Chapter II. Background: Tankers

A. Waterborne Oil Transportation

1. *Status*

Over the past decade, the world has experienced a major increase in reliance on the use of oil as a principal source of energy. At the same time, a large portion of this oil increasingly has been produced in one part of the world and consumed in another. For the year 1973, the world's petroleum consumption was 2.76 billion tons; of this 1.70 billion tons (62 percent) was recovered in one area and transported to another. Almost all of this was transported by tanker.[1]

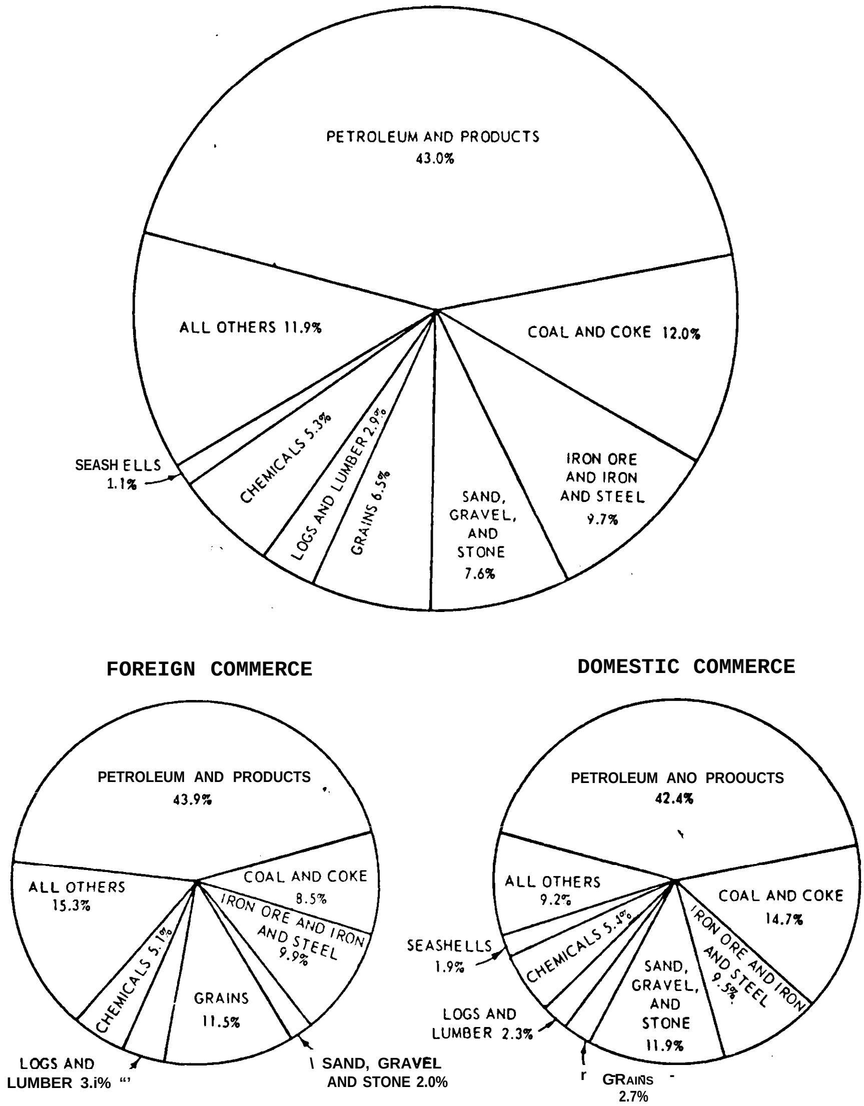
Tankers are also used to ship crude oil and refined products within local areas (such as along the coast of the U. S.) and to ship refined products from a major refinery to many areas. In both foreign and domestic shipping, petroleum and related products comprised just over 40 percent of all U.S. water-borne commerce in 1973. (See Figure II-l.)

Today's total world trade in petroleum shipped by tanker averages 30 to 35 million barrels per day.[2] This is carried by 238 million dead-

1 *BP Statistical Review of the World Oil Industry, 197S.*
2 *Ibid.*

FIGURE II–1. NATIONAL SUMMARIES.

PRINCIPAL COMMODITIES CARRIED BY WATER IN UNITED STATES—CALENDAR YEAR 1973—TOTAL COMMERCE



Waterborne Commerce of the United States-1973, U.S. Army Corps of Engineers

weight tons of tankers available in the world fleet.[3] In today's world fleet, supertankers are in use principally on two major trade routes-from the Arabian Gulf to Europe around Africa, and from the Arabian Gulf to Japan through the Malacca Straits. These routes also account for one half of the total seaborne tonnage carried throughout the world. Figure II-2 illustrates the major world tanker trade routes and the relative tonnages shipped on each route.

Today the majority of tonnage of tankers (but not individual ships) in the world fleet is comprised of supertankers. This use of supertankers has been stimulated by the economics of petroleum transportation over the two long trade routes noted above, particularly since the closing of the Suez Canal in 1967. The recent opening of the Suez may have some further conflicting implications on the demand for supertankers.

