however, that most of these imports were the product of trade with Communist countries.) Because many respondents to the ITC survey viewed such information as proprietary information, ITC believes that the above trade data understates the full dollar importance of U.S. countertrade. Despite this increase, it appears that, among the developed nations, the United States has the smallest percentage of countertrade, almost all of which involves private companies that find countertrade the only way to do business in certain places.

Although precise data are not available on the use of countertrade by other countries, it is used extensively. Western Europe has increased its countertrade with the LDCS, and even some 10 percent of trade among Western countries is thought to be countertrade. Moreover, roughly one-half of all Eastern European trade with developing countries is now through countertrade .39

While it assures supplies of scarce goods, market access to producers, and generally provides predictability to those involved, countertrade discriminates against outside actors. Exporters unwilling or unable to enter into countertrade may be excluded from some markets. Countertrade is, in effect, a "closed deal' between two parties—third parties

[33] *Business Week*, July 19, 1982, p. 118.

[34] U.S. Department of Labor, Office of Foreign Economic Research, *Report of the President on U.S. Competitiveness,* September 1980, pp. v-43 to v-45.

[35] *BusinessWeek*, July 19, 1982, pp. 118-123.

[36] U.S. International Trade Commission, *Analysis of Recent Trends in U.S. Countertrade* (Washington, D. C.: USITC, March 1982), pp. 13-14.

[37] 1bid.

[38] This would put the value of Countertrade at about $400 billion. John W. Dizard, "The Explosion of International Barter, " *Fortune,* Feb. 7, 1983, p. 89.

[39] Department of Labor, op. cit., p. V-44. Also see "Bartering, *Industry Week,* Mar. 28, 1977.

are excluded from these markets. As a result of countertrading arrangements, many American companies do not even have a chance to bid for projects and open new markets for their goods or services.

Aside from being often economically inefficient, countertrade poses major problems for an American Government that still wants to adhere to open trade. It also directly affects large segments of U.S. industry, including ship operators who compete internationally. However, no direct analyses have been done on how the growing use of countertrade affects the U.S. shipbuilding and operating industries. The effect on shipbuilding is probably small since the United States does not export major merchant ships. It may, however, affect yards that build offshore oil equipment, tugs, supply boats, and small warships where some export market exists or may exist in the future. Countertrade may eventually have a significant impact on U.S. ship operators to the extent that countertrade deals include shipping provisions and therefore further close access to foreign trade cargo. Again though, no quantitative estimates of these effects are presently available. Future policy development would benefit from more data and analysis on countertrade trends and effects.

UNCTAD Liner Code

Not only is cargo reservation a unilateral and increasingly a bilateral phenomenon, but, by October 1983, it became a multilateral phenomenon when the UNCTAD Code of Conduct for Liner Operations came into force.

UNCTAD was established as a permanent organ of the U. N. General Assembly on December 30, 1964. One of its principal purposes is to promote international trade, particularly with a view to speeding the economic development of developing nations. It includes all members of the U.N. as well as eight other countries. UNCTAD is comprised of six main committees which deal with specific areas of trade and development. Included is a Committee on Shipping.

In 1974, UNCTAD voted to accept a liner code as the standard for conference liner shipping worldwide. The adoption of the code was the result of several years of efforts on the part of LDCs—originally known as the Group of 77—to exert control over significant shares of their own nation's maritime cargo. The major complaints against the existing liner conference system were the refusal by conferences to admit shipping lines from LDCS as members, the inability of governments and shippers from LDCS to obtain information on the process of freight rate determination or to participate in this process, inequitable levels and changes in rates, inadequacy of service and a lack of a generally accepted dispute settlement mechanism.

The need for reform was first considered within the Committee on Shipping. At its third session in 1972, UNCTAD requested the General Assembly to convene a conference of plenipotentiaries to adopt a code of conduct for liner conferences. The code was adopted in Geneva in April 1974. The code would not come into force, however, until ratified by at least 24 nations controlling 25 percent of the world's tonnage. This was accomplished in early 1983. * The code, therefore, came into force in October 1983.

The code calls for closed conferences open to and controlled by the carriers of trading partners (with third-party carriers admitted to the conferences only with trading-partner member consent), formation of shippers' councils, mandatory time intervals between general rate increases, and prescribed dispute settlement arrangements to resolve differences between shippers' councils, conferences, and carriers. One of its most significant provisions is its cargo allocation principle, which ,guarantees any national shipping line the right to participate in any conference that serves its country and that reserves an equal share of the total trade between two signatories to the national-flag lines of each trading partner with "a significant share, say 20 percent' made available to third-flag vessels, agreed to by the national shipping lines. Therefore, while the code regulates only conference behavior, in effect, all LDC liner trades would likely be covered.

The reaction of the major shipping nations was originally opposition to the code. The liner trades among these countries are established and member-

* By April 1983, 58 countries representing 28.6 percent of the world's liner tonnage (measured in 1973) had accepted the UNCTAD Code.

ship in conferences (except in U.S. trades) is closed. In addition, vessels of some of the major shipping nations operate extensively as cross-traders (notably the Scandinavian, British, Dutch, and Greek fleets), whose business could be adversely affected under the UNCTAD scheme.

The U.S. Government has opposed the code since it was proposed, and the present administration boycotted the recent UNCTAD meetings (late 1982) concerning a bulk code. Many U.S.-flag liner operators and U.S. owners of the "effective controlled fleet" have strongly supported the administration in its opposition to the UNCTAD Liner Code. These operators believe that when the code is adopted, it will effectively restrict U.S. access to liner cargoes. They also claim that it will promote shipping inefficiencies due to extensive government intervention, as appears to be the case with some bilateral agreements now in effect. It is urged, however, that the United States must actively pursue an alternative shipping policy framework with our major trading partners to keep liner shipping markets open and competitive.[40]

Some of the opponents who have studied the UNCTAD Liner Code have argued that its adoption will lead to much more ominous consequences than a quick reading of the intent and major provisions would indicate.[41] For example, the code was first proposed partly because developing nations felt that the closed European and Japanese conferences victimized them with unreasonable rates. However, the code supports provisions such as closed conferences and anticompetitive activities which lead to similar results of unreasonably high rates and poor service. The UNCTAD Code is vague, which could lead to ambiguous definitions and applications of its provisions. Many believe that conferences operating under the code will evolve into closed trades without the benefit of independent carriers (which are not given any status) to competitively force efficiency. In addition, the code provision to allow cross-traders "if any' to carry a share of 'say 20 percent' appears to be designed to eliminate cross-traders whenever possible. Finally, the code is criticized for not having any provisions or rewards for carrier efficiency, and if closed trade with revenue pooling is practiced as indicated, inefficiency will produce the greatest reward to carriers.

Some have argued that U.S. accession to the UNCTAD Liner Code may be—on balance-beneficial to U.S. interests. At a December 1982 Seatrade Seminar, it was suggested that "traditional competition in our maritime liner trades no longer exists' and that "our (liner) cargoes are being carried increasingly by foreign-flag vessels of state-owned, Soviet-bloc fleets. '[42] It was further concluded that a combination of passage of Shipping Act amendments, U.S. access to cargo through the liner code, and the use of U.S. financial incentives could lead to encouraging foreign (and U. S.) investment in liner shipping. The Seafarers International Union (SIU) also has voiced strong support for U.S. participation in the UNCTAD Code. The union's support is based on a conviction that the cargo allocation schemes in the code will come into effect among all other major trading countries while the United States continues to lose access to cargo, and, at the same time, a viable shipping industry .43

The EEC Council eventually responded by authorizing its members to ratify the code with reservation. This response appears to be an attempt to limit the potential damage of the code while coming to grips with the need to recognize the legitimacy of the rights of their LDC trading partners. The EEC reservation (or Brussels package), as it is called, exempts from the provisions of the code all intra-OECD trade. It also opens to all members of OECD that portion of the bilateral trade of a member and an LDC other than the LDC share under the code. (In other words, 60 percent of any liner trade between an OECD country and an LDC is available to all OECD nations.) The effect of the reservation would be to substantially reduce the impact of the code on world trade. It also would eliminate the cargo-reservation benefits that some proponents of the code seek. In 1979, the value of all

[40] See Proceedings, ' 'The UNCTAD Code of Conduct for Liner Conferences, U.S. Maritime Resource Center, May 1982.

[41] See: Leslie Kanuk, "The UNCTAD Code: Impending Disaster for World Commerce, proceedings of a seminar, ' 'The UNCTAD Code of Conduct for Liner Conferences, U.S. Maritime Resource Center, Kings Point, N. Y., May 5, 1982, pp. 14-18.

[42] H, Clayton Cook, "Seatrade Seminar Financing Ships in a Difficult Market, " *Foreign Owernship Under the U.S. Flag,* Dec. 1, 1982.

[43] See !jIU-D.., 1982 Press Release—' 'Drozak and SIU go 100% for 40/40/20. "

international trade between developing countries accounted for 6.1 percent of total trade worldwide. Thus, the EEC reservation, if all developed countries accepted it, would exempt a large portion of world liner trade from the code.

The United States has held a number of discussions with European and Japanese trading partners in 1982 and 1983 regarding implementation of the UNCTAD Liner Code. Some U.S. experts believe that the EEC reservation to the code could have the effect of forcing U.S. carriers out of some trades. Based on this concern, U.S. negotiators, in a December 1982 meeting, stated that unless there is genuine reciprocity between the United States and its European allies in the form of legally binding commitments to keep European liner trades open to U.S.-flag carriers as cross-traders, the United States could not keep U.S. liner trades open to European cross-traders.

During March 1983, additional meetings on UNCTAD matters were held among Europe, the United States, and Japan. At that time, Japan announced its intention to ratify the code without the EEC reservations. If it does so, the EEC reservation fails to address U.S. participation in the trade between OECD nations when both the Europeans and the Japanese are code signatories. The final outcome of all these negotiations is not clear.

Unfortunately, while it appears that the United States and its major trading allies of Europe and Japan share similar goals in the area of shipping policy, no mutually acceptable strategy has been developed. The U.S. response to the UNCTAD Liner Code has been to deal on a bilateral basis with those countries that threaten to close their trades to the United States without such agreements. U.S. carriers also have indicated a fear that Europe will shut them out of their trades with LDCS. This seems to be based on their belief that other governments, including those of our trading partners, are more supportive of their carriers than is the United States. Because of this, some carriers fear that even though 60 percent of the trades may be theoretically open to lines from all OECD nations, in fact U.S. operators would not be allowed to participate. interestingly, our trading partners have expressed similar fears with regard to U.S. policies in regard to bilateral. In actual effect, some bilateral agreements the United States has negotiated are generally more restrictive than the UNCTAD Code would be with the EEC reservation. Bilateral can cover all trade, not just liner conference trades. 1t should be noted, however, that UNCTAD has begun discussions on the adoption of a code for bulk trades,

The potential loss of cross-trading opportunities by U.S.-flag carriers under the code is a major threat to some carriers. Sea-Land Service, Inc., Delta Lines, American President Lines, and U.S. Lines receive significant percentages of their revenues from cross-trading on itineraries involving the carriage of U.S. foreign commerce. These U. S.-flag carriers would incur almost all of the costs they now incur even if they did not carry foreign-to-foreign cargoes. The result would be either increased rates or reductions in the profits of the U.S.-carriers.

