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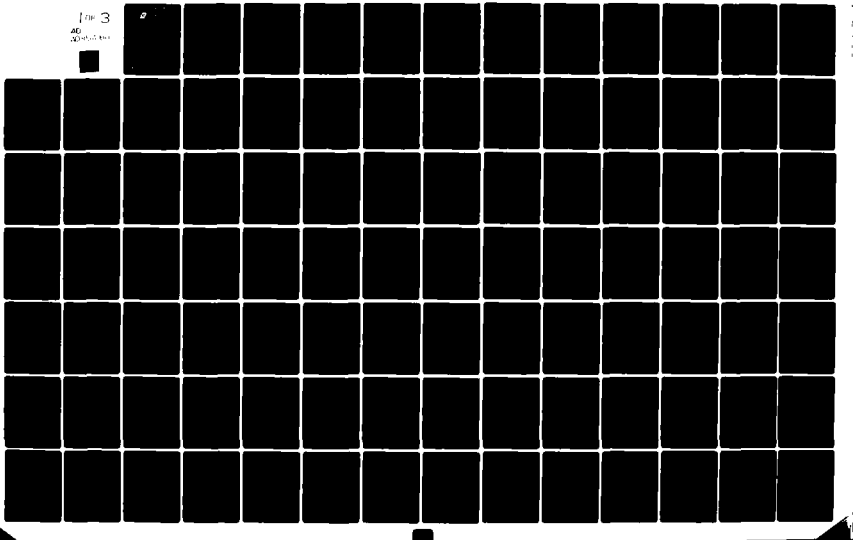

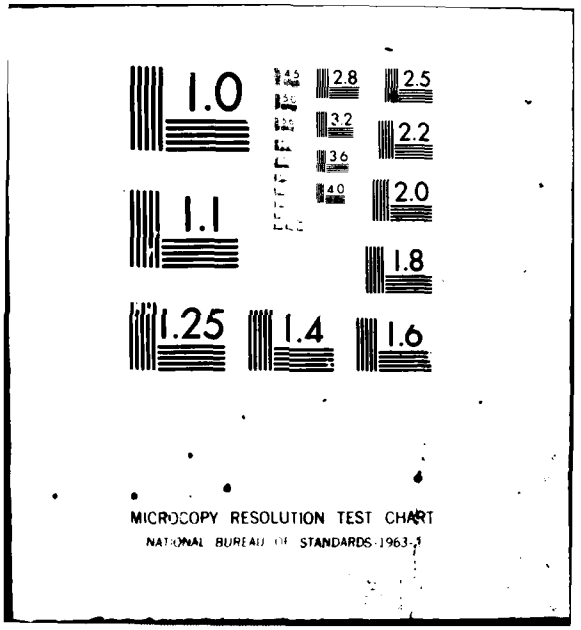
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DEPARTMENT OF TRANSPORTATION

COAST GUARD

FINAL

REGULATORY ANALYSIS AND ENVIRONMENTAL IMPACT STATEMENT

REGULATIONS TO IMPLEMENT THE RESULTS OF THE INTERNATIONAL CONFERENCE ON TANKER SAFETY AND POLLUTION PREVENTION

DOCKETS: CGD 77-038b, 77-063 and 77-057a

ABSTRACT: This document addresses the environmental and economic considerations of rulemaking actions concerning new standards for segregated ballast tanks, dedicated clean ballast tanks, crude oil washing systems, inert gas systems, and improved steering systems aboard U. S. flag tankers and foreign flag tankers which call on U. S. ports.

FOR FURTHER INFORMATION CONTACT:

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(202) 426-4431

DATE MADE AVAILABLE:

14 Nov 79

DEPARTMENT OF TRANSPORTATION
U. S. COAST GUARD
FINAL ENVIRONMENTAL IMPACT STATEMENT
REGULATORY ANALYSIS

SUMMARY

( ) Draft (x) Final Statement

Contact individual: Executive Secretary
Marine Safety Council
U. S. Coast Guard (G-CMC/81)
Washington, D. C. 20590
(202) 426-1477

1. Type of Action: (x) Administrative Action ( ) Legislative Action

2. Description of the Action:

The Coast Guard is amending certain pollution prevention regulations in Subchapter O and P of Title 33 of the Code of Federal Regulations and in Subchapter D of Title 46 of the Code of Federal Regulations. These regulatory changes are the result of the President's March 17, 1977 message to Congress entitled "Oil Pollution of the Oceans". These actions will implement the ship construction and equipment requirements of the International Conference on Tanker Safety and Pollution Prevention held under the auspices of the Inter-Governmental Maritime Consultative Organization during February 6-17, 1978 at London, England. These actions also implement many of the tanker construction and equipment standards in Section 5 of the Port and Tanker Safety Act of 1978, P.L. 95-474, which requires, among other things, that the minimum tanker construction and equipment requirements set forth in that law be adopted as U. S. regulations. The regulatory changes will require the following:

a. New crude carriers to have-

i. protectively located segregated ballast tanks, crude oil washing equipment, and inert gas systems on vessels of 20,000 DWT and over, and

ii. improved steering equipment on vessels of 10,000 GRT and over.

b. New product carriers to have-

i. protectively located segregated ballast tanks for vessels of 30,000 DWT and over,

ii. inert gas systems on vessels of 20,000 DWT and over, and

iii. improved steering equipment on vessels of 10,000 GRT and over.

c. Existing crude carriers to have-

i. segregated ballast tanks or crude oil washing systems on vessels of 40,000 DWT and over,

ii. inert gas systems on vessels of 20,000 DWT and over, and

iii. improved steering equipment on vessels of 10,000 GRT and over.

d. Existing product carriers to have-

i. dedicated clean ballast tanks or segregated ballast tanks on vessels of 40,000 DWT and over,

ii. inert gas systems on vessels of 40,000 DWT and over, and

iii. improved steering equipment on vessels of 10,000 GRT and over.

3. Environmental Impact and Adverse Environmental Effects:

The requirements for segregated ballast tanks, dedicated clean ballast tanks and crude oil washing systems will reduce operational oil outflows from the vessel and will reduce the volume of oily mixtures that must be treated at shore reception facilities. The protectively located segregated ballast tanks on new tank vessels, as well as the improved steering requirements, will reduce accidental oil outflows from collisions, rammings and groundings. Additionally, the requirements for inert gas systems will reduce the risk of fire and explosions in cargo tanks, thus reducing accidental pollution from this source.

This action will result in a significant reduction in operational and accidental oil pollution. The Coast Guard estimates that this regulatory action will result in an estimated 49,000 metric tons/year reduction in operational oil outflows from present levels - 46,600 tons/year reduction in crude oil outflows and 2,400 tons/year reduction in product outflows. While it is not possible to accurately predict the reduction in the average 8,000 metric tons/year due to accidental outflows from collisions, rammings and groundings in U. S. waters, it is felt that a significant reduction will occur.

4. Economic Impacts:

It is estimated that the initial capital cost to the owners of foreign flag vessels importing petroleum into the United States will be about 1.5 billion dollars to implement these proposed regulations. About 0.2 billion dollars will be spent to retrofit product carriers flying foreign flags, and about 1.3 billion dollars will be spent on foreign flag crude oil carriers. This results in a total outlay (capital costs, operating costs of any additional vessels, and interest) by owners of foreign flag vessels of about 2.8 billion dollars.

It is estimated that it will cost owners of U. S. flag vessels about 162 million dollars in capital costs to implement these proposed regulations. About 17 million dollars will be spent to retrofit product carriers and about 145 million dollars to retrofit crude oil carriers. This results in a total outlay of about 331 million dollars to owners of U. S. flag vessels.

5. List of Alternatives Considered:

a. Publish no additional regulations (take no action).

b. Reduce oil consumption and/or reduce oil imports.

c. Use different mode of transportation.

d. Institute oil outflow tax.

e. Improve tanker construction design standards, equipment standards, personnel competence requirements, and operational controls. Construction and equipment alternatives considered include the following:

i. Require double bottoms in lieu of protectively located segregated ballast tanks on new vessels.

ii. Increase applicability of protectively located segregated ballast tanks on new vessels.

iii. Delete crude oil washing option for existing crude carriers.

iv. Require segregated ballast tanks on all existing crude carriers 20,000 DWT and above.

v. Increase applicability of segregated ballast tanks or dedicated clean ballast tanks for existing product carriers.

vi. Increase the applicability of inert gas systems for existing vessels.

vii. Require manning of the steering gear room as an alternative to requiring a second steering gear control system.

viii. Require steering gear failure alarms.

ix. Require duplication of differential controllers in existing steering systems.

This document contains, in addition to a thorough analysis of the construction and equipment standards, a discussion of other measures the Coast Guard is presently utilizing or is in the process of developing to reduce marine oil pollution and increase safety. These additional measures include more stringent personnel qualifications, new tank barge design standards, the foreign tanker boarding program, and vessel traffic services.

6. Comments on the draft statement were requested from the agencies and groups listed below:

Department of State
Department of Treasury
Department of Defense
Department of the Interior
Department of Commerce
Department of Transportation
Department of Energy
Environmental Protection Agency
Federal Maritime Commission
Sierra Club
Connecticut Citizens Action Group
Center for Law and Social Policy
American Petroleum Institute
American Association of Port Authorities
American Institute for Merchant Shipping
American Maritime Association
American Waterways Operators, Inc.
Shipbuilders Council of America
Environmental Policy Center
Coalition Against Oil Pollution
National Audubon Society

7. Dates statements were made available to the Council on Environmental Quality and public:

Draft Statement February 12, 1979

Final Statement

Oil Pollution of the Oceans

The President's Message to the Congress Recommending Measures To Control the Problem. Dated March 17, 1977. Released March 18, 1977

To the Congress of the United States:

The recent series of oil tanker accidents in and near American waters is a grave reminder of the risks associated with marine transportation of oil. Though we can never entirely eliminate these risks, we can reduce them. Today I am announcing a diverse but interrelated group of measures designed to do so.

These measures are both international and domestic. Pollution of the oceans by oil is a global problem requiring global solutions. I intend to communicate directly with the leaders of a number of major maritime nations to solicit their support for international action. Oil pollution is also a serious domestic problem requiring prompt and effective action by the federal government to reduce the danger to American lives, the American economy, and American beaches and shorelines, and the steps I am taking will do this.

The following measures are designed to achieve three objectives: First, to reduce oil pollution caused by tanker accidents and by routine operational discharges from all vessels; Second, to improve our ability to deal swiftly and effectively with oil spills when they do occur; and Third, to provide full and dependable compensation to victims of oil pollution damage.

These are the measures I recommend:

• RATIFICATION of the International Convention for the Prevention of Pollution from Ships. I am transmitting this far-reaching and comprehensive treaty to the Senate for its advice and consent. This Convention, by imposing segregated ballast requirements for new large oil tankers and placing stringent controls on all oil discharges from ships, represents an important multilateral step toward reducing the risk of marine oil pollution. In the near future, I will submit implementing legislation to the Congress.

• REFORM of ship construction and equipment standards. I am instructing the Secretary of Transportation to develop new rules for oil tanker standards within 60 days. These regulations will apply to all oil tankers over 20,000 deadweight tons, U.S. and foreign, which call at American ports. These regulations will include:

—Double bottoms on all new tankers;

—Segregated ballast on all tankers;

—Inert gas systems on all tankers;

—Backup radar systems, including collision avoidance equipment, on all tankers; and

—Improved emergency steering standards for all tankers.

These requirements will be fully effective within five years. Where technological improvements and alternatives can be shown to achieve the same degree of protection against pollution, the rules will allow their use.

Experience has shown that ship construction and equipment standards are effective only if backed by a strong enforcement program. Because the quality of inspections by some nations falls short of U.S. practice, I have instructed the Department of State and the Coast Guard to begin diplomatic efforts to improve the present international system of inspection and certification. In addition, I recommend the immediate scheduling of a special international conference for late 1977 to consider these construction and inspection measures.

• IMPROVEMENT of crew standards and training. I am instructing the Secretary of Transportation to take immediate steps to raise the licensing and qualification standards for American crews.

The international requirements for crew qualifications, which are far from strict, will be dealt with by a major international conference we will participate in next year. I am instructing the Secretary of Transportation to identify additional requirements which should be discussed, and if not included, may be imposed by the United States after 1978 on the crews of all ships calling at American ports.

• DEVELOPMENT of Tanker Boarding Program and U.S. Marine Safety Information System. Starting immediately, the Coast Guard will board and examine each foreign flag tanker calling at American ports at least once a year and more often if necessary. This examination will insure that the ship meets all safety and environmental protection regulations. Those ships which fail to do so may be denied access to U.S. ports or, in some cases, denied the right to leave until the deficiencies have been corrected. The information gathered by this boarding program will permit the Coast Guard to identify individual tankers having histories of poor maintenance, accidents, and pollution violations. We will also require that the names of tanker owners, major stockholders, and changes in vessel names be disclosed and included in this Marine Safety Information System.

• APPROVAL of Comprehensive Oil Pollution Liability and Compensation Legislation. I am transmitting appropriate legislation to establish a single, national standard of strict liability for oil spills. This legislation is designed to replace the present fragmented, overlapping systems of federal and state liability laws and compensation funds. It will also create a $200 million fund to clean up oil spills and compensate victims for oil pollution damages.

• IMPROVEMENT of federal ability to respond to oil pollution emergencies. I have directed the appropriate federal agencies, particularly the Coast Guard and the Environmental Protection Agency, in cooperation with

state and local governments to improve our ability to contain and minimize the damaging effects of oil spills. The goal is an ability to respond within six hours to a spill of 100,000 tons.

Oil pollution of the oceans is a serious problem that calls for concentrated, energetic, and prompt attention. I believe these measures constitute an effective program to control it. My Administration pledges its best efforts, in cooperation with the international community, the Congress, and the public, to preserve the earth's oceans and their resources.

JIMMY CARTER

The White House,
March 17, 1977.

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1. INTRODUCTION

This document is the U. S. Coast Guard's Final Regulatory Analysis, Final Environmental Impact Statement (EIS) and Final Economic Impact Statement which address Final Regulations concerning additional construction and equipment requirements for new and existing tank vessels. These requirements contain new standards for segregated ballast tanks, dedicated clean ballast tanks, crude oil washing systems, inert gas systems, and improved steering systems aboard certain U. S. flag tankers and certain foreign flag tankers which call on U. S. ports.

The objective of this document is to enumerate the environmental and economic consequences of the regulatory action and the major alternatives to the regulatory action. These impacts are then analyzed with a detailed explanation of why the proposed action is recommended in lieu of the various alternatives.

This document is issued in compliance with the following:

a. Section 102(2)(c) of the National Environmental Policy Act (NEPA) of 1969.

b. Department of Transportation's "Regulatory Policies and Procedures" (44 FR 11034), February 26, 1979.

c. The Guidelines of the Council on Environmental Quality (CEQ), The Executive Office of the President (38 FR 20549), August 1, 1973.

The scope of this document includes, in addition to the actions contained in these Final Regulations, those other actions which were the subject of the May 16, 1977, rulemaking proposal and which are now being considered as final rules, or are already in effect as final rules. These interrelated actions were considered at the International Conference on Tanker Safety and Pollution Prevention in February,1978, and are expected to be implemented internationally. For these reasons, the impacts of all of these actions are assessed in this single document.

This rulemaking project is considered to be a "significant regulation" in accordance with the Department of Transportation "Regulatory Policies and Procedures." The regulations will apply to U. S. tank vessels carrying oil, and to those foreign tank vessels carrying oil that enter the navigable waters of the United States. These regulations will appear in Subchapters O and P of Title 33 and Subchapter D of Title 46 of the Code of Federal Regulations. The regulations for improved steering gear standards also apply to tankers carrying hazardous cargos, other than oil, in bulk.

2. DESCRIPTION AND PURPOSE OF THE ACTION

The purpose of these regulation changes is to reduce the risk of tanker accidents with resulting loss of life and property damage and to reduce accidental and operational oil pollution from tankers. This action will implement the ship construction and equipment requirements of the International Conference on Tanker Safety and Pollution Prevention held under the auspices of the Inter-Governmental Maritime Consultative Organization, February 6-17, 1978, at London, England.

This action is consistent with and will implement many of the tanker equipment and construction standards in Section 5 of the Port and Tanker Safety Act of 1978, P.L. 95-474 (amendments to the Tank Vessel Act, R. S. 4417a, 46 U.S.C. 391a), which requires, among other things, that the minimum tanker equipment and construction requirements set forth in that law be adopted as U. S. regulations.

Specifically, this regulatory action implements the requirements of R. S. 4417a(7) with the exceptions of Sections 4417a(7)(E), (H), (J), (M), and (N). Additional proposed regulatory action is presently underway to implement Sections 4417a(7)(E), (H), (M), and (N). These sections of the Act are not included in this rulelmaking action because much of the required analysis work was in the final stages when the Act was passed in October 1978. In the interest of publishing the rules in a timely manner, the decision was made not to incorporate the additional requirements in this rulemaking action.

Portions of Section 4417a(7)(J) have already been implemented as final regulations. Proposed regulatory action is underway on the portions that are not final rules.

2.1 Need for Action

2.1.1 Effect of Oil on the Marine Environment

One important question that must be answered prior to undertaking any action to reduce marine oil pollution is "What effect does oil have on the marine environment - both on the open ocean and on coastal waters?"

The introduction of oil into coastal waters is noticed most by the general public since its impact can easily be seen and felt. The short-term effects of oil in the coastal marine environment include the following:

a. The loss of aesthetic appeal of beaches and other coastal areas has a serious, but so far unquantified, impact

on recreation. The resort industry in an area affected by a large oil spill will probably suffer large losses. Additionally, continuing pollution of beaches by weathered tar from operational pollution affects this recreational aspect.

b. The killing or tainting of fish and shellfish populations due to oil spills results in hazards to humans who eat contaminated fish and shellfish populations. Also, marine oil pollution which affects commercial fisheries results in the loss of jobs and incomes.

c. The diversion of resources to clean up oil results in economic and productivity losses by the government and/or company that must pay for the clean-up operation.

d. The death of seabirds due to the oiling of nesting areas.

A longer range effect of coastal marine pollution is the modification of the marine and/or wetlands ecosystems. These ecosystems are altered by oil pollution because some species are more sensitive to oil than others. There is evidence that oil in small quantities can inhibit reproduction, stimulate or reduce growth, affect respiration and alter behavioral responses of various animal and plant species. Factors such as oil dosage, oil type, location, turbidity of the water, meteorological conditions, season of the year, cleanup method used and oceanographic conditions influence the effects of any given oil input. It is extremely important that the species in the food chains of the major fisheries areas are not affected so that decline of fishery productivity is prevented.

The effects of oil inputs to the open ocean have not been fully documented due to difficulties in observing animal and plant life in such an extensive environment. Additionally, much of the oil inputs to the open ocean are operational in nature, with no large concentrations in an area at one time. Opinions vary widely regarding effects of oil in the open oceans, from the position that long term operational pollution is causing irreparable contamination of the ocean, to the belief that oil has only a minimal effect. A more thorough treatment of the effects of marine oil pollution is contained in references 6, 17 and 21.

2.1.2 Oil Outflows

The problem of determining where oil pollution orginates is a complex subject. One of the most widely accepted references to date is a report published by the National Academy of Sciences in January 1975 entitled, Petroleum in the Marine Environment (reference 6).

At the time of the report it was estimated that 2.03 million metric tons of petroleum hydrocarbons were introduced into the oceans as a result of tanker operations; 3.48 million metric tons as result of other man-created situations and 0.6 million metric tons as a result of natural seeps. Table 1 contains a detailed estimate of sources that introduce petroleum hydrocarbons into the world's oceans. It is important to understand which vessels contribute to oil pollution and the manner in which they do so.

Tankships accounted for approximately 524 million metric tons of oil movements in U. S. ports during 1976. As can be seen from Table 2, foreign vessels accounted for about 70 percent of these movements. Thus, any regulatory action, to be effective, must encompass foreign flag vessels.

Tank vessels contribute to the oil entering the marine environment in two ways:

a. tanker accidents and

b. tanker operations.

2.1.2.1 Tanker Accidental Oil Outflows

Tanker accidents are responsible for about 15 percent of the quantity of oil inputs to the marine environment from tankers. This input occurs often in dramatic, concentrated, and striking ways. Because of this, accidental pollution receives significant public attention.

Accidental oil inputs to the world's oceans occur as a result of

a. collisions,

b. rammings,

c. groundings,

d. fires and explosions,

e. breakdowns,

f. structural failures, and

g. transfer spills.

Most of these accidents result from combinations of human error, lack of training, poor vessel maintenance, poor quality of inspection or bad design.

TABLE 1

Budget of Petroleum Hydrocarbons Introduced into the Oceans

SOURCE	INPUT RATE (mta) (1) Best estimate	Probable range
Offshore production	0.08	0.08-0.15
Transportation		
LOT Tanker (2)	0.31	0.15-0.4
Non-LOT tankers	0.77	0.65-1.0
Dry docking	0.25	0.2-0.3
Terminal operations	0.003	0.0015-0.005
Bilges, bunkering (4)	0.5	0.4-0.7
Tanker accidents	0.2	0.12-0.25
Nontanker accidents	0.1	0.02-0.15
Coastal refineries	0.2	0.2-0.3
Atmospheric rainout (3)	0.6	0.4-0.8
Coastal municipal wastes	0.3	-
Coastal, nonrefining industrial wastes	0.3	-
Urban runoff	0.3	0.1-0.5
River runoff	1.6	-
SUBTOTAL	5.513	
Natural seeps	0.6	0.2-1.0
TOTAL	6.113	

(1) mta, million metric tons annually.
(2) LOT is an abbreviation for "Load-on-top".
(3) Based upon assumed 10 percent return from the atmosphere.
(4) For all ships equivalent to an average loss of about 10 tons per ship per annum.

Source: National Academy of Sciences Report, Petroleum in the Environment, Washington, D. C., 1975, page 6.

TABLE 2

Transportation of Oil by Water

into U. S. Ports[1]

CARGO	TRADE	SHIPMENT ON	ESTIMATED AMOUNT (mta) (2)
Crude oil	Export-Import	Foreign Ships	297.3
Crude oil	Export-Import	U. S. Ships	8.8
Crude oil	Domestic	U. S. Ships	22.0
Black Product	Export-Import	Foreign Ships	59.4 (3)
Black Product	Export-Import	U.S. Ships	3.1 (3)
Black Product	Domestic	U.S. Ships	46.3
White Product	Export-Import	Foreign Ships	7.3 (3)
White Product	Export-Import	U.S. Ships	0.4 (3)
White Product	Domestic	U.S. Ships	79.1

(1) Compiled from information contained in:

a. Department of Army, Corps of Engineers, Waterborne Commerce of the United States, 1976 (ref. 22)

b. Department of Commerce, Maritime Administration, Characteristics of Tankers Entering U. S. Ports During 1976 (ref. 24)

(2) MTA - million metric tons annually

(3) It was assumed that the ratio of U. S. flag ships to foreign ships carrying white products and the ratio for ships carrying black products were the same and equal to the ratio for all product carried.

Tables 3 through 6 show the accident histories of foreign flag and U. S. flag vessels within 50 miles of the U. S. shoreline. Tables 3 and 4 break down the number of incidents and outflows as to year and type of accident. Tables 5 and 6 depict the number of incidents and outflows as to location and type of accident. As can be seen in these tables, foreign flag tank vessels contribute about 1,300 metric tons per year due to collisions and rammings and about 5,400 metric tons per year due to groundings. U. S. flag vessels contribute about 520 metric tons per year due to collisions and rammings and 770 metric tons per year due to groundings. The total of U. S. flag and foreign flag vessel accidental oil outflows in waters within 50 miles of the U. S. shoreline due to collisions, rammings, and groundings is about 8,000 metric tons per year.

Table 7 gives an indication of the major casualties worldwide involving tankers and the amount of oil outflow resulting from some of these incidents. The information presented is for those cases reported in Lloyd's List only. The average amount of oil outflow due to rammings, collisions, and groundings is about 85,000 metric tons/year worldwide.

The Coast Guard has limited data for oil spill clean up costs. There is no requirement for polluters to report their cleanup costs to the Coast Guard. The PIRS system has data only for clean up costs where the Federal Water Pollution Act Pollution Fund moneys are expended. This occurs when the spiller is unknown, unable or unwilling to clean up a spill. The Coast Guard contracts companies to clean up the spill and pays costs from the Pollution Fund. Coast Guard personnel will sometimes be used in the actual clean up along with contractors. When the spill has been cleaned up, the Coast Guard then bills the spiller for costs. However, in many cases where the clean up cost is high, recovery of the total cost is not possible due to limits of liability established by law.

Table 8 provides some insight into the cost of accidental oil spill cleanup that has occurred within 50 miles of the U. S. coast. This table considerably understates the actual dollar and manpower costs. If the spiller paid for any cleanup costs prior to Pollution Fund expenditures, they are not shown. The mandays accounted for include only those personnel actually involved in the clean up process. The data does not include personnel mandays involved in monitoring the spill or overseeing the clean up operation. Nor does the data include any costs associated with maintaining a pollution response system that can be activated when a spill occurs. The only cost accounted for in the majority of cases was the value of the cargo. In these incidents the spiller had either cleaned up the spill and paid for the costs or the nature of the cargo spilled and the conditions where the spill occurred has precluded clean up.

TABLE 3

Oil Inputs from Foreign Flag Tankships (of all sizes)

within 50 miles of the U. S. shoreline

1973-1977 Pollution Reporting System (PIRS) data

Calendar Year	Collision & Ramming no. of incidents/ metric tons outflow	Grounding no. of incidents/ metric tons outflow	All types of pollution incidents no. of incidents/ metric tons outflow
1973	1/2710	4/681	311/8720
1974	2/919	5/1145	458/3485
1975	5/2785	3/1213	343/4955
1976	2/7	2/24200	325/27625
1977	3/27	1/1	283/450
Totals	13/6448	15/27240	1720/45235

Notes:

1. This table includes all pollution incidents detected by or reported to the U. S. Coast Guard and recorded in the USCG Pollution Incident Reporting System which have been identified by vessel.

2. Discharge quantities reported in gallon in PIRS data have been converted to metric tons using a specific gravity of 0.85.

TABLE 4

Oil Inputs from U. S. Tankships (of all sizes)

within 50 miles of the U. S. shoreline

1973-1977 Pollution Reporting System (PIRS) data

Calendar Year	Collision & Ramming no. of incidents/ metric tons outflow	Grounding no. of incidents/ metric tons outflow	All types of pollution incidents no. of incidents/ metric tons outflow
1973	8/295	10/821	389/1470
1974	9/40	8/18	422/259
1975	10/1914	6/1719	307/3874
1976	6/323	3/1279	260/2468
1977	6/10	4/17	326/220
Totals	39/2582	31/3854	1704/8291

Notes:

1. This table includes all pollution incidents detected by or reported to the U. S. Coast Guard and recorded in the USCG Pollution Incident Reporting System which have been identified by vessel.

2. Discharge quantities reported in gallon in PIRS data have been converted to metric tons using a specific gravity of 0.85.

TABLE 5

Location of Accidental Oil Discharges from Foreign Flag Tankships of all sizes within 50 mile of the U. S. shoreline

1973-1977 Pollution Incident Reporting System (PIRS) data

Location	Collision & Ramming no. of incidents/ metric tons outflow	Grounding no. of incidents/ metric tons outflow
Harbor and Port Areas[3]	12/3737	14/3046
Territiorial Sea (baseline to 3 mi.)	0/0	0/0
Contiguous Zone (3 to 12 miles)	0/0	0/0
High Seas (12 to 50 miles)	1/2711	1/24194
TOTALS	13/6448	15/27240

Notes:

1. This table includes all pollution incidents detected by or reported to the U. S. Coast Guard and recorded in the USCG Pollution Incident Reporting System which have been inentified by vessel.
2. Discharge quantities reported in gallons in PIRS data have been converted to metric tons using a specific gravity of 0.85.
3. "Harbor and Port Areas" includes bays, estuaries, sounds, river areas, channels and other restricted waterways, port and harbor areas including terminals and docks, and beaches and shore areas adjoining these waters.

TABLE 6

Location of Accidental Oil Discharges from U. S. Tankships of all sizes within 50 mile of the U. S. shoreline

1973-1977 Pollution Incident Reporting System (PIRS) data

Location	Collision & Ramming no. of incidents/ metric tons outflow	Grounding no. of incidents/ metric tons outflow
Harbor and Port Areas[3]	35/2544	29/3836
Territorial Sea (baseline to 3 mi.)	0/0	2/18
Contiguous Zone (3 to 12 miles)	1/19	0/0
High Seas (12 to 50 miles)	2/19	0/0
TOTALS	37/2582	31/3854

Notes:

1. This table includes all pollution incidents detected by or reported to the U. S. Coast Guard and recorded in the USCG Pollution Incident Reporting System which have been identified by vessel.
2. Discharge quantities reported in gallons in PIRS data have been converted to metric tons using a specific gravity of 0.85.
3. "Harbor and Port Areas" includes bays, estuaries, sounds, river areas, channels and other restricted waterways, port and harbor areas including terminals and docks, and beaches and shore areas adjoining these waters.

TABLE 7
Accidental Oil Pollution from Tankships Worldwide

Calendar Year	Collision & Ramming no. of incidents/ metric tons outflow	Grounding no. of incidents/ metric tons outflow	All types of casualties no. of incidents/ metric tons outflow
1973	321/5,232	135/59,436	1273/85,809
1974	306/3,525	100/60,960	1168/68,189
1975	324/4,965	77/93,563	906/191,050
1976	245/7,600	82/126,315	819/207,503
1977	292/27,720	70/39,124	834/216,490
Totals	1488/49,042	464/379,398	5000/769,041

Notes:

1. This table was developed from the March 1979 Newsletter published by The Tanker Advisory Center, Inc. The Newsletter indicates that the casualty information came from Lloyd's List.

2. Column 4 of this table is not comparable to column 4 of Tables 3 and 4. Column 4 of this table contains only ship casualty information where columns 4 of Tables 3 and 4 also contain transfer related spills.

TABLE 8

ACCIDENTAL OIL POLLUTION CLEANUP COSTS
FROM ACCIDENTS WITHIN 50 MILES OF THE U. S. SHORE LINE
TANKSHIPS - RAMMINGS, COLLISIONS, AND GROUNDINGS
1973 - 1977 POLLUTION REPORTING SYSTEM (PIRS) DATA

	1973	1974	1975	1976	1977	TOTAL
Number of Incidents	10	10	11	3	6	40
Quantity Spilled (metric tons)	4,658	2,989	4,887	24,071	36	36,641
Pollution Fund Monies Used (Thousands of dollars)	57	340	1,117	1,739	17	3,270
Responsible Party Cost (Thousands of dollar)	79	161	5	8	13	266
Coast Guard Man-days	195	959	97	720	0	1,971
Other Federal Man-days	32	59	4	880	0	975
Other Man-days	0	1,246	157	3	0	1,406

NOTES:
1. This table includes pollution incidents detected by or reported to the U. S. Coast Guard in which cleanup attempts were made.
2. Discharge quantities reported in gallons in PIRS data have been converted to metric tons using a specific gravity of 0.85.
3. Responsible party cleanup costs as well as the other manday entries are probably understated. This information is voluntarily reported by responsible parties who have been involved in cleanups.