While the world inter-area movement of oil has been growing, imports of petroleum to the United States have been increasing as well. Because domestic production has not been able to keep up with rising U.S. demand, the United States presently is importing over 35 percent of its oil requirements. Except for pipeline imports from Canada, through which some 16 percent of total U.S. imports have been received, all U.S. oil imports are carried by tanker.

In 1974, imports of petroleum by tanker into the United States averaged 5.4 million barrels per day, of which half was crude and half refined products. The refined products were received mainly from Caribbean sources while the crude came from Venezuela, the Arabian Gulf, North and West Africa, and Indonesia.

The major portions of crude imports into the United States are received at the key refining centers located in the New York-New Jersey-Delaware-Pennsylvania area, the Texas-Louisiana area, or the California area. In the recent past (1972-74), two thirds of U.S. petroleum imports have been received on the East Coast.

Table II-1 summarizes petroleum import and exports by tanker over the past four years and projects the current one (1970-'74, and 1975). The data are taken from Bureau of Mines statistics and (for 1975) short-term projections of the Federal Energy Administration. The projected increase in tanker-carried imports for 1975 derives principally from the assumption that pipeline imports from Canada will be reduced by 200,000 barrels per day, requiring a corresponding increase from other sources, using tankers. (Canada has announced that it is reducing petroleum exports to the United States on a graduated basis, toward a goal of eliminating such exports by 1981.)

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[3] *Lloyds Register of Shipping, Statistical Tables*, 1974; total as of July 1, 1974. *Clarkson's Tanker Register reports* 296 million dwt (including Combos) as of January 1,1975.

WORLD TANKER TRADE ROUTES

INTERNATIONAL FLOW OF PETROLEUM 1972

FIQUBE II-2

TABLE *II-1.-Summary of tanker carried U.S. petroleum imports and exports*

	Millions of barrels per day averages over each year				
	Imports				
Year	Crude oil	Petroleum product	Total	Exports (products)	Total imports and exports
1970 ---------------- -	1.0	1.6	2.6	0.1	2.7
1971 ---------------- -	1.2	1.8	3.0	:2	3.2
1972 ----------- _ -_ ---	1.4	2.3	3.7	.2	3.9
1973-----------------	2.2	3.0	5.2	2	5.4
1974- ----------------	2.8	2.6	5.4	:2	5.6
1975-----------------	3.0	2.7	5.7	.2	5.9

Note: Notincludedinthis table is appoximately 450,000 barrels per day (1973 average) of crude oil passing through Portland, Maine and shipped ty pipeline to Canada. Also excluded is all Canadian crude imports which are by pipeline (1974-75 average S00,000 barrels per day).

Source: Bureau of Mines, Mineral Industry Survey; FEA, Petroleum Supply/Demand Projections for 1975.

The specific source of crude and refined product imports is also of interest when considering tanker traffic. Table II–2 lists the principal sources of petroleum imports to the United States during the second quarter of 1974 (excluding Canada), ranked by percent of total amounts Bureau of Mines statistics indicate that major increases of imports from Iran, Nigeria and Indonesia during 1974 already replaced some of the Canadian imports.

TABLE *H-2.-Principal sources of petroleum imports to the United States—1974*

Rank and mum	Typ+ of oil	Millions of barrelsd~~	Perc8nt total crude and product
1. Venezuela ----- -----------	}6 product, ~$ crude ------	0.9	17
2. Nigeria- -----------------	All crude-_ ------- -_ ----	.7	13
3. Iran ------------- ---- --- -----	-do-- -- _ _ -----------	.6	11
4. Netherland Antilles_ ---- -_	All product -------- -----	.5	9
5. Saudi Arabia ------ -------	All crude ----------- ----	.4	7
6. Virgin Islands- -----------	All product---- ---------	.3	6
7. Indonesia ------- ---------	All crude -------- -------	.3	6

Source: Bureau of Mines, monthly petroleum statement, January-June 1974.

The U.S. destinations of tanker-carried petroleum imports are distributed generally as shown on Table II–3, extrapolated from Bureau of Mines reports for the first half of 1974. Table 114 lists the major U.S. ports handling tanker imports of both crude oil and products.

TABLE H-3.-Destinotion by district of U.S. imported petroleum by tanker on!y—1974

District-destination	Millions of barrels per day average: Crude	Petroleum product	Total	Percentage
East Coast.. - _._. _ _ -- _ _ _ _ _ ---- _	* 1. 2	2.5	3.7	68
Gulf Coast. ---------- __ - _ ---- --	b 6	.1	. 7	13
West Coast- ---- _ -- _ -- _ ---- _ - _ --	“. 6	.2	. 8	15
Inland- -------------------- ----	.1	.1	. 2	4
Total- -------------------	2.5	2.9	5.4	**100**

• Major source: **Nigeria,** Iran, and Venezuela.
b Major source: Nigeria, Saudi Arabia.
c Major source: Indonesia, Iran, and Saudi Arabia.

Source: Bureau of Mines, Monthly Petroleum **Statements,** January-June, 1974.