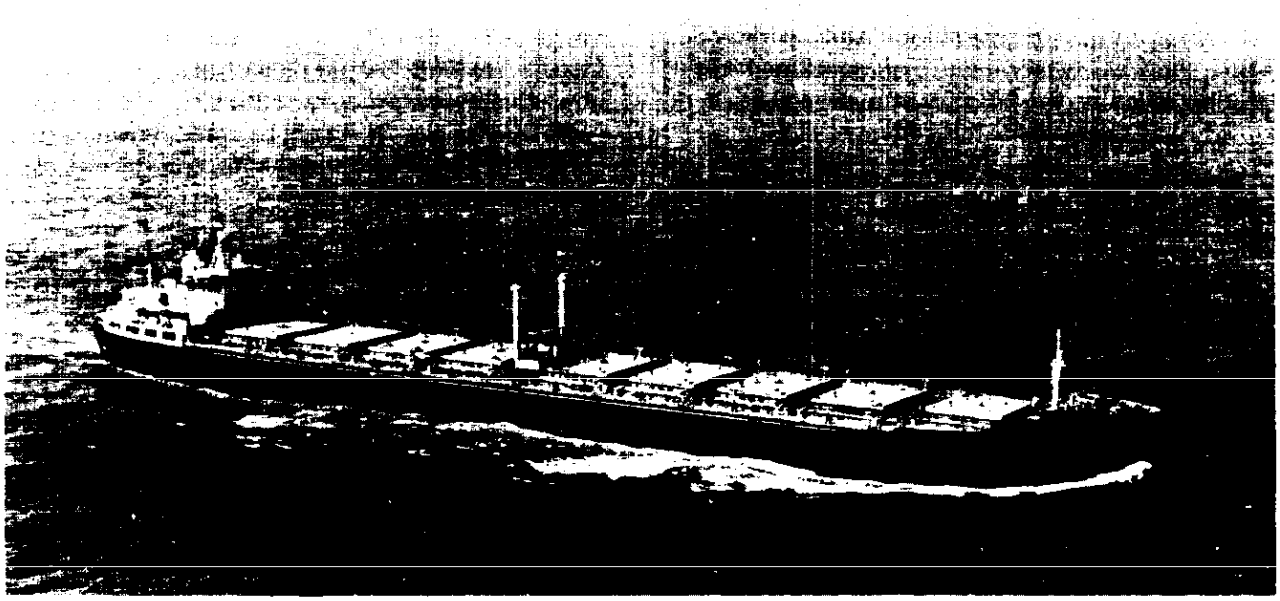
Other UNCTAD Initiatives

The nonliner trades have grown faster than the liner trades since World War 11. Much of the growth has been in basic commodities such as oil, grain, coal, and ores. Some of the growth, however, has come at the expense of the liner trades in such "neobulk' commodities as forest products, steel, and vehicles.

The distinction between liner and nor-diner operations is becoming blurred more quickly in the non-U.S. than in the U.S. trades. The major difference between the two types of service relates almost entirely to the common carrier nature of the liner service: a willingness to carry any cargo offered by any shipper between stated berths on a scheduled service with published rates. The same ship can offer liner and nonliner capacity on the same voyage. That is happening already in the U.S. trade (e. g., Blue Star Line, Ltd. carries nonliner forest products outbound and containerized products inbound, and ABC Containerline N,V. carries nonliner ore and containerized products inbound on the same leg of its round-the-world service).

Bulk Cargo Shipping Code

The UNCTAD Shipping Secretariat is investigating a bulk cargo-sharing code structured along



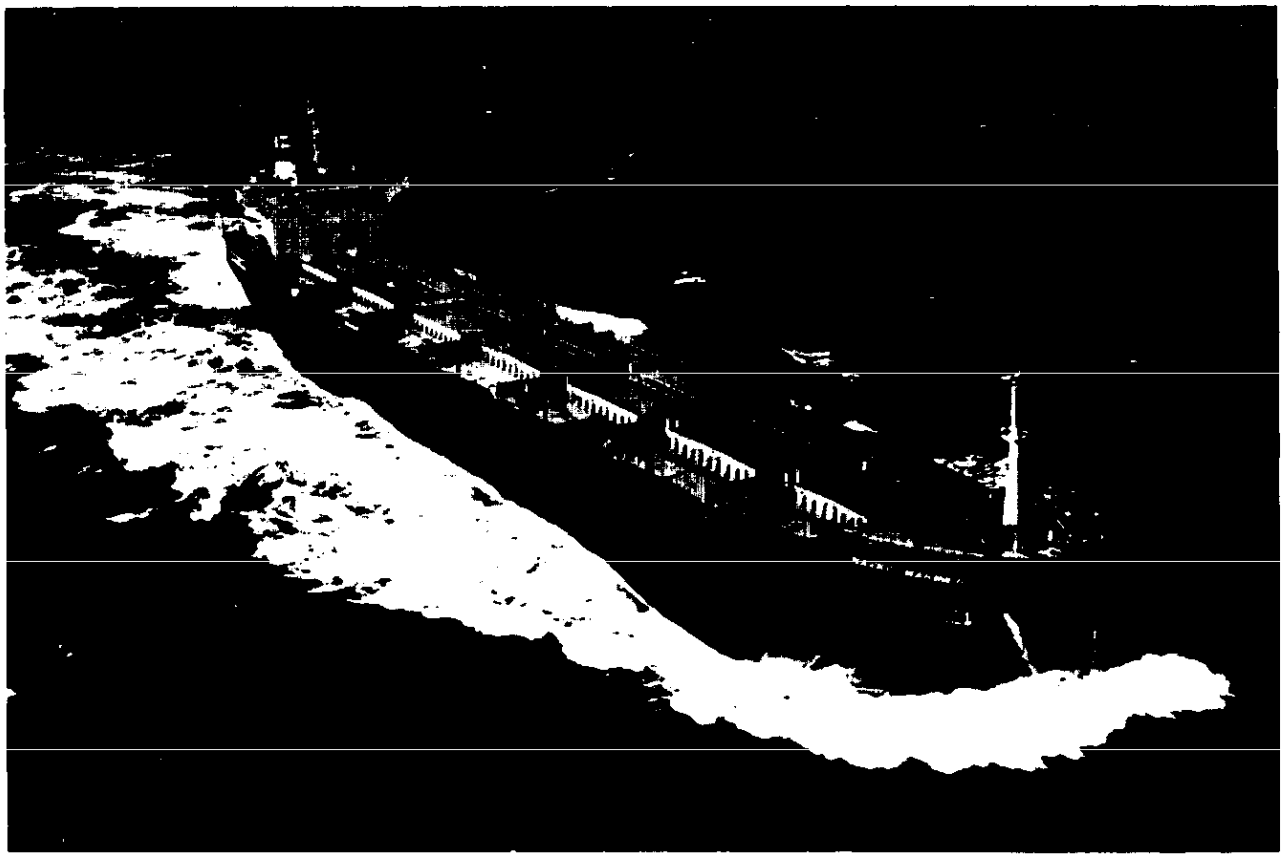


Photo credit: Navios Corp.

Both of these bulk carriers are Liberian flag, foreign built, and U.S. owners

the lines of the liner code. The initial focus has been on iron ore, bauxite, alumina, and phosphates; other ores and grains probably will follow. However, with united OECD opposition and with the Secretariat structuring what it considers an extreme position for the LDCS, it is unlikely that a document embodying such a position will be available for ratification in the near future.

In 1980, UNCTAD requested a group of experts to study any problems faced by developing countries in the carriage of bulk cargoes. In 1981, that group conducted a survey of major importers and exporters of iron ore, phosphate, bauxite, and alumina. The survey did not uncover any obviously discriminatory or unfair practices which would prevent developing countries from putting their national fleets into those trades. Forces of competition, experience, and economics seemed to be governing.[44]

In addition, there is a critical difference between the organization of the liner and the nonliner trades. The liner trades, except for the U.S. trades, are organized into strong, and often closed, conferences, access to which has been extremely difficult for the LDC carriers. There was also a feeling among LDCS that substantial profits were being earned by the conference carriers. The liner code reflected the LDCS' desires to overcome these noneconomic barriers to entry and a sense of 'fairness' has been a major factor underlying developed country support of the liner code. In the nonliner trades, however, no such noneconomic entry barriers seem to exist, and there is no presumption of high profit margins; consequently, there is practically no arWment on "fairness" to support a bulk code. 1n addition, the export of nonliner commodities is critical to LDCS economic survival, and the movement of these commodities is very sensitive to changes in freight rates. Increases in shipping rates could have serious economic consequences for individual LDCS.

Open Registry

1n November 1982, UNCTAD held the Second Intergovernmental Preparatory Group (IPG) meeting on ship registration. The delegates failed to agree on the UNCTAD Shipping Secretariat's plan to phase out open registry. The United States had attempted to persuade the other OECD countries not to attend the first IPG meeting in April 1982 on the grounds that the "recovery" of open registry ships is a domestic, not international issue. While the United States received some support for its principle, it received no support for its boycott. Only Liberia and Panama joined in declining to participate in the IPG.

Even though there were sharp divisions at both meetings— and an almost complete lack of consensus on any of the critical issues—the second meeting ended with a recommendation that a Conference of Plenipotentiaries be convened to consider the 8-page draft of a set of basic principles proposed by the IPG. The draft attempts to link the nationality of crews, equity owners, and ship managers to the registries of merchant ships.

There is some support for the draft proposal among developed countries as well as LDCS, despite different views on what would happen to the open registry ships after open registry is phased out. Some developed countries believe that the ships would be recaptured to the national flags of the beneficial owners (largely themselves); the LDCS (and the Secretariat) believe that the ships would (or should) largely be captured by the LDCS. There is broader support for the wider application of the safety, social, and environmental standards that are now embodied in the international Maritime Organization's (IMO) and the International Labor Organization's (ILO) conventions. The widely differing views in the proposed draft on how to achieve those goals were evident after the second IPG meeting. Despite the basic differences, it is likely that there will be a Plenipotentiary Conference within 2 or 3 years and a document on file for ratification approximately 3 or 4 years thereafter. How quickly it will be ratified will depend on how far the convention goes beyond the questions of ship operation and into the questions of forced re-flagging. Since the LDCS have powerful weapons (e. g., sanctions barring open registry ships from their ports), and since the major international maritime unions support some restraint on open registration, an open registry convention is possible sometime in the future. However, there is no consensus at pres-

[44] See "Shipping Practices of Major Importers and Exporters in the Bulk Trades, prepared by Arthur D. Little, Inc., November 1981 for Mr. Charles Kiskaddon, President, Alcoa S. S. Co.

ent for the strong solution contained in the Secretariat's draft for what many consider a mild problem.

Convention on Multimodal Transport

The Multimodal Convention, adopted by UNCTAD in May 1980, would regulate the carriage of goods between countries when more than one mode of transport is used. Once in force, it would be mandated if either an origin or a destination country had ratified.

The convention calls for the creation of Multimodal Transport Operators (MTOS), which would be licensed and regulated by contracting governments under the provisions of the convention. They would act as shippers' agents and would handle all phases of a multimodal cargo movement. The convention would regulate documentation, liability, claims, and certain customs matters.

The convention was opposed by the United States, which has indicated its unwillingness to ratify. Strong support has been voiced by the developing countries, the Soviet Union, and other Eastern bloc countries as well as Scandinavia. However, as of January 1983, only six countries had signed the convention, and just two had ratified. It does not appear that the convention is likely to come into force in the near future.

The Sixth General Conference of UNCTAD was held in June 1983. Its shipping activities agenda included further consideration and implementation of past initiatives. The main objectives of the LDCS included entry into force of the Code of Conduct on Liner Conferences, further research into the role of transnational corporations in shipping, efforts to abolish flags of convenience, and studies of investment and support policies. The background paper for this conference prepared by the UNCTAD Secretariat included a listing of six areas of current concern and review of recent activities as follows:

Major Areas of Concern

- Orderly development of liner and multimodal transport service.
- An equitable basis for participation by developing countries in bulk cargo transport.
- A regime to facilitate funding of shipbuilding and buying by developing countries.
- An equitable compilation of maritime laws.
- Adequate port facilities.
- Fostering management and technological expertise in shipping and port development in developing countries.

Review of UNCTAD Shipping Activities Since 1964

To demonstrate what it calls "the change in the pattern of the forces that manipulate market and operational structures, UNCTAD cites the following actions that have been taken under its auspices:

- in the liner trades, adoption of the Code of Conduct for Liner Conferences;
- in multimod~ transport, adoption of the Multimodal Convention;
- in the revision of law on carriage of goods by sea, adoption of the Hamburg Rules;
- in the bulk trades, investigations of market practices and procedures, particularly as regards the role of translational corporations;
- in *phasing out* flags of convenience, negotiations on conditions for registration of ships and the convening of a plenipotentiary conference to adopt a set of principles on registration; and
- in maritime legislation, preparation of model laws.

Inclusion of Service Industries Within GATT

GATT deals only with issues relating to trade in goods and does not apply to trade in services. With the increased importance of service transactions in both the overall economy and current account, Ambassador Brock announced in April 1981 the administration's intent to make trade issues relating to service a high priority in the administration's overall trade program. This was the administration's opening attempt at getting its major trading partners to recognize the need to develop a multilateral approach to dealing with trade in services. Presently, the bilateral approach is the only

track available on a case-by-case basis to resolve disputes over services.

At the time of the announcement, OUSTR recognized that progress would be slow in developing a multilateral regime and that the reduction of service-sector trade barriers could not be achieved before 1990. This prognosis was confirmed at the GATT Ministerial Conference in November 1982 when the administration won a minor concession from the other GATT members to exchange information on their countries' service sectors and review whether any multilateral action was appropriate. These national work programs are proceeding at differing paces, with the U.S. analysis now expected to be finished by late 1983. The other national work programs are not expected to be completed before the next GATT Ministerial in the spring of 1984.