2.1.2.2 Tanker Operational Oil Outflows

Tanker operational oil outflows do not receive the same degree of public attention as do accidental outflows because operational outflows usually take place in numerous, smaller events while vessels are underway at sea and thus are not concentrated in a local area where they would be noticed. It is estimated that about 85 percent of all oil outflows from tankers result from operational procedures.

Operational oil outflows result from the following:

a. deballasting,

b. tank cleaning for the removal of sludge,

c. tank cleaning for shipyard entry,

d. tank cleaning on product tankers to insure cargo purity, and

e. oil leakage into machinery space bilges and subsequent discharge overboard.

Operational oil outflows which result from deballasting operations occur because, after discharge of cargo, a tank vessel without sufficient segregated ballast tanks will take aboard sea water in the cargo tanks to ensure adequate propeller immersion and to improve handling and sea-keeping characteristics. The amount of ballast taken aboard depends upon the anticipated weather conditions, the distance and route of the ballast voyage, the vessel's lightship displacement (weight), length to depth ratio, and other vessel characteristics. The amount of ballast taken aboard generally varies from 20 to 50 percent of the vessel's total cargo carrying capacity, but may be greater during periods of severe, bad weather. Ballast that is put directly into cargo tanks immediately after cargo discharge comes into contact and mixes with oil still in those tanks. This remaining oil may have adhered to the tank surfaces, remained below the level of the suction bellmouth or in the piping after cargo discharge. This oily ballast must be disposed of in some way prior to the vessel's arrival at the loading port unless the loading port has suitable reception capabilies. After disposal of oily ballast, clean ballast, suitable for direct disposal overboard at the loading port, is taken aboard. In the absence of segregated ballast tanks, empty cargo tanks must be washed to remove the residue oil and provide space for the clean ballast. These tank washings are pumped overboard and the clean tanks are filled with sea water which can be discharged overboard at the loading port.

The number of tanks cleaned is a function of the particular vessel's proportions, the amount of operational ballast required and the need to periodically clean tanks for internal inspection, repair at a shipyard, or to control sludge buildup. This generally amounts to between one-third and one-half of the vessel's tanks per ballast voyage. It results in all of the oil residue from the cleaned tanks and approximately 15 percent of the oil residue from the tanks which were initially ballasted being pumped overboard. The amount of oil influx that results from this operation on any given voyage depends on the amount of oil that remains in the tanks after discharge at the unloading port. This number is commonly referred to as clingage. Clingage ranges from 0.1 percent to 0.9 percent of the cargo capacity depending on the type of oil, the stripping capability of the tanker, the particular cargo piping arrangement, and the internal structure of the tank vessel. Clingage is considered to average 0.4 percent for crude oil.

While some operational outflows from cleaning operations could be reduced somewhat by the use of tanks dedicated to a single product, these tanks would still require periodic cleaning to prevent sludge and sediment buildup. Additionally, there are many trades in which it is not possible to dedicate a tank to a single product.

All tank vessels do not pump the oil residue from their tank cleaning operations directly overboard. With the practice of the "load on top" (LOT) system, the tank cleaning residue (water and oil) is pumped into a holding tank. Here the mixture is allowed to settle and the water drawn off the bottom so that only oil and a small amount of water remains in the tank. These consolidated slops are then transferred to a reception facility or combined with the next cargo; hence, the term "load on top."

If all tank vessels employed a 100 percent efficient LOT system 100 percent of the time, tank cleaning and ballasting operations would not be a significant source of oil pollution. However, LOT is not being practiced aboard all tank vessels because of the following:

a. Some tank vessel operators in the nonpersistent and special oil product trade are unwilling to mix refined products with one another and to solve the problems associated with disposal of this type of slop.

b. Certain ballast voyages can be so short as to preclude the time necessary for satisfactory operation of the LOT systems.

c. Depending on sea conditions, the necessary separation process of oil from water may not be completely effective.

d. The oil-water interface in the holding tank cannot be accurately determined, often resulting in a portion of the oily layer being drawn off with the water.

e. Some components of oil are water soluble.

While the greatest bulk of oil outflow is due to operational discharges very little is known regarding the quantity or locations of these outflows. These discharges, if carried out in accordance with present requirements, should be diluted (60 liters or less per mile) and not discharged within 50 miles of land. However, these requirements are operational in nature and are difficult to enforce. Both oil slicks and tar balls are concentrated in the tanker traffic routes, clearly indicating that they result from operational outflows. Various tests have been conducted to attempt to quantify the amount of oil remaining as clingage, sludge, or in cargo lines, but the results vary widely because of differences in tank ship size, design, and operational procedures. The Coast Guard has developed an oil outflow model based on these estimates. This model is described in Appendix A. It should be reiterated that the results of the model are best estimates based on the very limited information available.

Results of the oil outflow model developed by the Coast Guard (See Appendix A) indicate that operational oil pollution from the world tanker fleet would be about 3.2 million metric tons/year if no pollution abatement measures were practiced. Results of the model estimate the present world outflow to be between 0.88 million and 0.66 million metric tons/year of operational oil pollution. The model estimates that vessels affected by this regulatory action (U. S. flag vessels and foreign flag vessels calling at U. S. ports) presently introduce about 224 thousand metric tons/year of operational oil pollution into the world's oceans - 58 thousand as a result of domestic oil movements and 166 thousand as a result of import or export oil movements.

Table 9 contains an estimate of the present operational oil outflows from vessels that would be affected by this regulatory action by source.

2.1.3 Methods of Reducing Oil Outflows

There are several approaches that could be used to reduce oil outflows from tankers.

A possible approach would be to reduce the amount of oil that is moved by tank vessels. This could be accomplished by-

a. reducing the amount of oil consumed by the United States through rationing, taxation, quota system, etc.; or

b. ' ulitizing alternative modes of transportation such as pipelines, railroads, etc.

TABLE 9

Estimated Present Operational Oil Pollution Resulting from Vessels Affected by this Regulatory Action [1]

TYPE OF OIL MOVEMENT	SOURCE OF POLLUTION	ESTIMATED OIL OUTFLOW (Thousand Metric Tons Annually)
Export and Import		
Crude	Ballasting	38
	Tank Cleaning	33
	Shipyard Entry	47
Product, Black	Ballasting	8
	Tank Cleaning	25
	Shipyard Entry	13
Product, White	Tank Cleaning	3
Domestic		
Crude	Ballasting	3
	Tank Cleaning	2
	Shipyard Entry	1
Product, Black	Ballasting	6
	Tank Cleaning	17
	Shipyard Entry	1
Product, White	Tank Cleaning	28

(1) Assumptions given in Appendix A

A significant reduction in the amount of oil consumed by the United States requires both a national commitment and long term changes in our energy consumption pattern. As stated by President Carter in his speech to the nation on July 15, 1979, we are committed to conservation and the reduction of imported crude oil. However at the present time and for the immediate future, a large scale reduction in the amount of oil consumed is not attainable, making this an unacceptable alternative.

Most of the crude oil which this country imports comes from the Middle East, Africa, and Latin America. At present the technology to economically transport oil by pipelines from these locations, across major bodies of water, does not exist. Furthermore, pipelines can offer utility to only those shippers and receivers which are linked to the system. It is obvious that alternative methods of transportation are not serious alternatives.

The only realistic means of reducing marine oil pollution is through tanker construction and equipment standards, upgrading crew competence, and various operating controls. These measures can be used successfully within the jurisdiction of the Coast Guard. This regulatory action addresses construction and equipment standards for tankers. In addition to these standards, the Coast Guard is undertaking additional actions designed to reduce oil pollution. These additional measures are outlined in Chapter 7 entitled, Additional Measures.

2.2 Background

2.2.1 Accident History

During the winter of 1976/1977 several tanker casualties, involving both foreign and domestic vessels, occurred in or near U. S. waters which demonstrated the need for a global effort to improve the level of tanker safety by upgrading the pollution prevention equipment and construction standards for tankers, and by improving crew standards and personnel training.

On December 15, 1976, the SS ARGO MERCHANT ran aground 28 miles southeast of Nantucket Island. The crew was evacuated to safety by Coast Guard rescue units and strenuous efforts were made to offload and refloat the vessel. These efforts were unsuccessful and the ARGO MERCHANT broke up in heavy weather, releasing its cargo of 23 thousand tons of No. 6 fuel oil.

Two days later, on December 17, 1976, the tanker SS SANSINENA experienced a massive explosion while moored at an oil terminal in Los Angeles harbor. The vessel had discharged her cargo and was taking on bunkers and ballasting cargo tanks when the explosion occurred. The force of the explosion blew the ship apart, broke windows as far as 20 miles away, and scattered over 1700 pieces of metal into the adjacent pier and terminal area. The explosion

resulted in six deaths, plus three missing and presumed dead, injuries to 58 other persons, the release of approximately 64 tons of bunker oil into the harbor, and the destruction of a vessel valued at $21.6 million.

On December 24, 1976, some 16 tons of bunker oil leaked through a rupture in the shell of the moored tank vessel OSWEGO PEACE into the Thames River at New London, Connecticut.

On December 27, 1976, the fully loaded tanker OLYMPIC GAMES grounded in the Delaware River, damaging a cargo tank and releasing some 424 tons of crude oil which spread out over a 22 mile stretch of the Delaware River and connecting wetlands and tributaries.

On December 28, 1976, the fully loaded ore/oil carrier SS DAPHNE grounded while attempting to enter the harbor of Guayanilla, Puerto Rico. Part of the cargo was offloaded into barges and the vessel was refloated. There was no apparent damage to the vessel and no pollution occurred.

On January 1, 1977, the ore/oil carrier SS MARY ANN suffered an explosion and fire, injuring two crewmen, while underway off the East Coast.

Sometime around January 2,1977,the tanker GRAND ZENITH enroute to Providence, Rhode Island, with 26 thousand tons of No. 6 fuel oil disappeared off NOVA SCOTIA and was presumed lost with all crew members.

On January 4, 1977, the tanker UNIVERSE LEADER went aground in the Delaware River. The vessel was refloated without any loss of cargo.

On January 10, 1977, the U. S. coastwise tanker CHESTER A. POLING broke in two and was lost off Cape Ann, Massachusetts, with loss of one life.

On January 17, 1977, the tanker IRENES CHALLENGER also broke in two in the North Pacific Ocean. Three crew members were lost.

On January 27, 1977, the EXXON SAN FRANCISCO suffered an explosion and fire while moored in Houston, Texas. Three lives were lost.

On February 24, 1977, the U. S. flag chemical carrier SS MARINE FLORIDIAN suffered a steering gear failure and severly damaged the highway bridge at Hopewell, Virginia.

This series of accidents and the attention they received, due in large part to the continuing media coverage of the ARGO MERCHANT during this period, resulted in great public concern within the

United States. Such concern was expressed by the theme that whatever is being done is not enough - if it were enough, this would not be happening. The demand for action was primarily focused on the federal government with a secondary focus on the international bodies involved. The executive branch responded to this concern by establishing the Interagency Oil Pollution Task Force to review the problem and to develop a comprehensive plan of action. The task group formalized its recommendations and submitted them to the President. On March 17, 1977, President Carter sent a message to Congress announcing a comprehensive series of recommended actions to deal with the problem of marine oil pollution caused by oil tankers.

Congress responded in a similar, timely fashion by holding oversight hearings. As a result of these hearings, Congress passed the Port and Tanker Safety Act of 1978. On October 17, 1978, President Carter signed this legislation as P.L. 95-474. The tanker equipment and construction provisions of this act parallel those contained in this regulatory action.

2.2.2. Presidential Initiatives on Oil Pollution of the Oceans

The actions outlined in President Carter's March 17, 1977, message to Congress, commonly referred to as "the Presidential Initiatives", included a diverse but interrelated group of measures intended to reduce the risks associated with the marine transportation of oil. These measures, both international and domestic in scope, were aimed at achieving the following objectives:

a. Reduce oil pollution caused by tanker accidents and by routine operational discharges from all vessels.

b. Improve our ability to deal swiftly and effectively with oil spills.

c. Provide full and dependable compensation to victims of oil pollution damage.

d. Reduce risk of tanker accidents and resulting loss of life and property damage.

The specific measures recommended by President Carter to meet these objectives include the following:

a. Ratification of the International Convention for the Prevention of Pollution from Ships - 1973 (MARPOL 73).

b. Reform of ship construction and equipment standards, to include for all oil tankers over 20,000 DWT;

i. double bottoms on all new tankers,

ii. segregated ballast tanks on all tankers,

iii. inert gas systems on all tankers,

iv. backup radar and collision avoidance equipment on all tankers,

v. improved emergency steering standards for all tankers, and

vi. where technological improvements and alternatives could be shown to achieve the same degree of protection against pollution or safety benefits, the proposed rules would allow their use.

c. Improvement of international system of inspection and certification of tankers.

d. Improvement of crew standards and training, including any necessary changes to licensing and qualification standards for American crews, and upgrading of international requirements.

e. Development of an expanded tanker boarding program and marine safety information system.

f. Approval of comprehensive oil pollution liability and compensation legislation.

g. Improvement of federal ability to respond to oil pollution emergencies.

2.2.3 Actions to Carry Out the Presidential Initiatives

Action to carry out President Carter's directions proceeded along two parallel tracks--domestic and international efforts. On the domestic side, MARPOL 73 was submitted to the Senate for ratification, on March 22, 1979 and implementing legislation has been submitted to both houses of Congress. (A detailed account of subsequent actions regarding MARPOL 73 is contained in Section 2.5.2). Proposed regulations which incorporate the changes to ship construction and equipment standards recommended in the President's message were published May 16, 1977. Final rules requiring vessels of 10,000 gross tons or more to carry a second marine radar system were published on July 24, 1978. A number of actions have been taken in the crew qualifications area. These include the further development of the endorsement for tankermen and radar observers, additional qualifications for the pilots of very large vessels, and the possible use of shiphandling simulators for the training of pilots, masters,

and chief mates. The Coast Guard's tanker boarding program had been expanded. Legislation had been submitted which provides comprehensive oil pollution liability and compensation. This legislation did not pass during the recently concluded 95th Congress and probably will be reintroduced during the next Congress. A number of studies are also underway to deal with the difficult question of how our federal ability to deal with oil pollution emergencies can be made more effective.

International actions to carry out the Presidential Initiatives have centered on two international conferences:

a. A special conference, the International Conference on Tanker Safety and Pollution Prevention (TSPP), which met February 6-17, 1978, adopted improvements to inspection and certification requirements, as well as ship equipment and construction standards.

b. The International Conference on Training and Certification of Seafarers, which met June 14 to July 7, 1978, established basic requirements for training, certification and watchkeeping for masters, officers, and crews of seagoing merchant ships.

Within a month after the President's message, the United States proposed to the thirty-sixth session of the IMCO Maritime Safety Committee that international measures be taken to improve tanker safety and pollution prevention. The response was both rapid and cooperative. The Maritime Safety Committee agreed to convene an International Conference on Tanker Safety and Pollution Prevention (TSPP) to be held in London in February 1978, the earliest practicable date. At that same meeting, in April 1977, a number of other actions were taken to begin accelerated preparations for the Conference. (The period generally needed to prepare for such a major international diplomatic conference is 4-5 years. The Tanker Safety and Pollution Prevention Conference was successfully concluded just 11 months to the day after President Carter's message to Congress called for a conference to be scheduled.) An Intersessional Working Group was set up to consider in detail the proposals made by the United States as well as alternative or additional proposals. This group met in May, June, and July of 1977. In addition, two meetings of the IMCO Marine Environment Protection Committee and one Subcommittee on Safety of Navigation meeting were used to prepare for the Conference. A joint two-week meeting of the Maritime Safety Committee and the Marine Environment Protection Committee was held in October to formulate proposals and prepare documentation for consideration by the Conference. Through this series of meetings and work carried out by various delegations in their own countries between meetings, a great deal of attention and study were devoted to the U. S. proposals and alternatives which might be considered equivalent to the specific U. S. proposals. These meetings were all

at least one-week sessions at IMCO headquarters in London involving delegations from a large number of countries. Thus, between meetings in London and work at home, a large expenditure of technical manpower on the part of a considerable number of nations went into preparation for the Conference. As a result of these preparatory meetings, agreement was reached on a number of proposals introduced by the United States, and the other issues were examined in depth and developed to a point such that they could be considered by the February Conference.

During this same period, several other preparatory activities for the conference took place. First, with the aid and cooperation of the Department of State, a series of bilateral discussions were held with other countries in order to make clear our concerns and to solicit their views. Second, the specific proposals and alternatives were evaluated to estimate the environmental, economic, and safety impacts of their adoption. These assessments and the insight gained in the process of having made them were invaluable tools in preparing for the negotiations and assessing alternative proposals presented at the Conference. Third, consultations were held with other concerned federal agencies, members of Congress and their staffs. In general, these activities were aimed at obtaining from all interest groups input for a well-advised U. S. negotiating position.

2.2.4 TSPP Conference

The United States approached the February Tanker Safety and Pollution Prevention Conference with specific proposals outlined in the President's March 17 message and a strong desire to seek solutions internationally through IMCO. If satisfactory agreement could not be reached on the specific U. S. proposals or on equally effective alternative measures, the possibility of unilateral action was reserved.

A draft Environmental Impact Statement was prepared in January 1978 to assess the possible U. S. implementation of standards expected to be adopted by the TSPP Conference. That document was made available to the Council on Environmental Quality and to the public on February 3, 1978, and was distributed to several departments within the executive branch of the federal government. The substance of the February draft document has been incorporated into this draft document because the issues addressed in both documents are essentially the same.

2.2.4.1 Objectives

The objective of the Conference was to develop and adopt two protocols, one modifying and incorporating MARPOL 73 and the other modifying the 1974 Safety of Life at Sea Convention (SOLAS 74). The two-week long Conference was attended by more than 450 delegates from

62 nations and 16 international organizations, as well as observers from three nations. The U. S. delegation was headed by the Deputy Secretary of Transportation and included representatives from the Congress, Department of State, Coast Guard, Maritime Administration, Environmental Protection Agency, President's Council on Environmental Quality, National Oceanic and Atmospheric Administration, industry, labor, and non-governmental environmental organizations. Three Committees and a number of subsidiary working groups were utilized to consider technical proposals and make recommendations. Committee I dealt with the Articles of the draft Protocols. Committee II considered inspection and certification measures, improved emergency steering standards, and requirements for second radar and collision avoidance aids. Committee III considered proposals for segregated ballast tanks, dedicated clean ballast tanks, crude oil washing, inert gas systems, double bottoms, and protective location of segregated ballast tanks.

2.2.4.2 Results of the Conference

The results of the International Conference on Tanker Safety and Pollution Prevention are documented in the Final Act and its attachments:

a. Protocol of 1978 Relating to the International Convention for the Safety of Life at Sea, 1974.

b. Protocol of 1978 Relating to the International Convention for the Prevention of Pollution from Ships, 1973.

c. Eighteen Resolutions adopted by the Conference.

The two protocols and their respective Annexes constitute the changes to the parent conventions proposed for implementation by the international community. The protocols describe the general obligations undertaken by parties to the protocols, application of the protocols, procedures for signature, ratification, acceptance or accession, entry into force, denunciation, and certain other procedural questions. The Annexes to the two protocols contain changes to the specific requirements of the two conventions. The Resolutions are an important part of the Conference results, giving target dates for entry into force of the protocol's provisions, outlining recommended actions nations should undertake to improve safety and pollution prevention, and identifying future work to be undertaken by IMCO as a result of the Conference.

2.3 General Outline of the Action

The proposed requirements, applicability information and effective dates of the requirements are contained in Table 10.

TABLE 10
REGULATORY ACTION
SHIP CONSTRUCTION AND EQUIPMENT REQUIREMENTS

CATEGORY OF VESSEL	REQUIRED FEATURE	TONNAGE CLASS	DATE REQUIRED
NEW TANK VESSELS (NOTE 4)			
Crude Carriers	PL/SBT (NOTE 6)	20,000 DWT and over	6/79
	COW (NOTE 6)	20,000 DWT and over	6/79 (NOTE 1)
	IGS	20,000 DWT and over	6/79
	Steering	10,000 GRT and over	6/79
Product Carriers	PL/SBT (NOTE 6)	30,000 DWT and over	6/79
	IGS	20,000 DWT and over	6/79
	Steering	10,000 GRT and over	6/79
EXISTING TANK VESSELS (NOTE 5)			
Crude Carriers	CBT or SBT or COW	40,000 DWT and over	6/81
	THEN,		
	SBT or COW	40,000 DWT to 70,000 DWT	6/85
		70,000 DWT and over	6/83
	IGS	20,000 DWT to 70,000 DWT	6/83 (NOTE 2)
		70,000 DWT and over	6/81
	Steering	10,000 GRT and over	6/81
Product Carriers	CBT or SBT	40,000 DWT and over	6/81
	IGS	40,000 DWT to 70,000 DWT	6/83 (NOTE 3)
		70,000 DWT and over	6/81
	Steering	10,000 GRT and over	6/81

Footnotes on Table 8:

1. An Inert Gas System (IGS) is required whenever a tanker uses a crude oil washing system.
2. Between 20,000 and 40,000 DWT, the Commandant may grant an exemption to the requirements for IGS if high capacity washing machines (i.e., tank washing machines having an individual throughput of greater than 60 cubic meters per hour) are not fitted and the ship's design characteristics make it impracticable to fit IGS.
3. Tonnage limit for IGS is to be reduced to 20,000 DWT if tank washing machines having an individual throughput of greater than 60 cubic meters per hour are fitted.
4. New tank vessels are defined for the purpose of this action as being one or more of the following:
    a. Constructed under a building contract awarded after June 1, 1979.
    b. In the absence of a building contract has the keel laid or is at a similar stage of construction after January 1, 1980.
    c. Delivered after June 1, 1982.
    d. Has undergone a major conversion for which;
        i. the contract is awarded after June 1, 1979, or
        ii. in the absence of a contract, conversion is begun after January 1, 1980, or
        iii. conversion is completed after June 1, 1982.
5. Existing tank vessels are defined for the purpose of this statement as being all tank vessels that are not new tank vessels.
6. These requirements apply to both tankships and tank barges.

Abbreviations used in Table 8:

CBT - dedicated clean ballast tanks
COW - crude oil washing
DWT - deadweight tonnage
GRT - gross registered tonnage
IGS - inert gas system
SBT - segregated ballast tanks
PL/SBT - protective location of segregated ballast tanks

Note: As a rule of thumb comparison, a vessel of 10,000 GRT is approximately the same size as a vessel of 20,000 DWT.

2.4 Description and Purpose of Specific Requirements

2.4.1 Segregated Ballast Tanks

Segregated ballast tank (SBT) regulations would require ballast tanks which are completely separated from the cargo oil and fuel systems and which are permanently allocated to the carriage of water ballast. Enough segregated ballast capacity must be provided to enable the vessel to meet specific minimum draft and maximum trim requirements in any ballast condition at any stage of a ballast voyage, including the condition of lightweight plus segregated ballast only. The propeller must also be fully immersed. The intent of this requirement is to provide vessels with enough segregated ballast capacity so that the ship may be operated safely on ballast voyages without putting water ballast in oil tanks except in unusually severe weather. The master of the vessel would be permitted to place additional ballast water in oil tanks in cases where he feels it must be done for the safety of the ship.

2.4.2 Protective Location of Segregated Ballast Tanks

Protective location of segregated ballast tank (PL/SBT) regulations for new vessels would require an area ratio coefficient of 0.45 for ships of 20,000 DWT, and 0.30 for ship of 200,000 DWT and above, with values of area ratio coefficient for intermediate ship sizes determined by linear interpolation. (Refer to Figure 1). The area ratio coefficient (J) is the ratio of the protected shell area to the total side and bottom shell area within the cargo tank length. Additionally, the regulation would allow a reduction in the area coefficient for ships larger than 200,000 DWT, in accordance with the following formula:

$$J = 0.3 - (a - (O_C + O_S)/(4\ O_A))$$

Where: a=0.25 for ships of 200,000 tons deadweight
a=0.40 for ships of 300,000 tons deadweight
a=0.50 for ships of 420,000 tons deadweight

(For intermediate values of DWT, the value of "a" shall be determined by linear interpolation.)

O_C= as defined in 33 CFR 157 Appendix A

O_S= as defined in 33 CFR 157 Appendix A

O_A= the allowable oil outflow as determined by 33 CFR 157.19(b)(1)

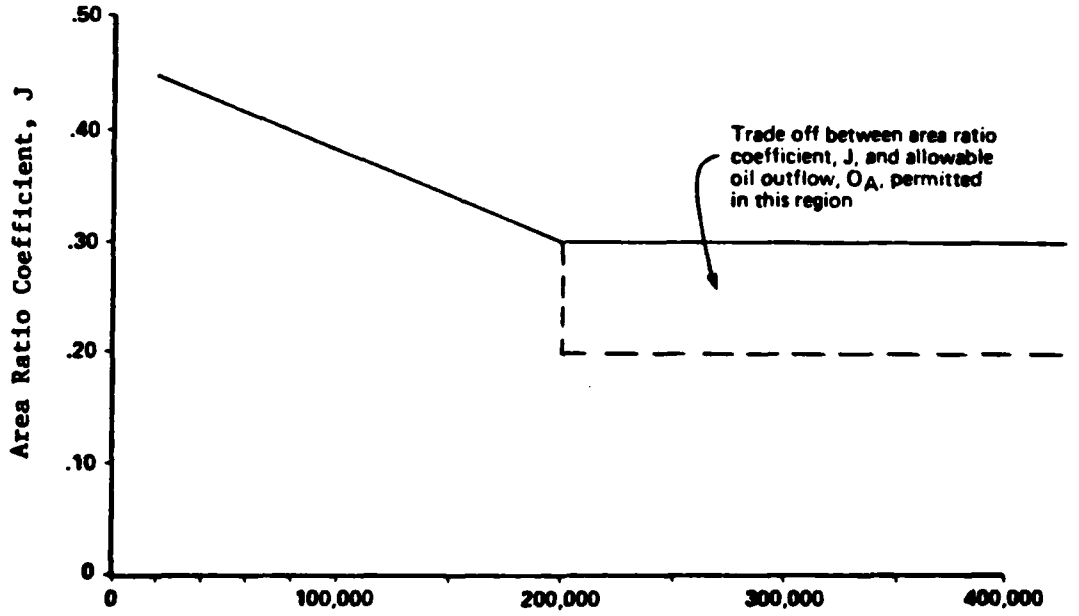
Figure 1

Area Ratio Coefficient, J, for

Protective Location of Segregated Ballast

vs.

Tanker Deadweight



In no case shall the area ratio coefficient be less than 0.20. The protective spaces would separate the cargo tank boundaries from the shell plating of a vessel by at least 2 meters, whether the spaces are located on the side or bottom. See Figure 2 for various methods that could be used to distribute protectively located segregated tanks.

2.4.3 Dedicated Clean Ballast Tanks

The dedicated Clean Ballast Tank (CBT) concept could be used as an option on existing product carriers and as an interim means of phasing in the SBT option on existing crude carriers without distortion of competition among vessel operators during the period allowed for vessel modifications necessary for SBT. The CBT concept would require a vessel to clean certain tanks which would normally be used to carry cargo and dedicate these tanks to the carriage of clean ballast water. Enough tanks are set aside for ballast to meet the draft and trim requirements of the segregated ballast tank concept. Thus it is be relatively quick and easy to convert a vessel to CBT, since no piping or bulkhead modifications would be necessary. The disadvantages of the CBT concept when compared to SBT are:

a. There is the need to flush out the common cargo/ballast piping to prevent discharge of an oily water mixture when discharging clean ballast. Failure to properly flush out the piping may result in significant pollution.

b. Since common cargo/ballast piping is utilized, the risk of contamination due to leakage is increased.

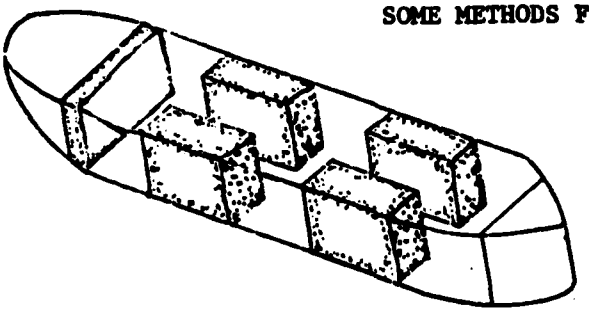
c. Enforcement is difficult because the effectiveness of CBT is dependent upon good operating practice, rather than built-in design features.

2.4.4 Inert Gas Systems

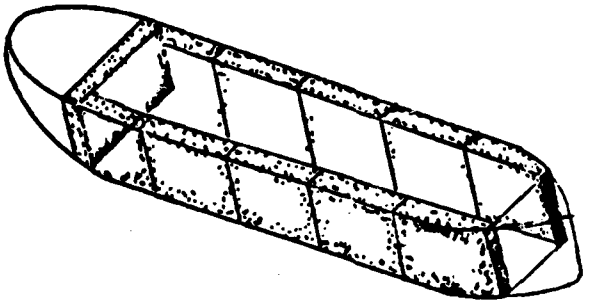
The inert gas system is a method of introduing a gas or mixture of gases with a sufficienty low oxygen content into the cargo tanks such that the tank atmosphere is rendered inert, or incapable of propagating flame. Normal air is 21% oxygen by volume. Below 16% oxygen the risk of flame propagation decreases, until, at 12% oxygen, a hydrocarbon-air mixture will not support a flame. The regulation would require that the inert gas supply be capable of delivering inert gas with an oxygen content not exceeding 5% by volume and that the oxygen level in the tanks be maintained at not more than 8% by volume during crude oil washing operations. With an inert gas system the need for fresh air to enter a tank during normal operations is eliminated, except when preparing a tank for entry by personnel. Cargo discharge is done with all tank covers and ullage openings closed. As cargo is drawn out of the tank it is replaced with inert

FIGURE 2

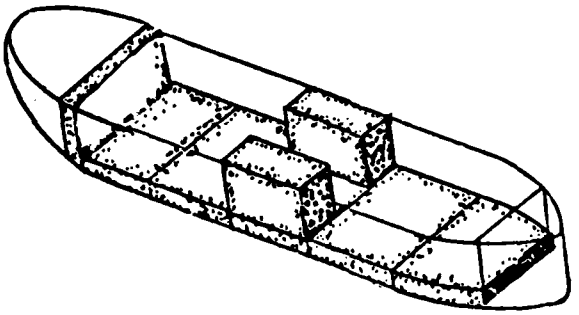
SOME METHODS FOR LOCATING SEGREGATED BALLAST



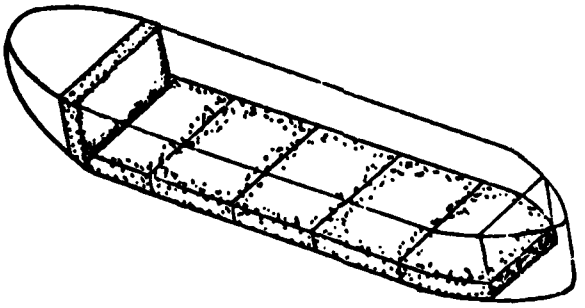
Staggered Wing Tanks



Double Sides



Double Bottom & Wing Tanks



Full Double Bottom

NOTE: Drawings are not to scale

gas, instead of air, so the vapor space above the cargo is maintained in an inert condition. Tank washing is also carried out with the tanks in a inerted condition. A properly operating inert gas system is an important factor in reducing the risk of fire and explosion aboard a tanker. This is especially true during tank cleaning operations.