TABLE II-4..—*Major U.S. ports handling tanker imports of crude oil and petroleum products for 1973*

[Average of millions of barrels/day]

Port	Crude oil	Petroleum products	Total
New York, N.Y___ ------------------	0.41	*0.73*	1.14
Delaware River Ports-- -------- --- - _-	87	*.13*	1.00
Portland, Maine---- -- ---- --------- _ _	‘: 46	. **03**	**.49**
Boston Fall River, Mass- ---- _ -------	.01	**.20**	**.21**
Long Beach, Calif - - ----------- - _____	.14	**.03**	**.17**
Galveston, Tax----------- -----------	.16	**.01**	**.17**
Rhode Island/Connecticut ports. -- _ ----- _ ---- -----		**. 13**	**.13**
Los *Angeles,* Calif---- ----------------	.11	**.02**	**.13**
Norfolk and Hampton Roads- --------- _ ---- _ ------		**.11**	**.11**
Houston, Tex- ------- -_ --- ---- - ---- -	. **09**	**.02**	**.11**
Baltimore, Md- -------------------- -	.02	**. 08**	**.10**

• The Portland trade in crude is all transshipped directly to Canada by pipeline and therefore is not included in statistical import data of Tables II-1 and II-3.

Note: Each 0.10 million barrels per day requires the unloading of one 100,000 dwt tanker per week.

Source: U.S. Army Corps of Engfneers-Waterbome Commerce of the United States-1973.

The foregoing described the sources and destination of petroleum imports; the major exports of petroleum product are from West Coast refineries, with small amounts shipped from the Gulf Coast. (See Table II-l.)

Petroleum tankers engaged in U.S. coastwise trade comprise a large majority of ships of the total U.S. flag fleet. Using smaller tankers, the trade is principally in products rather than crude oil. The following summarizes the principal interdistrict tanker-carried petroleum movements reported by the Bureau of Mines.

1974 *domestic coastwise tanker-carried petroleum*

Route:	*Average*
Gulf coast to east coast...	*1.6*
Gulf coast to west coast	.2
Other west coast	.3
Total	2.0

I .Million barrels per day.

(It should be noted that the above does not include considerable inland, intra-district, barge, and small tanker movements which are large in number but very small in total tonnage.)

2. Projections of Petroleum Movement

Already extensive, the world movement of petroleum is projected to grow in the future (1980–85) at a rate considerably lower than the recent past. In part, the lower growth rate is due to a decline in the growth rate of oil consumption, which is expected to be 34 percent per year in the near future, as compared with 7–8 percent in recent years.' This decline in growth is influenced by—and in turn influences-many factors, including world economic conditions, conservation policies, monetary system policies, environmental pressures, and others.

Tanker traffic follows oil demand, moving petroleum from sources of supply to points of consumption. Because of the slowing in growth rate due to factors noted above, a significant downturn in the rate of increase of tanker demand is projected through 1985. In fact, recent demand forecast indicates the requirement. for tanker tonnage may remain almost level through 1985.[5] However, there is a high degree of uncertainty in all forecasts of this nature, and the tanker market is notorious for major fluctuation in supply and demand.

Thus, recent reports indicate that the supertanker building boom has peaked out, and that incentives for ships much larger than 500,000 dwt have abated. Recent cancellations of orders for VLCCS are a case in point.[G] (The re-opening of the Suez Canal is likely to further affect decisions on tanker sizes and trade routes.) [7] In general, it appears that demand for supertankers in the future will be level, not increasing. The trend toward use of these larger ships will probably continue but at a lower rate than the past few years.

Oil transportation by tanker in U.S. waters is also subject to major uncertainties. On the import side, the President has announced a

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4 Mueller, W. U., Exxon Corporation, ***Seatrade Conference Presentation on World Tanker Outlook,*** London, March 1975.

5 ***Ibid.***

6 ***Marine Engineering/Log,*** December 1974.

7 The Maritime Administration Office of Policy and Plans has studied the implications of opening the Suez Canal on tanker trade. This and other work may be useful in more accurately determining future trends.

conservation plan incorporating a goal of reducing imports by 1 million barrels per day by the end of 1975. If such a reduction is possible, it appears that it cannot be achieved until after 1975 because of recent declines in U.S. production, delays in discoveries of new resources and delays in implementing price increases.

In addition, as noted above, Canada. plans to eliminate exports to the United States by 1981. The oil now shipped from Canada by pipeline will undoubted have to be replaced by tanker-carried oil from other sources. Given these factors, a reasonable near-term projection of imports by tanker would be that they will remain level. If new deepwater ports are developed, the future imports may be carried by a smaller number of much larger tankers than are used today. On the other hand, new deepwater ports may be more specifically tied to major new refineries or expansions in one region without substantially affecting another.

' .At the same time, domestic shipment of oil within the United States will undoubtedly grow substantially by 1980 principally because of the introduction of new production from Alaska, estimated to total 2 million barrels per day by 1980. This oil will be shipped from the Alaskan North Slope to Valdez by pipeline and then to West Coast ports by tanker. Since this trade will equal all of the present U.S. coastwise trade by tanker, it will mean a significant increase. in domestic tanker demand and use.. If other oil is cliscovered in Alaska (such as in offshore regions) even greater demancls for tanker trade will undoubtedly follow.