The status of services under GATT is of importance here because the maritime industry is included. Thus far, services have been excluded from GATT. Covered commodities are "bound," which means that a country can set a tariff rate for that good which cannot be raised in the future, although it can be lowered. This approach probably would not be feasible as a trade rule in shipping. Britain, Norway, Japan, and West Germany have indicated to a greater or lesser degree interest in extending GATT to shipping. France and virtually all LDCS have registered opposition.

An interesting question would arise were services to be covered. Under the most-favored-nation concept in GATT, each signatory must grant equal status in trade agreements to all other signatories. Nontariff trade barriers are discouraged. The UNCTAD Code, by its nature, erects such barriers (cargo-sharing). How the code would interact with GATT should services be covered is questionable. However, the likelihood that GATT will act in this area in the near future does not seem to be great, so the question probably will not arise soon.

Financing International Trade

One aspect of trade and cargo policy that does not appear to be incorporated in any multilateral or bilateral framework at present are the methods used or made available to finance international trade. These methods form an integral part of trade and cargo policy today because an increasing number of countries are getting involved in trade financing as a matter of government policy. While most industrialized nations historically have provided some instruments for foreign trade financing, such as use of export/import credits, many countries and organizations have moved far from these basic approaches. Among recent developments in international trade financing are:

Government Financing Assistance

- Foreign exchange rate insurance. Here a government guarantees the currency conversion rate.
- Barter or inkind payment for import or export goods with governments involved in supplying or purchasing and storing as well as stockpiling imported goods (discussed under countertrade).
- Foreign trade risk insurance, where governments assume the risk of providing coverage of the risk incurred in the trade.
- Cofinancing-with-foreign-aid exports, where the government's foreign aid or development agency pays part of the cost as a foreign-aid grant to the recipient country. This makes the export extremely competitive.
- Provision of technical aid grants (in support of exports), which are used for training of local staff, expatriate professional staff, installation, and other technical assistance as part of the trade at no cost to the exporter. This is often an appreciable component of the value of the export deal and may affect choice of procurement.
- Foreign trade import financing through use of excess foreign currency earned by governments from government-to-government trade. This often includes sale of such currency at below normal exchange rates.
- Low-cost export/import financing through government export/import bank.
- Import/export loan guarantees provided by government agency against small fee.

Commercial Financing Assistance

- Joint venture financing using multiple placements to minimize risk.

- Cofinancing by private banks or other financial institutions with domestic government agencies, foreign banks, or international financing institutions, such as the World Bank, Inter American Development Bank, and Asian Development Bank. Cofinancing is often also done with foreign government agencies for the local currency costs of the trade such as transport, insurance, installation, and training.
- Export financing through delivery or supply of finished goods produced by export. This type of financing scheme is usually combined with an advance sale of the goods to be delivered in the future. As an example, coal mining equipment export is paid for by future coal deliveries sold as an advance sale to an electric powerplant, etc.
- Trading company export/import financing. Here a trading company, which is usually also a commercial bank, finances foreign trade exports and uses proceeds to buy other goods for import or sale to a third country or party. It may also simply sell its proceeds to a third party. Because trading companies deal in a large number of goods and are represented world~'ide, they have the contacts and means to consummate the most complex chains of trading deals.

The above are just a few examples of foreign trade financing schemes used in recent years. Many foreign countries have Ministries of Trade (Commerce) anci Industry that combine development of trade and industrial policy. In the United States, these functions are dispersed among various agencies. There appears to be no overall strategy of U.S. trade financing policy that would serve to maintain a competitive U.S. position in world trade and trading industries.

SUMMARY

All trading nations have a self-interest in expanding their exports and controlling their imports. As trading complexities increase, governments have attempted to exercise rational management over their flow of imports and exports. The analysis in this chapter has illustrated that the economics and management of trade are closely linked to the economics and management of shipping.

As nations increasingly try to manage trade policy to their best economic advantage, they tend to increase governmental involvement in shipping. Most countries have some unilateral cargo reservation. In addition, many nations, particularly the LDCS that are attempting both to capture more export trade and to bolster their national-flag fleets, are pushing for the establishment of bilateral and multilateral cargo-sharing agreements. The latter attempts have achieved international recognition in the form of the UNCTAD Code of Conduct for Liner Operations. This calls for an even division of liner conference cargoes between trading partners, with some percentage reserved for third-flag vessels, if agreed to by the national-flag liner engaged in the trade. The United States is not a signatory to the code, although there are fears that U.S. carriers and possibly U.S. trade will be negatively affected once it is implemented.

The United States faces a significant disadvantage in dealing with countries where industry and government have established close ties and where national and corporate goals are meshed. Japan is an example of how successful such a nation can be in the international trade arena. The United States tends to disavow governmental interference in international trade and shipping and Government pronouncements historically have been in favor of free and open trade. Many U.S. shipping companies find it increasingly difficult to compete in international markets that are protectionist or where other governments more heavily subsidize their industries. Many foreign governments tend to intervene on behalf of their national carriers, while the U.S. Government has not intervened.

There have been attempts by the United States and some of its industrialized trading partners to work within international organizations such as GATT for tariff barrier reduction and freer trade. However, the reality is that trade is becoming more, not less, managed, Thus far, the United States has not developed a national response that would be effective in protecting our economic position and at the same time remain consistent with our historical national philosophy of free and open trade.

Appendixes

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Appendix A

Administration Announcements on Maritime Policy, 1982-83

The Reagan administration early in its term indicated that a strong merchant marine was one of its goals. Administration spokesmen, such as the Secretary of Transportation, the Maritime Administrator, and the Chairman of the Federal Maritime Commission (FMC), have reiterated the administration's commitment to rejuvenation of the U.S. fleet. This rejuvenation is supposed to be stimulated by a reduction of Government regulations that hinder the ability of the U.S. fleet to be competitive. The administration has supported regulatory reform legislation providing an expanded antitrust immunity and permitting the U.S.-flag liner operators similar flexibility as its international competitors.

Shortly after the administration took office, an interagency task force was set up to examine current maritime policies and to make specific recommendations for changes. The first major step was the curtailment initially and then the cutoff of construction differential subsidy (CDS) funding. For fiscal year 1982, no CDS funds were requested ($49. 5 million in carryover funds were made available), compared with an average annual request of$132 million in the previous 4 years. It was announced that this was intended as a phasing out of the CDS program and that in the future no funding would be made available. Temporary authority (for 1 year) was granted for the building of subsidized vessels abroad.

On May 20, 1982, Secretary of Transportation Drew Lewis announced the initial elements of a new program.[1] He stated the administration's intent to honor existing operating differential subsidy (ODS) contracts and to maintain the sanctity of the Jones Act and existing cargo-preference laws covering government-impelled cargoes. In addition, he announced the following initiatives:

- support of an extension of temporary authority for subsidized U.S. -flag operators to construct or acquire vessels built abroad without CDS but still qualify for ODS under U.S.-flag operations;
- administrative reform of ODS by Department of Transportation (DOT)/Maritime Administration (MarAd) to increase operating flexibility and reduce costs in the program;
- encourage foreign investment in U.S.-flag shipping and permit the current 49 percent foreign ownership in U.S. -flag vessels to be increased to 75 percent;
- relieve all U.S. -flag ships of the current 50 percent ad valorem duty on repairs performed abroad, providing flexibility to ship operators in making such repairs and reducing the repair costs to ODS;
- reduction of unnecessary regulation of the shipbuilding and ship operating industries and establishment of a top level government-industry group to further that effort; and
- support by the administration of elimination of FM-C re~lations governing the level of the rates of liner operators in the domestic trades.

On August 5, 1982, the Secretary announced a second set of policy initiatives:[2]

- the administration would authorize an increase in the fiscal year 1983 ceiling on ship financing guarantees (title XI) from $600 million to $900 million. The additional funds would be held in reserve by the Secretary to be used in the interests of national security;
- permission was to be granted to U.S.-flag operators to use existing and newly deposited tax-deferred moneys in capital construction funds (CCF) and construct or acquire foreign-built vessels; and
- the Department of Defense (DOD) would continue its efforts to expand use of civilian nongovernment seafarers to crew Government ships.

It was reaffirmed that the Government would honor existing ODS contracts, but that no new contracts would be signed. The fiscal year 1982-83 moratorium on new GDS contracts would be continued.

It also was announced that an interagency international shipping policy group would be established to evaluate the options available to the government. The group would be chaired by the Secretary of Transportation with the vice chairman from the State Department.

1t was affh-med that the U.S. Navy would be providing significant work for U.S. yards, not only in combatant ships, but the U.S. Navy T-ship programs that are essentially construction/conversion of merchant ships for Navy use,

[1] ‘<‘ ~’. S. Department of T'ransportatmn News, May 20, 1982, Washington, r) c

[2] ‘‘U.S. Department of Transportation News, ” Aug. 5, 1982, Washington, D c.

The administration subsequently announced that a third round of policy initiatives would be forthcoming in the first half of 1983.

Most of the initiatives listed above require legislative authority, although some can be implemented administratively. MarAd's proposed fiscal year 1983 authorization bill included some elements consistent with the administration's position and others that limit the administration's ability to implement some of the proposed policies. The proposed bill included a 9-month extension of authority for foreign building of ODS ships. The administration sought a 1 -year limit of $950 million *on* title XI guarantees and annual limits in the future, as well as limited guarantees because of vessel type (oil drilling rigs were to be prohibited).

The administration also has sought authority within authorization bills to allow use of CGF moneys for foreign building. Amounts for subsidy programs in the proposed authorization bill for fiscal year 1983 were $454 million for ODS, $15.3 million for research and development, $78 million for operations and training, and $25 million for three ships being turned into the reserve fleet by American President Lines Ltd.

In December 1982, the administration reported the status of its policy initiatives as follows:

. reform of ODS—simplification of procedures under section 605(c) of the Merchant Marine Act is under review in DOT. Other reforms were presented to the industry for comment, Legislation will be drafted within the next few months;

. shipbuilding, ship-operating regulatory reform—changes in the number of statutes regarding manning have been drafted. These deal with such items as mixing deck and engine room duties, persons subject to watch, and number of persons in bridge watch. They are all part of title 46 of the U.S. Code, which has been proposed for recodification. When this is accomplished, the above modifications will be pursued;

— amending the Longshoremen and Harbor Workers Compensation Act;

— revise buy America requirements for title XI ships. Would require modification of 46 CFR 298.1 l—a committee will be formed to evaluate the proposal and insure an opinion as to its economic consequences;

— memorandum of understanding between U.S. Coast Guard (USCG) and American Bureau of Shipping (ABS)—discussions are continuing to identify additional areas that can be transferred to ABS;

— simplify vessel documentation requirements—rules were published in June 1982;

— simplify and improve requirements for licensing of officers and motorboat operators—regulations have been drafted and are being received in USCG. Proposed changes are to 46 CFR part 10;

- revision of watch relief—Federal Communication Commission (FCC) has changed requirements for ships in coastal trade, international Maritime Organization (IMO) to consider changes in international requirements;
- modification of regulations for vessel sanitation devices—Coast Guard and Environmental Protection Agency (EPA) have under consideration, findings to be published in Federal Register shortly;
- review proposed Occupational Safety and Health Administration (OSHA) regulations pertaining to marine terminals and shipyards—Maritime Advisory Committee to review in near future;
- Interagency international Shipping Policy Group—working group will continue to monitor developments in a number of Asian countries and assess recent Organization for Economic Cooperation and Development (OECD) negotiations;
- authority for overseas construction of ODS vessels;
- use of Capital Construction Funds (CCF) for foreign-built ships;
- authority for reflagged vessels to gain immediate access to government-impelled cargoes;
- authority to increase allowable foreign ownership of U.S.-flag vessels;
- relief of duty on foreign repairs;
- rate deregulation of the domestic offshore trades—MarAd draft legislation is under DOT review, FMC staff report and analysis of comments will be sent to Commission shortly; and
- possible legislation on fiscal year 1983 title X1 ceiling.

The Shipping Act Amendments which are currently (September 1983) before Congress were also supported by the administration.

In summary, the promotional maritime policy elements which do not require legislation announced by the administration to date are: 1) operating subsidy contracts (22) will continue but no new contracts will be signed; 2) construction subsidies no longer will be funded; and 3) the mortgage guarantee program will continue, as will the CCF program.