2.4.5 Crude Oil Washing

Crude Oil Washing (COW) is a cargo tank cleaning system in which crude oil is the washing medium. Crude oil is discharged through fixed tank washing machines positioned so that oil impingement on tank bulkheads and internal structure cleans off the sludge and oil residue remaining in the tank after cargo is discharged. This occurs because crude oil (like latex paint) is thixotropic, and the spray action and subsequent run-down puts the semi-solid oily residues back into liquid suspension so that they can be collected, along with the crude oil used in the washing process, by the installed stripping system and then discharged into another cargo tank or ashore with the cargo. Since the crude oil used for washing can be discharged as part of the cargo, it is usually done during the cargo discharge operation. In case of a split discharge (cargo destined for more than one port), it may be desirable to crude oil wash between discharge ports. At present, clean ballast conditions can be achieved by water rinsing tanks after crude oil washing to remove any oil remaining in the bottom of the tank. It may in the future be possible to eliminate this water rinse through further development of equipment and procedures used in crude oil washing.

As a result of the splashing action of the crude oil during COW the amount of hydrocarbons in the tank's atmosphere is increased over the amount that would be present if COW was not used. If a crude oil tank on a vessel without SBT is to be ballasted these hydrocarbons would normally be forced into the atmosphere as the tanks are filled with liquid. (It should be noted that new vessels are required to have SBT thus they will not discharge these hydrocarbon vapors at the discharge port while taking on ballast water.) To prevent an increase in hydrocarbon vapors during ballasting operations on vessels without SBT, a means to discharge hydrocarbon vapors from each cargo tank that is to be ballasted to a cargo tank that is discharging cargo oil is being required. Thus, as the vapors are forced from the tank being ballasted, they are put into other cargo tanks from which cargo is being removed, thus preventing the vapors from escaping to the atmosphere.

2.4.6 Improved Steering Requirements

The improved steering requirements for existing vessels would require remote steering gear control systems (with power failure alarms), each capable of being brought into immediate operation from the navigating

bridge in the event of failure of one steering control system. Additionally, each tank vessel would be required to have the following:

a. A means in the steering gear compartment for controlling the main steering gear and for disconnecting each remote steering gear control system from its power supply.

b. A means to commumicate between the navigating bridge and steering gear compartment.

c. A rudder angle indicator system on the navigating bridge.

d. A means for indicating in the steering gear compartment the angular position of the rudder.

On new tankers, the steering gear must include two or more identical power units arranged so each can be placed in operation from the navigating bridge in case of failure of the unit in operation. Steering gear power units must be arranged to start automatically when power is restored following a power failure. Steering gear power unit failure alarms must be provided on the navigating bridge, and steering gear must be arranged insofar as is practicable such that a single failure in its piping or in one of the power units will not jeopardize the integrity of the entire system. An alternate power supply is required so that power is automatically restored to at least one steering gear power unit and its associated remote steering gear control system and rudder angle indicator within 45 seconds after a power failure.

The regulations also require the following:

(a) Testing of manual steering after prolonged use of the automatic pilot before entering areas where navigation demands special caution.

(b) The conducting of emergency steering drills.

(c) Posting of steering gear operating instructions.

These improved steering requirements are applicable to all tankships carrying hazardous cargos in bulk and are not limited to oil tankers.

2.4.7 Second Radar and Collision Avoidance Aids

All ships of 10,000 gross tons and upwards are to be fitted with two radars each capable of operating independently of the other. This

requirement, while a result of the TSPP Conference, is not included in this action. Final regulations concerning this second radar were published in the Federal Register of July 24, 1978, and came into effect June 1, 1979.

Collision avoidance aids are systems designed to help mariners in identifying and resolving vessel relative motion problems, thus helping to reduce the chance of collisions and related accidential oil pollution. The TSPP Conference approved a resolution on collision avoidance aids (CAA) urging IMCO to develop performance standards for them not later than July 1, 1979, and to prepare, within the same time period, requirements for the carriage of such aids on all ships of 10,000 gross tons and upwards so that SOLAS 74 could be amended. The Coast Guard is presently working internationally to develop these performance standards. It is expected that these standards will be submitted to the IMCO General Assemby in late fall of 1979. The CAA specifications and requirements will be the subject of future rulemaking action.

2.4.8 Inspection and Certification

Existing U. S. regulations satisfactorily address inspection and certification requirements for both foreign flag vessels registered in countries which are parties to the effective SOLAS Convention and foreign flag vessels registered in countries which are not. The existing inspection regulations are written so as not to become dated when a new SOLAS Convention comes into force.

The inspection and certification requirements for U. S. flag vessels operating on international voyages, as presently contained in U. S. regulations, meet or exceed the inspection and certification requirements of the 1978 Protocols resulting from the TSPP Conference.

2.5 Relationship of this Action to Previous U. S. Actions

The U. S. proposals covered in this analysis are consistent with the results of the 1978 International Conference on Tanker Safety and Pollution Prevention, including the Protocol which modifies and incorporates the 1973 Marine Pollution Convention and the Protocol which modifies the 1974 Safety of Life at Sea Convention.

The primary thrust of this action, and previous U. S. actions, are increased tanker safety and reduced pollution of the seas by oil from tankers. The previous U. S. actions are categorized as the 1969 Amendments to the International Convention for the Prevention of Pollution of the Sea by Oil, 1954; MARPOL 73; SOLAS 74; and Coast Guard regulatory actions.

2.5.1 1969 Admendments to the 1954 Oil Pollution Convention

In 1969 IMCO adopted amendments to the 1954 Oil Pollution Convention. These admendments placed an upper limit on the amount of oil a vessel could discharge operationally as well as specific locations in which operational oil discharges were prohibited. The Senate gave its advice and consent to the ratification of these amendments on September 20, 1971, and they were ratified by the President on October 13, 1971. They came into force worldwide on January 20, 1978.

Operational requirements are the extent of the marine oil pollution requirements that are presently in force internationally. These requirements are very difficult to enforce due to their operational nature (in lieu of design requirements).

2.5.2 MARPOL '73

In 1973 IMCO convened an International Conference on Marine Pollution which adopted an International Convention for the Prevention of Pollution from Ships, 1973 (MARPOL '73), which, when ratified and in force, would supersede the 1954 Oil Pollution Convention, as amended. This Convention broadened earlier regulations for dealing with oil pollution from ships and introduced new requirements relating to other forms of pollution such as noxious liquid substances, harmful substances in packaged forms, sewage and garbage. Additionally, MARPOL '73 contained equipment and construction standards to reduce operational oil outflows.

With respect to the discharge of oil, Annex I of MARPOL 73 maintains substantially similar criteria to those specified in the 1969 Amendments to the 1954 Oil Pollution Convention and also contains several new requirements which will effect profoundly the operations of oil tankers. These are as follows:

(a) The definition of "oil" has been broadened to mean petroleum in any form including crude oil, fuel oil, sludge, oil refuse and refined products (other than petrochemicals).

(b) For new tankers, the total quantity of oil which may be discharged into the sea due to operations must not exceed 1/30,000 of the total quantity of the particular cargo of which the residue formed a part.

(c) Oil tankers must be fitted with oil discharge monitoring and control equipment, including a recording device to provide a continuous record of any discharge.

(d) Any ship of 400 gross tonnage or more must be fitted with oily-water separating equipment or filtering system.

(e) Certain regions, including the Mediterranean Sea, the Black Sea, the Baltic Sea, the Red Sea, and the "Gulfs area between Ras Al Hadd and Ras Al Fasteh" have been designated as "special areas" in which any discharge of oil or oily mixture into the sea is prohibited except in cases of "force majeure".

(f) Parties to the Convention are obliged to ensure compliance with the provisions requiring adequate reception facilities for residues and oily mixtures at oil loading terminals, repair ports and in other ports in which ships have such residues to discharge; in certain special areas these facilities must be provided by January 1, 1977, and must be adequate for the reception and treatment of all dirty ballast and tank washings from tankers.

In addition, MARPOL 73 introduces certain requirements for the construction and equipment of ships with respect to the prevention of operational discharges of oil and the mitigation of uncontrolled release of oil should accidents to tankers occur. The following is a summary of these requirements:

(a) Oil tankers must be provided with suitable slop tank arrangements with the capacity necessary to retain the slops generated by tank washing, oil residues and dirty ballast residues.

(b) New oil tankers of 70,000 tons deadweight and above must be provided with segregated ballast tanks of sufficient capacity to enable them to operate safely on ballast voyages without recourse to the use of oil tanks for water ballast except in very severe weather conditions.

(c) Requirements for tank arrangement and limitation of tank size adopted as the 1971 Amendments to the 1954 Oil Pollution Convention have been retained.

(d) New subdivision and damage stability requirements have been introduced to ensure that tankers can survive assumed side or bottom damage to a degree specified on the basis of their length.

MARPOL 73 will enter into force twelve months after acceptance by at least 15 countries, whose merchant fleets represent at least fifty percent of the gross tonnage of the world's merchant shipping.

The U. S. has not ratified MARPOL 73, but the Convention was submitted to the Senate on March 22, 1977, for advice and consent. (However, the U. S. has, in effect, implemented or is implementing by regulation, Annex I of the Convention dealing with oil pollution.) Only three countries have ratified MARPOL 73 so it is not yet in

force. Many countries have expressed a reluctance to ratify MARPOL 73 due to their present technological inability to comply with the regulations set forth in Annex II, regarding the provision of reception facilities for residues and mixtures containing noxious liquid substances. In order to expedite entry into force of Annex I, it was agreed at the TSPP Conference to delay the entry into force of Annex II for three years (or such longer period as may be determined by a two-third's majority of Parties to the Protocol present and voting in the Marine Environment Protection Committee). This provision was included in the MARPOL Protocol, which incorporates and modifies the parent convention. Since the MARPOL Protocol incorporates and modifies the parent convention, it will be the legal instrument to be ratified in place of the MARPOL 73 Convention. In Janurary 1979 the President transmitted the MARPOL Protocol to the Senante for advice and consent to ratification. Implementing legislation has also been submitted to the Congress.

2.5.3 SOLAS '74

In 1974 IMCO convened and subsequently adopted a new International Convention for the Safety of Life at Sea, 1974 (SOLAS 74), which would supersede the 1960 SOLAS Convention. It also contains simplified procedures for amending technical provisions. SOLAS 74 contains requirements for inert gas systems for new tankers over 100,000 DWT and new combination carriers over 50,000 DWT, as well as detailed structural fire protection requirements for tankers.

The inspection and certification, steering, and radar requirements contained in SOLAS 74 are essentially the same as those contained in SOLAS 60, except that IMCO Resolution A.325(IX), adopted by the Assembly on November 12, 1975, contains in addition to other machinery and electrical standards, standards to improve the operation and reliability of steering gear. The Assembly recommended in its resolution that the Maritime Safety Committee seek to achieve these standards as amendments to SOLAS 74 after its entry into force.

On July 12, 1978, the Senate gave its advice and consent to the ratification of SOLAS 74, which was ratified by the President on August 15, 1978. Twenty-five countries have ratified SOLAS '74 with their combined merchant fleet comprising more than 50 percent of the world's gross tonnage, thus SOLAS 74 will become effective on May 25, 1980.

2.5.4 Coast Guard Regulatory Actions

October 14, 1975 - Final U. S. regulations were published making segregated ballast tanks (SBT) and the operational discharge standards of the 1969 Amendments to the 1954 Oil Pollution Convention and those of MARPOL 73 applicable to U. S. flag tank vessels in the domestic trade.

January 8, 1976 - Final requirements were published for the protective location of segregated ballast tanks on new U. S. tank vessels 70,000 DWT or more in domestic trade.

December 13, 1976 - Final U. S. regulations were published extending the application of SBT and operational and equipment standards of MARPOL '73 to U. S. flag tank vessels in foreign trade and foreign flag tank vessels operating in the navigable waters of the U. S. These regulations also extend requirements for protective location of segregated ballast to new U. S. vessels and to new foreign flag vessels of 70,000 DWT or more entering U. S. waters.

May 16, 1977 - Proposed U. S. regulations were published in response to the Presidential Initiatives which would require SBT on additional tankers and double bottoms on new tankers. Improved emergency steering standards, a second radar system with a computer aided collision avoidance system and inert gas systems were also proposed.

June 27, 1977 - Proposed U. S. regulations were published that would reduce accidental discharges during operations and during transfer of oil or oily wastes to and from vessels. Requirements for the installation and use of cargo oil monitors on tank vessels were also proposed.

July 24, 1978 - Final U. S. regulations were published which require a second radar that operates independently of the first radar, for all vessels of 10,000 gross tons and over.

February 12, 1979 - Proposed regulations were published implementing the TSPP Conference results and withdrawing the proposed rules published on May 16, 1977.

May 31, 1979 - Proposed U. S. regulations were published detailing rules that must be followed for lightering operations off our coast

May 31, 1979 - Published interim final rule requiring an electronic position fixing device on vessels when calling at ports in the continental United States including Alaska.

June 14, 1979 - Proposed rules were published that would require double hull construction for new tank barges designed to carry oil in bulk and to prohibit these barges from carrying oil in the void spaces of their double hulls.

June 14, 1979 - An Advance Notice of Proposed Rulemaking was published which would accelerate the normal attrition of certain existing single hull barges certificated to carry oil.

3. PROBABLE IMPACTS OF THIS ACTION

A QUANTITATIVE ASSESSMENT OF ECONOMIC AND POLLUTION PREVENTION IMPACTS WERE MADE WHERE POSSIBLE. OFTEN THERE WAS A CONSIDERABLE RANGE IN THE ACTUAL INFORMATION AND IN OTHER CASES, THERE WAS VERY LIMITED INFORMATION AVAILABLE. THUS, IT SHOULD BE EMPHASIZED THAT THE QUANTITATIVE VALUES, WHICH ARE DEVELOPED IN APPENDICES A AND B, ARE ESTIMATES.

3.1 Procedures for Assessing Economic Impacts

An assessment of the economic impact of the regulatory action was performed in terms of the costs to shipowners and an estimate of the increase in cost per gallon of gasoline. The estimated costs to shipowners are broken into two categories-capital construction costs and total outlays. All capital costs are calculated in 1978 dollars.

The initial capital construction costs include aquisitions, retrofit and installation costs. If additional ships would be required, the costs of bringing these ships into service is also included.

The total outlay is the dollar investment, including 10% interest, computed for each subsystem over the payback period. If additional vessels would be required, the costs of operating these additional vessels is included for the payback peroid. The payback (amortization) period used in this assessment was the average remaining life of the deadweight class being considered.

A demand analysis, to determine the number of tankers required to deliver crude and product to the United States, was not performed. Rather, data gathered by the Coast Guard and the Maritime Administration was used to estimate the number of tankers and the deadweight distributions needed to deliver crude and product oils to United States' ports. The MARAD data base covered a 12 month period; the Coast Guard data base covered an 18 month period. It was assumed that these estimates are reasonable approximations of the tanker fleet utilized for the period from 1978 through 1985.

These regulations involve tanker construction and equipment requirements. To arrive at the costs involved in the selection of any single option, it was necessary to obtain subsystem costs and retrofit costs for the regulatory action and those alternatives considered. Those subsystem and retrofit costs which are a function of tanker deadweight were presented in graphical form.

The deadweight distribution of the tanker population, the subsystem and retrofit costs, and the time sequencing requirements for this regulatory action were then used to compute both foreign and domestic costs. These costs were computed for this regulatory action and for selected alternatives. Detailed procedures used in the development of these costs are given in Appendix B.

3.2 Procedure for Assessing Impacts on the Marine Environment

There are three categories of concern which impact on the "human environment":

a. Operational oil pollution
b. Accidental oil pollution
c. Deaths, injuries, and property damage

The definition of marine pollution attributed to the joint IMCO/FAO/UNESSO/WMO/WHO/IAEA/UN Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP) in reference (17) is adopted:

"Marine pollution means the introduction by man, directly or indirectly, of substances or energy in the marine environment (including estuaries) resulting in such deleterious effects as harm to living resources, hazard to human health, hindrance to marine activities (including fishing and other legitimate uses of the sea), impairment of the quality for use of sea-water and reduction of the amenities".

Considering first the impacts of operational and accidental oil pollution, the impact of the environmental losses (risk of environmental damage) of various proposed changes to ship construction and equipment standards, and inspection and certification requirements should be assessed. However, the current knowledge of the relationship between oil inputs to the marine environment and risk of environmental damage does not permit such a direct evaluation. About the best that can be done at this stage is to estimate the impact of the regulations on the quantity of oil entering the water in two geographical areas:

a. Worldwide, recognizing that the U. S., along with other countries, has an interest in maintaining the quality of the world's oceans as a whole.

b. In coastal waters, for purposes of this analysis defined as within 50 miles of the U. S. coastline, recognizing that we may be more concerned about oil inputs close to our shores than further at sea or adjacent to some other country's shores.

Where a quantitative assessment was possible with some degree of certainty it was made. Subjective assessments were made in the other cases. Quantitative impacts were assessed for operational oil outflows from existing vessels. This gives a reasonable short-term indication of actual outflows from vessels subject to this regulatory action. This estimate is reasonable primarily because the present

excess tanker tonnage on the world market will result in almost no new tanker construction for the next 5 or 6 years. Thus, short term operational oil outflows will consist of outflows mostly from existing vessels. The oil outflow model, described in Appendix A, was utilized in making the quantitative assessments of the various alternatives considered for existing vessels. It should be emphasized that very little quantitative information is available regarding actual tanker operational oil outflows on a vessel basis. The assumptions made in calculating the baseline oil outflows were based on this information.

The costs of equipment and construction features that reduce the possibility of accidental oil outflows have been determined. However, it would be pretentious to estimate the reduction in oil outflows resulting from equipment such as an inert gas system or a second radar. There are many factors that contribute to an accidental oil spill. For instance, it may be possible to determine the percentage of time the primary radar is inoperative, but whether an accident would occur during this down time would depend on factors such as location of vessel, attentiveness of the deck officer, experience of the crew, etc. If the accident histories were studied for all cases where an accident occured when a radar was inoperative considerable subjective judgement would be necessary to determine if the accident would have occured if the radar had been working. No estimate of a reduction in accidental oil pollution resulting from the regulatory action has been made due to these uncertainties.

3.3 Direct Impacts of this Action

3.3.1 Segregated Ballast Tanks (SBT)

3.3.1.1 Impact of SBT on Operational Oil Outflows

SBT reduces operational oil outflows by eliminating nearly all oil/water mixtures which are created by ballasting of cargo tanks. SBT does not reduce oil remainders, clingage, or sediment in cargo tanks. There is some indication that SBT may reduce slightly sediment formation by reducing the amount of water washing of cargo tanks. SBT does not eliminate cargo tank washing for sludge and sediment removal. SBT would be most effectve on a vessel which carries crude or black residual oil, and much less effective on a vessel that carries white products since most white product tanks are cleaned each voyage to maintain cargo purity.

It is anticipated that neither existing crude carriers nor existing product carriers will be converted to SBT, given the options provided under this regulatory action. This statement is based on economic considerations. (See Sections 3.3.1.4, 3.3.3, and 3.3.4.) However if the owners of all existing crude carriers regulated by this action did chose this option, it is estimated that oil outflow from crude

carriers would be reduced by 33,000 metric tons/year and outflow from product carriers would be reduced by an estimated 2,500 metric tons/year from present levels.

3.3.1.2 Impact of SBT on Accidental Oil Outflows

SBT, when located against the shell of the ship, provides a defensive zone which may reduce oil outflow by maintaining cargo tank integrity in the event of a low engergy collision or grounding. In the case of a high energy collision or grounding, cargo might be transferred from a damaged tank to an empty segregated ballast tank to avoid loss of oil overboard, provided some way of transferring can be found. SBT could result in greater initial oil outflow during a grounding as the result of the segregated ballast tanker's having greater freeboard, therefore more cargo above the waterline, than a conventional tanker.

3.3.1.3 Impact of SBT on Safety

SBT may reduce loss of life and property damage following collision if the collision occurs in way of a segregated ballast tank rather than a cargo tank, thus helping to prevent a fire or explosion.

3.3.1.4 Economic Impact of SBT

The economic impact of retrofitting SBT on existing vessels can be broken down into two general categories - capital construction costs and costs due to loss of cargo capacity.

When SBT is retrofitted, capital costs vary, depending on how close a solution to optimum is desired. As an optimal solution is approached, capital costs increase because of the number of bulkheads that must be added and/or moved increases. Additionally, there are increased capital construction costs for tank coatings, as well as additional piping and valves necessary for segregating the ballast system from the cargo system. Capital construction costs are also a function of vessel deadweight and vary between 0.5 and 8.0 million dollars for existing vessels. Figures B-3 and B-4 of Appendix B show the estimated relationship.

The second major cost of SBT is due to loss of cargo capacity. This occurs because the SBT concept requires that a portion of the vessel's tankage be devoted exclusively to ballast and thus cannot be used to carry oil. This loss of cargo capacity is a function of deadweight. Figure B-5 of Appendix B gives estimates of deadweight loss for various sized vessels. To compensate for this loss in deadweight capacity additional vessels must be brought into use. This loss in cargo carrying capacity was estimated to be about 1.0 million tons, about 12.6 percent of the original cargo carrying capacity of the foreign product tankers effected by this regulatory action. The loss of cargo carrying capacity on U. S. flag product

vessels is estimated to be about 100 thousand deadweight tons which represents about 15 percent of the capacity of U. S. flag product vessels 40,000 DWT or greater.

If the owners of existing vessels effected by this regulatory action choose the SBT option, the capital costs to owners of foreign flag product and crude carriers for SBT would be about 585 million dollars (a total outlay of about 1.8 billion dollars) and about 185 million dollars (total outlay of about 730 million dollars) to owners of U. S. flag vessels.

3.3.2 Protective Location of Segregated Ballast Tanks (PL/SBT)

3.3.2.1 Impact of PL/SBT on Operational Oil Outflows

The impact of PL/SBT on operational oil outflows is the same as the impact of SBT given in 3.3.1.1.

3.3.2.2 Impact of PL/SBT on Accidental Oil Outflows

The intent of requiring protective location of SBT is to selectively locate segregated ballast tanks in way of the cargo spaces to provide a measure of protection in case of accidents such as groundings or collisions. PL/SBT may be accomplished by fitting double bottoms, double sides, staggered wing tanks (with wing bulkheads located further outboard then is usual today), or some combination of these. With a given volume of segregated ballast spaces, there is a tradeoff between the total area to be protected and the depth of protection provided. A relatively small area can be protected against most hazards, including fire or explosion following a major collision, or a relatively large area can be protected against some hazards. Protective location of segregated ballast arrangements which used double bottoms would affect a portion of the outflow from groundings. Protective location of segregated ballast which uses staggered wings or double sides would affect a portion of outflow from both groundings and collisions depending on the area of the ship which was covered. There is a difference of opinion among naval architects and ship designers concerning how to best utilize segregated ballast tanks as protective spaces. This difference of opinion is largely due to uncertainties over basic information regarding accident probability and severity, probable damage location along the ship's length and around its girth, longitudinal and girth-wise extent of damage, and depth of penetration. Segregated ballast spaces, distributed so that proposed percentages of the total side and bottom shell area are covered, would be equally as effective in reducing accidental oil outflows as a requirement for double bottoms.

3.3.2.3 Impact of PL/SBT on Safety

PL/SBT may avoid explosion or fire following a collision if the collision occured in way of a segregated ballast tank. This would not be the case if the segregated ballast were located in the double bottom or if the segregated ballast tank were not sufficiently deep at the side to avoid penetration in the case of collision.

3.3.2.4 Economic Impact of PL/SBT

The economic impacts of PL/SBT are similar to those of SBT contained in section 3.3.1.4. Since the new vessels would be ordered for a specific deadweight capability, there would be no loss of deadweight capacity cost. The major costs would be the capital construction costs and the additional operating costs of propelling through the oceans a vessel that is larger than is currently required for the deadweight of cargo carried. It is estimated that PL/SBT would add approximately 1.5 million dollars to the cost of a new tank vessel of about 65,000 DWT and up to 15 million dollars for an ULCC.

3.3.3 Dedicated Clean Ballast Tanks (CBT)

3.3.3.1 Impact of CBT on Operational Oil Outflow

CBT reduces operational oil outflows in much the same manner as SBT, however, in cannot be considered equally effective because this method depends more on operational techniques than does SBT. Ballast tanks are dedicated to only ballast in both the CBT and SBT concepts, however, with CBT a separate ballast piping and pumping system is not required as it is in the SBT concept. This is a significant difference in that in CBT the cargo remaining in piping must be cleaned and pumped into a cargo tank or slop tank prior to taking on ballast.

It is anticipated that most owners of existing product carriers will choose CBT in lieu of SBT due to the lower capital costs. Implementation by existing product vessels of the CBT requirements of this regulatory action will reduce operational pollution that occurs as a result of ballasting by an estimated 2,400 metric tons/year (600 tons/year from domestic movements and 1,800 ton/year from vessels importing petroleum products). It is estimated that when TSPP results are ratified worldwide there will be a reduction of 6,000 metric tons/year of operational outflows of product world wide when compared to the estimated operational outflows from ships operating under the requirements of the 1969 Admendments to the 1954 Marine Pollution Convention.

3.3.3.2 Impact of CBT on Accidental Oil Outflow

The effects of CBT on accidental oil inputs are the same as those for SBT, given in 3.3.1.2.

3.3.3.3 Impact of CBT on Safety

The effects of CBT on safety are the same as those for SBT, given in 3.3.1.3.

3.3.3.4 Economic Impact of CBT

The concept of CBT was developed for existing vessels on the precept that only minor modifications to existing vessels would be required. Thus, capital construction costs of CBT would be negligible for most vessels and the cost of the loss of deadweight capacity would be the major cost. This occurs because, as in the case of SBT, CBT requires a portion of the vessel's tankage be devoted exclusively to clean ballast and thus cannot be used to carry oil. This loss of cargo capacity is a function of deadweight and is estimated in Figure B-5 of Appendix B. To compensate for this loss of deadweight capacity, additional vessels must be brought into use. This loss in cargo carrying capacity was estimated to be about 1.0 million tons, about 12.6 percent of the original cargo carrying capacity of the foreign product tankers affected by this regulatory action. The loss of cargo carrying capacity on U. S. flag vessels is estimated to be about 100 thousand deadweight tons which represents about 15 percent of the capacity of U. S. flag product vessels 40,000 DWT or greater.

Assuming that most of the existing product carriers would be fitted with the CBT option, it is estimated that it would cost owners of foreign flag vessels about 24 million dollars (total outlay of about 205 million dollars) and owners of U. S. flag vessels about 2 million dollars (total outlay of about 26 million dollars) to retrofit existing laid-up tonnage to carry the deadweight capacity lost to dedicated ballast tanks.

3.3.4 Crude Oil Washing (COW)

3.3.4.1 Impact of COW on Operational Oil Outflows

COW reduces oil remaining on board ship following cargo discharge, and, therefore, reduces the amount of oily mixtures created. COW would allow a large reduction in water washing, consequently, a large reduction in oil/water mixtures. COW may not be applicable to certain crude oils and is not applicable to black product and white product carriers. The use of COW helps remove tank clingage and bottom sludge, thus allowing the operator to deliver more cargo per trip when compared to a normal load-on-top voyage. Also, COW saves time in preparing a vessel for drydock in that tanks are always relatively clean. These features make COW economically attractive to the owner in addition to helping reduce oil outflows. It is expected that COW will be the method chosen by most operators of existing crude oil carriers to meet this proposed regulatory action. Given this assumption it is estimated that oil outflows on existing vessels

bringing crude oil into the U. S. will be reduced by 47,000 metric tons/year (11,000 tons reducton in ballasting operations outflows, 9,000 tons reduction in tank cleaning operations and 27,000 tons reduction due to sludge removal and tank cleaning prior to entry into a shipyard). It is estimated that COW, when fully implemented worldwide, will reduce world tanker operational oil outflows by 440,000 metric tons/year when compared to the outflows estimated under the 1969 Amendments to the 1954 Oil Pollution Convention, and 255,000 metric tons/year when compared to the estimated outflows that would be result from the full implementation of the MARPOL 73 requirements.

3.3.4.2 Impact of COW on Accidental Oil Outflows

COW has no affect on accidental pollution.

3.3.4.3 Impact of COW on Safety

COW nearly eliminates manual tank cleaning operations, thus reducing the risks to tank cleaning personnel assocated with entry into cargo tanks.

COW may increase hydrocarbon emissions into the atmosphere unless steps are taken to control or eliminate such discharges. COW will reduce the need for oily waste reception facilities (See Section 3.3.3).

3.3.4.4 Economic Impact of COW

Crude oil washing systems require that the vessel be fitted with washing machines which are fixed-in-place and permanently connected to the cargo pumping system. The costs of a COW system are a function of the vessel's deadweight. It is estimated that the cost of COW would range between 0.15 and 1.5 million dollars per vessel. The primary economic advantage of COW is that there is no loss of cargo capacity as in CBT or SBT. There are additional economic benefits in that most of the tank clingage and sludge is discharged at the terminal allowing all the vessel's deadweight to be used to carry cargo. Cargo discharged from a tank vessel which utilizes a COW system is of a consistent quality, since water is not introduced into the cargo tanks for cleaning purposes. Other economic impacts are that a vessel usually requires more time at the terminal to unload when COW is utilized, however, the time required for shipyard entry is considerably reduced because of the reduced amount of sludge.

The cost to owners of foreign ships would be an estmated 325 million dollars (total outlay of 595 million dollars) and to the owners of U. S. flag vessels, an estimated 50 million dollars (total outlay of 105 million dollars) if all existing crude carriers are fitted with

this option.