B. Historg of Tanker Growth

Tanker size increased dramatically beginning in the mid-1950's. Until then most of the world's tanker fleet was comprised of ships little larger than the 12,500 dwt tanker *Narragansett,* launched *in* 1903. Tankers of comparable size were even then, as supertankers today, among the largest ships afloat.

During World War II, the T–2 of 16,000 tons, built in large numbers to fill wartime demands for shipping fuels, became the standard for tanker measurements. By T–2 standards, a 25,000 dwt tanker of 1950 was considered large. However, in 1948, an analysis published in a Society of Naval Architects and Marine Engineers paper showed that a 50,000-ton tanker could reduce the ton-mile costs of shipping petroleum to 60 percent of the costs of a 12,000 -tonner. At this time, most of the worlclk petroleum was being transported in "handy-sized" tankers, defined (today) as ships in the 6,000–35,000 dwt range.

By the mid-1950's, a few of the larger and more ambitious owners had begun operating tankers in the 40,000-50,000 dwt range. In 1955, an 84,000 -tonner was ordered. and, impelled by the Suez crisis the following year, the first 100,000 ton ship was begun. Such ships demonstrated the economic advantages of increased capacity, so that the sizesof tankers subsequently ordered increased rapidly, until in the 1960's the most-frequently-ordered VLCC was just over 200,000 dwt. By 1968, a 326,000-ton ship had entered service, orders had been placed for ships in the 500,000-ton class, and patents sought for design and construction techniques for building one million ton tankers.

The 200,000-ton VLCC remained the most sought, however, and with the economic impetus to order large ships enhanced by the Middle East war of June 1967, the world's shipyards were pressed with orders for them. An unprecedented boom in tanker construction (especially supertankers) followed over the next several years, lasting until 1974 when the aftermath of the oil embargo began to be felt. During 1974, both tanker tonnage under construction and maximum sizes reached a peak.

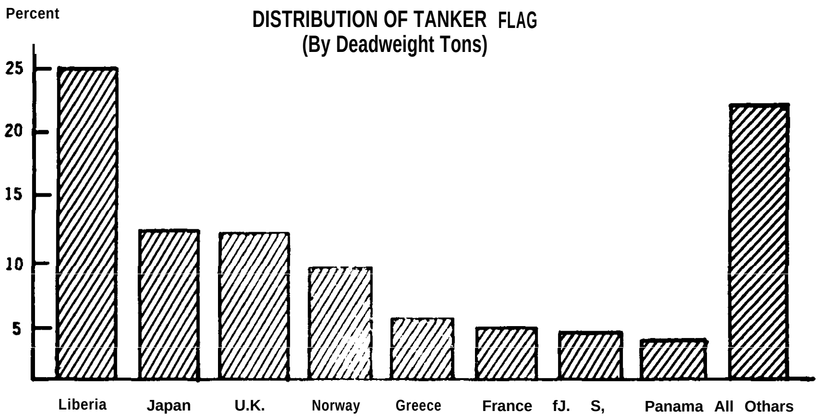
C. *status and Trends of Tankers*

Table II-5 summarizes the makeup of the world tanker fleet by flag and size range. Figure II–3 illustrates the large growth in total tonnage capacity of tankers and supertankers over the past 10 years. Also apparent is a corresponding growth in the world fleet of VLCCS (over 200,000 dwt), illustrated in Figure II–3 (including near-term projections).

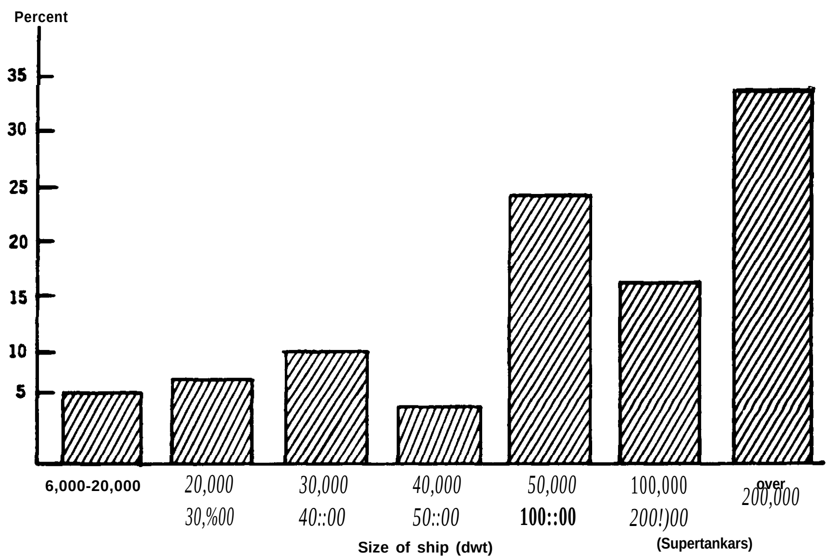
Table II-5
THE WORLD TANKER FLEET
1974
(Excluding Combination Carriers)