On April 8, 1983, the Secretary of Transportation transmitted draft legislation to implement five promotional elements of the previously announced maritime policy package. The following are excerpted from that letter:

(1) Build ***Foreign***

Since the enactment of the Merchant Marine Act of 1936, vessels receiving operating differential subsidy (ODS) have been required to be constructed in the United States. Such vessels were generally constructed with the

aid of construction differential subsidy (CDS). Public Law 97-35 added section 615 to the Merchant Marine Act authorizing the granting of ODS for the operation of foreign-built, U.S.-flag vessels in the absence of available CDS. However, that authority technically expires at the end of fiscal year 1983, and because of certain restrictions such authority cannot be used after the last day of fiscal year 1982. The draft legislation continues the statutory authority to permit subsidized operators to construct and acquire vessels outside the United States and still receive ODS. It also clarifies current authority to acquire existing vessels outside the Untied States to be reflagged and made eligible to receive ODS.

(2) ***Immediate Cargo Preference*** *Eligibility for* ***Reflagged Vessels***

Section 901(b) of the Merchant Marine Act of 1936 currently requires that foreign-built or rebuilt vessels must be documented under U.S. laws for 3 years before they can carry Government-impelled cargoes under the provisions of that section. This requirement is inconsistent with a major thrust of the President's policies, which is to allow U.S. operators to construct or acquire foreign tonnage. Government-impelled cargoes are a major source of revenue for virtually all the U.S. liner operators and many U.S. bulk operators. U.S.-flag vessels cannot be denied immediate access to such important cargoes if we are to have a strong U.S.-flag merchant marine. The draft legislation would provide immediate eligibility for reflagged vessels of less than 5 years of age for the carriage of Government-impelled cargoes. Vessels between 5 and 10 years of age could receive immediate eligibility if they were determined to be useful for the national defense.

(3) ***Foreign Investment in U.S.-Flag Shipping***

There currently are no U.S.-ownership requirements for a U.S. corporation to operate U.S.-flag vessels in the foreign trade of the United States. However, problems arise with respect to the citizenship requirements for a U.S. corporation that has availed itself of one or more of the promotional programs provided by the Merchant Marine Act of 1936. Such a situation invokes the citizenship definition set forth in the Shipping Act of 1916, which requires that the controlling interest of a U.S. corporation must be owned by U.S. citizens. Relaxation of the existing citizenship requirements would provide additional potential sources of capital for new investment in U.S.-flag tonnage. The draft legislation provides that foreign investment in U.S.-flag shipping be encouraged by increasing the current 49 percent foreign-ownership linlitation to 75 percent.

(4) ***Capital Construction Funds for Foreign Building or Acquisition***

Section 607 of the Merchant Marine Act of 1936 authorizes the Secretary to permit a citizen of the United States owning or leasing vessels to defer the tax on certain funds generated by particular vessels when such funds are deposited into a CCF and subsequently used for the acquisition of qualified vessels. The tax-deferred funds from a CCF are an important source of capital for the construction of U.S.-flag vessels, particularly for subsidized operators engaged in the foreign trade. Present law, however, requires that CCF may be used only in connection with vessels constructed in the United States. Thus, subsidized operators who acquire foreign-built ships under section 101 of the draft bill would be deprived of this important source of capital for the acquisition of their vessels. Nonsubsidized U.S.-flag operators who acquire tonnage abroad are in the same difficult position with regard to the availability of CCF to assist in their capital programs. The draft bill would authorize a U. S.-flag operator engaged in foreign commerce to use CCF in connection with foreign built vessels.

(5) ***Ad Valorem TarifTon Foreign Repairs***

Pursuant to the Tariff Act of 1930, a 50 percent tariff currently is levied on the cost of nonemergency foreign repairs that have been made on U.S.-flag vessels. This ad valorem duty adversely affects the ability of U. S.-flag vessels to compete with foreign-flag vessels. By requiring U.S.-flag vessels to return to the United States for such repairs, this ad valorem duty limits the flexibility of our liner operators, places undue hardship on our bulk carriers operating in foreign-to-foreign trades, and results in the interruption of service with the loss of operating revenues. The draft legislation would amend the Tariff Act so that the current 50 percent ad valorem duty would no longer apply to foreign repairs made to U.S.-flag vessels. In addition, section 606 of the Merchant Marine Act of 1936 currently requires subsidized operators to perform repairs in the United States or Commonwealth of Puerto Rico. The draft legislation would permit subsidized operators who are eligible for repair subsidy to perform such repairs in foreign shipyards without subsidy or within the United States and Commonwealth of Puerto Rico with subsidy.

Appendix B

Maritime Cargo Policies of 64 Foreign Countries 1982-83[1]

Algeria

Algeria requires a 50-percent clause in its export contracts for both oil and liquefied natural gas (LNG) that gives preference to Algerian-flag vessels.

Article 1 of Algerian Law No. 78-02 of February 11, 1978, gives the state a monopoly on foreign trade. It reads, "In accordance with the provisions of the national charter and applying Article 14 of the Constitution, the import and export of goods, supplies and services of all kinds are under the exclusive control of the state. "

Except for crude oil, traffic between metropolitan France and Algeria is reserved for Algerian- and French-flag vessels.

Algeria and Brazil have signed a maritime navigation and transport agreement to cover all traffic between the ports of the two countries except for petroleum and bulk-cargo shipments.

Algeria also has bilateral agreements with the U. S. S. R., Bulgaria, the German Democratic Republic, Guinea, the People's Republic of China (P. R. C.) and the Republic of Cape Verde that divide cargo on a 50/50 or 40/40/20 basis.

Transportation of LNG is provided for in the sales contracts and varies according to contract with the state-owned Campagnie National Algerienne de Navigation (CNAN) usually receiving at least one-third of the cargo generated.

Angola

Imports in Angola pay 20 percent less import duty on cargoes carried by state-owned Angolan-flag lines. Preferential customs legislation and reduced port dues as well as handling priorities are given Angolan-flag vessels.

In March 1976, the Angolan Government decreed that priority be given to vessels flying the Angolan flag in the shipment of imports and exports. The use of foreign ships is allowed only when there are no national ships available or when expressly authorized in specific areas by the Merchant Navy Board. At present, only Angonave (Angolan Shipping Lines) is authorized to carry or delegate Angolan Government cargo. The trade is said to be served by Communist Bloc nonconference lines, and Western European lines cannot get access to cargoes.

Argentina

According to its 1973 Merchant Marine Law, the government of Argentina must approve all freight conference agreements that involve Argentina's "right" to carry 50-percent of its waterborne foreign trade, Any freight conference agreement that appears to place limitations on Argentine ships or assign a smaller than 50 percent share to Argentine ships will not be recognized by the government. The government reserves the right to deny port facilities to foreign ships that do not operate under approved agreements. In actuality, the new legislation adds little to the previous legislation, but instead acts as enforcement legislation, reinforcing the 50 percent provision. The new legislation also clarifies the financial aspects of the domestic provisions while making known the internal promotion mechanisms.

All imports consigned to a government organization must be transported on Argentine-flag vessels. Argentine vessels must also be assigned the largest possible share of government exports.

Argentina has commercial agreements with Uruguay, Peru, Chile, the P. R. C., and the U.S.S.R. whereby the exchange of goods is to be divided in equal proportions between Argentine-flag ships and ships of these trading partners. In case of a shortage of such ships, it is necessary to obtain a waiver for transport in third-flag carriers.

In practice, a liner conference that gives Argentina at least 50 percent of the pool may carry cargo up to a maximum of 50 percent. The 50/50 agreements reserve trade to conference vessels of two parties. Second preference is given to national nonconference lines and then to other—preferably Latin American—third flags. Only a very small percentage of the trade is carried by nonconference lines, however, and an even smaller percentage is carried by cross-traders (primarily Brazil).

Australia

Australia has no national laws, regulations, or administrative practices requiring international carriage to be

[1] U.S. Department of Transportation, "Maritime Subsidies, February 1983, Washington, D.C with update by the Office of Technology Assessment,

reserved either totally or in part for national flag carriers. No apparent flag discrimination has been reported.

Japan agreed to purchase 6.5 million tons per year from Australia's Northwest Shelf LNG project in early 1981. Shipping requirements are estimated to be seven, 125,000 M^3. vessels starting in 1986. Vessel ownership is to be divided between Australian and Japanese flags.

Bolivia

Legislation provides for 50-percent reservation to the national flag, including general, reefer, and bulk cargo. The remaining 50 percent is open to associate foreign lines which have an agreement with the Bolivian national line. Implementation has not been possible, however, because of a lack of tonnage (fleet of only two ships).

Brazil

Under Decree Law 666 of July 2, 1969, all imports and exports in which the government provides financial assistance must be carried on Brazilian ships when available. However, this law provides for the waiver of cargo preference in the following instances:

1: import or export cargoes obligatorily linked to transportation in Brazilian-flag ships can be liberated in favor of the flag of the exporting or importing country by weight up to 50 percent of the total as long as the legislation of the buying or selling country concedes at least equal treatment in relation to Brazilian-flag ships;
2. in case there is no Brazilian-flag ship or flag ship of the importing or exporting country in position to take on the cargo, the Brazilian Superintendent of Merchant Marine can, in his exclusive judgment, liberate the transportation (of the cargo) to a third-flag ship specifically designated; and
3. when the exportation or importation of merchandise subject ~o liberation is made to or from a country that is not served by ships of both the countries involved, the Brazilian Superintendency of Merchant Marine will effect prior liberation of the cargoes covered by this decree, designating the transporter.

Only a small percentage is allowed to be carried by nonconference lines. Foreign shipping companies cannot operate to Brazil unless they are comembers with a Brazilian line of a conference. Most agreements cover the whole trade and do not recognize third-flag rights.

The government has a monopoly on the transportation of petroleum and petroleum products, except for some small companies that were in operation when the monopoly law went into effect.

All imports of ordinary paper (excluding special paper and pulp) must be carried in Brazilian ships, but in trades where special arrangements are made, as in the case of the Equal Access Agreement between SUNAMAM and the U.S. Maritime Administration, the other national lines also can participate in this carriage.

Algeria and Brazil have signed a maritime navigation and transport agreement to cover all traffic between ports of the two countries except petroleum and bulk-cargo shipments.

Since 1967, Brazil's legislation has called for the establishment of cargo quotas through pooling agreements aimed at achieving a 40-percent share for Brazilian carriers, 40 percent for national-flag lines of its trading partners, and 20 percent for third flags. Between Brazil and Argentina, Chile, Ecuador, Mexico, Peru and Uruguay, however, the agreement is 50-50 unless national-flag ships are unavailable.

A protocol to the Brazil/West Germany maritime agreement provides for participation in equal rights in regards to tonnage and freight values for governmental cargo. Brazil also has signed maritime agreements with the U. S. S. R., Poland, Romania, and East Germany.

Burma

In Burma, up-to-date information is not available, but earlier legislation reserves all cargo to the national line, except for certain regional trades where Burma operates in a conference.

Cameroon

The Cameroon Shipping Lines is given exclusive right to transport all imports for the government, public collectives, or state-owned companies. All contracts for private imports and exports must give priority to or obtain a waiver from the company for any shipment it cannot handle.

Chile

Decree Law No. 3059 reserves for Chilean-flag vessels 50 percent of international ocean transport except when reciprocity by foreign countries determines their individual participation above or below this *limit.*

Decree law signed December 23, 1975, provides that 50 percent of export cargoes may be carried on ships of flag of country of destination as long as that country recognizes an equal right for Chilean vessels.

Cargo moving between Chile and Argentina, Chile and Brazil, and Chile and Peru, must be carried in equal portions by ships of the two countries when available.

Chile and Israel have signed a convention according the two countries equal shipping access to cargo in bilateral trade and equal port facilities in their respective nations.

People's Republic of China

A new maritime code is being drafted that is likely to contain protectionist measures. The Chinese lay down all conditions on which cargo moves in their trades. They discriminate by buying f.o. b. and exporting c.i. f. and by fixing freight rates. In practice, much cargo is carried in foreign ships because of their small fleet.

Colombia

Legislation reserves a minimum of 50 percent of all national cargo to Colombian vessels on routes where a Colombian vessel operates. Import/export licenses only are given to approved lines, i.e. , lines in a conference with a pooling agreement that guarantees 50 percent of the trade to Colombian lines. These licensing procedures virtually preclude the operation of nonconference lines, except for a very small group of unstamped cargoes. Conference cross-traders are not necessarily excluded, provided they do not take away from the 50 percent Colombian share.

Decree No. 1208 of July 1969, states as follows:

Article I.—In order to effect Article 1 of Legislative Decree No. 994 of 1966, a reserve is made for Colombian-flag ships of no less than 50 percent of the general cargo of imports and exports on routes served by Colombian vessels, providing that the requirements of Article 2 of the same Legislative Decree are met.