3.3.4.5 Impact of COW on Hydrocarbon Vapor Emissions

The use of COW to remove the sludge and clingage from the tank sides and bottoms causes an increase in the hydrocarbon vapor content in the tank's atmosphere. This increase in the hydrocarbon content is caused by the splashing of the stream of crude oil on the tank internal structure. Without any restrictions these hydrocarbon vapors would normally be emitted to the atmosphere as the tanks are filled with liquid. To offset this possible increase in hydrocarbon emissions, the regulations require a means to discharge hydrocarbon vapor from each cargo tank that is to be ballasted to a cargo tank that is discharging crude oil. (Other equivalent methods to prevent discharge of the hydrocarbon vapors to the atmosphere would also be considered.) Additionally the vessel's master must utilize the system to meet the national primary and secondary ambient air quality standards under 40 CFR Part 50, when required. When this system is used, the hydrocarbon emissions at the cargo discharge port would be less than the emissions that would occur from a vessel that did not have COW installed.

Crude oil washing and subsequent ballasting is normally carried out at the discharge port. As the vessel undertakes the ballast leg of its voyage to the loading port, some of the suspended hydrocarbons might settle out, however the hydrocarbon level in the tank at the loading port will be higher than if COW had not been used. Thus the hydrocarbon emissions at loading ports will be higher from crude oil washed ships unless other procedures are used. One such possible procedure is the purging of cargo tanks with inert gas during the ballast voyage.

The total impact of crude oil washing is that on a round trip the hydrocarbon vapors emissions are increased over those of a similar vessel equipped with a waterwash system. The regulatory action will require the vessel to have the capability of simultaneous ballast and discharge, or equivalent capability, which the master must use where required. This will reduce the discharge port emissions from a COW vessel below those of a similar non-COW vessel. Some of the vapors that are not emitted at the discharge port will settle out with the remainder emitted underway or at the loading port.

3.3.5 Inert Gas Systems (IGS)

3.3.5.1 Impact of IGS on Operational Oil Outflows

IGS would have an no impact on operational oil pollution.

3.3.5.2 Impact of IGS on Accidental Oil Outflows

IGS would have a impact on accidental oil outflows by reducing explosions and fires and the subsequent oil outflows.

3.3.5.3 Impact of IGS on Safety

IGS would have an important impact on safety. Risk of fire and explosion would be reduced greatly during tank cleaning, and loading and discharge. This is accomplished by reducing the oxygen content of the gases such that a flame could not propogate, as indicated in section 2.4.4.

3.3.5.4 Economic Impact of IGS

The addition of an inert gas system requires the installation of a scrubber to remove carbon and sulfur from the stack gases and to cool the gas. Fans, valves and piping systems are required to distribute inert flue gas to the cargo tanks. On some vessels the flue gases are *not* suitable for use, requiring the utilization of an inert gas generator. The size of the IGS and consequently the cost of a system are functions of the vessel's deadweight. The cost of an IGS for an individual vessel ranges between 1 million and 3 million dollars.

3.3.6 Improved Steering Regulations

3.3.6.1 Impact of the Improved Steering Regulations on Operational Oil Outflow

The improved steering regulations would have no effect on operational oil outflows.

3.3.6.2 Impact of the Emergency Steering Regulation on Accidental Oil Outflows

Improvements to steering requirements would affect accidental oil outflows by helping to reduce collisions, rammings and groundings, thus reducing accidental oil outflows.

3.3.6.3 Impact of the Improved Steering Regulations on Safety

The improvements in the steering gear regulations would result in an improvement in safety by helping to avoid collisions, rammings, and grounding accidents resulting from steering failures.

3.3.6.4 Economic Impact of the Improved Steering Regulations

The cost of the improved steering requirements is a one-time cost that, for the most part, is independent of vessel size. The cost of the second steering gear control system and required alarm on existing vessels is estimated to be approximately $30,000 per vessel. It is estimated that approximately 40 percent of the foreign vessels entering U. S. ports and 30 percent of U. S. flag vessels will require another steering gear control system. Further, it is

estimated that 90 percent of the foreign flag vessels and 70 percent of the U. S. flag vessels will need the additional alarm and/or circuit arrangement modifications. This results in an initial capital cost of 2.0 million dollars to U. S. flag vessel owners and 18.0 million dollars to owners of foreign flag vessels.

3.4 Secondary Impacts

This regulatory action will cause an increase in shipyard activity - especially in repair yards. It is anticipated that all the foreign flag vessels will be retrofitted in foreign shipyards while it is estimated that most of the work on U. S. flag vessels will done in U. S. shipyards. Additionally this will have a ripple effect into related industries which make inert gas and crude oil washing equipment. The present shipyard capacity is more than adequate to handle this additional work since the industry is presently in a depressed state. It is anticipated that the work on U. S. flag vessels will be distributed throughout the coastal repair yards.

The cost of complying with this proposed regulatory action will reduce the number of older ships that come into our ports since the retrofit costs will be such to force them into other trades or to be scrapped. However, it is felt that the present size mix of vessels will remain about constant due to the draft limitations of our ports.

It is not anticipated that these regulations will impact any particular segment of shipping industry other than what has previously been indicated. It is possible that some operators running old ships will sell or scrap their vessels and leave that segment of the industry rather than retrofit the required equipment.

This proposed regulatory action will not cause a shortage of vessels calling at U. S. ports. The proposed regulatory action would, for existing vessels, allow dedicated clean ballast tanks to be a permanent measure on product oil tankers and an interim measure on crude oil tankers. CBT may be used with only minimum modifications, thus a large number of vessels will not require extended shipyard stays to retrofit equipment. Additionallly COW may be retofitted without extended shipyards stays. These facts coupled with the present world surplus tonnage, indicate a general shortage of oil carrying capacity is not anticipated.

The regulations will not have a significant effect on the size of the vessels coming into U. S. ports. This happens because most of our ports are draft limited. Some ports that have a high flow of tank vessels carrying products might see an increase in traffic that reflects the reduced carrying capacity of product carriers that are using SBT or CBT.

3.5 SUMMARY OF IMPACTS

This action will result in a significant reduction in operational and accidental oil pollution. The Coast Guard estimates that this regulatory action will result in an estimated 49,000 metric tons/year reduction in operational oil outflows from present levels - 46,600 tons/year reduction in crude oil outflows and 2,400 tons/year reduction in product outflows. The relationship of this reduction to present operational outflow levels can be seen in Figure 3. While it is impossible to estimate the reduction in the average 8,000 metric tons per year due to accidental outflows from collisions, rammings and groundings in our coastal waters, it is felt that a significant reduction will occur.

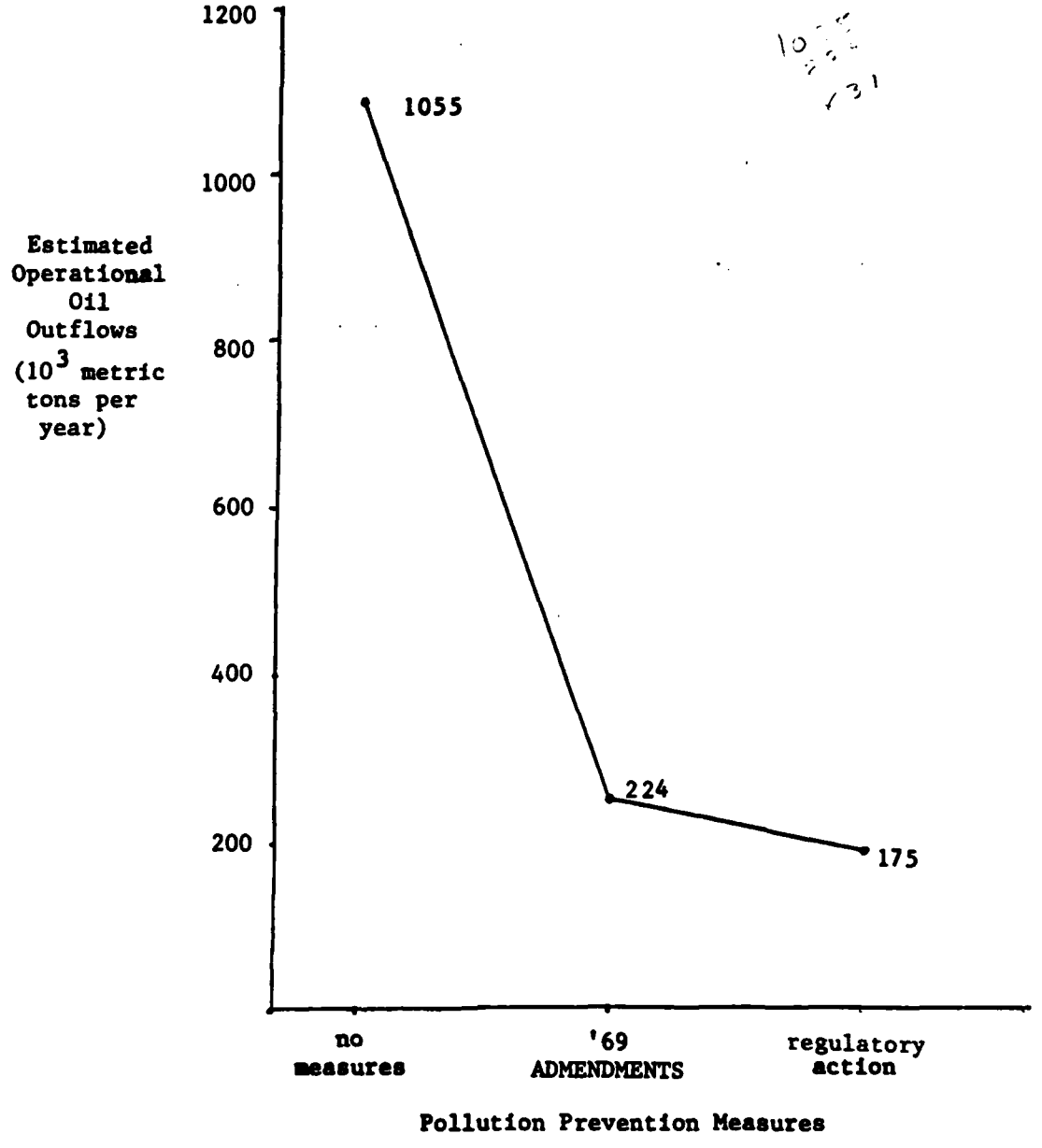
It is estimated that the capital costs to owners of foreign flag vessels importing petroleum into the United States will be about 1.5 billion dollars to implement the proposed regulations. About 0.2 billion dollars will be spent to retrofit product carriers flying foreign flags, and about 1.3 billion dollars will be spent on foreign flag crude oil carriers. This results in a total outlay by owners of foreign flag vessels of about 2.8 billion dollars.

It is estimated that it will cost owners of U. S. flag vessels about 162 million dollars in capital costs to implement these proposed regulations. About 17 million dollars will be spent retrofitting product carriers and about 145 million dollars retrofitting crude oil carriers. This results in a total outlay of about 331 million dollars to owners of U. S. flag vessels.

FIGURE 3

WORLDWIDE OPERATIONAL OIL OUTFLOW FROM VESSELS

AFFECTED BY THIS ACTION



4. ALTERNATIVES TO THE REGULATORY ACTION AND THEIR IMPACTS

This section contains descriptions and impacts of various alternatives to the regulatory action.

4.1 NO ACTION

4.1.1 Description of Alternative

One alternative to the regulatory action is to take no action and to not publish new marine pollution prevention regulations.

4.1.2 Impact of Alternative

The alternative of taking no action would result in no decrease in the amount of operational or accidental oil outflow. This alternative would have no cost to the world tanker fleet.

The alternative of taking no action is not acceptable. The effects of marine pollution from ships operating under the present regulations are considered unacceptable.

4.2 DOUBLE BOTTOMS

4.2.1 Description of Alternative

Another alternative is to require all new crude oil carriers of 20,000 DWT and over and product carriers of 30,000 DWT and over be built with double bottoms in lieu of meeting the requirements for PL/SBT contained in this action. This alternative would probably result in segregated ballast being carried in the space between the cargo tank bottoms and the bottom skin of the vessel. These double bottom tanks would not be used for the carriage of oil. These tanks would thus serve as a buffer between the cargo tanks and the bottom skin of the vessel.

The United States supported the double bottom concept, however, at the preparatory meetings preceeding the Conference it was realized that a vast majority of the other delegations had strong reservations regarding any mandatory requirements for double bottoms. The United States then supported development of the concept of protective location of SBT as an alternative to double bottoms, provided it achieved comparable benefits in the reduction of accidental oil outflows.

4.2.2 Impact of Alternative

4.2.2.1 Impact of Double Bottoms on Operational Oil Outflows

Operational oil outflows would probably be reduced slightly due to double bottom construction. The normal design of double bottoms would be expected to remain unchanged, i.e. with stiffening members for both the outer skin and the double bottom located within the inner bottom tanks. This method provides a smooth surface on the deck of the cargo tanks, which reduces clingage and sludge buildup while facilitating tank cleaning. Because less residue is expected in the cargo tanks, quantitatively less operational pollution would be expected.

4.2.2.2 Impact of Double Bottoms on Accidental Oil Outflows

The primary purpose and benefit of double bottoms is in the prevention of oil outflows in groundings where the outer bottom would be penetrated and the inner bottom would remain intact. The structural connection between the outer shell and the double bottom seems to diminish this advantage by transmitting the impact of wide area groundings into and rupturing the double bottom. Double bottoms would probably have no effect in reducing accidental oil outflows due to collisions or rammings. The secondary effect of double bottoms on a grounded vessel has both positive and negative aspects.

A loss in buoyancy due to the punctured double bottom will help the vessel to settle aground more, reducing pounding and providing a stable platform for salvage efforts. This same loss in buoyancy, however, would make the vessel more difficult to refloat, should refloating be necessary due to impending severe weather or other circumstance where loss of the vessel could result.

Understanding the variety of impacts of double bottoms on accidental outflows is complicated by the above factors and a general lack of experience with double bottomed tankers. This understanding is further complicated by a critical dependence on vessel route. In general, vessels which will normally be in shallow waters seem more susceptable to groundings and would benefit from double bottoms more than vessels which will normally operate in deep waters.

In an attempt to resolve the uncertainties stated above and in support of Resolution 17 of the 1978 TSPP Conference, the Coast Guard intends to undertake an additional study of protective location of segregated ballast tanks, based on accident statistics available and probability theory. Until the results of this definative study are known, the location of segregated ballast tanks, whether in double bottoms, wing tanks, or a combination of the two, will be left to the judgement of the individual vessel's owner/designer.

4.2.2.3 Impact of Double Bottoms on Safety

There are two potential safety impacts that have been identified with double bottoms on new vessels:

a. Potential for fire or explosion in double bottom space.

b. Impact on safety of personnel entering double bottom spaces.

Persons would have to enter double bottom tanks occasionally for inspection of the tank interiors. Corrosion, deterioration due to corrosion, accumulation of sludge and silt deposits from ballast water, repair of cracks and piping, and renewals of plating due to grounding or other damage are common reasons. There would have to be sufficient ventilation to carry away fumes from welding and to provide air for breathing. This would be difficult because of the long distances from tank access openings and minimal clearances within the double bottoms. Tank cleaning could also be a significant problem where cargo has leaked into the double bottom tank and the tank must be gas freed to make it safe. If double bottom tanks are inerted, routine entry for inspection by the vessel's crew would be more difficult and hazardous.

There is some potential for fire or explosion in double bottom spaces, as discussed in reference (1), pages 76, 202-203, 251, and reference (4), page 47. Fire or explosion risk arises due to the following sequence of events:

a. Cargo leaks from cargo tanks into double bottom space through cracks or other openings in inner bottom plating.
b. Flammable vapors accumulate within the double bottom space to within the explosive limits.
c. A source of ignition ignites the vapors.
d. A fire or explosion results.

4.2.2.4 Economic Impact of Double Bottoms

Inasmuch as double bottoms are a special application of protective location of segregated ballast tanks, the economic impacts are basically the same. The two major costs are the capital costs of extra steel and fabrication and the operating cost of deadweight that is not used for cargo. There is an additional fabrication cost associated with double bottoms versus PL/SBT using wing tanks. The total cost of a vessel with double bottoms is an estimated 5 percent greater than the vessel cost for PL/SBT using wing tanks.

4.2.2.5 Impact of Double Bottoms on Strength

A double bottom does not increase the overall strength of a vessel. The strength requirements of the various classification societies are

such that the actual stress level must be below a maximum allowable stress. This maximum allowable stress level is the same whether or not double bottoms are fitted. However, the after-grounding strength of a double bottom vessel will usually be better because, initially, the outer bottom may be damaged but the inner bottom usually has considerably less damage, giving a double bottom vessel a greater remaining percentage of its orginal strength. Thus, a double bottom vessel will usually survive longer than a single bottom vessel in a grounding situation.

4.3 INCREASE APPLICABILITY OF PL/SBT FOR NEW VESSELS

4.3.1 Description of Alternative

An alternative to the regulatory action regarding PL/SBT on new vessels is to extend the applicability to all new product carriers of 20,000 DWT or more. The regulatory action does not require PL/SBT on new product carriers in the range of 20,000 to 30,000 DWT.

4.3.2 Impacts of Alternative

The impacts of PL/SBT on new tank vessels are outlined in section 3.3.2. New product vessels in the range of 20,000 to 30,000 DWT are not required to have PL/SBT according to the standards developed at the TSPP Conference. As previously indicated, a quantitative oil outflow analysis was not done for new vessels because of the large uncertaintity over the number of vessels that will be built. It is estimated in reference (23) that the cost of installing PL/SBT on a new tanker in the range of 20,000 to 30,000 DWT is between 4 and 4.5 million dollars per vessel.

4.4 DELETE COW OPTION FOR EXISTING CRUDE CARRIERS

4.4.1 Description of Alternative

An alternative to the regulatory actions for existing crude carriers is to delete the COW option and require SBT or CBT for an interim period, and by 1985 require all existing crude carriers to be fitted with SBT.

4.4.2 Impacts of Alternative

4.4.2.1 Impact on Operational Oil Outflows

The deletion of the COW option for existing crude carriers would require SBT as the final solution. The SBT option would be more effective than COW on oil outflows as a result of ballasting operations, however SBT provides almost no help for other operations such as tank cleaning or sludge removal prior to shipyard operations. Looking at the vessel population affected by the proposed action, it is estimated that deletion of the COW option would cause an additional

oil outflow of 11,600 metric tons/year. The oil outflow due to ballasting would decrease by an estimated 24,500 tons/year, while outflows due to tank cleaning and shipyard entry would increase an estimated 8,800 tons/year and 27,300 tons/year, respectively. Thus, if the COW option were deleted, a net expected increase of 11,600 metric tons/year would occur.

4.4.2.2 Impact on Accidental Oil Outflows

The impacts of CBT or SBT on accidental oil outflows are contained in paragraph 3.3.1.2. The probability of an oil outflow if an accident takes place is somewhat reduced if the COW option is deleted, since a portion of the vessel's tankage consists of dedicated ballast tanks. Thus, if a collision, ramming, or grounding occurred in way of a dedicated ballast tank, no pollution would normally occur.

4.4.2.3 Impact on Safety

The impact of this alternative would be the impacts of CBT and SBT contained in paragraph 3.3.1.3.

4.4.2.4 Economic Impact

The economic impact of the deletion of the COW option would be to require SBT which, for most vessels, would be economically undesirable because of the loss of deadweight capacity associated with the segregated ballast tanks. Furthermore, it would result in the loss of the other economic incentives of COW listed under 3.3.4.4. It is estimated that this alternative would cost owners of foreign flag crude carriers approximately 485 million dollars (total outlay of about 1445 million dollars) and owners of U. S. vessels about 165 million dollars (total outlay of about 685 million dollars) to retrofit existing vessels and to bring existing idle deadweight into service. Thus, this alternative would cost the owners of foreign flag vessels about 160 million dollars (851 million dollars in total outlay) and the owners of U. S. flag vessels 117 million dollars (580 million in total outlay) more than if the COW option were acceptable.

4.5 REQUIRE SBT ON EXISTING CRUDE CARRIERS 20,000 DWT OR MORE

4.5.1 Description of Alternative

This alternative would require all existing crude carriers 20,000 DWT or more to be fitted with SBT. This would differ from the regulatory action by the following:

a. Deleting the COW option for existing crude carriers.

b. Extending the applicability of SBT from 40,000 DWT down to 20,000 DWT.

4.5.2 Impacts of Alternative.

4.5.2.1 Impact on Operational Oil Outflows

This alternative would reduce the operational oil outflows into the oceans by an estimated 4,700 metric tons/year from vessels in the 20,000 to 40,000 DWT range that would be affected by U. S. regulations. This alternative would have no effect on operational oil outflows due to tank cleaning or shipyard entry.

4.5.2.2 Impact on Accidental Oil Outflows

This alternative would extend the impacts of SBT enumerated in section 3.3.1.2 to existing crude carriers in the 20,000 to 40,000 DWT range.

4.5.2.3 Impact on Safety

This alternative would extend the safety impacts of SBT outlined in section 3.3.1.3 to existing crude oil vessels in the 20,000 to 40,000 DWT range.

4.5.2.4 Economic Impact

This alternative of requiring SBT on crude carriers 20,000 DWT and above would cost owners of foreign vessels an additonal 325 million dollars more than the regulatory action to retrofit and bring existing laid up vessels into service. This results in an additional total outlay of about 1665 million dollars. The alternative would cost U. S. flag vessel owners an additional 150 million dollars in capital costs, resulting in an additional total outlay of 756 million dollars.

4.6 INCREASE APPLICABILITY OF SBT OR CBT FOR EXISTING PRODUCT CARRIERS

4.6.1 Description of Alternative

This alternative would, in addition to the requirements of the final action, require all existing product carriers 20,000 DWT or more to be fitted with SBT or CBT. This would differ from the regulatory action by extending the applicablity of SBT or CBT from 40,000 DWT down to 20,000 DWT for existing product carriers.

4.6.2 Impacts of Alternative

4.6.2.1 Impact on Operational Oil Outflows

This alternative would reduce the operational oil outflows into the oceans by an estimated 6,000 metric tons/year when compared with the proposed action.

4.6.2.2 Impact on Accidental Oil Outflows

This alternative would extend the impacts of SBT, enumerated in section 3.3.1.2, to product vessels in the 20,000 to 40,000 DWT range.

4.6.2.3 Impact on Safety

This alternative would extend the safety impact of SBT, outlined in section 3.3.1.3, to product carriers in the 20,000 to 40,000 DWT range.

4.6.2.4 Economic Impacts

It is estimated that SBT, retrofitted to existing foreign flag product carriers 20,000 DWT and above that are affected by U. S. regulatory action, would cost owners of those foreign flag vessels about 250 million dollars more than the proposed action. The additional total outlay would be about 1009 millions dollars. The additional capital costs of this alternative for U. S. flag product vessels larger than 20,000 DWT would be about 176 million dollars (a total outlay of 296 million dollars) in excess of the regulatory action.

4.7 INCREASE THE APPLICABILITY OF IGS FOR EXISTING VESSELS

4.7.1. Description of Alternative

An alternative to the regulatory action regarding inert gas systems would be to require all existing product carriers 20,000 DWT and above to have IGS. The regulatory action requires IGS on vessels in the 20,000 to 40,000 DWT range only if high capacity tank washing machines are installed.

4.7.2 Impacts of Alternative

4.7.2.1 Impacts on Accidental Oil Outflow and Safety

The extention of the inert gas system requirements to existing product carriers in the 20,000 to 40,000 DWT range could be expected to have only a small impact on safety. The incidence of fire and explosions on these smaller vessels is relatively low and an IGS requirement would not be effective in reducing significantly those fires and explosions which do occur.

4.7.2.2 Economic Impacts

The average estimated per vessel cost for IGS hardware and installion is about 1 million dollars for vessels in this 20,000 to 40,000 DWT range. Were this alternative adopted, it would increase the capital costs to the owners of foreign flag vessels by 235 million dollars (increased total outlay by 440 million dollars) and to owners of U. S. flag vessels by 110 million dollars (increased total outlay by 121 million dollars).

4.7.2.3 Impact on Hydrocarbon Vapor Emissions

Most tank vessels not equipped with IGS leave their hatch covers and ullages open during cargo operations to allow air to replace the cargo being pumped out. During this operation some hydocarbon vapors are emmitted due to mixing, etc. When an IGS is installed the hatch covers and openings are kept closed except during short intervals for tank soundings if a closed gauging system is not being utilized. Thus, the impact of IGS on hydrocarbon emissions is that the amount of hydrocarbon vapors released to the atmosphere at the discharge port decreases.

4.8 U. S. PROPOSAL TO TSPP CONFERENCE

4.8.1 Description of Alternative

A detailed presentation of the United States proposal to the TSPP Conference is provided in Table (11).

The U. S. proposal at the TSPP Conference differed from this proposed regulatory action in the following ways:

a. SBT would be required for all existing tank vessels 20,000 DWT and above carrying crude oil. The applicability would have been extended to include crude carriers in the 20,000 to 40,000 DWT range.

b. SBT would have been required for all existing tank vessels 20,000 DWT and above, which carry products. The applicability would have been extended to include product carriers in the 20,000 to 40,000 DWT range.

c. COW would not have been required on new crude carriers.

d. New product carriers between 20,000 and 30,000 DWT would have been required to have SBT, and all new tank vessels of 20,000 DWT and greater would have been required to have double bottoms.

e. Existing product carriers 20,000 DWT and above would have been required to have IGS.

TABLE 11

ORIGINAL US PROPOSAL AT TSPP CONFERENCE
FOR
SHIP CONSTRUCTION AND EQUIPMENT REQUIREMENTS

	Required Construction Feature	Vessel Tonnage	Date Required
NEW TANK VESSELS CARRYING			
Crude Oil	DOUBLE BOTTOMS AND SBT	20,000 DWT & over	6/82
	IGS	20,000 DWT & over	6/82
	Steering	10,000 GRT & over	6/82
Product Oil	DOUBLE BOTTOMS AND SBT	20,000 DWT & over	6/82
	IGS	20,000 DWT & over	6/82
	Steering	10,000 GRT & over	6/82

	Required Construction Feature	Vessel Tonnage	Date Required
EXISTING TANK VESSELS CARRYING			
Crude Oil	SBT	20,000 DWT & over	6/82
	IGS	20,000 DWT & over	6/82
	Steering	10,000 GRT & over	6/82
Product Oil	SBT	20,000 DWT & over	6/82
	IGS	20,000 DWT & over	6/82
	Steering	10,000 GRT & over	6/82

4.8.2 Impacts of Alternative

4.8.2.1 Impacts on Operational Oil Outflows

It is estimated that this alternative would result in a reduction in the operational outflows from existing vessels affected by this regulatory action of about 6,000 short tons/year. The variations in operational oil outflows between the proposed regulatory action and the original U. S. proposals can be broken into three categories - ballasting on crude oil carriers, tank cleaning and preparation for shipyard entry of crude oil carriers, and ballasting of product carriers:

a. Ballasting on crude oil carriers - The original U. S. proposals would result in a reduction of about 29,300 metric tons/year of operational oil outflows from ballasting operations when compared to the proposed action. Approximately 85 percent of this reduction is due to SBT in lieu of COW and the remainding 15 percent results from the increased applicability of SBT to the crude carriers in the 20,000 to 40,000 DWT range.

b. Tank cleaning and preparation for shipyard entry of crude oil carriers - The original U. S. proposal, when compared to present levels, would result in an estimated increase in operational oil outflows of about 8,800 metric tons/year as a result of tank cleaning and of about 27,300 metric tons/year from sludge removal prior to shipyard entry. This results from the fact that SBT does not reduce oil outflows from these two operations.

c. Ballasting of product carriers - the original U. S. proposal would result in a reduction of about 9,500 metric tons/per year outflow from ballasting operations. About 35 percent of this reduction is due to the use of SBT in lieu of CBT and the remainder is due to the increased applicability of SBT to product carriers in the 20,000 to 40,000 DWT range.

The net effect of the above three categories would be a reduction in operational outflows of 2,700 metric tons/year if the original U. S. propasal were utilized in lieu of the proposed regulatory action.

4.8.2.2 Impact on Accidental Oil Outflows

The original U. S. proposal would have a slightly better impact on accidental oil pollution than the proposed action for the following reasons:

a. SBT would be required on all existing tank vessels between 20,000 and 40,000 DWT, thus, the impacts outlined in section 3.3.1.2. would extend to these vessels.

b. IGS would be required on existing vessels between 20,000 and 40,000 DWT, thus the impacts outlined in section 3.3.5.2 would extend to this deadweight class.

4.8.2.3 Impact on Safety

The extention of the inert gas system requirements to existing product carriers in the 20,000 to 40,000 DWT range could be expected to have only a small impact on safety. The incidence of fire and explosions on these smaller vessels is relatively low and an IGS requirement would not be effective in reducing significantly those fires and explosions which do occur.

This alternative would extend the safety impact of SBT, outlined in Section 3.3.1.3, to existing vessels in the 20,000 to 40,000 DWT range.

4.8.2.4 Economic Impact

The original U. S. proposal would have cost owners of foreign flag vessels an estimated 2.3 billion dollars in capital costs which would result in a total outlay of approximately 6.3 billion dollars. The cost to owners of U. S. flag vessels would be about 599 million dollars in capital costs with a total outlay of about 1565 million dollars. As can be seen, the original U. S. proposal would have cost vessel owners about 1.2 billion dollars more than this proposed regulatory action in capital costs. This would translate into an additional outlay of about 3.7 billion dollars.

4.9 MANNING OF STEERING GEAR ROOM

4.9.1 Description of Alternative

An alternative to the regulatory action regarding steering systems is the required manning of the steering gear room while the vessel is underway on the navigable waters of the United States in lieu of duplicating the steering gear control systems.

4.9.2 Impacts of Alternative

The manning of the steering gear room when a vessel is in a maneuvering situation has both advantages and disadvantages as compared to the requirement for a duplicate steering gear control system. A trained crewman might quickly remedy some situations, allowing only a momentary loss of steering, however, in the event of

a failure of the control system, a duplicate system would be better in most instances. It is felt that redundency of design is better than having to rely on people. There was no support at the TSPP Conference for a requirement to man the steering gear room in maneuvering situations as an alternative to requiring a duplicate control system. The primary reasons for this lack of support was the enforcement aspect. There is no method of enforcing such a requirement nor, at present is there a procedure which would require the proper training of persons assigned to the steering station.

4.10 STEERING FAILURE ALARM

4.10.1 Description of Alternative

A feasible addition to the action regarding steering systems would be a requirement for a steering failure alarm. A steering failure alarm would sound an audible signal when the rudder was not aligned at the angle ordered at the pilot house steering position. The alarm would be isolated from the steering gear control systems in order to prevent failure of the alarm in the event of a failure of a component of a control system.