Tolal Number of tankers in the world fleet	6,785*
Total deadweight of world tanker fleet . . .	238 million tons
Total Number U.S. flag tankers (excluding U.S. Gov't reserve fleet)..	218
Total deadweight of U.S. flag tanker fleet	7.4 million tons

DISTRIBUTION OF TANKER FLAG
(By Deadweight Tons)



DISTRIBUTION OF TANKER SIZE
(By Deadweight Tons)

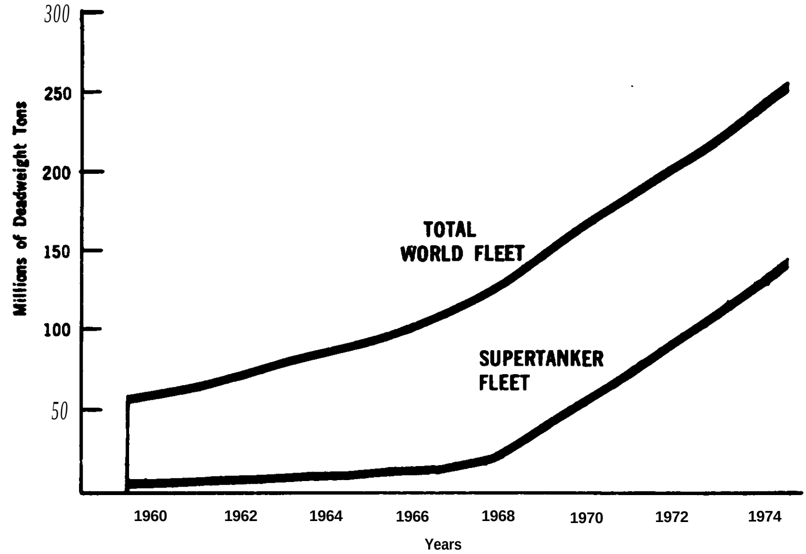


'Lloyds Register of Shipping—Statistical Tables-1974; data as of July 1, 1974.

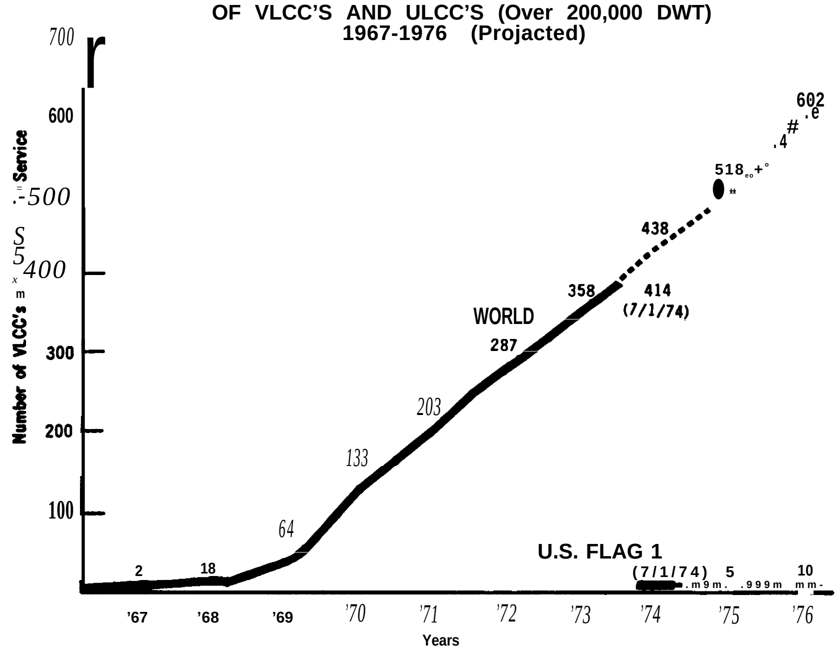
Figure II-3

GROWTH IN TONNAGE OF THE WORLD TANKER AND:SER'J)VNKER FLEETS

(Including Combination Carriers)



GROWTH IN WORLD AND U.S. FLAG FLEET OF VLCC'S AND ULCC'S (Over 200,000 DWT) 1967-1976 (Projacted)



Source: 18th Annual Tanker Confaranca, API, 1973 and MARAD, Office of Policy and Plana, Dac. 1974.

From 1966 to 1970, supertanker fleet capacity increased, through the construction of 188 ships, from less than 2 million tons to over 50 million tons. During the next two years (1971-72), another 50 million tons were added to the supertanker fleet. As of July 1, 1974, that fleet was comprised of 623 ships (over 100,000 dwt each) totalling 127 million deadweight tons. Also, 699 additional supertankers were under construction or on order in the world which, if completed, could add an additional 170 million tons to the world fleet in the next five years.[8] It should be noted, however, that many tanker cancellations have taken place during late 1974 and early 1975, and that the present situation is changing rapidly. There is now a large worldwide over-supply of tanker tonnage, causing the lay-up of many ships.[9]

Relative to the world fleet, the U.S. tanker fleet is small (seventh largest), numbering 218 ships with a total capacity of 7.4 million deadweight tons, and comprising less than 4 percent of world tanker tonnage. Nonetheless, the United State is a significant maritime power since such nations as Liberia and Panama do not possess the power commensurate with their fleet size.