The Colombian Government, after examining the capacity and speciality of the mentioned vessels through a study made by the Ministry of Development, the Merchant Fleet, and a representative of the Colombian Shipowners, will establish a reserve of no more than 50 percent of Colombian-flag ships transporting bulk, liquid and refrigerated cargoes of imports and exports.

The reserved cargoes stipulated in this article will be applied only if they are not in conflict with previous Government obligations with regard to foreign loans.

Article 2.—The reserved cargoes could be included in the transportation treaties between Colombian shipowners and foreign maritime companies, in order to enlarge, integrate, or consolidate the services and to reduce their costs.

The Latin American shipowners registered in the Latin American Association of Shipowners could participate in the transportation of reserved cargoes under equal conditions as the Colombian ships, provided that equal treatment or its equivalent be given to Colombian ships in their respective countries.

Decree 616 of 1972 states: "The Colombian reserve for Colombian flag vessels also operates for cargo with final destinations to Colombian trade zones. "

Costa Rica

At present, 80 percent of all exports are reserved to a Caribbean line, but in response to complaints from foreign governments, Costa Rica has agreed to revise the law when the U. N. Liner Code comes into force.

Cuba

All cargo is allocated to Cuban- or Soviet-flag ships.

Denmark

Effective July 31, 1973, any sea transport of goods from Denmark to Greenland requires a permit from the Minister for Greenland. Exempt from this requirement are Danish Government and Government institution ships, and sea transport of goods required for the operation of the Danish-American defense areas. With the exception of this Greenland trade, Denmark has no other national laws or regulations on cargo preference.

Dominican Republic

In the Dominican Republic, Law No. 180 of May 31, 1975, provides that 40 percent of commercial import and export cargo, 50 percent of "exonerate" cargo and 60 percent of government-controlled cargo be carried on Dominican Republic-flag ships. It is believed that this law is ineffective in practice.

Ecuador

Ecuador reserves 100 percent of hydrocarbon cargoes exclusively for state companies or mixed companies in which the state has 51 percent interest and the right to carry 50 percent of all cargoes imported to or exported from Ecuador.

All imports and exports that are the property of the Government or its enterprises, or of public or private institutions that are intended for social or public purposes, as well as cargo belonging to companies in which the government owns more than 50 percent of the capital, are to be transported in vessels owned by national shipping companies or by those which the cargo reserve law considers as such. Fifty percent of the cargo may

be transported on vessels of the importing or exporting country provided it is done on the basis of reciprocity.

A series of decrees reserve 100 percent of imports from Brazil, Argentina, and South Africa and 100 percent of all trade with Panama, to Ecuador flag vessels or to vessels of foreign companies associated with an Ecuadoran line.

Implementation is taking place route by route as Ecuadoran vessels become available. Associate status has been granted to a number of foreign lines in the direct trades to Europe.

Egypt

In 1976, Egypt's Council of State issued a ruling through the Supreme Administrative Court in Cairo that in the future all seaborne shipments entering or leaving Egypt on the business of the Arab Republic of Egypt, her public institutions, organizations, and their affiliates must be arranged and supervised by the Egyptian Company for Maritime Transport or the foreign agents of this company.

Article 1 of Ministerial Decree 221 of 1974 requires all organizations in which the Government has 25 percent or more interest to give priority to Egyptian-flag companies. More recently, Government cargoes, plus 30 percent of all imports and exports, have been reserved for Egyptian-flag ships. The state cargo-allocation agency gives priority to the state line and second preference to major Egyptian private lines.

Ethiopia

In Ethiopia, legislation is not known, but import licenses bear the words ''to be shipped in Ethiopian-flag vessels." However, the fleet is very small and waivers are given automatically.

France

According to a decree of April 1931, as amended in August 1970, two-thirds of the crude oil imported for internal consumption must be carried in French ships or in ships of which the charter parties have been approved by the Ministries concerned [i.e., Ministry of Fuel and Ministry of Transport (Merchant Marine)]. A 1935 French law specifies that 50 percent of France's coal imports be carried in French-flag vessels. Exceptions can be granted if needed ships cannot be supplied.

French-flag ships have a monopoly on coastal traffic in metropolitan France; they also have a de facto monopoly on traffic between ports of the French Departments of La Guyane, La Guadaloupe, and La Martinique, and between ports of the same overseas Departments. Trafiic between ports of metropolitan France and Tunisian ports is reserved jointly to French- and Tunisian-flag ships. It is the same for traffic between metropolitan France and Algerian ports according to recent agreements. Trafilc between France and former French colonies is not reserved to French-flag ships.

France has bilateral agreements with the Ivory Coast and with Senegal dividing cargo on a 40/40/20 basis.

A French/Morroccan agreement divides cargo either 40/40/20 or 50/50 on a case-by-case basis.

Concerning export credits, France imposes French-flag vessels if the transport is being financed as well as the goods being exported. This restriction relates only to those exports that are being undertaken on a c.i. f. basis. If, however, only the products are being financed and not the transport, a complete freedom-of-choice flag exists.

Gabon

A government decree signed on September 7, 1978, confirms the division of cargo using the UNCTAD 40/40/20 formula, with the qualification that Government and quasi-Government cargo be expressly reserved for Gabonese-flag vessels.

Gabon's national merchant marine company, *Societe Natiomde de 7knsports Maritime* (SONATRAM), has signed agreements with both a West German and a Belgian company to divide cargoes on a 40/40/20 basis, which is similar to a French/Gabonese agreement. The agreements also provide for the Transportation of freight by the Belgian and West German companies, for the account of SONATRAM if no SONATRAM ships are available. A similar agreement has been negotiated with the Dutch line Nedlloyd.

Federal Republic of Germany

There are no legislative provisions requiring the use of West German ships in the transportation of supplies for development assistance provided by the Federal Republic of Germany (FRG). Bilateral agreements on capital assistance provide that receiving countries shall allow free choice of transportation enterprises to passengers and suppliers of goods and shall abstain from any measures that might exclude or impair the participation by West German transportation enterprises.

Cargo may be reserved, however, to West German-flag vessels if the receiving countries preclude West German lines from participation in the carriage of such cargo. Furthermore, cargo may be reserved under existing agreements on sea transport concluded with the Re-

public of Ivory Coast and Brazil. West Germany has signed an agreement with the Ivory Coast to divide cargo on a 40/40/20 basis.

Cargo- and revenue-pooling agreements that involve nonresident shipping companies, and freight contracts and charters with carriers from countries that discriminate against West German vessels, must be approved by the government.

A supplementary protocol to the Brazil/FRG Maritime Agreement provides for participation on equal rights regarding freight values and tonnage for governmental cargoes.

Ghana

Ghana favors f.o. b. purchasing as a means of discrimination, and all indications are that cargo control will be tight and effective. All cargoes ordered by the Ghana Supply Commission, the Government's purchasing organization, are handled by the Black Star Lines as shipping agents. However, cargo is moved by the first available conference vessel. Ghana has indicated that nonconference lines will be allowed to participate but only up to a certain share of trade (yet to be decided).

Guatemala

Guatemala Congressional Decree No. 26/77 derogated the previous basic shipping laws and established a nondiscriminatory regime. A 6-percent surcharge, which must be paid by all national or foreign shipping lines that transport merchandise destined to the Republic of Guatemala, is levied on the value of maritime freight on all products or merchandise entering the country through national ports and customs houses. Until 1983, 30 percent of the revenue collected will go the National Maritime Co. (in which the state has a majority interest), with the rest going into a loan fund to assist the merchant marine.

Honduras

In Honduras, no effective measures are yet in force. The 1970 legislation reserves imports of certain "privileged companies" to Honduran vessels. However, the fleet is too small for this legislation to be enforced.

India

Government cargoes in India are reserved to the national-flag fleet. Further legislation is under consideration to reserve 40 percent of all export cargoes to Indian vessels.

India is exerting cargo preference pressure on her oil import trade The national refineries give preference to shipping under the Indian flag, which is to transport 90 percent of all crude oil imports.

India has agreements with Peru, Romania, Czechoslovakia, Hungary, Bulgaria, the U.S.S.R, Poland, East Germany, Iran, and Egypt to utilize as far as possible shipping of either party in the carriage of mutual trade. The agreements provide for the carriage of bilateral trade on the basis of suitability and equality in tonnage and earnings.

India has signed a bilateral agreement with Czechoslovakia that divides cargo on a 40/40/20 basis with the 20 percent share allocated to Polish and Yugoslav vessels.

Export-Import Bank cargoes that are not carried in U.S.-flag vessels must be carried on national-flag vessels.

Shipments for Government account must be carried on national flag ships.

Indonesia

An instruction of November 27, 1964, orders that all requests for shipping space for export of Indonesian commodities be channeled through the Directorate for Shipping of the Directorate General of Sea Communications. This is designed to give national shipping companies priority in the transportation of Indonesian export goods.

The Minister of Sea Communications has ruled that trans-shipment of goods for Indonesia must be with Indonesian-owned ships using only Indonesian transshipment ports. It also was pointed out that as soon as possible, Indonesian-owned coasters will be used for tram-shipment from Bangkok, Thailand and Kompongsom, Cambodia. Licenses will be issued by the National Shipping Bureau. If national vessels are unavailable, foreign-flag ships can be licensed to carry transshipment. The Government has stipulated that national-flag ships carry 40 percent of all cargo moving between Indonesia and Europe.

Fifty percent of c.i. f. fertilizer imports (100 percent of f.o. b. fertilizer imports) must be carried on Indonesian-flag vessels. In late 1981, Indonesia and Korea negotiated an agreement to split the shipping of their bilateral trade 50/50.

Minister of Communications Decree No. KM/16/PR. 302/PHB-82 dated January 18, 1982, provides for a 50-percent reduction in port and bunkering charges for national oceangoing ships, including ships chartered by national oceangoing companies, loading nonoil and natural gas export products. The reduction is to be ac-

counted by the shipping company as port charges relief to exporters.

Presidential Decree 18-82 dated April 12, 1982, states "the transportation of export and import commodities owned by the Government of Indonesia will be carried out by vessels operated by Indonesia shipping companies.

Iran

Iranian Decree No. 35510 of August 23, 1976, created a bureau at the Ministry of Commerce for the purpose of planning and programing the importation and shipment of Government goods. All ministries and Government enterprises and organizations, as well as Government-aflllliated organizations (excluding the War Ministry and the Armed Forces) are responsible for arranging for the shipment of their own goods, whether by sea or by air, through the Ministry of Commerce. The Ministry of Commerce arranges with the Iranian merchant marine for the shipment of such goods, and all Government cargoes are apparently reserved to the Iranian flag.

Iraq

Preference in the carriage of cargo is given to Iraqi-flag vessels.

Italy

Generally, Italy has no overall cargo-preference laws or regulations. Italy and the U.S.S.R. have signed a bilateral shipping pact that stipulates that Italian ships should carry all raw materials while Soviet ships should carry general cargo.

Italy and the Ivory Coast have signed an agreement to divide cargo on a 40/40/20 basis.

Ivory Coast

An order of 1975 declares that cargoes of all types coming from or destined for the Ivory Coast are divided between Ivorian and foreign shipping following the 40/40/20 sharing formula of the UNCTAD Code of Conduct for Liner Conferences.

Cargo booking offices in most trades contribute to close control of cargoes. Preference for allocation is as follows:

- Ivory Coast-flag ships,
- trading partner-flag ships,
- conference cross-traders,
- Ivory Coast nonconference lines, and
- others.

The Ivory Coast has signed agreements with West Germany, France, and Italy which divide bilateral cargo on the above basis.

Jamaica

The Cargo Preference Act of 1979 requires specified import and export cargo be carried by ships owned, chartered, or operated by the Jamaican Government. Those cargoes are: all bauxite, alumina, and such other natural resources of Jamaica and their byproducts as may be prescribed; such agricultural products to be exported from Jamaica as may be prescribed; and all Government-controlled cargoes. A waiver of 50 percent of cargoes can be based on reciprocity. The requirement can be completely waived if in the national interest. A strong directive has been issued to Government departments to use Jamaican-flag ships, but it has not been well-implemented.

Japan

Japan has no generally applicable laws or regulations in support of cargo preference. However, utilization of Government financing or licensing services often result in the direction of commercial cargoes to Japanese-flag carriers. The shipment of tobacco from the United States to Japan is a case in point—such cargoes have been shipped exclusively on Japanese-flag vessels for years. The close Government-industry relationship in Japan necessarily results in a shipping policy that has the net effect of a "ship Japanese' program.