4.10.2 Impacts of Alternative

Such a device would warn an inattentive helmsman that a steering failure had occurred, regardless of the cause, thus it would help reduce accidents. Arguments against such an alarm are that it is no better than a helmsman using an independent rudder angle indicator and that the rudder angle indicator should remain the primary instrument relied upon by helmsmen. The Coast Guard, in a separate regulatory action, is proposing that steering failure alarms be installed on U. S. flag vessels. The estimated cost of this alarm including installation is $5,000 per vessel.

4.11 DUPLICATION OF DIFFERENTIAL CONTROLLERS IN STEERING SYSTEMS

4.11.1 Description of Alternative

An addition to the action regarding steering systems could be a requirement for a duplicate differential control unit in the steering system.

4.11.2 Impacts of Alternative

Duplication of the steering differential control unit would allow greater flexibility if one differential control unit failed. However, this requirement was not accepted at the TSPP conference because of the difficulties in adding a second differential control unit to many existing foreign steering gear designs.

Many foreign and U. S. vessels use a floating lever unit for hydraulic pump control which typically is slow moving and not subject to the type of failures experienced by other designs. Additionally, most foreign vessels have steering gear designed such that two hydraulic pumps must be operated simultaneously to meet rudder movement standards. The single floating lever unit is capable of operating either one pump, for normal underway steering or two pumps, to meet maximum rudder movement standards. Designing and retrofitting a second control and follow-up system for such an existing arrangement, where multiple pumps are common, would be both difficult and very complex. The complexities at the common interfaces would be such that the probability of a failure, when the total differential control system is considered, may actually increase when compared to existing systems.

4.12 OIL OUTFLOW TAX

4.12.1 Description of the Alternative

This alternative would be a method where, in its simpliest form, the government would tax vessel owners according to the cost to society of the oil pollution they create. This alternative would be structured to make pollution control a part of the competitive market. The owner could install the pollution prevention measure of his choice while the government would set the tax sufficiently high to cover the cost of any damage caused by the oil pollution.

4.12.2 Evaluation of the Alternative

An oil outflow tax on the surface appears to be an excellent way to accomplish the desired goal of reducing oil pollution. The people and property which are affected by the pollution would be adequately compensated while the profit motive would force vessel owners to develop the most cost effective methods to control oil outflows.

A more indepth look at the alternative reveals several major problems. First our knowledge of the fates and effects of oil pollution is not now sufficient to enable us to set proper rates and administer such a program. For instance there may be certain types of product oils of which a gallon may cause the equivalent environmental harm that 5 gallons of another type of oil might cause. The effect of oil on some species of animal and plant life has been documented but there is still a lot unknown in this area. Very little is known about the secondary effects on various food chains. Additionally there is still much to learn about the long term cumulative effects of oil on various types of animal and plant life.

Secondly even if the fates and effects of the various oils are throughly understood, there is the problem of regional rate administration along with the problem of developing adequate

technology to do the desired monitoring cheaply and effectively. The rates in some highly sensitive areas would be considerably different than other not so sensitive areas. The monitoring technology would be required to have the ability to record not only the amount of outflow but also the location and type of oil. Another monitoring problem is that no technology is available to detect leakage from a small hole in the vessel hull, pipe, or location other than the monitored discharge point.

A third disadvantage of this alternative is that the systen would have major international implications. Many of the tar balls, etc. that wash up on our beaches are caused by discharges from foreign tankers that are not in our waters. Obtaining international agreement on a plan such as this would be extremely difficult with enforcement more of a problem.

For all these reasons it is impractical to consider the use of this alternative at this time.

5. SUMMARY OF ALTERNATIVES

5.1 New Vessels

The major impact of the regulatory action will be felt in the near future by existing vessels - not by new vessels. A surplus of tanker deadweight exists in the world today, thus, there is very little demand for new tanker construction. Most predictions indicate that this surplus capacity will continue beyond 1985 with the possible exception of product vessels. This present surplus capacity makes it impracticable to estimate reduction in operational oil outflows from new vessels or to determine the total monetary impact of this regulatory action on new vessels except on a per vessel basis. In any case, the impact of this regulatory action would be small for the next few years due to the lack of demand for new tanker construction.

5.1.1 Double Bottoms on Crude and Product Carriers

One of the alternatives to the regulatory action is a requirement for segregated ballast to be placed in double bottoms in lieu of letting the owner/designer decide where to place the required protectively located segregated ballast tanks. (See section 4.2). PL/SBT and double bottoms have the same impact on operational oil pollution in that both eliminate about 94 percent of the possible oil outflows due to ballasting operations. Neither measure is effective in reducing oil outflows from tank cleaning and preparaton for shipyard entry. The differences between these alternatives is in their impact on accidental oil outflows due to collisions, rammings and groundings. In order to meet the PL/SBT requirements most designs would use wing tanks for the segregated ballast to provide some degree of protection in a collision, ramming or grounding. Double bottoms would provide protection only in a grounding situation and would provide very little protection from collisions or rammings. In order for a double bottom to be effective in a grounding situation, the energy must be such that the inner bottom is not penetrated and the location and circumstances such that the vessel will not be lost. Due to questions that have been raised regarding both the benefits and liabilities of double bottoms, including the possible impact of double bottoms on the salvage of tankers, the Coast Guard is of the opinion that sufficient information is not available at the present time to require double bottoms as the only acceptable means of locating segregated ballast on new vessels. It is very possible that a double bottom requirement may result in more pollution than if wing tanks were used for segregated ballast. As indicated in section 4.2.2.2, the Coast Guard is undertaking a study of protective location of segregated ballast, including double bottoms, to develop U.S. input for IMCO in response to Resolution 17 of the TSPP Conference which recommends that IMCO develop a more rational probabilistic formula or criterion for the protective position of segregated ballast tanks.

5.1.2 PL/SBT on Product Carriers Between 20,000 and 30,000 DWT

As indicated in section 4.3.2, new product carriers between 20,000 and 30,000 DWT were not required to have PL/SBT by the standards adopted at the TSPP Conference. Existing vessels in this deadweight range presently have operational outflows due to ballasting of about 2,000 metric tons/year. It is felt that, given the indirect impacts discussed in Chapter 6, this alternative should not be required unilaterally at the present time.

5.2. Existing Vessels

The estimated operational oil outflows from existing tank vessels are shown in Table (12) for the regulatory action and the various alternatives discussed in Chapter 4. The operational oil outflow model described in Appendix A was used to estimate the oil outflow. The estimated capital costs to retrofit equipment and construction features of the various alternatives affecting the operational oil outflows are listed in the right hand column of the table. These costs were taken from Tables B-11 and B-14 of Appendix B. As can be seen, the regulatory action reduces the estimated operational oil outflows from 224 to 175 thousand metric tons/year, at a capital cost of 400 million dollars.

Table (13) was developed in order to determine the most cost effective operational pollution prevention equipment and construction features that could be retrofitted to existing vessels. The estimated reduction of oil outflows from present levels for specific options were calculated using results from the oil outflow model. The reductions were calculated for domestic crude and product movements as well as for product and crude vessels entering or leaving U. S. ports in foreign trade. The capital costs for all vessels for specific equipment and/or construction features were obtained from Appendix B for the same categories.

The cost effectiveness of the various options available was then determined by dividing the cost of the specific option by the reduction in oil outflow in metric tons/year attributed to that option. The results were then divided by the remaining average life of the vessels. (An average remaining vessel life of 10 years was assumed f the fleet of vessels that would be affected.) It should be pointed out that the costs are capital costs to the ship owner and do not take into account payment of interest and the time value of money.

The most cost effective operational pollution prevention measure for existing crude oil carriers is a crude oil washing system. COW costs approximately $805 to reduce one metric ton of operational oil outflow. COW is an option in the proposed regulatory action. The

Estimated Operational Oil Outflows and Costs

of Alternatives to the Proposed Action for Existing Vessels

Alternative \ Type of Oil Movement	Operational Oil Outflows (thousands of metric tons)					Capital Costs to reduce operational oil outflows in millions of dollars
	Imported Crude	Domestic Crude	Imported Product	Domestic Product	TOTALS	
No Action (Section 4.1)	117.5	5.5	48.3	52.9	224.2	0
Proposed Regulatory Action (Section 3)	71.9	4.5	46.5	52.3	175.2	400
Original US Proposal to IMCO (Section 4.8)	80.[illegible]	3.0	40.7	48.6	172.6	1300
Proposed Action but Deleting COW Option (Section 4.4)	84.1	3.9	46.5	52.3	186.8	678
Proposed Action Plus SBT on Crude Carriers 20,000 DWT and above Section 4.5)	80.3	3.0	46.5	52.3	182.1	873
Proposed Action Plus SBT on Product Carriers 20,000 DWT (Section 4.6)	71.9	4.5	40.7	48.6	165.7	828
Proposed Action Plus CBT on Product Carriers greater than 20,000 DWT (Section 4.6)	71.9	4.5	42.9	49.9	169.2	497

(1) Operational oil outflows from model described in Appendix A

(2) Capital costs from Appendix B

TABLE 12

Cost Effectiveness of Various Features Used to Reduce Operational Oil Pollution[1] from Existing Tank Vessels

		Reduction of Oil Outflow from Present Levels (thousands of metric tons)			Capital Costs[2] (millions of dollars)			$/ton[3]
		Imported	Domestic	Total	Foreign Flag	U.S. Flag	Total	
CRUDE CARRIER	COW 40,000	45.6	1.0	46.6	325	50	375	805
	SBT 40,000 DWT	33.4	1.6	35	485	167	652	1,863
	SBT 20,000	37.2	2.5	39.7	648	199	847	2,133
PRODUCT CARRIER	SBT 40,000 DWT	2.5	0.9	3.4	101	17	118	3,470
	CBT 40,000 DWT	1.8	0.6	2.4	24	2	26	1,083
	SBT 20,000 DWT	7.6	4.3	11.9	275	178	453	3,807
	CBT 20,000 DWT	5.4	3.0	8.4	91	31	122	1,452

(1) Operational oil outflows from model described in Appendix A
(2) Capital costs from Appendix B
(3) Assumes the average vessel will be in service 10 more years

TABLE 13

costs associated with SBT are more than double those of COW while SBT produces a smaller reduction in operational oil outflows than does COW. Thus, it is felt that any alternative that eliminates a properly engineered and enforced COW option is undesirable.

The most cost effective operational pollution prevention measure for existing product carriers is the dedicated clean ballast tank concept. Use of CBT costs approximately $1083 to eliminate one metric ton of operational oil outflow. It would cost approximately $3,470 to eliminate a metric ton of oil outflow using SBT, three times the cost for CBT. While SBT reduces the total outflow by a slightly larger amount than CBT, because of economic considerations it is felt that any alternative that eliminates a properly engineered and enforced CBT option would also be undesireable.

This analysis indicates that if it is determined that operational pollution should be reduced beyond this regulatory action, a CBT requirement should be considered for product carriers between 20,000 and 40,000 DWT. Such an action would eliminate an additional 6,000 metric tons/year of operational oil outflow at a cost $1,452 per metric ton. However, it is felt that this requirement should not be made at this time due to the indirect impacts of unilateral action that are discussed in Chapter 6.

6. INDIRECT IMPACTS OF UNILATERAL ACTION BEYOND THIS REGULATORY ACTION

6.1 GENERAL

This regulatory action implements the results of the International Conference on Tanker Safety and Pollution Prevention held in London, England, between the 6th and 17th of February, 1978. The results of this Conference, which was convened at the request of the United States, are the product of intense negotiation at the international level. The orders of the United States delegation were to obtain changes to the international standards for tanker construction and equipment as recommended by President Carter in his message to Congress on March 17, 1977. The Conference delegates were aware that the U. S. had to obtain results that were in accordance with the Presidential Initiatives or the U. S. would act unilaterally.

The results of the Conference achieved the goals set forth in the Presidential Initiatives. If the U. S. were to enact regulations that go beyond or are not in agreement with the results of the TSPP Conference, it is anticipated that there would be internatonal reactions that could be harmful to the interests of the United States.

6.2. INTERNATIONAL RATIFICATION IMPACTS

6.2.1 Jeopardize Ratification of Earlier Agreements

Unilateral action on the part of the U. S. could jeopardize the coming into force of the MARPOL Protocol and the other TSPP Conference results. Thus, the pollution prevention requirements remaining in effect internationally would be the 1969 Admendments to the 1954 Marine Pollution Convention. Because these standards are operational in nature, this would be a serious setback in the effort to reduce oil pollution in the world's oceans. Design standards are more effective than operational standards because they are self-enforcing. Therefore, the MARPOL Protocol, which incorporates many design standards, is highly desirable because it, in addition to containing additional, more stringent standards, it is more enforceable than the operational requirements contained in the 1969 Ammendments.

6.2.2 Proliferation of National Standards

Unilateral action on the part of the United States possibly would cause other countries to develop their own national standards which

would be aimed at their own interests. This could have a serious effect on the free movement of vessels from one country to another because ships would need to be fitted with a variety of specific design and equipment standards needed to comply with unique requirements at the ports upon which the vessels called.

6.2.3 Potential Energy Interruptions

If the U. S. enacts unilateral actions, only a portion of world's tanker fleet would be retrofitted or constructed to meet these standards. The portion of the fleet modified would probably be adequate for periods of normal oil usage, however, it is likely that there would not be sufficient tanker capacity to meet periods of high demand.

6.2.4 Negate Innovations in International Maritime Law

The results of the TSPP Conference contained several innovations in international maritime law that could possibly be lost if the Conference results are not ratified by the required number of nations. These innovations are detailed below:

a. Extensive equipment and construction standards were made retroactive to existing vessels for the first time. It is felt that this innovation will have a major impact in the future.

b. The TSPP Conference results contained a recommendation that member states implement the tanker construction and equipment requirements by a specific date even if the specific legal instrument (Protocol) has not entered into force by that date.

c. Another innovation is the "no more favorable treatment" clause. This requires member nations to apply the agreed upon standards to all vessels which enter their ports, including the vessels of nonparty nations. This in effect makes the requirements applicable to all tank vessels that engage in international trade.

6.3. IMCO

6.3.1 Weaken IMCO

It is felt that unilateral action on the part of the U. S. would weaken IMCO as a creditable international institution. IMCO is a valuable institution in the solution of safety and environmental problems related to the marine industry. The recent TSPP Conference is a good example of the value of IMCO. Response to the U. S. initiatives of March 1977 was both rapid and cooperative. The

Maritime Safety Committee agreed to convene the International Conference on Tanker Safety and Pollution Prevenion (TSPP), to be held in February 1978. The period of time generally allowed for preparation for such a major international diplomatic conference is 4 to 5 years. The TSPP Conference was successfully concluded just 11 months after President Carter's message to Congress called for such a conference. Other recent international standards developed by IMCO, such as the Code for the Construction and Equipment of Ships Carrying Liquified Gases in Bulk and the Code for the Constructor and Equipment of Ships Carrying Dangerous Chemicals in Bulk, point out the value of IMCO.

6.3.2 U. S. Leadership

Unilateral action would weaken the United States' leadership role in such ongoing projects at IMCO as in the following areas:

a. Crew quality standards.

b. Collision avoidance aid standards.

c. Crew and supply boat standards.

d. Liquified gas ship standards.

e. Bulk chemical carrier standards.

f. Cargo ship subdivision standards.

g. Dynamically supported craft.

U. S. shipbuilding, shipping concerns, and others concerned with the marine environment, have an interest in the outcome of these standards. It is necessary that the U. S. position be put forward from a point of strength. At present there are few existing international standards in these areas. The nature of the problems do not lend themselves to control through unilateral actions. U. S. leadership is necessary in these projects.

Crew standards and training requirements are examples of present ongoing work that is of significant importance to the United States. These requirements should better the quality of personnel on board ships, thus improving safety and reducing pollution in U. S. ports and waters through a reduction in accidents. The United States is also involved in such IMCO projects as drilling unit standards, crew and supply boat standards, bulk chemical carrier requirements and dynamically supported craft (hydrofoil, hovercraft, etc) standards, trying to upgrade the world fleet toward uniform, high standards. In most cases these high standards are already met by U. S. vessels. Uniform, high standards will increase the level of safety, aid in the

protection of the marine environment, and support the competitiveness of U. S. interests. No adverse environmental effects are anticipated as a result of this action.

It is therefore felt that a weakened IMCO would have undesirable impacts on these projects and that these impacts must receive serious consideration prior to any unilateral action.

6.4. OTHER FOREIGN RELATIONS

There are other areas of foreign relations outside the marine safety and marine environment protection areas in which unilateral action on the part of the U. S. could have an impact. The transportation ministries of many foreign governments regulate not only marine, but also land and air transportation. Unilateral action has the potential to be seen as a breach of good faith and is likely to affect other negotiations on a wide variety of issues in which the U. S. has strong interests. Other countries could retaliate against the U.S. for a unilateral ship construction and equipment standard by blocking the U. S. efforts in other international transportation forums. Thus, it is important to consider possible impacts of any unilateral actions on these diplomatic efforts.

6.5. EXTENDING OF JURISDICTIONS

Unilateral actions on tanker construction and equipment standards by the U. S. may impel other nations to extend their jurisdictional claims in a way that adversely affects U. S. interests.

7. ADDITIONAL MEASURES

This regulatory action is only a part of the overall Coast Guard effort to reduce operational and accidental pollution of this nation's territorial waters as well as the world's oceans. This total effort involves approval of vessel design and construction, maintenance of the completed vessel throughout its life and the qualification of the personnel who crew the vessel. This effort encompasses both ships and barges, domestic and foreign, which trade in the United States. In order to put this regulatory action into perspective, other specific actions that the Coast Guard is undertaking to accomplish this overall goal are outlined in this Chapter.

7.1 MARINE SAFETY INFORMATION SYSTEM

Marine Safety Information System (MSIS) - The Coast Guard has modified and enhanced the capabilities of the existing Port Safety Reporting System (PSRS) so that it meets the criteria established by the President for the U. S. Marine Safety Information System (MSIS). The purpose of the MSIS is to maintain records of vessel casualties, pollution incidents, violations of Federal safety and pollution prevention regulations, and names of vessel owners. Coast Guard Marine Safety Offices (MSO), Coast Guard Captains of the Port (COTP), and Marine Inspection Offices (MIO) have the capability to access a vessel's history and enter the results of boardings and inspections through fifty five remote terminals. Major coastal, inland river and Great Lakes ports in the continental U. S., Alaska, Hawaii and Puerto Rico are included in the MSIS.

In addition, each Coast Guard District Office has a computer terminal to access the MSIS to retrieve histories of responsible parties involved in repeated violations of federal pollution regulations. This information is considered by the district hearing officer in the civil penalty assessment process.

The Coast Guard has loaded the MSIS with historical information on tank vessel casualties and pollution incidents to complement the established violation history of vessels calling at U. S. ports. The MSIS is operational 24 hours a day to retrieve vessel histories and update vessel boarding and inspection information.

7.2. TANK BARGES

President Carter set forth "additional initiatives" to be undertaken by the Department of Transportation when he presented his March 17, 1977, message to Congress. These additional initiatives are studies, one of which is an evaluation of design construction and equipment standards for tank barges which carry oil. The Coast Guard completed

this evaluation and forwarded its report to the President in August 1978.

Pursuant to recommendations made in the study, the Coast Guard initiated a regulatory project and published in the Federal Register of June 14, 1979, a Notice of Proposed Rulemaking which would require double hull construction for new tank barges and an Advanced Notice of Proposal Rulemaking for existing barges for the purpose of receiving comments from all interested parties as to how the existing tank barge fleet can be regulated to prevent pollution due to hull damage and as to how best phase out single hull barges. These proposals cover barges that are not part of this regulatory action. See Table 10.

7.3. REVISION OF TANKERMAN REQUIREMENTS

The Coast Guard, in the Federal Register dated April 25, 1977, published a Notice of Proposed Rulemaking which proposed expanding certification requirements for the following:

a. Persons in charge of oil transfer operations.
b. Persons involved in the handling, transfer, and transportation of dangerous cargoes in bulk aboard ships and barges.

Tankerman certification is now required only for combustible or flammable products. The proposal included standards for dangerous liquids and compressed gases. These proposals would have included application to the following:

a. Tankships
b. Tank barges
c. Tank cleaning facilities
d. Cargo & Miscellaneous and Passenger Vessels
e. Bunkering operations
f. Uninspected vessels of 100 GT or more
g. Certain foreign flag vessels

After evaluating the large number of comments received on these proposed rules, and due to new requirements imposed by the Port and Tanker Safety Act of 1978 (Pub. L. 95-479), the proposed rules were withdrawn on April 30, 1979. A revised proposal will be published in the near future. The revised proposal will implement the additional requirements of the Port and Tanker Safety Act of 1978 and will also be consistent with standards in the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978.

7.4. LICENSING REQUIREMENTS FOR PILOTS

The present licensing regulations allow an applicant who presents service aboard vessels of relatively limited tonnage to be examined

for a pilot license or pilotage endorsement for vessels of "any gross tons". Service on vessels of limited tonnage, under today's conditions, is not considered to be fully adequate in qualifying personnel to pilot very large vessels whose size and maneuvering characteristics differ significantly from small vessels. Therefore, the Coast Guard is considering that certain tonnage limitations be placed on a license or an endorsement as first class pilot, which would more realistically reflect the applicant's experience, training and qualifications. More stringent qualifying requirements regarding recency of service for renewal of a license or a license endorsement is also being considered.

The Coast Guard is presently studying the feasibility of requiring shiphandling simulator training for those masters, mates and pilots who are serving on very large vessels whose size and maneuvering characteristics differ significantly from smaller vessels.

7.5. INTERNATIONAL CONFERENCE ON TRAINING AND CERTIFICATION OF SEAFARERS, 1978

President Carter, in a March 17, 1977, message to Congress, proposed a series of initiatives on tank vessel safety and pollution prevention which should be taken both nationally and internationally. The initiatives, broad in scope, recommended improvement of crew standards and training.

The improvement of crew standards and training was the subject of the International Conference on Training and Certification of Seafarers, 1978. Originally scheduled for the end of 1978, the Conference date was advanced to June-July at the request of the United States as part of this initiative on tank vessel safety and pollution prevention. The mission of the Conference was to work for a strong and effective Convention, capable of early ratification by all nations, so that it might come into force as early as possible.

At the Conference, seventy two nations agreed on the text of the world's first international convention establishing basic requirements on training, certification and watchkeeping for masters, officers and crews of "seagoing" merchant ships. This Convention does not apply to war ships, naval auxiliaries, or other government owned ships in governmental, non-commercial service, nor does it apply to fishing vessels or yachts.

The new treaty, the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, has the stated purpose: "to promote safety of life and property at sea and the protection of the marine environment." Given the assumption that human error, in some aspects, is a contributing factor in over 80 percent of maritime accidents, the improved training and qualification standards, when implemented, should better qualify personnel on board ships, thus improving both safety and pollution prevention.

7.6. FOREIGN TANK VESSEL EXAMINATION PROGRAM

On January 21, 1977, the U. S. Coast Guard, in response to conditions found by the SS SANSINENA Marine Board of Investigation, issued a Commandant's Notice to Marine Safety Offices and Marine Inspection Offices to immediately assign qualified marine inspectors to examine the cargo venting and handling systems of foreign flag tankships calling at U. S. ports. Subsequently, detailed guidelines were issued in amplification of the original order, detailing the goal of the program and outlining the scope and philosophy for conducting the examinations.

These guidelines require that each foreign flag tank vessel calling at U. S. ports shall be examined at least annually, with re-examinations conducted as necessary to ensure the correction of outstanding deficiencies. The scope of the examination ensures that each foreign flag tank vessel entering U. S. waters is in compliance with the general safety control provision of SOLAS '60, the applicable International Load Line Convention (1930 or 1966) and with all applicable U. S. regulations. Each full examination is conducted by at least two U. S. Coast Guard inspectors (normally, a qualified Marine Inspector and a qualified Dangerous Cargoman/Pollution Investigator).

Deficiencies which are required to be corrected (temporarily or permanently) while a tank vessel is in a U. S. port are those that pose an imminent threat to the safety of the port, crew, vessel or environment. Depending upon the nature of the deficiency, correction may be required prior to cargo transfer, or cargo transfer may be allowed to proceed with corrective action being required prior to the vessel's departure. The Officer in Charge, Marine Inspection (OCMI), indicates the date (month/year) by which a deficiency should be permanently corrected. In making this determination, every effort is made to consult with the master to ensure a reasonable and equitable time period is allotted. However, the maximum time period allowed for permanent correction of any deficiency may not exceed one year.

Deficiencies required to be permanently corrected prior to a tank vessel's re-entering a U. S. port are those that have been allotted a specific time period to affect permanent repairs. A vessel with a deficiency on record must be boarded at the first U. S. port of call after the expiration date for correction of that deficiency. Depending upon the nature of the deficiency, consideration is given to conducting this boarding at anchorage or at the sea buoy rather than at the transfer terminal. If permanent repairs have not been completed within the allotted time period, a re-evaluation of the temporary repair is made, and this could result in an extension of the time limit for permanently correcting the deficiency. Essentially, these are the same procedures that are observed for U. S. flag vessels given similar circumstances.

In the event an extension of the time period for permanent repair is not granted, the vessel will be denied entry or detained. The Ports and Waterways Safety Act, 33 USC 1221 et seq. (as amended by Section 2 of the Port and Tanker Safety Act of 1978, PTSA) provides authority to deny entry into the navigable waters of the U. S. to a tankship which is not in compliance with applicable provisions of the Tank Vessel Act, as amended, or regulations issued thereunder. The USCG Captain of the Port (COTP) has been delegated this authority by 33 CFR 160.37 (to be revised to reflect the new PTSA) and may exercise the authority when non-compliance constitutes a hazard to the environment or to the safety of the port. When a COTP determines that a vessel is not in compliance with applicable regulations, he will notify the Master or Agent that vessel entry into U. S. navigable waters is denied until the vessel complies with the applicable regulations. However, the COTP only uses this authority when he is satisfied that the vessel, if not in compliance, would constitute a hazard to the environment or to the safety of the port. In making such a determination, the COTP must fully weigh the possible result of denial of entry against the safety of the vessel's crew.

The Ports and Waterways Safety Act and 33 CFR 160.35 provide authority for the COTP to direct, control or restrict the movement of any vessel in the navigable waters of the U. S. for safety reasons. The Act also provides the authority for a COTP to order a vessel to depart U. S. waters when a hazardous condition results from non-compliance with applicable regulations. This authority provides the COTP with an effective tool to direct, control or restrict the movements of a foreign flag tank vessel when hazardous circumstances exist. The hazardous circumstance is always weighed against the welfare of the vessel's crew in exercising this authority.

In the twenty four months (January 1977 through December 1978) that the foreign tanker examination program has been in effect, 1,934 of 4,225 examinations on approximately 1,600 different vessels revealed no deficiencies, while the remaining 2,291 examinations resulted in the issuance of deficiency letters to the Masters of these foreign flag tankers. Since the commencement of this program, the Coast Guard has denied entry to eight tank vessels and has detained sixteen additional tank vessels under the control povisions of SOLAS 60.

7.7. MANEUVERING AND STOPPING

Another "additional initiative" to be undertaken by the Department of Transportation and U. S. Coast Guard is an evaluation of devices to improve maneuvering and stopping ability of large tankers, with research to include the use of a ship simulator. Work on this project to date has included the following:

a. Shallow water maneuverability trials, utilizing the SS ESSO OSAKA in the Gulf of Mexico.

b. Tug assisted maneuverability trials, utilizing the SS ARCO ANCHORAGE and the tug SEA SWIFT at Valdez, Alaska.

c. Observation and documentation of worldwide tug practices.

d. Simulation of tanker transits into Valdez, Alaska, and Puget Sound.

e. Tug-tanker maneuverability trials, utilizing the MSC tanker YUKON and tug TINA.

Much of this work is being done in cooperation with other agencies, such as the Martime Administration and U. S. Navy. The Coast Guard is to prepare a final report by September 1979.

7.8 VESSEL TRAFFIC SERVICES (VTS)

A VTS is an integrated system used to coordinate vessel movements in or approaching a U. S. port or waterway. A VTS includes all or some of the following components, depending on the needs of the port:

(a) Traffic separation schemes, where vessels traveling in the same direction remain within distinct lanes.

(b) Vessel Movement Reporting System (VMRS), wherein a vessel reports positional information to a shore-based center and the center advises that vessel of the position and intentions of the other vessels in the area in order to reduce the element of surprise and uncertainty.

(c) Surveillance systems, which use shore-based radar or television to monitor vessel movements.

(d) Computer for more efficient processing and display of information.

Major VTS's are presently installed in New Orleans, Houston-Galveston, San Francisco, Puget Sound, and Prince William Sound (Alaska). It is anticipated that a system will be operational in New York in the fall of 1980.

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REGULATORY ANALYSIS AND ENVIRONMENTAL IMPACT STATEMENT, REGULAT--ETC(U)
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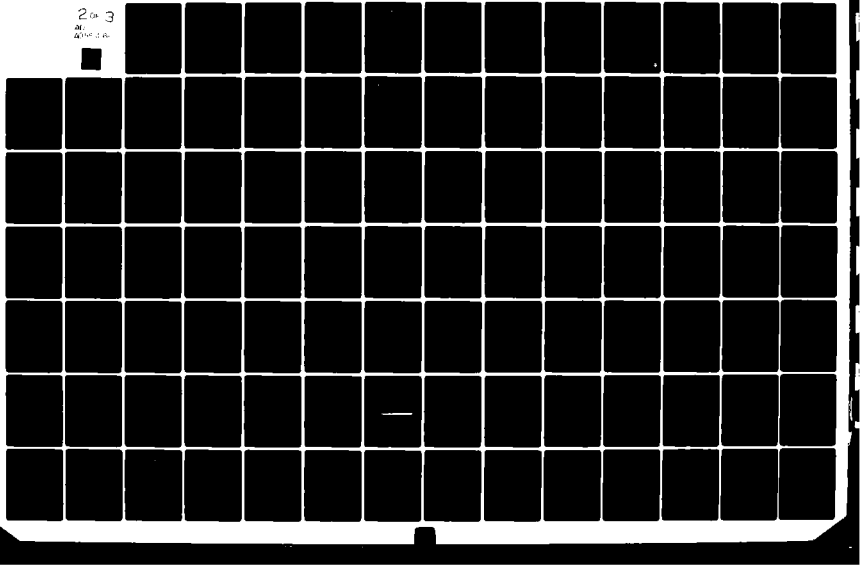

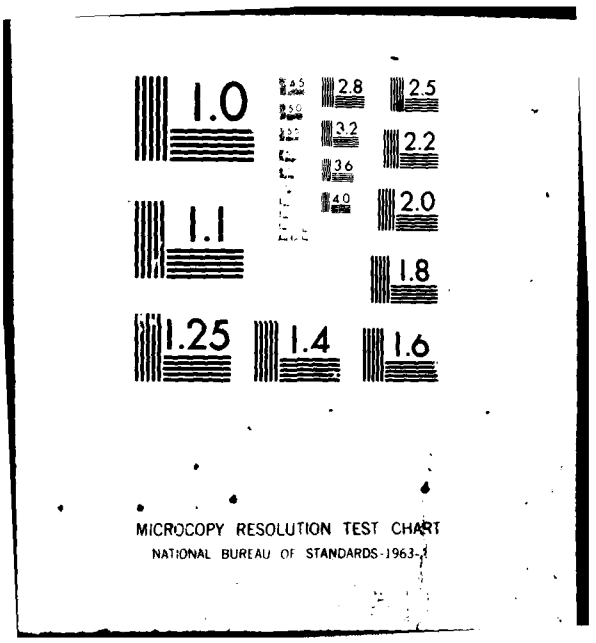
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8. PROBABLE ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

The overall effect of these regulations would be to reduce the amount of oil entering the oceans as indicated in Section 3. No adverse environmental effects are anticipated as a result of this action.