Most of this is used in domestic trade. At present many of the U.S. flag tankers are old and in need of replacement soon. Because they are less expensive to operate, foreign flag ships bring in 94 percent of the petroleum imported by the United States.[10] Table II–6 lists the various countries of register for those tankers carrying oil imports to this country.

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8 *The Petroleum Economist*, October 1974, and Appendix A. Also, on January 1, 1975, *Clarkson's Tanker Register* reported 895 tankers over 100,000 dwt and an additional 186 combination bulk/oil and ore vessels over 100,000 dwt.

9 *Business Week*, April 28, 1975.

10 U.S. flag tanker statistics are from the Martime Administration, Office of Policy and Plans, December 1974. Also see Appendix B.

Table II-6.-8unwwuwy of tankers carrying U.S. imports/exports of crude and petrolewn products by country of registry

country of registry	Percent of total tons of cargo	Country ofregistry	Percent of total tons of cargo
Liberia-.. --------------	39.77	**Medico** ------------------	.24
Greece. - ----------------	10.79	**Somalia** ------------------	.24
Panama ----- ----- --- --- --	9.82	**Spain** --------------------	.19
Norway. ------------ --- --	8.63	**Kuwait** ------------------	.19
United Kingdom- --- ------	6.84	**Brazil**----_---------------	.16
United States--- ---- ---- --	6.34	**Iran** ---------------------	.15
Unidentified vessels ------ --	2.55	**Uruguay**-----------------	.15
Italy ---------------------	2.41	**Yugoslavia** ---------------	.13
Germany (West)----------	2.25	**Chile**--------___-_-------	.12
Netherlands--------------	1.73	**India** --------------------	.12
Sweden ------------------	1.16	**Venezuela** ----------------	.08
Denmark-------------_---	1.03	**Ethiopia** -----------------	.08
Belgium------------------	1.00	**Thailand** -----------------	.07
Finland ------------------	.89	**British Colonies** -----------	.06
Japan--------------------	.70	**Algeria** -------------------	.06
fiance -------------------	**.42**	**Ecuador** ------------------	.03
Cyprus-------------_--- -	**.38**	**Poland** -------------------	.03
Korea (South)------------	**.37**	**Iceland**--------_---------	.02
Canada ------------------	**.30**	**Turkey** ------------------	.01
Union of Soviet Socialist Republics--------------	**.25**	**Burma** -------------------	.01

Source: **MARAD Office of Subsidy Administration, December 1974.**

Comprised of eight ships at the present time, the U.S. flag supertanker fleet is also small relative to the total fleet. Six 120,000 dwt vessels were recently constructed for the Alaska-to-West Coast trade and two 225,000 dwt tankers recently completed for foreign trade. In addition, one 120,000 dwt and eight VLCCs (225,000-265,()()() dwt) are under construction; and six 165,000 dwt and three VLCCs (390,-000 dwt) are on order for U.S. shipping companies. Figure II–5 depicts a recently-built foreign flag VLCC; Figure II-4 shows the launching of the U.S. flag VLCC, Massachusetts.[11]

[11] **The *Massachusetts*, a 265,000 dwt tanker, built** for **Boston Tankers, Inc.,** was **launched** on January 10, 1975, at Bethlehem's Shipyard in Baltimore, Maryland. The two other U.S. flag **VLCCs** in service are the ***Brooklyn***, a 225,000 **dwt** tanker delivered in December 1973 to **Langfitt** Shipping Company by Seatrain Shipyard, New York City and the ***Williamsburg*** of the same class delivered in 1974. The two additional **VLCCs** which were under construction at **Seatrain** were **cancelled** early this year and an EDA loan guarantee was subsequently made for the purpose of completing the construction.