Republic of Korea (South Korea)

A preferential interest rate for importing raw materials for export production is extended to cover freight costs when the imports are carried on Korean-flag ships.

The Marine Transportation Promotion Law of December 5, 1978, as supplemented by Presidential Enforcement Decree of June 8, 1979, reserves 100 percent of all liner cargoes for Korean-flag vessels.

The Shipping Promotion Law enacted by South Korea makes it mandatory for exporters and importers in that country to use only Korean-flag vessels for all their shipments.

The Government encourages the use of Korean-flag ships by awarding some Government procurement contracts on a f.o. b. rather than a c.i. f. basis, enabling these ships to compete on a more equal level. The extent to which this policy is successful is indicated by the relatively large ratio of cargoes carried by its oceangoing merchant fleet.

There is a waiver system designed to assure the utmost cargo for the national fleet. A waiver is allowed only when there is no Korean vessel available for carrying cargo.

A Transportation Ministry decree names five commodities, imported in foreign bottoms, which as soon as possible are to be carried in Korean-flag ships. These items are crude oil, iron ore, logs, grains, and fertilizers.

Korea has trade agreements for the carriage of cargo by ship with the United States, West Germany, Japan, and Denmark.

Kuwait

Government of Kuwait crude oil sales contracts include terms that require that cargo preference be given first to Kuwait-flag tankers, and then to other Arab flags.

Libya

A Libyan decree reserving all imports to domestically owned or chartered vessels was to have been issued, but, if issued, has never been implemented.

Malaysia

Malaysian law requires all coastal trade be carried on Malaysian-flag vessels. All goods destined for East Malaysia must pass through Johore Baru, eliminating Singapore trans-shipment. The prime benefactor will be the Malaysian International Shipping Corporation (MISC), which is 51 percent owned by the Government.

Malaysia has adopted the UNCTAD Code of Conduct for Liner Conferences cargo carriage ratio of 40/40/20. Legislation and fiscal incentives reserving Government and quasi-Government cargoes to the national flag are ineffective at the moment, but Malaysia has ambitious plans for fleet expansion.

Malta

The Maltese minister for ports may exclude from trade with Malta those lines not party to an agreement of which he approves. Legislation has led to a number of 50/50 commercial deals.

Sea Malta Co. Ltd. is to share in the carriage of freight on the routes between Malta and Belgium, West Germany, Holland, Italy, and the United States routes on a 50/50 basis as a result of an agreement reached between the island's national carrier and a number of foreign lines that operate on the Malta route.

Previous nonconference lines were accommodated in these agreements, but presumably there would be difficulties for new nonconference lines. Cross-traders also were accommodated but on a limited basis.

Mexico

The constitution of the Caribbean Multinational Shipping Line (NAMUCAR) requires members to use that line for all shipments between member countries in which there is a Government interest, unless such cargo is reserved to national lines.

Preferential treatment is on the basis of administrative actions rather than laws. These actions have taken the following forms:

1. approval of applications for import licenses with the provision that the goods covered by the application be imported in Mexican-flag vessels;
2. in some cases where the importation of a given item is restricted by allocations of quotas in currency, the cost of sea transportation is not charged against the quota when the goods are imported in Mexican-flag vessels. The effect of such a "credit' is to increase the quota of the importer who chooses to utilize the services of Mexican-flag ships;
3. a decree ofJanuary 30, 1967, grants a 97.7-percent reduction of the export tax on cotton to cotton producers, The purpose of the decree is to encourage producers to seek foreign markets. It is stated in the decree that preferential treatment will be given to shippers who use Mexican-flag vessels or vessels chartered by a national shipping company;
4. a decree of January 18, 1963, established an export tax of 1 percent of the invoice value on bee honey if the shipment is made on a Mexican-flag ship. The tax applied on bee honey shipped on a foreign-flag vessel is 3 percent; and
5. a decree effective January 1, 1966, provides the following subsidies of products intended for export: 50 percent of the railroad freight rate for manufactured products not for end consumption. When such products are shipped by sea, the subsidy can only be given when either a Mexican-flag vessel or a foreign-flag vessel under charter to a Mexican shipping company is used.

A provision has been published under the Mexican Export Tax scheme which applies rebates on a progressive scale to exports if the exporter uses Mexican insurance and c:arriers.

Article 6 of the Mexican Decree on Fiscal Incentives to the National Merchant Marine provides a tax credit equivalent to 10 percent of the cost of transport and other costs associated with the transport of imports to those who contract with a Mexican-flag transport firm.

The Law of the Development of the Mexican Merchant Marine enables the Secretariat of Communications and Transport to reserve specific shipments of cargo for transport solely in ships of Mexican registry and to fix the Mexican-registered vessels' percentage shares of the transport of import and export cargoes that are the property of the Government or semi-public institutions. Under the law, import or export cargoes marketed with state financing, subsidy or guarantee, and duty exempt cargoes are preferably to be transported in ships of Mexican registry.

Regulations published on October 27, 1981, implementing Mexico's Law for the Development of the Mexican merchant marine reserves 50 percent of all general and bulk cargoes for the Mexican merchant marine.

Mexico's Multimodal Transport Decree requires equal participation of Mexican-flag carriers in the transport of containers. Despite legislation favoring conference shipping, a high proportion of trade continues to be nonconference.

Morocco

State enterprises and mixed public-private activities and/or concessions or subsidiaries of such entities reserve all their cargo for Moroccan-flag carriers. Forty percent of imports and 30 percent of exports are required to move on Moroccan vessels. Morocco has agreed to divide cargo 40/40/20 or 50/50 on a case-by-case basis with France and Spain. Existing bilateral exceed the UNCTAD Code by implicitly covering bulk trades.

Mozambique

All trade between Mozambique and Portugal is reserved for Portuguese-flag vessels. There is a 20-percent reduction in taxes on goods shipped via Portugal.

Nicaragua

Decree Law No. 299 of March 24, 1972, provides that cargoes purchased or sold by the State shall be transported exclusively by Nicaraguan shipping enterprises. Fifty percent of commercial cargoes shall be carried by national flag ships, and 50 percent by ships of the other party. Should the other party not provide shipping services, the Nicaraguan share may go up to 80 percent.

A recently passed Government decree states that 40 percent of each shipment in or out of Nicaragua must be transported on the state shipping line, Naviera Nicaraguaense (NANICA). Forty percent of the shipment can be transported by a line from the trading partner and 20 percent by a shipping line of any Central American country. Recent legislation, not yet implemented, calls for Government approval of freight rates and increases.

Nigeria

On December 29, 1981, Nigeria anounced its adoption of the UNCTAD 40/40/20 cargo-sharing formula with implementation to be effective January 1, 1982. It was also announced that bilateral agreements will be undertaken with friendly countries to promote shipping trade. A 50/50 agreement has been concluded with Brazil, and discussions with OECD trading partners are currently underway. A high proportion of current trade is carried by nonconference lines.

Pakistan

Cargo preference is practiced among participants in international shipping conferences that reserve a portion of the conference trade to Pakistan ships.

Half of U.S. and World Bank aid cargo and most Government cargo is reserved to national-flag ships.

It is reported from Karachi that 40 percent of the country's imports and exports will be reserved to national-flag ships. Pakistan is believed to have had a 50/50 cargo sharing agreement with Poland dating from 1975.

Paraguay

A decree reserving 100 percent of Paraguay's inbound cargo for Paraguayan ships was signed on August 21, 1981.

Peru

For certain types of cargo (wheat, corn) Peru reserves 100 percent of cargo for Peruvian-flag vessels. For other cargoes, it reserves 50 percent, but since export cargo is normally sold full-lot, the effect is that Peruvian flag vessels end up with the entire cargo.

A decree, effective March 26, 1976, guarantees that Compania Peruana de Vapores, the state-flag line, shall receive preference in the carriage of all Government cargoes, whether national or local.

A Peruvian decree provides that all public bodies give preference to the transportation of import and export cargoes to vessels belonging to the Peruvian Shipping Company (CPV). Also, the organization will contract through CPV the transportation of cargoes which CPV vessels cannot carry.

A Peruvian Government decree established that up to 50 percent of Peruvian exports and imports (calculated on a monthly basis) must be reserved for Peruvian shipping lines. In practice this started at 30 percent and permitted a periodic increase to bring it up to 50 percent, to which it was raised by a decree of June 2, 1980.

Decree 22067 of January 11, 1978, obliges all public sector entities to contract Peruvian-flag shipping lines for the maritime transport of nonconference articles for import and export with priority to: 1) Corporation Peruana de Vapores (CPV); 2) Peruvian-flag vessels; 3) foreign-flag vessels chartered to Peruvian companies.

Supreme Decree No. 024-80-TC signed December 30, 1980, reserves cargo exclusively for Peruvian-flag vessels in cases where the trading partner does not have a representative line calling in Peru. Argentina and Brazil have similar agreements with Peru whereby the parties have an equal right to transport the cargoes and share the freight receipts derived from their bilateral trade. Peru has acceded to UNCTAD code with reservations.

Philippines

In the Philippines, an original decree reserved all Government cargoes to the national flag. A subsequent decree (January 1982) reserves 40 percent of all liner trade to the national-flag vessels and 40 percent to the bilateral partner. Legislation on Government cargo is already in force, but implementing regulations for the general cargo reservation law have been issued only for the U.S. route so far. The combined effect of the two decrees will probably mean 60 percent of the trade is reserved for Philippine vessels.

Presidential Decree 806 states that the Government will take all steps necessary, including the provision of direct incentives to Philippine- flag vessels and national shipping lines, to enable them to carry a substantial and increasing share of the cargo generated by Philippine foreign trade. It also states that Philippine-flag vessels and those that are owned, controlled, or chartered by Philippine nationals shall carry at least an equal share of cargo as that carried by vessels of another country in trade between the two countries.

Exporters will be able to deduct from their taxable income an amount equivalent to 150 percent of overseas freight expenses and charges in Philippine ports incurred in shipping export products, provided they use Philippine-flag carriers. Enterprises registered with the Board of Investments also will be allowed to deduct from their taxable income 200 percent of shipment costs incurred in the transport of their products and raw materials to and from foreign ports, provided the shipments are on Philippine vessels.

Under a Philippine licensing regulation, import licenses will be issued for a Government cargo only when such import is to be transported on Philippine-flag ships. However, import licenses may be issued if no Philippine-flag vessel is available at the port of shipment. In actual practice, many shipments go to foreign liners due to the unavailability of Philippine ships.

Presidential Order No. 37 requires that all purchases of Philippine imports be made on an f.o. b. basis, that all freight payments be made in pesos in the Philippines, and that preference on the carriage of imports be given to Philippine-flag vessels.

Presidential Decree 917 of April 1, 1976, established the Freight Booking and Cargo Consolidation Center to: 1) encourage, facilitate, and assist Philippine shippers, and affect the consolidation of their cargoes, in order to achieve economy and efficiency in bulk shipments; 2) provide systematic vessel-chartering services or charter vessels for the benefit of Philippine shippers; 3) secure adequate shipping services for the carriage of Philippine overseas trade and book cargoes at reasonable freight rates; 4) serve as the central implementing authority for the utilization of Philippine shipping lines for the seaborne transport of Philippine export and lumber imports as prescribed under Presidential Decree No. 894; and 5) foster cooperation among, and enter into suitable arrangements with, appropriate private and public sectors in the Association of Southeast Asian Nations for these purposes and projects.

Decree No. 894 of February 26, 1976, requires Government offices, agencies, and instrumentalities, Government-owned or controlled corporations, and persons and entities enjoying tax exemption, incentive, or subsidy from the Government to utilize in international transportation the services of Philippine-flag shipping lines to the maximum extent service by such lines is available.

Presidential Decree 1466 narrowed the provisions of Presidential Decree 894 by requiring only those cargoes paid for with Government funds or with Government loans, credits, or guarantees to be carried on Philippine-flag vessels (waivers may be granted on the basis of reciprocity y).

All imports of U.S. agricultural commodities under section 402, of the U.S. Government Mutual Security Act and U.S. Public Law 480 that are in excess of the 50 percent required to be carried on U.S.-flag ships must be shipped in Philippine vessels when available.

Executive Order No. 769 signed onJanuary 19, 1982, orders the maritime industry authority to issue the necessary rules and regulations to reserve 80 percent of the Philippine export and import liner cargo trade not cov-

ered by Presidential Decree 1466 for flag carriers of the Philippines and those of the bilateral partner, with the reserved cargo to be shared equally.

Portugal

Decree Law 75-U/77 prescribes that the maritime transportation of goods by any public administration or public enterprise must be on ships under Portuguese flag or on foreign ships chartered by the Portuguese ship owners. This regime must also be observed for c. i. f. exports made by any public administration or public enterprise.