9. RELATIONSHIP BETWEEN LOCAL, SHORT-TERM USES OF MAN's ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY.

As the Coast Guard can best determine, these regulatory actions do not involve any trade-offs between short-term and long-term environmental gains and losses, nor does the regulatory action foreclose any future options.

10. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

No irreversible or irretrievable commitments of resources are involved in this regulatory action except for material and energy expended in retrofitting existing vessels and incorporating the additional features required for new vessels. While many materials, such as steel are recoverable other materials are not. The character of these materials are not unique nor will the quantities used be significant in terms of our national resources.

11. COMMENTS

11.1 Comments on the draft statement were requested from the agencies and groups listed below:

* Department of State
** Department of Treasury
* Department of Defense
** Department of the Interior
** Department of Commerce
** Department of Transportation
Department of Energy
** Environmental Protection Agency
Federal Maritime Commission
Sierra Club
Connecticut Citizens Action Group
** Center for Law and Social Policy (representing a number of enviromental groups)
* American Petroleum Institute
American Association of Port Authorities
* American Institute for Merchant Shipping
American Waterways Operators, Inc.
Shipbuilders Council of America
Environmental Policy Center
Coalition Against Oil Pollution
National Audubon Society

** indicates comments were received and are contained in this section if comments requiring discussion were made.

* indicates comments were received but pertained primarily to details in the proposed regulations and not the impacts of this regulatory action. These comments are discussed in the preamble to the final regulations.

In addition, correspondence on the draft statement were received from the following states or territories and are contained in this section if comments requiring discussion were made:

Alaska
Connecticut
Delaware
Florida
Georgia
Hawaii
Illinois
Louisiana
Maryland
Massachusetts
Mississippi
New Jersey
Oregon
Pennsylvania
Texas
Virginia
Virgin Islands
Washington

UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Science and Technology
Washington, D.C. 20230
(202) 377- 4335

April 9, 1979

Admiral Henry H. Bell
Chief, Office of Merchant Marine Safety
COMMANDANT (G-CMC/81)
(CGD 77-058, 6b, 77-057a, 77-063)
U.S. Coast Guard
Washington, D.C. 20590

Dear Admiral Bell:

This is in reference to your draft environmental impact statement entitled "Regulations to Implement the Results of the International Conference on Tanker Safety and Pollution." The enclosed comments from the National Oceanic and Atmospheric Administration and the Maritime Administration are forwarded for your consideration.

Thank you for giving us an opportunity to provide these comments, which we hope will be of assistance to you. We would appreciate receiving six (6) copies of the final statement.

Sincerely,

Sidney R. Galler
Deputy Assistant Secretary
for Environmental Affairs

Enclosures Memos from: Bud Ehler
Office of Coastal Zone Management
National Oceanic and Atmospheric Administration

George C. Steinman
Chief, Environmental Work Group
Office of Shipbuilding Costs
Maritime Administration

UNITED STATES DEPARTMENT OF COMMERCE
Maritime Administration
Washington, D.C. 20230

April 3, 1979

MEMORANDUM FOR: Dr. Sidney R. Galler
Deputy Assistant Secretary for Environmental Affairs
Department of Commerce

Subject: Draft Regulatory Analysis and Environmental Impact Statement - Regulations to Implement the Results of the International Conference on Tanker Safety and Pollution Prevention

In accordance with your request, the Maritime Administration has reviewed the subject draft regulatory analysis and environmental impact statement and submits the following comments for consideration.

1. Introduction, Section 1, page 1

Discussion:

The Introduction, among other things, describes the history of the proposed rulemaking, including the Notice of Proposed Rulemaking of May 16, 1977 and the Tanker Safety and Pollution Prevention (TSPP) Conference of 1978.

Comment:

The summary on page i includes, in addition to the statement that the proposed rulemaking reflects the results of the TSPP Conference, but also many of the tanker construction and equipment standards of Section 5 of the Port and Tanker Safety Act of 1978, P.L. 95-474. The Introduction should also reflect this fact. It also should be stated if there are any construction and design standards from P.L. 95-474 that are not included in the proposed rulemaking and the reason for this omission.

2. Background, Section 2.2, page 18

Discussion:

It is stated that the tanker equipment and construction provisions of the Port and Tanker Safety Act of 1978 parallel those contained in the proposed regulatory action.

Comment:

P.L. 95-474 does not exactly parallel the proposed rulemaking. The law requires that all product and crude carriers 20,000 DWT and above, but below 40,000 DWT retrofit segregated ballast or dedicated clean ballast, or segregated ballast or crude oil washing, respectively, not later than January 1, 1986, if fifteen years old, or on the date it reaches 15 years of age, whichever is later.

3. Procedures for Assessing Economic Impacts, Section 3.1, page 35

Discussion:

This section outlines the procedures used for assessing the economic impacts of the proposed regulations.

Comment:

No reference appears in the section as to what year dollars are being used in the cost/benefit calculations. The base year should be identified. If costs of ship modifications are expressed in dollars for any other year other than the cost data base year, the factor used to account for inflation should be given.

4. Baseline Outflow Calculations, Attachment 1, page A-13

Discussion:

The source for the "$^{12}/_{21}$" factor assumed for shipyard entry outflows has not been identified.

Comment:

The basis for the shipyard entry outflow factor should be stated in Appendix A.

5. Baseline Outflow Calculations, Attachment 1, page A-13

Discussion:

Page A-12, Section 1.1.F gives a factor for "clingage taken out of tank upon pumping out of oily ballast" for Crude Oil Ballasting Outflow calculations.

Comment:

Some factor for pumping out of oily ballast for black products should also be included in the baseline outflow calculations.

6. Typographical Errors

The clinage factor in Section 2.1.1b should be given as .004. The factor for tanks ballasted in Section 2.1.2 should be given as 0.2.

GEORGE C. STEINMAN
Chief, Environmental Activities Group
Office of Shipbuilding Costs

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Rockville, Maryland 20852
Office of Coastal Zone Management
Washington, D.C. 20235

CZ4:BE

DATE: April 4, 1979

TO: PP - Richard L. Lehman

FROM: CZ4 - Bud Ehler CE.

SUBJECT: DEIS 7902.23 - Regulations to Implement the Results of the International Conference on Tanker Safety and Pollution

I. DRAFT ENVIRONMENTAL IMPACT STATEMENT

2.1.2 Oil Outflows

The first paragraph of this section refers to the report published by the National Academy of Sciences entitled, Petroleum in the Marine Environment. The National Oceanic and Atmospheric Administration (NOAA) supports a revision of this report. This recommendation is also found in the Report of the Study of Tanker Safety and Pollution Prevention Requirements for U.S. Tankers in Domestic Trade compiled in June 1978 by an interagency task force. The recommendation states:

> "The [domestic trade] study indicates considerable additional information on oil inputs fates, and effects and measuring economic impacts of oil pollution has been developed since the 1975 Report by the National Academy of Sciences. A review and update of the NAS assessment should be conducted since it is very difficult for an individual or even a whole agency to assemble, digest, and put into perspective all this information in a way that is useful in making policy decisions."

2.4.7 Second Radar and Collision Avoidance Aids

The regulations omit the second radar provision of the TSPP Protocol of 1978 Relating to the International Convention Convention for the Safety of Life at Sea, 1974 (SOLAS). Is there a particular reason why the Coast Guard postponed implementation of this provision until June 1, 1979?

It is NOAA's understanding that the proposed regulations do not represent a final rulemaking on all aspects of tanker safety. For

instance, details governing the Collision Avoidance Systems will be developed during the summer of 1979, when the signatories of IMCO reconvene and focus on an agreed set of specifications to govern this modification. Presumably other issues may arise and NOAA would appreciate being apprised of any further activity in this area as it becomes available.

4. Alternatives to the Proposed Action and Their Impacts

The alternative of direct economic incentives was not explored in the DEIS. Some consideration should be given to the feasibility and likely impacts of systems of effluent charges (taxes) and/or fees and penalties in reducing oil outflows from tankers.

II. REGULATIONS - General Comments

The economic impact analysis states that a very few new tankers will be constructed between now and 1985. Tanker construction beyond 1985 is presently unknown. For these reasons a zero cost for new tanker construction is assumed.

Because tankers have a relatively short operating life, on the order of twenty years, and because oil transport on the high seas is expected to continue for at least forty years, it is not reasonable to assume a zero cost impact on new vessel construction from SBT, COW, and/or CBT. The economic impact section should either (1) be revised to reflect best estimates of new vessel construction (perhaps through a survey of shipyards) or (2) be modified to indicate clearly the bias imparted to the cost estimates from this assumption of no new construction.

cc: S. Bleicher
R. Kifer

Comment - Sections 1 and 2

The introduction should reflect the fact that the proposed rulemaking contains many of the tanker construction and equipment standards of Section 5 of the Port and Tanker Safety Act of 1978. Additionally, it should be stated which design and equipment standards contained in the Act are not included.

Response

The fact that many of the standards of the Port and Tanker Safety Act were incorporated in this rulemaking action is indicated at the beginning of Section 2. Wording has been added to indicate which portions of the Act will be separate regulatory actions. Most of the analysis for this project was completed prior to the passage of the Act. The decision was made not to incorporate the additional standards of the Port and Tanker Safety Act to avoid delays in imlementing the TSPP standards. Also the additional standards of the Port and Tanker Safety Act have a longer time frame than the TSPP new vessel criteria.

Comment - Section 3.1, Appendix B

The base year dollar being used in the cost/benefit analysis should be specfied along with factors used to convert cost data from other years to the base year.

Response

The base year of 1978 was specified in Appendix B. This information has been added to Section 3.1

Comment - Appendix A

The source for the "12/21" factor assumed for shipyard entry outflows should be identified.

Response

Wording has been added to the assumption sections in Attachment 1 to Appendix A indicating that the "12/21" factor is the frequency factor for cleaning tanks for shipyard entry.

Comment - Appendix A

The black product ballasting oil outflow calculation should use the same criteria as the crude oil ballasting outflow calculation.

Response

The Coast Guard agrees with the comment. The assumptions and calculations for black oil ballasting outflow have been reworded to better reflect the actual use of departure ballast and arrival ballast, using the same assumption contained in the crude oil ballasting outflow calculation. This change has negligible effect on the calculated results since approximately 20% of the clingage of all tanks would be considered outflow in either case.

Comment - Section 2.1.2

The National Academy of Sciences report Petroleum in the Marine Environment dated 1975 should be revised and updated.

Response

The Coast Guard agrees. Plans for the ulpdate of this material is presently underway.

Comment - Second Radar

This Regulatory action does not include the second radar provisions of TSPP. Why were implementation provisions of second radar postponed until June 1, 1979?

Response

This regulatory action does not include rules requiring second radars since final rules on this subject were published on July 24, 1978. Additional refinements of the second radar requirements were published in the May 7, 1979, Federal Register. As indicated in the July 24, 1978, Federal Register, the June 1, 1979, effective date is in accordance with international commitments made at the Tanker Safety and Pollution Prevention Conference.

Comment - Direct Economic Incentatives

The alternative of direct economic incentives, such as taxes or fees on oil outflows, should be considered.

Response

A new section 4.12 has been added which discusses the alternative of direct economic incentives.

Comment - Appendix B

The economic impact should be revised to reflect best estimates of new vessel construction or be modified to indicate the bias imported by the assumption of no new construction.

Response

The estimates of future new ship construction vary widely in the sizes and numbers to be built. The reason for this wide range of estimates is that they depend a great deal on the governmental policies of many nations. Small changes in consumption and/or production of oil would have a significant impact on the need for new tankers. Laws putting age limits on existing vessels, as well as other actions of this type, could result in major shipbuilding programs. Additionally there is the problem of estimating whether a owner's preference is to retrofit or build new. Considering the uncertainty involved in such predictions, it is felt that the most reasonable course of action is to indicate the incremental costs of this regulatory action for various sized new vessels.

Form DOT F 1320.1 (1-67)

UNITED STATES GOVERNMENT

Memorandum

DEPARTMENT OF TRANSPORTATION
OFFICE OF THE SECRETARY

DATE: MAR 29 1979

In reply refer to:

SUBJECT: Draft Regulatory Analysis and Environmental Impact Statement for Regulations to Implement the Results of the International Conference on Tanker Safety and Pollution Prevention

FROM: Director, Office of Environment and Safety

TO: Chief, Marine Environmental Protection Division, G-WEP-7/73

This office has reviewed the subject draft environmental impact statement. We have previously reviewed the preliminary EIS and commented on that document (copy attached). It appears that some of those comments have not yet been addressed, and should be responded to in the final statement.

We appreciate the opportunity to review this document and look forward to reviewing the final EIS.

Martin Convisser

Attachment

DEC 8 1978

Preliminary Draft Regulatory Analysis and Environmental Impact Statement: Regulations to Implement the Results of the International Conference on Tanker Safety and Pollution Prevention

Director, Office of Environment and Safety

Chief, Marine Systems Evaluation Branch, G-MTT-1/82

This office has reviewed the preliminary draft environmental impact statement. We recognize that the net effect of this action will be needed environmental improvement and have no comments regarding the environmental aspects. However, we are providing the following comments on various other aspects of the statement in order to assist you in preparing a final document.

It would be useful to know the relationship of the present proposed action to the Port and Tanker Safety Act of 1978. If actions discussed in this legislation will require further rule making, a brief explanation of what may be expected would be desirable.

Certain terms used in the EIS are not clear in their applicability to the actions. In this context, 10,000 GRT should be related to 20,000 DWT. Black products and white products might be defined in terms of their different procedural requirements. A brief definition of wing tanks (p. 57) might explain why these would provide protection in certain circumstances. Charts would be more readable if scientific notation were deleted and replaced by normal number terms (million, etc.)

It is important that the public be provided with a general picture of any economic or other costs of the action in terms that can be interpreted into the frames of reference of the interested lay or industry reader. Since our expertise does not extend into the economic areas, comments dealing with economic issues are general and intended only as a guide to types issues that seem pertinent to the action. Some of these include:

Secondary impacts of the action should be discussed These may be largely economic in nature. Will the regulations cause increased activity in the ship building and maintenance sectors of the economy? Where is this likely to be located geographically? Will certain types of shipping interests be severely hurt financially? Will the U.S. shipping interests fare differently from foreign concerns? Are there likely to be broad shifts in vessel size or type as a result of the action. Could there be a shortage of vessels eligible to call at U.S. ports at any period of time?

Some of the cost figures would be more meaningful if they were related in some way to the total costs of vessels. This could be done in terms of percentages, ranges, or even examples typical of categories of vessels. If these figures differ greatly from country to country (i.e. if U.S. costs were higher) this should be pointed out.

Certain terms and concepts in the economic sections would benefit from more refinement. Since capital construction costs (p. 34 and throughout) apparently do not include opportunity costs it might be more precise to call these initial capital construction costs. In some instances (p. 39 1st full sentence) it is not clear which category of costs are being discussed. On page 40 and 45 the term "economic costs" is used without apparent definition. The figures relating costs per vessel seem particularly understandable. It would be useful to include these wherever they are available. Are maintenance, administration and operating costs included in any of these figures?

cc:Chron;Subj;Harbaugh
CHARBAUGH:mch:12-7-76

Original signed by
Joseph Canny

Martin Convisser

Comment - Section 2

The relationship of the proposed regulatory action and the Port and Tanker Safety Act should be more clearly defined.

Response

A new paragraph has been added to Section 2 indicating the parts of the Act that will require separate regulatory actions.

Comment - Section 2

Certain terms in the draft statement should be more fully explained. These include the relationship between GRT and DWT, wing tanks and black and white products. Additionally, the use of scientific notation should be deleted and replaced by words.

Response

The indicated terminology has been more full explained and the scientific notation clarified.

Comment - Secondary Impacts

The secondary impacts of the regulatory action should be discussed.

Response

Section 3.4 has been added to discuss secondary impacts.

Comment - Appendix B

The cost figures should be related to the total costs of the vessels.

Response

Section 2.2.9 and Tables B-3 and B-4 have been added to Appendix B. This section discusses the relative cost estimates of various pollution prevention measures compared to the cost of new vessels, both foreign flag and U. S. flag, and to the salvage value of various sized vessels.

Comment - Appendix B

The question was asked if administrative and operating costs are included in the cost figures?

Response

Section 2.2.10 has been added to Appendix B. This Section discusses the incremental operating costs associated with CBT or SBT options.

Comment - Appendix B

Will the U. S. shipping interests fare differently than foreign concerns?

Response

Both U. S. flag vessels and foreign flag vessels trading in U. S. ports will be required to meet the various equipment and design standards. The differences in costs to retrofit U. S. flag and foreign flag vessels is documented in Appendix B.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

13 APR 1979

OFFICE OF THE ADMINISTRATOR

Executive Secretary
Marine Safety Council
U.S. Coast Guard (G-CMC/81)
(CGD77-057a, 058 & 063)
Washington, D.C. 20590

Dear Sir:

The U.S. Environmental Protection Agency has reviewed the Draft Regulatory Analysis and environmental impact statement (EIS), "Regulation to Implement the Results of the International Conference on Tanker Safety and Pollution Prevention" dated February 12, 1979, and the associated proposed rules "Tank vessels of 10,000 gross tons or more and tank vessels of 20,000 DWT or more carrying oil in bulk", (33 CFR Parts 154 and 164) and (46 CFR Parts 30, 32, and 34) as published in the Federal Register, February 12, 1979, Vol. 44, No. 30.

We have rated the EIS as Environmental Reservations, Insufficient Information (ER-2) due to possible air emissions in and around U.S. port areas associated with:

- Crude oil washing
- Purging and gas inerting

Our detailed comments are submitted as enclosure (1) and explain the specifics of our concerns. We also tender suggestions to clarify and strengthen this EIS and proposed regulation.

Thank you for the opportunity to comment on this EIS and the proposed regulation.

Sincerely yours,

William N. Hedeman, Jr.
Director
Office of Environmental Review (A-104)

Enclosure

ENVIRONMENTAL PROTECTION AGENCY'S
SPECIFIC COMMENTS ON THE COAST GUARD'S
DRAFT REGULATORY ANALYSIS AND ENVIRONMENTAL IMPACT STATEMENT
"REGULATION TO IMPLEMENT THE RESULTS OF THE INTERNATIONAL CONFERENCE ON TANKER SAFETY AND POLLUTION PREVENTION" AND THE ASSOCIATED PROPOSED RULES "TANKER VESSELS OF 10,000 GROSS TONS OR MORE AND TANK VESSELS OF 20,000 DWT OR MORE CARRYING OIL IN BULK"

Air - EPA is concerned over any action that will affect hydrocarbon emissions in areas of the country where ozone levels exceed the national ambient air quality standard of 0.12 part per million. The ozone standard has been set at a level deemed necessary to protect public health (see Enclosure 2). The hydrocarbon vapors present in the cargo tanks of vessels carrying crude oil are precursors to ozone formation and most imported crude is delivered in areas of the country that are exceeding the ozone standard (See Enclosure 3). We encourage the ultimate discharge of hydrocarbon vapors beyond the point where they could have an impact on land.

1. It is not clear how the proposed Coast Guard regulations will affect hydrocarbon emissions in or near ports. The issue is treated very superficially in the proposed regulations and in the "Draft Regulatory Analysis and Environmental Impact Statement," dated February 1979. The proposed regulations are likely to significantly increase the use of crude oil to wash the tank vessel cargo tanks. As a result, the hydrocarbons content of the cargo tank vapors will increase, thus increasing emissions from pressure relief, gas freeing, purging, ballasting, loading and lightering. On the other hand, the proposed regulation requires that tank vessels be equipped to vent vapors from tanks being ballasted to tanks that are discharging crude oil. If this provision means that emissions from ballasting operations in port would be eliminated, the Coast Guard proposal may lead to an overall reduction in emissions from current levels. There is a need to clearly understand how the Coast Guard regulations will affect ballasting emissions as they are generally the most significant single source of emissions from tank vessel operations in U.S. ports.

2. Similarily, it is not clear how the inert gas provisions (44 FR 9039) will be implemented and enforced. We are concerned over emissions that may result from purging in port in order to inert the cargo tanks. It is our understanding that purging would most likely occur in conjunction with opening hatches to visually check crude oil levels during transfer operations and from routine inspections.

Water - 1. The Annex to Resolution 14(Section 3.1(d)) states that while wing tanks (for CBT) are preferable, center tanks are acceptable if they are better with regard to tank volume and piping arrangements. The Coast Guard interpretation does not demonstrate a preference. The discussions during October 1977 session of MSC/MEPC indicated a definite preference for side tanks, to the point of originally prohibiting center tanks (see MSC/MEPC/W.P.6). This preference should be more clearly stated in the Coast Guard regulations (40 FR 8992).

2. EIS page ii concerning SBT, CBT, and COW will not only reduce the volume of oily mixtures that must be treated ashore, but will also reduce the quantities of oily water that is discharged at sea.

3. The tables on pages 8-9 of the EIS, showing oil inputs from tankers within 50 miles of the U.S. shores do not reflect the magnitude of the pollution problem caused by tanker accidents. This results from showing only information in PIRS which have been indentified by vessel, and occurring within 50 miles of the U.S. While this is pertinent, the analysis should increase the data base by including information such as reported by Card, Ponce and Snider in their analysis of worldwide accidents from 1969-1973.

General - A. Proposed Rules:

1. In the discussion regarding the withdrawl of the May 1977 proposed rules, (44 FR 8985), the statement is made that the standards adopted by the Conference are at least equivalent to the Presidential Initiatives. This statement needs to be qualified since we did not in all cases achieve the tonnage limits proposed, nor has the equivalency of protective location of segregated ballast and double bottoms been completely accepted.

B. Draft EIS:

We have a few suggestions with regard to improvements which could be made in the presentation and analysis of information for the Final environmental impact statement (EIS).

1. The FEIS should state clearly that Coast Guard's plans for requiring tank vessels to be equipped with computer assisted collision avoidance radar. The DEIS discussion of this safety feature is somewhat confusing.

2. The Economic impact estimates for the various structural and operational safety features should be given in relative terms, as well as in absolute terms. For example, at page 40, the DEIS indicates that requiring the installation of protectively located segregated ballast tanks would add $1.5 million to $15 million to the cost of a new tank vessel. This paragraph should also indicate what percentage of the total cost of the tanker this would be (MARADS July 1977 Tanker Pollution Abatement Report should assist you in this matter).

3. Similarly, Page 41 estimates the dollar costs of replacing cargo capacity that has been "used up" by dedicated clean ballast tanks but does not tell the reader how significant these costs are when compared to the total cost/value of the affected tank vessels. It should address that question and, based upon the data in Appendix B, indicate what percentage of the available cargo capacity would need to be "replaced."

4. The economic analysis would also be more useful if it:

(a) Compared the costs of these measures with the costs of controlling and cleaning up oil spills totaling 49,000 metric tons per year (this would require that the capital costs be annualized).

(b) Briefly discuss the kinds of tax incentives and public sector subsidies available to the investors in general and the maritime industry in particular that would, in fact, reduce the cost to the industry of these requirements.

5. Finally, Appendix B, in order to support the relative cost comparisons recommended here, should contain a discussion of the construction costs for tank vessels in the U.S. and in foreign countries. This discussion should include a table or tables which shows the range of costs by deadweight ton capacity class.

Comment - Hydrocarbon Emissions

It is not clear how the proposed regulation would affect hydrocarbon emissions. The impacts of the regulatory action on hydrocarbon emissions should be included.

Response

Section 2.4.5 has been modified and a new Section 3.3.4.5 has been added to further describe the equipment and designs that are being required. Procedures to reduce air emissions are required. The ports where these procedures must be utilized will be established by the Environmental Protection Agency since that agency is charged with administering the quality of air in the United States by the Clean Air Act as amended (42 USC Sections 7401 - 7642). The provisions for state and local responsibility for clean air are contained in the Act.

Comment - Hydrocarbon Emissions

Concern was expressed that hydrocarbon emissions may result from purging in port in order to inert the cargo tanks. Also concern was indicated over the emissions that would occur during the checking of the oil levels.

Response

Tank purging is not an operation that is normally carried out in port. It is not necessary to purge a cargo tank prior to inerting. As the cargo is removed from the tank the inert gas takes its place. This is further explained in Section 2.4.4. It is a fact that some hydrocarbon vapors will be emitted while ullages are taken, however with an IGS the cargo is discharged with tank covers and ullage openings closed while most vessels that do not have an IGS system leave these openings open during cargo discharge operations thus the hydrocarbons emitted during discharge operations when an IGS is being used will be less than if an IGS was not being used. See Section 4.7.2.3 for a more detailed discussion.

Comment - Regulations

The regulations do not state a preference for wing ballast tanks when the CBT option is utilized.

Response

The regulations have been reworded to clearly indicate that wing tanks are preferred by requiring the Commandant's approval prior to the use of center tanks for ballast.

Comment - Regulations

The preamble of the Proposed Regulations state that the standards adopted by the Conference are equivalent to the Presidential Initiatives. This statement should be qualified since we did not, in all cases, achieve the tonnage limits proposed, nor has the equivalency of protective location of segregated ballast and double bottoms been completely accepted.

Response

Although the minimum DWT limits of these regulations are, in some instances, higher than those recommended in the Presidential Initiatives, our estimates show that the addition of the COW and CBT alternatives at the higher DWT limits of these regulations result in approximately the same reduction of operational oil outflows as would the SBT requirements on tank vessels of the sizes recommended by the Presidential Initiatives. The comparison of the effectivenesses of double bottoms and PL/SBT is extremely difficult due to the uncertainties in accidential oil pollution statistics involving tanker casualties. This problem is more fully discussed in Section 4.2.2.2. Thus it is felt that this regulatory action is basically equivalent to the Presidential Initiatives.

Comment - Summary

The regulatory action would reduce the volume of oil mixtures that are discharged into the sea as well as those that must be treated ashore.

Response

The wording has been changed to reflect the comment.

Comment - Section 2.1.2.1

The tables show accidental oil outflows from tankers within 50 miles of the U. S. shore and do not reflect the magnitude of the world pollution problem caused by tanker accidents. Information on the world pollution should be included.

Response

New Table 6A has been added to give an indication of world-wide accidental oil pollution. The world accidental pollution statistics in Table 6A are taken from the March 1979 Newsletter published by Tanker Advisory Center, Inc. The Coast Guard is presently updating

its world-wide accidental data and will publish the information in a form similar to that in the paper "Tankship Accidents and Resulting Oil Outflows, 1969-1973," by Card, Ponce, and Snider.

Comment - Collision Avoidance Aids

The discussion of collision avoidance aids should be clarified with the Coast Guard intentions stated.

Response

Section 2.4.7 has been rewritten to discuss the purposes of collision avoidance aids and to indicate the Coast Guard's future plans.

Comment - Appendix B

The cost of various construction and equipment standards should be given in relative terms as well as in absolute terms.

Response

Section 2.2.9 has been added to Appendix B. This section discusses the relative cost estimates of various pollution prevention measures on the basis of new foreign and U. S. flag vessels as well as relative to the salvage value of various sized vessels.

Comment - Appendix B

The amount of cargo capacity lost due to dedicated clean ballast tanks should be specified. The cost of dedicated clean ballast when compared to the total value of the affected vessels should be indicated.

Response

Sections 3.3.1.4 and 3.3.3.4 have been modified to indicate aggregate capacity lost. New Section 2.2.9 of Appendix B discusses the cost of various options relative to the value of the vessels.

Comment - Appendix B

Compare the costs of the regulatory action with the costs to control and clean up oil spills of 49,000 metric tons per year.

Response

It should be pointed out that the estimated 49,000 metric tons per year that this proposed action would save are operational outflows as described in Section 2.1.2.2. These outflows are part of the daily operation of tankers. They usually occur at sea and thus are almost never cleaned up. Accidental oil spills of either the transport or transfer nature often occur near shore with cleanup attempted. Information has been added to Section 2.1.2.1 regarding costs of accidental oil spill cleanup attempts.

Comment - Appendix B

The tax incentives and public sector subsidies that would reduce the cost of these requirements to the industry should be discussed.

Response

It is felt that it is outside the scope of this action to go into a lengthy discussion of the tax incentives, loan guarantees and public subsidies that are available in the various shipbuilding and ship operating countries. A rough analysis of the effect of these programs on U. S. flag vessels indicates that the 162 million dollar capital investment by U. S. owners would be reduced by about 28 million dollars because of tax subsidies and investment tax credits. The specific breakdown of the various programs are indicated below.

U. S. flag vessels that engage in domestic trade are not eligible for the Construction Differential Subsidy administered by the Maritime Administration. Only those vessels engaged in foreign trade, about 20 tank vessels, are eligible for construction subsidies which can cover up to 50% of the retrofit costs. The value of this program to owners of these vessels is estimated to be about 21 million dollars.

The investment tax credit, available to all U. S. industry, provides a tax credit of 10% of the capital investment. The actual value of this tax credit would depend on the owners profit situation. The maximum value of this tax credit to the industry in reducing the cost of these pollution prevention measures would be about 7 million dollars.

Comment - Appendix B

A discussion of the relative costs of vessel construction in the U. S. and foreign countries should be discussed.

Response

A discussion of the relative costs of vessel construction in the U. S. and foreign countries has been added in secton 2.2.9 of Appendix B.

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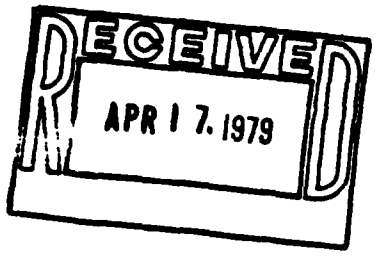
LAW
AND
SOCIAL
POLICY

1751 N STREET N W WASHINGTON D C 20036 202 872-0670



Commandant
(G-CMC/81)(CGD 77-058(b); CGD 77-063)
U.S. Coast Guard
Room 8117
Department of Transportation
Nassif Building, 400 7th Street, S.W.
Washington, D.C. 20590

Re: Proposed Rules for Tank Vessels of 10,000 Gross Tons or More and Tank Vessels of 20,000 DWT or More Carrying Oil in Bulk (CGD 77-058b and CGD 77-063)

Dear Admiral Hayes:

We are submitting these comments on behalf of 15 environmental organizations -- Natural Resources Defense Council, Sierra Club, Friends of the Earth, Environmental Defense Fund, Wilderness Society, National Parks and Conservation Association, Clean Water Action Project, American Littoral Society, Oceanic Society, Environmental Policy Center, Defenders of Wildlife, Fund for Animals, World Wildlife Fund, Animal Welfare Institute, and National Wildlife Federation (hereinafter collectively referred to as "the environmental organizations")[1/] -- in response to 44 Fed. Reg. 8984 et seq. (February 12, 1979), regarding new proposed rules for oil tanker construction and equipment and new proposed steering gear standards.