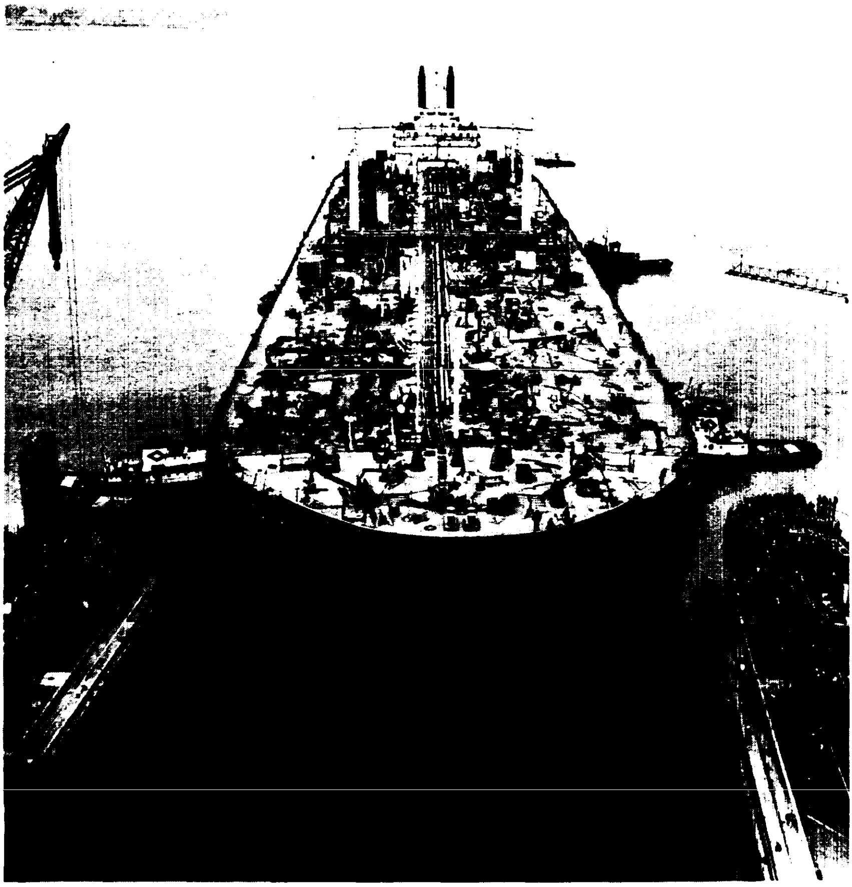

FIGURE 114.—The Largest U.S. Flag Tanker Massachusetts-265,000 DWT.—Launched January 1975.

—(Photo Credit—Bethlehem Steel Corp.)

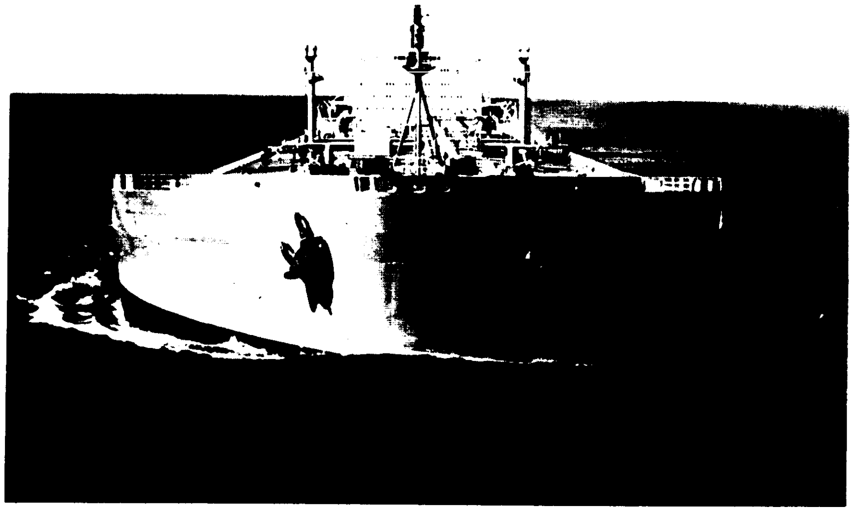

FIGURE II–5.—A Supertanker of 256,000 Tons Delivered in 1974.
—(Photo Credit—Sun Oil Co.)

Two factors providing impetus for growth in the U.S. supertanker fleet are the pending Alaska-to-U.S. West Coast trade, and the Maritime Administration's (MARAD) subsidy construction program. Nevertheless, while several VLCCS for use in foreign trade are now being built under subsidy in U.S. shipyards. In the absence of legislation requiring otherwise, it is expected that foreign flag tankers will continue to be the major carriers of the U.S. oil imports.

In addition to conventional crude oil and product tankers, the fleet of ships known as combination carriers is also growing—ships designed to carry oil or other bulk products, such as ore, salt, grain, etc. In the world fleet in 1975, there are over 175 bulk/oil and over 200 ore/oil ships, about 90 of each being over 100,000 deadweight tons.

D. Super fankers in U.S. Waters

The transportation of petroleum by mammoth ships expanded unusually rapidly, a result of extrapolating many technologies. In combination, these may present new hazards ancl unexpected impacts. Indeed, the history of supertanker operations over the past six to eight years has shown that safety hazards are present, that polluting accidents do occur, and that the operation of these ships could present a range of new problems. During this period, supertankers operating in many world trade routes outside of U.S. water have generated an experience from which can be derived projections of results to be expected from their potential use in U.S. waters.

The unusual experiences of supertankers derive primarily from their size. The existing world supertanker fleet includes ships that are the largest afloat. Their main deck dimensions are equivalent to the flight deck of the largest aircraft carriers, and their displacement tonnages exceed carriers by two to five times. Their most striking and limiting dimension is their deep draft (60 to 90 feet).

Typically, a supertanker contains 15 to 20 large individual tanks formed by bulkheads across and lengthwise to the ship. These tanks or compartments may each contain 10,00040,000 tons of cargo. The oil cargo tanks are an integral part of the ship, running from near the bow to the engine room in the stern. The bow usually contains ballast tanks, while the stern houses propulsion equipment and other machinery as well as crew's quarters and the navigating bridge in a pilot house above.