The principles that govern the granting of a derogation are expressed in the Decree Law 75-U/77, in its Article 2:

> Up to 50 percent of the import or export consignments covered by the provisions of Article 1 may be freed for carriage in foreign ships, in particular those of the importing or exporting country, provided that the legislation of such countries grants equal treatment to Portuguese vessels.

In practice, Portuguese authorities intervene only when there is no agreement between carriers and shipowners, and even then only in cases in which there are no significant differences in transportation costs and there is no delay in the expedition or reception of goods.

In the other cases, waivers are automatically granted. At present, there is no record of any waiver being denied. If the laws of the importing or exporting country grant equal treatment to the vessels sailing under the Portuguese flag, then up to 50 percent of the import or export cargoes may be liberated in favor of ships flying that country's flag.

The maritime transport companies of Portugal and the U.S. S. R. are entitled to equal shares in the carriage of merchandise in the bilateral trade between their ports.

Saudi Arabia

By royal decree, preference shall be given to Saudi companies whenever financial and other items are equal. Saudi legislation in 1975 reserved 5 percent of Saudi exports—mainly oil—for national vessels. This figure was supposed to increase to 50 percent by 1980. Saudi flag is also given first preference for defense and governmental cargoes.

Singapore

The Singapore Shipping Association and the Indonesian Shipowners Association have an agreement dividing cargo between them on a 50/50 basis. Otherwise, Singapore has no cargo preference laws.

South Africa

All goods shipped from the United Kingdom or Europe to South Africa for government use must be shipped in vessels operated by the South and South-East African Conference Lines of which SAFMARINE, Ltd. is a member. No other cargo preference laws are in effect.

Spain

A ministerial order dated March 15, 1963, implies certain limitations on the freedom of shipping for imports of essential commodities, "the prices of which, due to their absolutely essential nature, are exposed to the very frequent changes of freight rates in the international market, and which being considered as governmental trade, do not contravene, therefore, to the rules of the international organizations of which Spain is a member.

In this connection, the freedom of trade and freight rates will be limited in the following cases:

- imports *of* governmental cargoes, which have to be carried in full shiploads and on Spanish-flag vessels; and
- the same conditions apply to the imports of those crude oil loads, which are assigned to be consumed within the area covered by the petroleum monopoly.

However, this regime is not entirely restrictive, in view of the fact that 45 percent of crude oil is moved in foreign-flag vessels, and waivers are granted when or where there are no Spanish flags for the cargoes.

Spanish exports enjoying some kind of official support are not subject to any restriction on the flag of the carrying vessels. If transportation is contracted with non-Spanish vessels, the freight value is considered as foreign content. Offlcia.1 support for foreign content normally is limited to 10 percent of total contract value. The above comment implies exports on a c.i. f. basis only. There is no restriction at all on a f.o. b. basis.

Spain restricts to national vessels, through Government monopolies, many imports such as petroleum, tobacco, and cotton. When Spanish-flag ships are subjected by another country to measures contrary to free competition, they shall have the right to apply similar measures in return.

A ministerial order of February 24, 1977, provides that imports of goods classified as "commerce of state' are reserved for national-flag ships.

Sri Lanka

The state-operated Ceylon Shipping Corporation has a monopoly on all cargo imports for the Government and state-owned corporations. If that company is not ready to carry cargo within 14 days it can be diverted to other shipping companies. Law No. 26 of 1973 established the Central Freight Bureau of Sri Lanka to centralize the booking of freight from Sri Lanka to foreign ports. All export cargo is allocated by the Ceylon Freight Bureau since 1971, with first preference given to the state line.

Sudan

Virtually all Government or quasi-Government cargo (about 75 precent of total) uses Sudan's national line.

Taiwan

Government agencies and state-owned enterprises in Taiwan are required to consign their import cargoes to national-flag shipping lines with second priority to flag-of-convenience vessels. Liner operators may be licensed and may be restricted if overtonnaging is found on a route.

Other regulations require that imports of bulk commodities be shipped by national-flag vessels with second priority to flags of convenience.

The Joint Overseas Shipping Association (JOSA), a group formed by Taiwanese ship operators serving Taiwan, is responsible for ensuring Taiwanese vessels have a preference on cotton cargoes. Each cotton importer is required to approach JOSA before the issuance of the import license in order to verify the shipping schedule and intended Taiwanese vessels to be utilized for the shipment. (A waiver can be issued if no Taiwanese vessels are available.)

Additionally, the financing for cotton shipments to Taiwan is arranged through the Central Trust of China (CTC) or a bank named by CTC. The importer is attracted to this financing because of the low interest rate. within this financing there is a double check on JOSA approval, and letters of credit will not be opened without the proper import license approved by JOSA.

Tanzania

Tanzania has imposed an income tax on gross receipts accrued from outbound shipping freight and passengers effective April 2, 1976. This tax applies only to foreign shipping lines. The tax does not apply to trans-shipment traffic.

The Tanzanian Government is establishing a central freight bureau to oversee implementation of UNCTAD Code of Conduct's 40/40/20 formula and to negotiate freight rates.

Thailand

Government agencies are encouraged to use the Government-owned forwarding agent and vessels belonging to the Thai Maritime Navigation Co. Ltd. and the United Thai Shipping Corporation.

The Mercantile Marine Promotion Act B.E. 2521, passed in October 1978, aims at promoting Thai-flag vessels through fiscal and other measures, including cargo preference and the prevention of dumping by foreign-flag vessels. It empowers the Government to permit a deduction amounting to not more than 50 percent of the costs of carriage from the shippers net income prior to income tax calculation when using Thai-flag vessels for import and export cargoes. It also empowers the Government to make mandatory the use of Thai-flag vessels for the seaborne transportation of cargoes ordered by governmental agencies and enterprises.

The Communications Ministry has issued regulations requiring Government agencies, governmental organizations, and state enterprises to use Thai ships to transport their imported goods on five routes (Japan-Thailand, Korea-Thailand, Hong Kong-Thailand, Taiwan-Thailand, and Europe-Thailand). Goods purchased through loans by foreign governments and international financial institutes are exempt from the regulations. To date, most imports have fallen into the nonreserved category.

Trinidad and Tobago

No legislation has been enacted to date, but discussions are underway concerning a proposed edict that would reserve all governmental or quasi-governmental cargoes (about 70 percent of all cargo) to the national line.

Tunisia

Trade between Tunisia and metropolitan France is reserved for Tunisian- and French-flag vessels. The Government owns the Compagnie Tunisienne de Navigation (CTN) which aimed to carry 30 percent of the country's maritime trade by 1981.

Turkey

All "public sector" cargoes must be carried in Turkish-flag ships. Furthermore, the Maritime Bank exerts pressure on Turkish exporters and importers to ship commercial cargo on Turkish ships when available.

The Turkish Government issued a decree in 1975 which directs that cargo for Turkish destinations should be carried by Turkish ships whenever possible. However, should there be no Turkish ship in port at the time the goods are ready to be taken on board, ships of any other flag are free to take the business after obtaining a Turkish nomination certificate.

United Kingdom

The only cargoes required to be shipped in British vessels are sensitive stores and equipment of the armed forces for which security considerations require them to remain under national control.

In the United Kingdom, guaranteed finance is not available for the foreign element of the freight costs:

- where there is clause in the contract which discriminates against United Kingdom shipping or in favor of foreign ships; or
- for business with the CO MECON countries and P. R. C., where the United Kingdom recognizes that, even though there may be no overt flag discrimination clauses in the contract, the goods are to be carried in COMECON vessels or, in the case of P. R. C., in Chinese-registered vessels.

Uruguay

Law No. 14650, the Uruguayan Merchant Marine Development Law, was enacted by Executive Power on May 12, 1977. It reserves 50 percent of all waterborne, (in particular, 100 percent of all imports) for Uruguayan-flag vessels; except where one is not available or is fully loaded. Prior authorization from the Ministry of Transportation and Public Works is needed to use a non-Uruguay an-flag vessel. Such vessel must fly the flag of a country which has an international convention with Uruguay, be in a conference approved by the Ministry of Transport and Public Works, or grant reciprocal treatment to Uruguay an-flag vessels.

The above reservations can be extended to exports that are tax exempt or are financed by the national banking system. Tax allowances are awarded to export freights carried on national-flag vessels. Uruguay has agreements with Brazil and Argentina that provide for an equal sharing of their bilateral trade.

Venezuela

Legislation is in force reserving 50 percent of all cargo to national flag vessels, with all Government cargoes being reserved to the state line. In practice, the national line gets 50 percent of the conference trade. Nonconference lines have free access to nonreserxred cargoes but rarely to reserved cargoes.

The Law for the Protection and Development of the National Merchant Marine stipulates that ships should be 80 percent owned and 100 percent administered by Venezuelan nationals to qualify as Venezuelan flag, and on the general cargo side, the law requires 50 percent of the traffic of each shipper and importer to travel in Venezuelan-flag vessels; it also further excludes the Venezuelan private sector from much of this trade.

The National Executive shall initially reserve for Venezuelan-flag ships the transport of a percentage that is not less than 10 percent of the export and import of petroleum and its derivatives. This percentage shall increase gradually until 50 percent of the total is reached. In a like fashion, the transport of iron ore, wheat, and other free-flowing cargo shall be treated equally whether they are exports or imports.

Compania Anonima Venezalana de Novegacion (CAVN) maintains joint services with several "associated' * foreign-flag lines and under the agreements establishing the joint services imports partially or totally exempt from import duties (known as exonerated cargo), ** must move on CAVN or "associated' line ships. The ' 'exoneration " is at the discretion of the Government agencies concerned and amounts to about 15 percent of the value of Venezuelan imports. This assures a definite share of the cargo to CAVN in areas where it maintains a service.

Yugoslavia

An export premium on ocean freight of 20 percent to U.S. North Atlantic ports and 30 percent to other ports is being given to Yugoslav exporters by the Yugoslavia National Bank when the following conditions are met: 1) shipment is made via a Yugoslav port on a Yugoslav vessel, and 2) if no Yugoslav vessel is available and shipment is made via a Yugoslav port, a foreign-flag vessel may be utilized; however, a certificate

*CAVN is associated with a number of lines in the Scandinavian countries, Europe, and Japan whereby joint services are maintained.

"*Government financed cargoes The Government of Venezuela points out the majority of ' 'exonerated cargo' IS bulk cargo that is not normally carried by CAVN ships.

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must be obtained from the Association of Yugoslav Shipowners stating that no Yugoslav-flag vessel is available.

Zaire

Law 70-014 of July 10, 1974, gives Compagnie Maritime Zairoise the monopoly of transport by sea of exports from the Republic of Zaire and the monopoly on imports of all goods and products imported with the assistance of the Bank of Zaire. It may bestow a part of the operation on other companies of its choice.

Appendix C

Federal Departments With Maritime Responsibilities Related to Commercial Shipping and Shipbuilding Industries

Transportation

Department of Transportation

- Primary administration spokesman on maritime policy issues. Has overall lead in all maritime issues, subject to coordination with other agencies having specific areas of responsibility.

Maritime Administration

- Administers subsidy programs (ODS, CDS).
- Provides financing guarantees (title XI) for the construction, reconstruction, and reconditioning of ships.
- Enters into capital construction fund agreements which grant tax deferrals on moneys to be used for the acquisition, construction, or reconstruction of ships.
- Conducts research and development activities.
- Under emergency conditions, charters government-owned ships to U.S. operators, requisitions or procures ships owned by U.S. citizens, and allocates them to meet defense needs. In conjunction with the Department of the U.S. Navy, develops definition of shipyard mobilization base and sealift requirements.
- Maintains a National Defense Reserve Fleet of government-owned ships.
- Operates the U.S. Merchant Marine Academy and administers Federal assistance to State maritime academies.
- Oversees enforcement of cargo-preference laws.
- Develops maritime policy analysis under guidance of the Office of the Secretary of Transportation.

U.S. Coast Guard

- Administers and enforces safety standards for the design, construction, equipment, and maintenance of commercial vessels of the United States.
- Enforces vessel personnel manning and crew qualifications standards.
- Administers the vessel documentation laws.

Commerce

International Trade Administration

- Advises on the formulation and implementation of international economic policies of a bilateral, multilateral, or regional nature.
- Develops policies and implements programs dealing with import and export administration issues.
- Administers U.S. antidumping and countervailing duty laws.
- Advises on international trade and investment policies pertaining to domestic business sectors and carries out programs to promote world trade and to strengthen the position of the United States.
- Manages ITA's trade-related information and research-gathering and dissemination functions.