For over six years, the Center for Law and Social Policy has been deeply involved in the effort to control oil pollution from tank vessels on behalf of many of the above-listed organizations. We have testified frequently in a variety of fora.

1/ Attached as Appendix A is a description of these organizations.

Center attorneys were among the U.S. delegates to both the 1973 Marine Pollution Convention and the 1978 International Maritime Consultative Organization (IMCO) Conference on Tanker Safety and Pollution Prevention (TSPP). At every occasion we have stressed the need for a comprehensive systems approach to the regulation of oil tanker design, equipment and operations in order to reduce both accidental and operational marine oil pollution.

We submit that the proposed rules, allegedly meant to implement the 1978 Port and Tanker Safety Act (PTSA), do not adequately deal with the problem posed to the marine environment by oil tankers. Specifically, as set out more fully below, the environmental organizations urge that the Coast Guard require:

1. Stricter standards than are provided in the 1978 IMCO Protocol for all U.S. domestic fleet vessels. New tankers over 20,000 DWT should be built with segregated ballast tanks, double bottoms, and fully redundant steering gear; all existing tankers over 20,000 DWT should be required to retrofit segregated ballast capacity by 1981;

2. Stricter standards than are provided in the 1978 IMCO Protocol for international fleet vessels calling at U.S. ports, including segregated ballast tanks on all new tankers over 20,000 dwt, both product and crude carriers, dedicated clean ballast tanks on all existing tankers over 20,000 dwt, with retrofit of segregated ballast capacity on existing tankers over 20,000 dwt by 1981;

3. Equipment to improve maneuverability and stopping capacity and to provide a sophisticated, computer-assisted collision [illegible] capacity for all new and existing tank vessels calling at U.S. ports; and

4. Stringent and comprehensive personnel qualification and manning requirements for all tank vessels which seek to operate in the navigable waters of the United States, including use of simulation training.

I. The Problem

The world population remains unable to curb its appetite for petroleum and petroleum products. Since most of the world's oil supply derives from one part of the globe and is consumed in another, accelerating world consumption of oil has been accompanied by an increase in tank vessel transportation. In 1977, the total world production of oil was approximately three billion metric tons.[2/] Of this, sixty-six percent -- or approximately two billion metric tons -- were distributed by marine transportation.[3/] There is no reason to believe that this trend will be soon reversed.

With greater volumes of crude and product petroleum shipped among nations, the probability of operational and accidental oil outflows into the marine environment has proportionately increased. Presently, routine operational discharges are estimated to account for anywhere from one to 3.6 million metric tons of oil lost annually to the marine

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2/ J.C. McCaslin, International Petroleum Encyclopedia, 1978 Edition, Tulsa, Oklahoma.

3/ World Shipping Statistics, 1977, Research Division, H.P. Drewry Ltd., London, England.

environment;[4] non-catastrophic tanker casualties add more than two hundred thousand additional tons of oil each year.[5] From 1973 to 1978, data collected from Lloyd's List show a 300% increase in tons of oil spilled due to tanker accidents. In that same period, the number of tons of oil spilled per tanker year rose from 23 to 63. Moreover, tanker operations tend to lead to a concentration of oil discharges in specific areas, because

-- tankers essentially follow set routes between originating and discharge ports, such that cleaning and ballasting operations, dictated by time and distance will basically occur at approximately the same geographical location within the voyage;

-- most accidents occur within the continental shelf and are most prevalent in the vicinity of congested sealanes and port or harbor areas. These spills are highly concentrated and thus more lethal in effect; and

-- spills occasioned by terminal operations, loading or unloading, are fixed in location and continuous.[6]

Tragically, oil pollution tends to be most concentrated in the coastal and estuarine areas of greatest ecological vulnerability. It has been estimated that 80% of spills occur within ten miles off shore.[7]

4/ Oil Transportation by Tankers: An Analysis of Marine Pollution and Safety Measures, Office of Technology Assessment, U.S. Congress (1975); Hearings before the House Committee on Government Operations, 95th Cong. 2nd Sess., July, 1978, (Statement of William O. Gray, Exxon Corp.); March, 1979 Newsletter, Tanker Advisory Center, Inc., New York, N.Y.

5/ The Tanker Advisory Center, Inc. estimates that 260,000 tons of oil were lost through casualties in 1978. Non-catastrophic casualty figures do not include major disasters, such as the Amoco Cadiz and Torrey Canyon which spilled 225,000 and 120,000 tons of oil, respectively.

6/ A Systematic Process for Evaluation Measures which Minimize Oil Tanker Outflows by Joseph Porricelli and Virgil Keith, ECO, Inc., Annapolis, MD (1978), pp. 16-17.

7/ Hardy, Definition and Forms of Marine Pollution, in 3 NEW DIRECTIONS IN THE LAW OF THE SEA 73 (S. Lay ed. 1973).

The pollution damage threat to ocean ecosystems and surroundings is serious and substantial. The environmental deterioration caused by oil spills has in many cases been documented, and specific spills have been studied to document significant pollution damage. Environmental damage has included fish kills, bird kills, other biological losses, and damage to beaches and other coastal areas.[8/] Moreover, we know far too little about the long-term effect of oil in the seas. Algae, plankton and intertidal organisms not killed immediately by the presence of oil may absorb oil, introducing toxins into the fish that feed upon them and throughout the food chain. Some studies have suggested that this process may have mutagenic effects.[9/]

Finally, economic losses to fishing, recreational, and aquaculture industries as a result of oil pollution are great and increasing yearly.

In the face of these known and unknown costs of introducing oil into the marine environment, the environmental organizations have consistently urged that the most stringent practicable measures be adopted on every front -- internationally, Congressionally, and administratively -- to minimize the occurrence of both operational and accidental oil discharges.

8/ Petroleum in the Marine Environment, National Academy of Sciences, 197

9/ Blumer, Oil Pollution of the Ocean, in Oil on the Sea 5 (D. Hoult ed. 1969); Payne, Maloney, Rahimtula, Are Petroleum Hydrocarbons an Important Source of Mutagens in the Marine Environment? Proceedings of 1969 Oil Spill Conference, Environmental Protection Agency, American Petroleum Institute, U.S. Coast Guard.

II. Historical Perspective

The disastrous winter of 1976-1977 underscored the need for government action to regulate tankers in our waters. On December 15, 1976, the grounding of the SS Argo Merchant released twenty-three thousand tons -- seven million gallons -- of fuel oil southeast of Nantucket Island. Two days later, the SS Sansinena exploded while moored in Los Angeles harbor. On December 27 of that same year, the Olympic Games grounded in the Delaware River, releasing some 424 tons of crude oil over a 22-mile stretch of the Delaware and connecting wetlands. The Coast Guard has described nine other major tanker casualties that occurred in or near US waters that winter.[10/]

As a result of these casualties and the focusing of public attention on the problem, President Carter on March 17, 1977 announced to Congress a comprehensive series of actions to control oil pollution fr tankers. In a proposed rule-making of May 16, 1977(42 FR 24868), the Coas Guard prepared to implement those suggestions. They included much of what the environmental organizations had been urging for years, including the following construction and equipment standards for tankers over 20,000 dead weight tons (DWT):

- double bottoms on all new tankers
- segregated ballast tanks on all new and existing tankers
- inert gas systems on all new and existing tankers
- backup radar and sophisticated collision avoidance equipment on all new and existing tankers
- improved emergency steering standards for all new and existing tankers.

10/ Department of Transportation, U.S. Coast Guard, Draft Regulatory Analysis and Environmental Impact Statement (hereinafter draft EIS), February, 1979, at 15-17.

Unfortunately, these proposed rules never became final. While the Coast Guard obtained virtually everything that the IMCO TSPP Conference last February was prepared to give regarding existing vessels, the U.S. nonetheless returned with far less than unilateral action consistent with the President's initiatives would have achieved. The Coast Guard's new rule-making is identical to the IMCO standards in almost all respect representing a step forward from the winter of 1976-77, but a retreat from the high hopes of March and May, 1977.

While much has been achieved, there is no doubt that more can be done. We have been most fortunate, indeed, that the most dramatic oil spills the past few years have been away from our shores; but this does not reduce in any way the need for added protection. The incidence of recent tanker accidents reinforces the need for stricter controls. Just in the past few weeks, the following accidents have occurred:

-- Kurdistan broke in half off the coast of Nova Scotia on March 16, spilling several thousand tons of heavy fuel oil;

-- Donoravia ran aground north of Frederica, Denmark with 67,000 tons of crude abroad;

-- Grey Hunter ran aground on March 10 off Gibralter spilling over 500 tons of crude that washed up on Gibralter beaches;

-- Antonio Gramsci ran aground off Turkey in late February, spilling 6,000 tons of crude;

-- Messiniaki Frontis ran aground off Crete in early March spelling over 6,000 tons of oil;

-- Sea Valiant lost 1,700 tons of oil after a tank split in a storm off the Orkneys on March 13;

-- Irenes Serenade ran aground on March 21 near Venezuela carrying 75,000 tons of oil, but the ship was successfully lightened and refloated;

-- Neiva, carrying 320,000 tons of crude, caught fire at Le Havre on March 20, destroying the control and engine rooms, although explosions were prevented.

The environmental organizations urge the Coast Guard, as they have frequently in the past, to demonstrate to the maritime nations of the world that we remain committed to the professed international goal -- "the complete elimination of intentional pollution by oil and other harmful substances...by 1975, if possible, but certainly by the end of the decade," 11/ and the strict minimization of accidental pollution. The U.S. must further show that we are prepared to begin in our own waters, without waiting for the impetus of an Amoco Cadiz disaster along the U.S. coast.

Thus, while we applaud the international gains achieved by the Coast Guard at the TSPP conference, we are very disappointed that the Coast Guard has not chosen to propose stricter standards for vessels calling at U.S. ports or, at minimum, for those vessels engaged in the coastwise ("Jones Act") trade. Unilateral action is authorized under existing law, should achieve great environmental gains, and is in keeping with President Carter's March, 1977 message to adopt measures "designed to reduce the risks associated with the marine transportation of oil...measures that are both international and domestic."

Far from undercutting international efforts, such action would encourage them; moreover, refusal to adopt stricter standards for the coastwise fleet undercuts those American shipbuilders and shippers who have been concerned enough to build more safety into their ships. Only if minimum standards applicable to all Jones Act vessels were enacted

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11/ IMCO Assembly Resolution A.237 (VII)(Oct. 12, 1971).

could domestic tanker owners seeking maximum environmental protection do so without incurring a competitive disadvantage. This is particularly important given the likelihood of new tanker construction for the US fleet in the next few years to service the Alaska and OCS trade.

III. Regulatory Authority

There is presently not a single international agreement that would preclude the US from establishing additional, more stringent requirements for foreign tankers entering its navigable waters or for domestic vessels which ply the coastal trade.

Under present international law, coastal and port states have the right to prohibit pollution by foreign vessels coming into their harbors and throughout the 12-mile territorial sea, at the very least. Port states may also punish violations. This position is consistent with the 1973 MARPOL convention and the 1972 Ports and Waterways Safety Act (PWSA).[12/] The United States has gone out of its way to protect this principle in various international negotiations.

Other nations have taken unilateral measures, concurrent with continued international participation, when they felt it necessary. Iran, in 1973, asserted the right to board all vessels within 50 miles of its coast to enforce pollution prevention regulations.[13/] And Canada has asserted broad jurisdiction to proscribe certain activities within the Arctic Circle and to ban certain vessels altogether, as well as to establish stiffer construction and equipment requirements.[14/]

12/ Ocean World, April-May 1978.

13/ Anderson, National and International Efforts to Prevent Traumatic Vessel Source oil Pollution, 30 U. Miami L. Rev 1001 (1976)

14/ Gold, Pollution of the Sea and International Law - A Canadian Perspective 3 J. Mar. Law and Com 13 (1971)

The 1973 Senate Report on the PWSA made clear the US position that adequate standards for protection of the marine environment should "be adopted, multilaterally if possible, but adopted in any event" (Senate Report at 2788), and that Congress was "not willing to sacrifice the objective of protection of the marine environment on the alta of...[the] principle of international regulation." (Senate Report at 2783).

As Russell Train stated in testimony before the Senate Commerce Committee on November 14, 1973, "the [MARPOL] treaty does not contain any provision, positive or negative, regarding the rights of States to set more stringent standards within their jurisdiction" and there is "nothing whatsoever" in the treaty which would prevent the United States from requiring double bottoms or any other design feature on tankers trading in U.S. waters. In this regard, we would note that the Official U.S position at the Law of the Sea Conference has been that port states must be given the right to impose and enforce vessel pollution standards that are stronger than existing international standards on any ships entering their ports. One might ask why we hold to this position if we are not prepared to set higher standards where appropriate. Clearly, this was the President's view in 1977 when he announced that although oil pollution is a global problem, it "is also a serious domestic problem, requiring prompt and effect action by the federal government."

There can be no doubt as to the validity of this view since passage of the Port and Tanker Safety Act (PTSA) of 1978. - Section subsection 6(A), of that Act explicitly states that "[t]he Secretar

issue differing regulations applicable to vessels engaged in the domestic trade, and may also issue regulations that exceed standards agreed upon internationally." The legislative history reiterated the message: "The Secretary of Transportation has complete authority to issue regulations applicable only to the domestic trade tankers which would differ from those applied in the international trade."[15/] It remains only for the Coast Guard to acknowledge this authority and exercise it where clearly called for.

That Congress was not reluctant to assert this authority where necessary is evident from several passages in the PTSA where it deliberately chose to exceed international accords. Section 5, subsection 7(E), for example, mandating minimum standards to be promulgated by the Secretary, provides that existing crude tankers between 20-40,000 DWT must be equipped with segregated ballast tanks (SBT) or crude oil washing systems (COW) by 1986, or upon reaching 15 years of age, whichever occurs later. Paragraph (H) provides that existing product tankers in the same range must retrofit to SBT or operate with dedicated clean ballast tanks (CBT) by 1986 or upon reaching 15 years of age. Neither of these categories of vessels was required to implement such a change under the 1978 IMCO Protocol. Amendments to delete both paragraphs because the requirements exceeded international agreements were defeated both in committee and on the House floor.[16/] It is simply not tenable for the Coast Guard to deny this authority or to refrain from issuing stricter regulations for domestic tankers where it can be shown to be cost effective and necessary.

15/ 124 Cong. Reg. §16762 (daily ed. Sept. 30, 1978)

16/ [1978] U.S. Code Cong. and Adm. News, 5081 (minority views of Rep. McCloskey)

Because so much of the world petroleum is destined for the United States, imposition of stringent standards on all vessels which seek to enter US waters will go a long way toward making sound U.S. standards the effective worldwide norms.

IV. Specific Measures for the Reduction of Marine Pollution

A. Segregated ballast tanks

Segregated ballast tanks (SBT) involve the physical separation of tanks which carry cargo and those which carry sea water ballast. In the absence of segregated ballast capacity, sea water is pumped into empty cargo tanks on a vessel's return voyage; this ballast mixes with residual cargo and is a major source of pollution when ultimately discharged into the sea. In fact, such operations represent a staggering 70% of all operational pollution from tankers -- approximately 700,000 tons of oil in 1975, or some three times the amount spilled by the Amoco Cadiz in the worst oil spill catastrophe to date. Of those 700,000 tons of oil, approximately 500,000 tons were from ballasting, 200,000 tons from tank washings. (actual figures may be as much as three times greater.) 17/

The most direct way to limit the release of oil to the sea during ballasting operations is simply never to mix oil with ballast water. This is the position that the environmental organizations have stressed, and that the United States presented to the February, 1978 IMCO Conference.

The Department of Transportation and the Coast Guard have had a clear mandate to implement clean ballast controls at least since the

17/ See note 4, supra; LT Anderson, of the Coast Guard has calculated that deballasting may account for as much as 781,824 tons of oil discharge each year, with tank-washings accounting for 1,303,040 tons, for a total of 2,084,864 tons from both sources annually. 30 U. Miami L.R. at 997.

Ports and Waterways Safety Act of 1972 (PWSA). That act directed the Coast Guard "...to the extent possible...[to] reduce damage to the marine environment by normal vessel operations such as ballasting, deballasting, cargo handling and other activities." 46 U.S.C. 391(a)(7)(A). The legislative history was equally persuasive on this point:

> "Even more important than accidental spills is pollution occurring from normal, everyday operations of tankers, primarily from deballasting operations... [T]here seems little doubt that the adoption of a segregated ballast (sic) could contribute significantly to protection of the marine environment and ...could be done at a relatively little incremental construction cost or incremental required freight rate." S. Rep. 92-340 (1972)

IMCO expressed a similar confidence that SBT would be the central feature to end operational pollution by 1980. The IMCO Convention on the Safety of Life at Sea (SOLAS 1974) also strongly suggested that signatory nations adopt segregated ballast requirements or the functional equivalent for all tankers.

Retrofit of segregated ballast capacity can be accomplished on existing vessels by dedicating a percentage of existing cargo space to use for segregated ballast. The primary mechanical changes involve refitting piping and pumping systems to ensure isolation of cargo and seawater ballast. Two studies for IMCO placed the cost of SBT retrofit for the existing world fleet greater than 20,000 DWT at an average of approximately $2 million per vessel.[18/] [19/] A direct pass-through

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18/ French Government (Secretariat General de la Marine Marchande), A Study on the Retrofitting of the French and the World Fleet, October, 1977

19/ Organizations for Economic Cooperation and Development (OECD), Report of the Ad Hoc Working Party of the Council on Measures Concerning Oil Carriers, The Economic Implications of Retrofitting Segregated Ballast Tanks, Dedicated Clean Ballast Tanks, and Similar Techniques, September, 1977.

of the retrofit costs as freight charge would increase crude oil transport charges about 30 cents per ton or one tenth of a cent per gallon of crude. U.S. estimates presented to the February 1978 IMCO session were in the same "ball park", ranging from $1,921,000 to $2,931,000 as the cost of retrofitting each of 2,192 vessels larger than 20,000 DWT.[20/]

Nonetheless, SBT retrofit was defeated at IMCO, for two reasons. First, several maritime nations and the oil and shipping industries submitted very high cost estimates. Second, positions at the Conference were greatly influenced by a nation's existing tanker capacity. Nations employing full tanker capacity were opposed to SBT retrofit because it would have required a reduction in available cargo space; nations which had excess capacity supported the proposal because it would have enabled many idle tankers to return to competitive service.

Neither of these criteria should have any applicability for decisions regarding the Jones Act fleet. Retrofit costs for the Jones Act trade would be significantly smaller than the IMCO estimates, because of the smaller size of the average U.S. flag tanker.[21/] And, the U.S. fleet is not currently employed at full capacity; SBT retrofit would reduce storage costs of idle tankers and stimulate shipyard activity, both through retrofit and new construction.

Adoption of SBT provides one further benefit. If a ship's center tanks are used for ballast, maximum sagging stresses can be reduced

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20/ TSPP/CONF/INF 17

21/ SBT retrofit cost varies positively with the size of the vessel involved. Draft EIS, app. B, Figure B-4 suggests that most U.S. flag vessel under 55,000 DWT could retrofit to SBT for a maximum of $500,000 each; those up to 100,000 DWT for less than $1.7 million each.

up to 20%. This lessens the possibility of the vessel breaking up under stress. Since a principal determinent of stress-related breakups appears to be age -- a 15-year old tanker is three times as likely to suffer a structural failure as one under 10 years of age, and will lose, on the average, ten times as much oil -- segregated ballast retrofit may be of crucial importance in preventing such losses in the aged domestic fleet.[22/]

B. Crude oil washing; load-on-top

Crude oil washing (COW) was developed as a special procedure to clean cargo tanks to remove sludge buildup, using a pressure spray of crude oil as a solvent. This enables more cargo to be pumped ashore and leaves a cleaner tank. COW addresses the second major component of operational pollution - the more than 200,000 tons of oil lost in tank washings.

Properly viewed, COW to remove sludge buildup is not a substitute for SBT, but complements it. If taken with SBT, operational pollution from its two major sources - tank washings and oiled ballast water - would be virtually eliminated.

The proposed rules are deceptive in suggesting that COW can effectively substitute for SBT. Although effective in preventing sludge buildup, COW cannot prevent pollution from oiled ballast water discharge. Oil would inevitably continue to be discharged in dirty ballast. Any value of the COW method of tank cleaning to reduce dirty ballast dis-

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22/ See generally, OTA, 1975, at 54-57, esp. Tables IV-5 and IV-6; Keith and Porricelli, "An Analysis of Oil Outflow Due to Tanker Accidents" McKenzie, "A Study of Tanker Total Losses 1964-1973", October 1974.

charge assumes a maximally effective load-on-top (LOT) procedure. This is a highly questionable assumption, since the limitations of LOT are very well known. LOT involves using a second water rinse on the crude oil-washed tank, storing the oil water in a slop tank, decanting the water (which ideally has separated from the oil during the voyage), and loading a new cargo on the residual oil.

LOT is not suited for use on most product tankers, where cargo purity is important. It is ineffective on voyages which are too short for effective separation to occur, or in rough seas. These qualifications severely limit its usefulness in the U.S. coastwise trade, where a significant fraction of voyages are relatively short hauls of Alaskan or OCS crude. Finally, decanting generally continues until oil is detected in the discharge, presenting considerable opportunity for human error. As is the case with COW, its effective use is largely dependent on the good faith, training and conscientious effort of shipboard officers and crew. Enforcement of good practice by shore personnel would be all but impossible. Yet the value of COW in the absence of SBT depends on successful LOT.

COW has further limitations of its own. Investment and installation cost must be considered, as well as the cost of an increased turnaround time in port, where washing must take place. Finally, COW presents air pollution problems because of increased release of hydrocarbons; California has opposed its use for that reason.

No stretch of the imagination will render COW for sludge buildup an appropriate pollution prevention substitute for SBT. The TSPP Conference

currently proposed regulations implicitly acknowledge their complementary nature by mandating both COW and SBT for new crude tankers over 20,000 DWT. Together, they result in significant pollution prevention.

C. Clean ballast tanks

Dedicated clean ballast tanks (CBT) involve providing a number of tanks to be permanently dedicated to carriage of ballast water. A CBT operation does not involve retrofit of pumping and piping systems, which must be thoroughly flushed and rinsed between operations. The Coast Guard has previously described four shortcomings of CBT compared to SBT:[23/]

(1) The common cargo/ballast piping must be flushed to prevent oil/water mixtures in the clean ballast tank. Failure to flush the piping could result in significant pollution;

(2) Utilization of common cargo/ballast piping increases the risk of contamination due to leakage;

(3) Enforcement is difficult because the effectiveness is based upon good operating practice, not built-in design features;

(4) An excess of tonnage may be removed from cargo carriage in order to meet CBT requirements, resulting in "wasted" deadweight capacity.

CBT cannot be considered as anything better than a stopgap measure for use while existing vessels retrofit to SBT.

D. Double bottoms

The environmental organizations have encouraged and supported various Coast Guard proposals for double bottoms for over six years. Many state and local governments concerned about protecting coastal and marine resources have endorsed the concept as well, as have a number of

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23/ U.S. Coast Guard, Draft EIS presented on International Conference on Tanker Safety and Pollution Prevention, February, 1978, at 21.

shipowners, shipbuilders and naval architects. Indeed, the government made a commitment to double bottoms for the Alaska trade when approving the Trans-Alaska pipeline. In testimony before the Joint Economic Committee on June 22, 1972, Secretary of Interior Rogers Morton said that "newly constructed American flag vessels...will be required to have segregated ballast systems, incorporating a double bottom..."

Incorporation of a double bottom on a vessel provides not only a means of preventing accidental pollution, but a simultaneous means of achieving segregated ballast capacity. Earlier Coast Guard studies have clearly demonstrated that "[i]n terms of segregated ballast designs studied, the double bottoms design is clearly the most cost effective when both operational and accidental pollution are considered."[24/] The original Coast Guard studies prepared for the 1973 IMCO Conference found the benefits of the combined segregated ballast/double bottom system to be: (1) operational pollution reduced 95%, (2) accidental pollution reduced 35%, and (3) total pollution reduced 67%.[25/] So far as we are aware, these figures have not been updated, and remain valid.

Commitment to the double bottom concept continues to be justified. Of thirty groundings studied by (then Lt.) Cmdr. James Card between 1969 and 1973, outflow would have been prevented in twenty-seven cases by a double bottom whose height was one-fifteenth the beam.[26/] A

24/ IMCO EIS, 1973, at 50.

25/ Segregated Ballast Tankers Employing Double Bottoms, supporting document to D.E. VIII/12 and M.P. XIV/(c), presented to IMCO by the United States of America (November 1972); United States Coast Guard, Reports on Parts 1 and 2 of Study I, Segregated Ballast Tankers (June '72 and Feb '73

26/ Card, Effectiveness of Double Bottoms in Preventing Oil Outflow from Tanker Bottom Damage Incidents (1973)

height of two meters, commonly used, would have prevented outflow in 29 cases. Card's study was not selective - every grounding in U.S. waters was considered. And his findings have never been controverted.

A double bottom thus provides an immediate benefit in most grounding situations: there is no outflow of oil. And, even in the fraction of high-energy groundings which would have damaged two bottoms, actual outflow would have been 30% less on double bottom tankers.

The U.S. conveyed the conclusion that double bottoms would have prevented 87% of outflows from those groundings - 11,000 of 12,499 tons in a Note presented to the 1973 IMCO Conference (M.P./Conf/C.2/WP 33). That Note stressed that double bottoms are needed on small as well as larger vessels "entering ecologically sensitive waters where traffic density, physical configuration, or weather factors combine to create a substantial risk of accident."

It is worth noting that double bottoms are incorporated on numerous liquid cargo carriers, and are internationally required for vessels carrying other hazardous polluting substances.[27/] Likewise, MARAD has subsidized construction of a number of double-hulled vessels in this country over the last six years. Almost five years ago the President's Council on Environmental Quality specifically recommended to the Coast Guard that it require "new tankers in the US coastal trade (which would include the tankers used to carry OCS oil to shore) to be constructed

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27/ See IMCO Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk, Chapter II, IMCO Assembly Resolution A.212(VII) (October 12, 1971); 1973 IMCO Convention, Annex II, Regulation 13; proposed IMCO Code for the Construction and Equipment of Ships Carrying Liquified Gases in Bulk, D.E./92 (September 20, 1973); 46 C.F.R. Subchapter D.

with segregated ballast capacity with double bottoms where ship safety would not be jeopardized.[28/]

Double bottoms protect the entire bottom of a ship. In addition since at least one wing tank of a double bottom tanker would typically be needed for additional ballast water, that portion - probably one-sixth-of the ship's side would be protected from oil outflows from collisions.

Any increase in cost due to adoption of double bottoms is likely to be relatively small, perhaps as low as 2% in some cases, and may be substantially offset in any event by reductions in operating costs. Those United States'tankers incorporating this feature have apparently done so for a relatively low incremental cost increase over the base ship price.[29/] It must be concluded that double bottoms can be added to new tank vessels with little or no economic penalty.

E. Protective location of segregated ballast tanks

"Protective Location" of segregated ballast (PL/SBT) is the Coast Guard's alternative to double bottoms. Under this approach, builders are free to distribute protective space over any portion of the cargo areas they choose. This formula allows tanker operators to leave anywhere from 55 to 80% of the cargo area unprotected in future building. For the largest supertankers, only approximately 20% of the cargo area would be protected.

28/ President's Council on Environmental Quality, OCS Oil and Gas - An Environmental Assessment 1-28 (April 4, 1974).

29/ OTA report, supra note 4.

V. Criticism of Proposed Design Regulations

A. SBT

1. New vessels

The proposed Coast Guard regulations would require SBT on all new crude carriers over 20,000 DWT but would raise the threshhold to 30,000 DWT for new product tankers. This latter standard, reflecting the lowest common denominator of consensus at IMCO, is unacceptable, and should also be set at 20,000 DWT.

A large number of product tankers below 30,000 DWT currently call at U.S. ports; since their size is limited by harbor depth, there is no reason to believe that this situation will change in the future. In 1975, for example, 82% of the tankers arriving in New York were under 20,000 DWT; 78% of the tankers arriving in Philadelphia were under 30,000 DWT. The Coast Guard's draft EIS made no prediction of the amount of outflow that would be prevented were the threshhold for new product vessels lowered to 20,000 DWT, "because of the uncertainty over the number of vessels that will be built."[30] Logically, the uncertainty as to the number of vessels affected is not a reason for failing to extend a pollution prevention requirement where each impact will be positive. Nonetheless, if one assumes the Coast Guard conclusion that there will be no demand for new product vessels in the 20-30,000 DWT class because of tanker oversupply, the retrofit of existing vessels becomes all the more imperative.

2. Existing vessels

The most glaring defect in the proposed regulations is the refusal to require SBT retrofit on existing tankers, As outlined above,

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30 / Draft EIS at 49.

SBT is the most efficient way to reduce outflow through ballasting operations, and addresses a different problem altogether than COW. Giving existing crude carriers the choice of installing COW or retrofitting for SBT, as do the proposed regulations, misses an opportunity to solve the problem at its source. The Coast Guard suggests that COW will reduce operational pollution by about 38% if properly done, and is therefore the equivalent of SBT, which would reduce operational outflows 28%.[31/] This ignores the fact that both measures will work to reduce pollution, are technically feasible, and cost effective. Together, they would reduce operational pollution by some 60%. Rather than seeking the maximum cost justified reduction in oil pollution, the Coast Guard has sought merely to reduce outflows by an arbitrary amount -- the approximate "equivalent" of the 1978 SBT retrofit proposal. It certainly has offered no convincing reason why more should not be required in the U.S. trade.

The proposed regulations should be amended to require all existing crude carriers over 20,000 DWT to retrofit to SBT; if this is deemed to be unacceptable in the international political context at least all US vessels should meet this requirement.

Although the Coast Guard's draft EIS does not break down pollution savings by vessel class, it does estimate that requiring SBT of all existing crude carriers down to 20,000 DWT would save an additional 4,700 tons per year of oil pollution.[32/] This, it should be noted, is over and above the COW alternative. Since COW addresses a different tanker function, most of the 47,000 tons per year of additional oil outfl

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31/ 44 Fed. Reg. 8786, Feb. 12, 1979.

32/ Id. at 50.

which that standard is expected to prevent could be avoided by adopting the two in tandem.