Tankers and supertankers are usually powered by steam turbines or large diesel engines driving single propellers. Commonly their operating speeds are 15–16 knots (nautical miles per hour). The ships are of all-welded steel construction, and have extra-heavy plating and framing members to form a composite structure that will resist the static and dynamic loads of the cargo in the tanks as well as the winds and waves of the external ocean.

While much larger than orclinary ships, supertankers are manned by a deck and engine-room crew of 25–35 men, equivalent to most cargo ships of much smaller sizes. Because automation of machinery and planned maintenance systems permit a small crew to cover a large expanse of ship, crew size and associated costs have remained virtually constant as ship sizes have increased and productivity has grown.

Supertankers are usually allocated to specific trade routes between major loading and unloading terminals. Because they spend much more time at sea than normal ships, crews stay aboard with little or no shore leave for several months at a time. The ship seldom spends more than a day or two in port unless undergoing major repairs.

I)rydocking facilities for supertankers are widely spread, the major repair facilities for VLCCS being located in Japan, Portugal, Singapore and ATorthern Europe. Several new facilities are under construction in the Arabian Gulf area.

The fact that very large tankers can operate at less cost per ton mile than smaller ships is evident from a simple analysis of operating costs. Capital costs per deadweight ton of ship decrease as the size increases, because machinery horsepower, the total amount of steel, and other required equipment increases at a very slow **rate compared with carrying capacity. At present, costs for a shipment of petroleum imported from the Arabian Gulf to the united States by tanker in the 50,000 dwt size category is $2 to $3 per barrel. The cost of shipping a barrel of** oil by means of a VLCC in the 250,000 dwt size category is $1.00 to $1.50 per barrel.1[2] From a net energy perspective, the system is energy-efficient for transporting oil. Having been demonstrated by experience, these form the economic rationale for the supertanker. While additional savings probably would result from still larger ships, the trend is less clear f or ships exceeding 500,000 dwt.

Only a few supertankers have begun trading in U.S. ports, and these during just the past year. Because their deep drafts prevent supertankers from entering any ports serving major refining centers on the East Coast and Gulf Coast, only the West Coast ports of Los Angeles, Puget Sount, and Long Beach, which have channels deep enough, have so far received small supertankers (of 100,000 or so dwt). Table 11–7 lists the capabilities of major U.S. tanker ports. Also, several transfers of entire VLCC cargoes to smaller vessels have been safely effected in the Gulf of Mexico and off the coast. of Southern California between Santa Catalina and San Clemente Islands.

TABLE *H-7.-Major U.S. tanker port capabilities*

Port or harbor area	Contr:;o:{ (feet)	Maximum draft vessel using areas (feet)		Ap~rQwJ..:I& tanker size provided for dwt
		1970	1973	
Portland, Maine---- -----------	45	51	47	80,000
Boston, Mass- ----------------	40	42	41	50, 000
New York, N. Y--------------	45	44	46	[2]55, 000
Delaware Bay to Philadelphia---	40	46	47	255, ()()
Baltimore, McL---- -----------	42	40	42	55, 000
Hampton Roads, Va- --- --- ----	45	47	47	50, 000
Jacksonville, Fla- --- ---------	40	35	35	30, 000
Houston, Tex- ----------------	40	40	40	55, 000
Galveston, Tex----- -----------	40	40	40	55, 000
Los Angeles, Calif - --- -_ -------	51	45	54	100, 000
Long Beach, Calif - ------------	55	51	54	150, 000
San Francisco Bay ---- --- --- ---	50	51	50	235, 000
Seattle area ----- --- ---------- -	60	39	39	150, 000

² The practice of lighterin from larger tankers at entrances to these harbors effectively doubles the maxi-mum sizes accommodateds rfce these larger tankers are partially unloaded before entering the port.

Note.—The largest tankers using U.S. ports are about 135,000 tons in LongBeach and 125,000 tons at Cherry Point near Seattle. The controllingdepths listed for these ports are at the existing unloading terminals: plans are underway to increase theship size capacity of each port.

Source: Corps of Engineers, “Waterborne Commerce of the United States-1973,” and MARAD Division of Ports—1974. Also Port of Long Beach and Port of Seattle, January 1975.

The hazards and impacts associated with an expected acceleration of supertanker operations in U.S. waters pose a complex set of new questions: How effective would historical, standard practices be in dealing

~ M.i RAD Office of Policy and Plans, estimates.

with potential damage from tankers that are two to twenty times larger than most ships now delivering petroleum to the United States? What new protective, regulatory and control measures are needed to provide the best possible safeguards ? Are design and construction standards for supertankers such that the risk of hull and machinery failure will be acceptable over the life of the ship? What technical and logistical capabilities are available to deal with a catastrophic supertanker accident ? What economic, social and environmental impacts are to be anticipated if supertankers replace the existing large fleet of smaller tankers operating in the United States? How much control will the United States be able to exert over a supertanker fleet that operates mainly under flags of other countries?

The next section of this report will discuss possible oil pollution and safety hazards presented by all tankers in U.S. waters and, in particular, those special problems posed by the introduction of supertankers.