Navy

- Military Sealift Command owns or charters a fleet of cargo vessels for logistical military support.
- Office of Assistant Secretary (Shipbuilding and Logistics). Responsible for maritime policy analysis within DOD. In conjunction with MarAd, develops definitions of shipyard mobilization base and sealift requirements.
- Deputy Commander for Acquisition and Logistics. Develops and approves national defense features for merchant vessels.

Justice

Antitrust Division

- Reviews and represents the U.S. Government in cases involving agreements and activities of carriers and conferences which may be anticompetitive.

State

- Office of Maritime and Land Transport Affairs—has lead in coordinating U.S. Government responses to international shipping issues as they affect international conventions and trade practices.

Independent Federal Agencies and Groups With Maritime Responsibilities

Federal Maritime Commission

- Regulates the waterborne foreign and domestic offshore commerce of the United States and protects against unauthorized, collusive activity.
- Approves or disapproves agreements filed under section 15 of the Shipping Act, 1916; reviews activities under approved agreements.
- Accepts or rejects tariff filings.
- In domestic offshore trade, can set maximum or minimum rates or suspend rates.

Interstate Commerce Commission

- Regulates inland waterway, Great Lakes, and coastal shipping, primarily in maximum rate regulation, financial responsibility of passenger carriers, and in collective agreements.

Interagency Group on International Shipping Policy

- Formulates and coordinates administration policies on international shipping issues, such as bilateral and multilateral cargo agreements, and positions on legislative proposals; includes representatives from FMC, OMB, USTR. and the Departments of Transportation, St-ate, Justice, Commerce, and Defense.

U.S. Trade Representative

- A cabinet-level official in the White House with responsibilities for interagency coordination and representing the United States in international trade negotiations.

Appendix D

Glossary of Acronyms and Terms

Glossary of Acronyms

ABS —American Bureau of Shipping
ACVS —air-cushion vehicles
AID —U.S. Agency for International Development, Department of State
ANL —Australian National Line
APL —American President Lines
ASIB —Active Shipbuilding Industrial Base
AWES —Association of West European Shipbuilders
BLS —Bureau of Labor Statistics
CAB —Civil Aeronautics Board
CAD/CAM—computer-aided desigrdcomputer aided manufacturing
CAORF —Computer-Assisted Operations Research Facility
CCA —Controlled Carrier Act
CCF —Capital Construction Fund
CDS —construction differential subsidy
CGRT —compensated gross registered tonnage
c, i. f. —cost, insurance, and freight
CMEA —Council for Mutual Economic Assistance
CPES —centrally planed economies
CPI —Consumer Price Index
DITI —proposed Department of International Trade and Industry
DOD —U.S. Department of Defense
DOT —U.S. Department of Transportation
dwt —deadweight tons
EEC —European Economic Community
ETCA —Export Trading Company Act
Eximbank —Export-Import Bank
FMC —U.S. Federal Maritime Commission
f.o.b. —free on board
FTC —U.S. Federal Trade Commission
GATT —General Agreement on Trade and Tariffs
GDP —gross domestic product
GNP —gross national product
grt —gross registered tons
IATA —International Air Transport Association
Icc —U.S. Interstate Commerce Commission
IMCO —Inter-Governmental Maritime Consultative Organization
IMO —International Maritime Organization
IREAPS —Institute for Research and Engineering Automation and Productivity in Shipbuilding
ITB —integrated tug barges
LASH —lighter aboard ship
LDCS —less developed countries
LNG —liquefied natural gas
LOILO —lift-on/lift-off
LPG —liquefied petroleum gas
MarAd —U.S. Maritime Administration
MEL —Marine Equipment Leasing, Inc.
MSC —Military Sealift Command, U.S. Navy
MTN —Multilateral Trade Negotiations
NACOA —National Advisory Committee on Ocean and Atmosphere
NSC —National Security Council
NSRP —National Shipbuilding Research Program
OBO —oil, bulk ore
ODS —operating differential subsidy
OECD —Organisation for Economic Cooperation and Development
OPEC —Organization of Petroleum Exporting Countries
OPIC —Overseas Private Investment Corporation
OTA —Office of Technology Assessment
R&D —research and development
ROIRO —roll-on, roll-off
SAJ —Shipbuilders Association of Japan
SCA —Shipbuilders Council of America
SESS —surface effects ships
SNAME —Society of Naval Architects and Marine Engineers
SWATH —small-waterplane-area twinhull vessels
teu —twenty-foot equivalent units
U.N. —United Nations
UNCTAD —United Nations Conference on Trade and Development
USCG —U.S. Coast Guard
USTR —United States Trade Representative
VLCCS —very large crude carriers

Glossary of Terms

ABS—American Bureau of Shipping: A U.S.-based, private classification, or standards-setting, society for merchant ships and other marine systems.

ASIB—Active Shipbuilding Industrial Base: The major U.S. shipbuilding and repair facilities engaged in seeking contracts for construction of U.S. naval ships and/or major oceangoing or Great Lakes merchant ships. Presently 26 yards are included and, for defense purposes, are considered to be the core of the Nation's shipbuilding capability and a principal measure of the U.S. ability to respond to a national emergency.

bare-boat charter: A charter agreement which stipulates that the charterer provides for all operating expenses including crew, fuel, maintenance, etc.

beneficial ownership: Designates the owner who receives the benefits or profits from the operation.

breakbulk: A general, multipurpose, cargo ship that carries cargoes of nonuniform sizes, often on pallets, resulting in labor-intensive loading and unloading.

bulk: Cargoes that are shipped unpackaged either dry, such as grain and ore, or liquid, such as petroleum products. Bulk service generally is not provided on a regularly scheduled basis, but rather as needed, on specialized ships, transporting a specific commodity.

CAD/CAM-computer-aided design/manufacturing: An industrial term referring to the development of specifications and design data, via computers, which later are used as manufacturing inputs and controls.

CAORF—Computer-Assisted Operations Research Facility: A MarAd R&D facility.

CCF—Capital Construction Fund: A tax benefit for operators of U.S.-built, U.S.-flag ships in the U.S. foreign, Great Lakes, or noncontiguous domestic trades, by which taxes may be deferred on income deposited in a fund to be used for the replacement of vessels.

CDS—construction differential subsidy: A direct subsidy paid to U.S. shipyards building U.S.-flag ships to offset high construction costs in American shipyards. An amount of subsidy (up to 50 percent) is determined by estimates of construction cost differentials between U.S. and foreign yards.

CGRT—compensated gross registered tons: A measure of shipbuilding output which modifies total gross tonnage by allowances for differing levels of complexity in ships being built.

c.i. f.—cost, insurance, and freight: Export term in which the price quoted by the exporter includes the costs of ocean transportation to the port of destination and insurance coverage.

CMEA—Council for Mutual Economic Assistance: A Soviet-bloc organization comprising: Bulgaria, Cuba, Czechoslovakia, East Germany, Hungary, Poland, Romania, and the Soviet Union.

cabotage policies: Reservation of a country's coastal (domestic) shipping for its own flag vessels.

cargo preference: Reserving some portion of a nation's imports and exports for their own flag vessels.

carriers: Owners or operators of vessels providing transportation to shippers. The term is also used to refer to the vessels.

coastwise: Domestic shipping routes along a single coast.

conference: An international group of ocean carriers serving common trade routes that collectively agree on rates and service.

container ship: A vessel designed to carry standard containers enabling efficient loading, unloading, and transport to and from the vessel.

countertrade: A form of international bartering involving importing and exporting companies or countries.

cross-trades: Foreign-to-foreign trade carried by ships from a nation other than the two trading nations.

DITI—proposed Department of International Trade and Industry: This proposed department would consolidate existing offlces and programs into a single cabinet-level department.

dwt—deadweight tonnage: The total lifting capacity of a ship, expressed in tons of 2,240 lb. It is the difference between the displacement light and the displacement loaded.

domestic offshore trades: Domestic shipping routes serving Alaska and noncontinental U.S. States and territories.

Eximbank—Export-Import Bank: A Federal agency that aids in financing exports of U.S. goods and services through direct loans, loan guarantees, and insurance.

f.o.b.—free on board: Export term in which the price quoted by the exporter does not include the costs of ocean transportation, but does include loading on board the vessel.

flag of registry: The flag representing the nation under whose jurisdiction a ship is registered. Ships are always registered under the laws of one nation but are not always required to establish their home location in that country.

flags of convenience: Sometimes referred to as flags of necessity; denotes registration of vessels in foreign nations that ofter favorable tax structures and regulations.

GDP—gross domestic product: The total value of goods and services produced by a nation over a given period, usually 1 year.

GNP—gross national product: GDP plus the net income accruing from foreign sources.

grt—gross registered tons: A common measurement of the internal volume of a ship with certain spaces excluded. One ton equals 100 cubic feet.

Government-impelled: Cargo owned by or subsidized by the Federal Government.

IMO—International Maritime Organization: Formerly known as the Inter-Governmental Maritime Consultative Organization (IMCO), was established in 1958 through the United Nations to coordinate international maritime safety and related practices.

IREAPS—Institute for Research and Engineering Automation and Productivity in Shipbuilding: IREAPS is a not-for-profit organization of shipbuilders and other members of the maritime industry set up to facilitate contracting and the dissemination of information from the National Shipbuilding Research Program.

intercostal: Domestic shipping routes serving more than one coast.

intermodalism: The concept of transportation as a door-to-door service rather than port-to-port. Thus, efficiency is enhanced by having a single carrier coordinating the movement and documentation among different modes of transportation.

intracoastal: Domestic shipping routes along a single coast.

Jones Act: Merchant Marine Act of 1920, Section 27, requiring that all U.S. domestic waterborne trade be carried by U.S.-flag, U.S.-built, and U.S.-manned vessels,

LASH—lighter aboard ship: A barge carrier designed to act as a shuttle between ports, taking on and discharging barges.

Iandbridge: A system of through rates and service offered by a carrier for cargo shipments from a foreign port to a U.S. port, across U.S. land to another U.S. port and finally by sea to a foreign port destination.

lift-onflift-off (LO/LO): Ships designed to load and unload cargoes with cranes.

liner service: Vessels operating on fixed itineraries or regular schedules and established rates available to all shippers.

microbridge: A system of through rates and service offered by a carrier for cargo shipments from any inland U.S. location to a port, by sea to a foreign port and finally overland to foreign inland destination.

NSRP—National Shipbuilding Research Program: A research program jointly sponsored by the Federal Government and members of the shipbuilding industry.

neobulk: Shipments consisting entirely of units of a single commodity, such as cars, lumber, or scrap metal.

noncontiguous: Domestic shipping routes serving Alaska and noncontinental U.S. States and territories.

OBO—oil, bulk, ore: A combination carrier designed to transport combinations of petroleum, ore and dry-bulk commodities.

ODS—operating differential subsidy: A direct subsidy paid to U.S.-flag operators to offset the high operating costs of U. S. -flag ships when compared to foreign-flag counterparts.

open registry: A term used in place of ' 'flag of convenience' or "flag of necessity" to denote registry in a country which offers favorable tax, regulatory, and other incentives to ship owners from other nations.

RO/RO—roll-on/roll-off: Ships designed to allow trucks or other vehicles to drive on with trailers of cargo.

Shipper's Council: An organization of shippers formed to collectively negotiate rates and services with the conferences of ship operators.

Seabee: A barge carrier design similar to "LASH" but which uses rollers to move the barges aboard the ship.

shippers: Individuals or businesses who purchase transportation services for their goods or commodities.

teu—twenty-foot equivalent units: A measurement of cargo-carrying capacity on a containership, referring to a common container size of 20 ft in length.

title XI: A ship financing guarantee program, originally established in Title XI of the Merchant Marine Act of 1936, under which the government guarantees up to 75 percent of the construction cost of vessels built with CDS or up to 87.5 percent of the construction cost of nonsubsidized vessels.

tramp service: Vessels operating without a fixed itinerary or schedule or charter contract.

USTR—United States Trade Representative: A Cabinet-level ofllcial in the White House with responsibilities for interagency coordination and representing the United States in international trade negotiations.

U.S. Effective Controlled Fleet: That fleet of merchant ships owned by United States citizens or corporations and registered under flags of 'convenience' or ' 'necessity' such as Liberia or Panama. The term is used to emphasize that, while the fleet is not U.S.-flag, it is effectively under U.S. control by virtue of the ship's owners and can be called to serve U.S. interests in time of emergency.

VLCCs-very large crude carriers: Crude oil tankers between 200,000 and 400,000 dwt.

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