Existing product tankers under 40,000 DWT are, likewise, exempt from any retrofit requirement. Unfortunately, this happens to exclude exactly 91.7% of the Jones Act product tankers; only 13 of 157 are larger than 40,000 DWT and within the affected class.[33/] Exempting the other 144 only serves to extend their useful lives, further delaying construction of a new generation of safer tankships. While this holds true for small crude tankers as well -- exemption improves economic attractiveness, prolonging useful life -- it is especially disconcerting for product tankers, because of the concentration of smaller, antiquated ships in the U.S. coastal trade. 113 of the 144 product vessels excused from SBT retrofit were built before 1961; 82 of the 144 are over 24 years old.[34/]

Requiring even a CBT/SBT choice on existing product carriers between 20-40,000 DWT would reduce oil outflows by an additional 6,000 tons per year, compared to the proposed regulation.[35/] In so doing, it would stimulate construction and modernization of the U.S. fleet.

All SBT standards set should apply to all existing vessels at least down to 20,000 DWT. If SBT were required on all existing Jones Act vessels greater than 16,000 DWT, up to 18,000 tons per year of oil outflow would be avoided by 1985.[36/]

33/ U.S. Coast Guard, Report of Study of Tanker Safety and Pollution Prevention. Requirements for U.S. Tankers in Domestic Trade, June, 1978 (Table 3)(hereinafter "Domestic Trade Study").

34/ Id.

35/ Draft EIS at 51.

36/ Domestic Trade, at 49, using the class of U.S. tankships between 5-40,000 DWT, of which none between 5-16,000 DWT are active.

It should be noted that the Coast Guard made one attempt to directly address the issue of applying more stringent standards to the Jones Act trade, in the June, 1978 Domestic Trade Study (note 32, supra). That report concluded that loss of up to 18,000 metric tons of oil -- 135,000 barrels of oil each year -- could be prevented by requiring SBT or CBT on vessels under 40,000 DWT. That study also noted the importance of adopting measures to control oil discharges from increasing OCS shipments.

Unfortunately, the Domestic Trade Study appears to have seriously underestimated the potential benefits to be achieved. All of its calculations assumed a 40% decrease in actual shipments by US. tankships under 40,000 DWT by 1985. This, in turn, rested on at least four untested assumptions:

(1) Existence of a Northern Tier pipeline by 1985;
(2) Existence of a pipeline from Long Beach by 1985;
(3) Continued trans-Alaska pipeline throughput of 1.2 million barrels per day;
(4) No quantification of OCS oil to be transported.

While it is unknown just how much oil, if any, will be shipped by new trans-continental pipelines by 1985, trans-Alaskan throughput has been projected by the Department of Energy to rise 60% to 2.0 mb/d.[37/] Governor Hammond has announced his intention to reach a level of 4.0 mb/d from all Alaskan sources. Both the Northern Tier and Long Beach pipeline proposals appear very questionable at present. In addition, tanker shipment of OCS crude may become a significant factor in domestic tankship demand, assuming OCS drilling continues to increase.

The Environmental organizations are extremely concerned that

37/ Petroleum Supply Alternatives For the Northern Tier and Inland States, Feb. 1979, at 3-11 (table 38).

domestic demand for tanker transportation will not decrease sharply.

B. CBT as an interim measure

As previously noted, CBT is a less effective alternative than SBT, and should only be allowed for a short time while vessels retrofi

The proposed regulations would allow CBT until 1983 for existing crude tankers greater than 70,000 DWT, and until 1985 for those in the 40-70,000 DWT range. This phase-in is much too slow. Two years should be more than enough time to implement SBT retrofit. We urge that CBT be allowed only until 1981 for all sizes of existing vessels.

C. Double bottoms

The proposed regulations do not require double bottoms for new tankers engaged in the coastwise trade. Double bottom contruction, however, will protect the entire bottom of the cargo area, while the PL/SBT alternative only protects a fraction of the cargohold.

The Coast Guard concedes that double bottoms construction would probably reduce operational outflows slightly, compared to PL/SBT, because the smooth surface on the cargo tank deck reduces clingage and sludge buildup while aiding tank cleaning.[38] More important, vessels which will normally be in shallow waters are more susceptible to ground ings and would benefit more from double bottoms than would vessels whic normally operate in deep waters. While PL/SBT may provide more protection against outflows in the event of a collision, protection agains groundings may be more applicable to the U.S. coastwide trade. And, although incidences of grounding and collisions historically are approximately the same, more oil is lost through groundings.[39]

38/ Draft EIS at 47.

39/ An Analysis of Oil Outflows Due to Tanker Accidents, Keith, V, and Porricelli, J, 1972 Oil Spill Conference, American Petroleum Institute Environmental Protection Agency, U.S. Coast Guard.

Finally, loss of cargo due to collisions may be better reduced by other safety measures, such as dual radar and collision avoidance systems. Groundings are less susceptible to such alternate methods of avoidance. The point remains that international adoption of the PL/SBT alternative cannot be allowed to substitute for rational decision-making regarding maximum reduction of oil outflows in the U.S. trade. Double bottoms should be required of all new vessels in the coastwise trade.

D. Steering gear

The environmental organizations support the Coast Guard's minimal requirement that all tankers over 10,000 gross tons have two remote steering gear control systems and two or more identical power units. But this represents only one step toward reducing the risk of accidents due to loss of steering capacity. We are extremely disappointed with the Coast Guard's abandonment of any measure requiring manning of the steering gear room such as was present in the proposed rulemaking of May 16, 1977 and presented by the US at the TSPP conference. The analysis of the Coast Guard is sound insofar that redundancy of design is preferable to "having to rely on people."40/ This is precisely the approa that the environmental organizations have stressed in urging design features (such as SBT) over operational ones (such as COW, LOT, or CBT flushings). But the point here is that complete redundancy of design is simply not present. The Amoco Cadiz is only the latest reminder of this fact. The Coast Guard's own inspection program of vessels entering US ports has revealed quite a large number of steering gear deficiencies.

40/ Draft EIS at 56.

We are disturbed that the requirement of separate and independent steering gear control systems that have separate differential control units, as proposed in the Coast Guard's May, 1977 notice of proposed rulemaking, has been dropped, even though that proposal elicited "over 130 comments, most of them favorable," 44 Fed. Reg. 9035, February 12, 1979. The position of the environmental organizations is that manning requirements would not be necessary if the entire complex of hydraulic/electrical steering control mechanisms were indeed redundant. In the absence of such complete duplication, risks of steering gear failure are simply too great to tolerate. Manning of the steering gear room is a remarkably inexpensive, cost-effective method of reducing that risk. We strongly urge the Coast Guard to require, as was originally proposed in May, 1977 and at the TSPP conference, manning of the steering gear room on all US tankers, effective immediately, and believe that serious consideration should be given to making the same requirement applicable to all tankers coming to U.S. ports. We also urge that the differential control units regulation be promulgated with a deadline of 1982.

The Coast Guard's draft EIS on these proposed regulations further suggests that a forthcoming regulation will require steering failure alarms on U.S. flag ships. The notice of proposed rulemaking of February 12, 1979, states that such a regulation would only touch "most new US vessels," 44 Fed. Reg. 9036. Such a limited approach demonstrates an intolerably narrow vision, given that the total cost of the installed alarm is only $5000 per vessel. A steering failure alarm should be required on all new and existing foreign and domestic ships calling at U.S. ports, effectively immediately.

E. Maneuverability and stopping

For nearly six years now, the environmental organizations have urged the Coast Guard to adopt standards on vessel maneuverability. It has been our view that the PWSA required the Coast Guard to issue such regulations. None have been formally proposed by the Coast Guard either prior to or since passage of the PTSA. The factors that aroused Congress' concern in this area in 1972 are still operative. The legislative history of the PWSA noted that:

> "a small 17,000 DWT tanker can come to a 'crash stop' within a half mile in about five minutes -- [and] it takes a 200,000 DWT tanker two and one-half miles for an emergency stop...during [which time] the vessel cannot be adequately steered...the propulsion unit currently being installed in supertankers is the equivalent to a one third horsepower motor on a forty foot boat:" S. Rep. 93-340 (1972).

Subsection 201(7)(A) of the PWSA directed the Secretary of Transportation, to the extent possible, to "improve vessel maneuvering and stopping ability and otherwise reduce the possibility of collision, grounding, or other accidents." When no action of this type had been taken by March of 1977, President Carter announced to Congress that he had directed the Secretary of Transportation to study and evaluate "devices to improve maneuvering and stopping ability of large tankers" and to report back to him within six months. Still, as of this writing, no regulatory action has been taken, nor any report released.

The PTSA demonstrated Congress' continuing concern in this area. Section 5, subsection 6(A) provides that "the regulations issued by the Secretary under this subsection shall include ... (v) improvements in vessel maneuvering and stopping ability and other features which reduce the possibility of collision, grounding, or other accidents." (Emphasis added).

One of main features that should be considered is lateral thrusters. Bow thrusters not only improve maneuverability, but help provide some measure of steering redundancy. The Amoco Cadiz might not have run aground had it had such equipment. Controllable pitch propellers, improved rudders, twin screws, increased horsepower per deadweight ton, and auxiliary braking devices should all be considered as well. We urge that percentage reduction criteria in stopping distance and percentage improvement criteria for maneuverability be promulgated by the Coast Guard, with the industry left some discretion to choose the mix of features it thinks best to meet those criteria. These features have been extensively studied[41/], involve existing technology, and are in current production in many cases. The MARAD Pollution Abatement Report found these features workable, effective, and of significant potential for the reduction of marine pollution (see esp. Table III-7). Since the potential exists to reduce straight-line stopping distance by some 25%, these features would be especially valuable "in coastal and harbor situations where maneuverability is restricted."[42/] They are thus especially relevant to the coastwise trade, which will increasingly involve transport of Alaskan crude through the treacherous straits of Juan de Fuca.

41/ See, e.g., MarAd Eis VI58-VI68; Porricelli, Keith and Storch, Tankers and the Ecology, paper presented at the annual meeting of the Society of Naval Architects and Marine Engineers (November 1971); Proceedings of the Panel Discussion on Environmental Protection and Tanker Design for the Intersociety Conference on Transportation, Denver, Colorado (September 25, 1973); Norrby, A Study of Crash Stop Tests with Single Screw Ships (1972); MarAd Pollution Abatement Report, Chapter III (July 1977).

42/ MARAD EIS at VI-63, C4.

The Coast Guard's semi-annual Regulation Report, dated January 31, 1979 announces no plans for regulations on this subject. The environmental organizations insist that the Coast Guard act soon to fulfill this part of its statutory mandate. The possibility of new litigation on this point is now under consideration.

F. CAS/Dual radar

Another feature that has been discussed extensively in the past is computer assisted collision avoidance systems (CAS) with dual radar. MARAD, convinced of the values of CAS installation, has required this equipment on all subsidized American vessels since 1970. The National Transportation Safety Board endorsed the CAS concept in 1972, and the 1975 OTA study indicated CAS would contribute to better decision-making by deck officers, who spend between 40-50% of their working time in collision avoidance activities. While the Coast Guard once issued an Advance Notice of Proposed Rulemaking mentioning CAS as "under consideration," 39 Fed. Reg. 24157, June 28, 1974, the idea was buried following a number of negative comments and has not resurfaced in a rule-making to this day.

That computerized avoidance aids can contribute dramatically to tanker safety, and thereby reduce pollution in the marine environment due to collisions, should by now be undisputed. This conclusion has been borne out again by a recent MARAD study.[43/] The study found that use of a computerized system increased threat direction range 1.75 times and doubled safe passing distances; and that the average assessment workload of a desk officer was reduced 5.5 times,

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43/ An Automated Standardized Bridge Design for the U.S. Merchant Marine, Executive Summary, Maritime Administration, U.S. Department of Commerce, January 1977

and the peak assessment workload was reduced 7.5 times[44]/ These are significant findings which serve as further evidence of the efficacy of CAS.

It is also clear that President Carter, in his March 1977 message to the Congress (supra, at 6) had this standard in mind as a requirement for all tankers. Only computerized collision avoidance equipment can meet the standard set out in the White House fact sheet which accompanied that message -- a standard requiring that CAS be able to be "programmed" to "automatically process radar information and trigger an alarm when dangerous situations arise, as well as provide information to the crew for maneuvering to avoid the potential danger."

CAS provides a computer assisted process for interpreting radar data. By combining data from the ship's gyrocompass and speed indicator with radar input, closing times on stationary or moving objects can be calculated. CAS represents a very sophisticated tool for a trained deck officer. Dual radar is usually discussed with CAS because the two are best installed simultaneously. While dual radar will be required on vessels over 10,000 gross tons as a result of the IMCO Conference (Regulation 12 amending SOLAS '74) CAS was not included pending development of an internationally-approved performance standard. We have serious concern about proceedings at IMCO during the past year to develop that standard.

The Coast Guard should move to reinforce the gains made last year at IMCO by requiring dual radar on all vessels entering US ports, thus encouraging the timely ratification of SOLAS '74 and its early enforcement. Additionally, a CAS requirement should be adopted immediately for all US flag tankers over 10,000 gross tons. A similar rule for foreign

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44/ Id, at pp. 7-12

vessels over 10,000 gross tons entering U.S. ports should be made effective in July 1980, allowing IMCO's study to be issued and international action instituted prior to enforcement of the requirement. These rules must require sophisticated, computer assisted CAS and not some watered-down version of automated plotting.

Since the Coast Guard has argued that efficient installation requires CAS and dual radar to be considered together, 42 Fed. Reg. 5960, January 31, 1977, the CAS issue must be resolved promptly in order to facilitate implementation of the TSPP radar resolution. Its importance to the domestic transport of Alaskan crude and the U.S. Coastwise trade in general cannot be overstated. The Coast Guard is forever saying that 85% of accidents occur because of human error, yet it refuses to act aggressively to improve this problem.

G. Manning and Crew Standards

It is generally recognized that human error is a significant cause of vessel casualties, and that improved training programs and personnel policies can diminish the number of vessel casualties and thereby reduce the probability of such casualties induced by human error.[45/] Section 5 of the PTSA explicitly declares the Congressional

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45/ See, e.g., "Risk Analysis of the Oil Transportation System", Oceanogr Insitute of Washington, September 1972 (suggests (at p. 85) that human er is a contributing cause in 35%-80% of vessel casualties); and "Human Erro in Merchant Marine Safety", Maritime Transportation Research Board of the National Research Council, June 1976 (concludes (at p. 39) that approximat 85% of all vessel casualties were caused in part by human error).

policy ... "(B) that existing standards for the ... personnel qualificat: and manning of all such vessels [carrying oil in bulk] ... which operate in the navigable waters of the United States, must be more stringent and comprehensive for the mitigation of the hazards to life, property, and the marine environment." Section 5, subsection (9) of the PTSA charges the Secretary of Transportation with a non-discretionary duty to " ... prescribe standards for the manning of any vessel of the United States ...."

Despite these clear-cut statements of the policy, the Coast Guard has yet to promulgate any rule-making to effect more stringent standards.

Although the 1978 IMCO Conference on Training and Certification of Seafarers provided a tentative push in the right direction by prescribing certain personnel certification standards, the transitional provisions contained in the Conference are clearly deficient. Major weaknesses include the broad grandfather clauses, limitation of port state enforcement rights, and the unlimited period of seafarer certificate validity. Perhaps the most serious flaw, however, is the lack of specific training requirements for various sizes and types of tank vessels and major types of sophisticated equipment. Presently, a certified master of a 1600 ton tankship can be placed in charge of a VLCC regardless of his degree of experience with the larger ship and such equipment as inert gas, COW, or collision avoidance radar. Simulation training -- for deck officers, engineering officers, and pilots -- should be an absolutely essential precondition to certification for different categories of vessels and equipment.

The environmental organizations would merely reiterate that crew standards and training were stressed as one of President Carter's concerns in the 1977 Presidential initiatives. That action directed the Secretary of Transportation to identify requirements which could be imposed if the 1978 international accords proved to be unsatisfactory, as they clearly are.

A systems approach to reducing the amount of operational and accidental oil pollution requires that training and manning standards be put into effect along with the other proposed regulations released on February 12, 1979, rather than delaying the issuance of proposed regulations on that subject.[46/]

VI. Other Concerns

A. Marine safety information system

Section 5, subsection 16(A) of the PTSA directs the Secretary of Transportation to establish a Marine Safety Information system (MSIS) and authorizes him to require disclosure of ownership interests in vessels subject to the Act. President Carter's Message of March 17, 1977 directed the proper federal agencies to initiate action to require disclosure of the names of tanker owners and major stockholders for inclusion in the MSIS.

46/ Semi-Annual Regulation Report of the U.S. Coast Guard, dated January 31, 1979, noting that an NPRM is set for June 1979 concerning the qualifications of the person in charge of oil transfer operations and tankerman requirements (p. 2). We are unclear as to just what the Coast Guard intends to cover in that rulemaking.

The environmental organizations are distressed to see the Coast Guard back away from vigorous enforcement of this directive (44 Fed. Reg. 6956, February 5, 1979). Assessments of safety records and imposition of penalties and liability against vessels which have been chartered, sub-chartered, and sub-chartered again, often with the name changed, is difficult indeed; the Coast Guard should maintain a complete MSIS to aid in tracking ownership, consistent with the presidential directive. We urge the Coast Guard to reconsider its abandonment of this task.

B. Lightering

The environmental organizations are concerned by the lack of uniform standards to govern the practice of lightering, the process of offloading tankers at sea or outside of port from large tankers to smaller ones. We are awaiting early Coast Guard action as directed by § 5, subsection 17(b) of the PTSA.

C. Treaty Amendments

The Coast Guard has drafted legislation on behalf of the Administration which addresses the protocals to MARPOL 73 and SOLAS 74 agreed to by the U.S. at the 1978 IMCO conferences. The environmental organizations look forward to reviewing that legislation as soon as it has been cleared by OMB, with an interest in promoting effective implementation of those protocals in relation to U.S. vessels and foreign flag vessels entering U.S. ports at the earliest possible date.

VII. Conclusion

The environmental organizations remain appreciative of the international negotiating efforts undertaken by the Coast Guard at (and prior to) the 1978 TSPP Conference. Nonetheless, IMCO remains a shipowner-dominated forum, representing the lowest common denominator of international consensus. While IMCO has passed many fine sounding resolutions since 1954, progress toward its goals has been tentative, at best. We have no guarantee that its second quarter-century of existence will produce action any more decisive than has its first.

In order to effectively protect our own marine and coastal environments, and to demonstrate leadership to the international community, the United States must finally shift away from exclusive reliance on international standard-setting. All of the additional measures discussed in these comments, if adopted unilaterally, would work significantly to minimize oil discharges into the marine environment. All are technically feasible and cost effective. Quantifiable and non-quantifiable benefits from their adoption would far exceed their costs. Serious consideration should be given toward requiring the measures we have discussed and recommended for all vessels calling at U.S. ports. At the very least, they should be adopted for our Jones Act fleet.

Respectfully submitted,

Dated: April 16, 1979

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*Anthony B. Leuin, a Law Student Intern at the Center, helped prepare these comments.

APPENDIX "A"

NRDC, whose principal office is at 122 East 42nd Street, New York, New York 10017, and which has additional offices in Washington, D.C. and Palo Alto, California, has amembership of approximately 38,500 persons, including members residing in 21 foreign countries. The Sierra Club, whose principal place of business is at 530 Bush Street, San Francisco, California 94104, has a membership of approximately 180,000 persons, including persons residing in 67 foreign countries. Wilderness Society, which has its principal office at 1901 Pennsylvania Av N.W., Washington, D.C. 20006 has a membership of approximately 65,000 persons. Environmental Defense Fund, whose principal place of business is 475 Park Avenue, New York, New York 10016, has a membership of approximate 45,000 persons and a 700 member Scientist's Advisory Committee, including members residing in 18 foreign countries. FOE, whose principal place of business is 124 Spear Street, San Francisco, California 94105 has a membership of 20,000 persons and is affiliated with "sister organizations" in 12 foreign countries. The World Wildlife Fund, U.S. is a non-membershi publicly supported organization with offices at 1601 Connecticut Avenue, N Washington, D.C.20009. National Parks and Conservation Association, whose principal place of business is 1701 18th Street, N.W., Washington, D.C. 20009, has a membership of approximately 35,000 to 40,000 persons. The Animal Welfare Institute, whose principal place of business is P.O. Box 3650, Washington, D.C. 20007, has a membership of approximately 22,000 persons. Fund for Animals, whose principal place of business is 1765 P Street, N.W., Washington, D.C. 20036, has a membership of approximately 200,000. The Clean Water Action Project is a non-membership organization with offices at 1341 G Street, N.W., Washington, D.C. 20009.

Oceanic Society, which has its office at Magee Avenue, Stamford, Connecticut, 06902, has a membership of 60,000 persons. American Littoral Society is a non-membership organization located at Sandy Hook, Highlands New Jersey, 07732. Defenders of Wildlife has a membership of approximately50,000 persons and offices at 1244 19th Street, N.W., Washington, D.C. 20036. National Wildlife Federation has offices at 1416 16th Street, N.W., Washington, D.C. 20036, and is composed of associate members and members of state affiliate organizations comprising over 200,000 persons. Environmental Policy Center is located at 317 Pennsylvania Avenue, SE, Washington, D.C. 20003 and represents coalitions of citizens around the country on energy and natural resource issues.

Comment - General

The proposed regulatory action reflects the international gains achieved at the TSPP Conference and does contribute to the protection of the marine environment, however, the regulations do not go far enough. The Coast Guard should have chosen to propose stricter standards for vessels calling at U. S. ports or, at minimum, for the vessels engaged in the Jones Act Trade. The United States should not be limited by an IMCO standard which reflects the lowest common denominator of consensus of the IMCO delegates, but should take unilateral action.

Response

The regulatory action reflects the results of the Tanker Safety and Pollution Prevention Conference as well as most of the tanker design and construction standards contained in Section 5 of the Port and Tanker Safety Act of 1978. (The portions of the Port and Tanker Safety of 1978 that exceed the TSPP standards will be the subject of future rulemaking as described in the introduction to Chapter 2 of this document.)

There are two major reasons why the Coast Guard did not publish proposed rules exceeding the standards that resulted from the TSPP Conference and were contained in the Port and Tanker Safety Act of 1978.

First, that oil pollution is a global problem requiring an international solution. Major unilateral action on the part of the United States, while benefitting our own waters, might cause an overall reduction in the quality of the world's oceans. Foreign countries would then not have a need to ratify the international agreements because they would have a fleet that would exclusively service the United States. This point, as well as other indirect impacts that could be harmful to the interests of the United States, are discussed in Chapter 6 of this document.

Secondly, it is important to balance cost and benefits, especially when inflation is considered the major national problem in the United States. This proposed regulatory action reduces oil pollution by about the same amount as the original U. S. TSPP Conference proposals, but at about 1/3 of the cost. These pollution regulations are inflationary in that they result in a decreased transportation efficiency. Because most of the vessels effected by this regulatory action are foreign flag, most of the retrofit work is expected to be done in foreign shipyards. There will be almost no stimulation of our economy to offset this loss of productivity.

Comment - SBT - New Product Vessels

All new product vessels of 20,000 DWT and above should have SBT in lieu of only those vessels of 30,000 DWT and above. Draft EIS made no prediction of outflow that would be prevented if cutoff point was lowered to 20,000 DWT because of uncertainty over the number of vessels that will be built. Uncertainty over number of vessels affected is not sufficient reason to not extend requirement to lower deadweight.

Response

The lower tonnage limit of 30,000 DWT for new product vessels was used in accordance with the international agreements of the TSPP Conference and as set forth in the Port and Tanker Safety Act of 1978. Uncertainty over the number of vessels that would be affected was not a reason for setting the lower limit at 30,000 DWT.

Estimates in the reduction in operational oil outflows due to the construction of new vessels were not made because of the uncertainty in the number of new vessels that will be built. This uncertainty was due to owners preference and the effect of various laws putting age limits on existing vessels. It is felt that the amount of new construction will be limited due to the number of vessels that are presently laid up.

Comment - COW, Existing Crude Carriers

COW should not be considered equivalent to SBT on crude oil carriers because of the following:

1. Although effective in preventing sludge buildup, COW cannot prevent pollution from oiled ballast discharges.

2. Any value of the COW method of tank cleaning to reduce dirty ballast discharge assumes a maximally effective LOT procedure.

3. COW presents air pollution problems because of increased release of hydrocarbons.

Response

The Coast Guard feels that COW reduces operational oil pollution more than SBT. It it estimated that COW would reduce operational oil

pollution from vessels affected by this regulatory action by about 47,000 metric tons/year (page 41) while SBT would reduce operational outflows by about 33,000 metric tons/year (page 37).

COW will reduce the amount of pollution resulting from ballasting operations. It is estimated this reduction will be about 11,000 metric tons/year. These estimated reductions in operational oil outflows are independent of LOT since the present level of operational oil outflow used throughout this statement assumes LOT is being utilized. The oil outflow model does not assume any prevention measure is "maximally effective." The model attempts to assign effectiveness measures commensurate with the quality of the operator. See Appendix A for a more thorough discussion of this topic.

COW does increase hydrocarbon vapors on a round-trip basis, however, the regulations include design features that allow simultaneous ballast and discharge. This is a method where the hydrocarbon vapors from the tank being ballasted are put into the tank from which cargo is being discharged. This method would reduce vapor emissions at the discharge port below those that occur at the present time. See sections 2.4.5 and 3.3.4.5 of this statement for additional information.

Comment - SBT, Existing Vessels

SBT should be required on all tank vessels in the 20 - 40,000 DWT range because of the large number of these smaller vessels that call at U. S. ports. If these suggested requirements are unacceptable in the international political context, at least all U. S. flag vessels should be required to meet them. Exempting the 144 (91.7%) U. S. Flag vessels that are smaller than 40,000 DWT will only serve to extend ther useful life and delay construction of a new generation of safer tankships.

Response

The applicability of the existing tanker regulations are in accordance with the TSPP Conference results and the Port and Tanker Safety Act of 1978. The regulatory action proposed by the commenter would put U. S. flag tankers that are engaged in foreign trade at a greater competitive disadvantage. It should be pointed out that section 5, subsection 7, paragraphs (E) and (H) of the Port and Tanker Safety Act of 1978, require all tank vessels in the 20,000 to 40,000 DWT range that are 15 years or older be retrofitted with CBT, SBT, or COW. This applies to U. S. flag as well as foreign flag vessels and will be implemented at a later date.

Comment - CBT, Existing Crude Carriers

CBT is a less effective alternative than SBT and should be allowed for only a short time while vessels retrofit. The proposed phase in period would allow CBT on existing vessels greater than 70,000 DWT until 1983 and until 1985 on vessels in the 40 - 70,000 DWT range. It is urged that CBT be allowed only until 1981 for all sizes of existing vessels.

Response

The time periods are in accordance with the TSPP Conference results and the Port and Tanker Safety Act of 1978. The present time schedule is considered satisfactory.

Comment - Double Bottoms

Double bottoms should be required on all new tankships and tankbarges engaged in coastwise trade because vessels which normally operate in shallow waters are more susceptible to groundings and would benefit more from double bottoms than would vessels that would normally operate in deep waters. Double bottom construction will protect the entire bottom of the cargo area, while the PL/SBT alternative only protects a fraction of the cargo hold.

Response

A study entitled Study of Tanker Safety and Pollution Prevention Requirements for U. S. Tankers in Domestic Trade, June 1978 (reference 21), was conducted by the Coast Guard and other Federal Agencies to determine if, among other things, design and equipment standards for domestic tank vessels should exceed this regulatory action. One conclusion reached by the study was that, except for U. S. tankers transporting oil from the Outer Continental Shelf, the environmental benefits of requirements beyond those contained in this regulatory action would be outwayed by the additional costs at this time. This decision, however, does not foreclose invoking additional requirements at some future date.

A large portion of the coastal trade is barge traffic. On June 14, 1979, the Coast Guard issued proposed rules which would require double skins, which includes a double bottom, on new barges. This proposal was based on the results of various barge studies and casualty information contained in the Pollution Incident Reporting System. The case to require double bottoms on tankships is not as clear-cut.

Comment - Steering Gear

The Coast Guard should require:

1. Manning of the steering gear on all vessels that do not have a separate and independent steering gear control system including separate differential control units.

2. Differential control units by 1982.

3. A steering failure alarm on all new and existing ships calling at U. S. ports.

Response

The Coast Guard will be publishing in the near future proposed rules requiring a steering failure alarm and duplicate differential control units on new U. S. flag vessels. Additionally, the U. S. is working toward international acceptance of these requirements through IMCO.

The Coast Guard feels that this regulatory action requiring duplicate control systems on existing vessels and duplicate control, power sources and power systems on new vessels is a satisfactory alternative to manning of the steering gear room.

Comment-Maneuverability and Stopping

The Coast Guard should develop regulations on maneuverability and stopping. Bow thrusters, controllable pitch propellers, improved rudders, twin screws, increased horsepower per deadweight ton, and auxiliary breaking devices should be considered.

Response

The Presidential Initiative for an Evaluation of Devices and Techniques to Improve Maneuvering and Stopping Ability of Large Tank Vessels, to be published in the near future, will address these concerns. The purpose of this evaluation is to develop information for making decisions on further action to reduce accidental oil pollution resulting from vessel collisions, rammings, and groundings. These actions could include regulatory proposals, engineering studies, research and development projects, or other administrative action (e. g. training facility agreements).

Comment - CAS/Dual Radar

The Coast Guard should require:

1. All vessels entering U. S. ports to immediately have dual radars.

2. All U. S. flag tankers over 10,000 gross tons to immediately have a collision avoidance system.

3. All foreign flag tankers entering U. S. ports to have a collision avoidance system by July 1980.

Response

The draft statement indicates that all ships of 10,000 gross tons and larger were required to have two radars as of June 1, 1979. Additionally, the Coast Guard is participating in the development of international standards for collision avoidance aids and intends to comply with the provisions of the Port and Tanker Safety Act of 1978.

Comment - Manning and Crew Standards

Simulator training for officers and pilots should be an essential precondition to certification for different categories of vessels and equipment. Training and manning standards should be put into effect with the February 12, 1979, proposal rather than delaying the issuance of proposed rules.

Response

The Coast Guard presently has rules regulating manning and crew standards that have been in existence for several years. As indicated in the Draft Statement, proposed rules will be published in the near future. These rule revisions will implement the measures of the International Conference on Training and Certification of Seafarers, 1978, as well as upgrade the tankerman requirements and amend licensing requirements for pilots.

Comment - Marine Safety Information System

The Coast Guard should require the disclosure of the names of tank vessel owners and major stockholders for inclusion in the MSIS.

Response

The Coast Guard issued proposed rules on April 13, 1978, which would have required, among other things, disclosure of all beneficial owners and the names of major stockholders. This proposal was withdrawn on January 9, 1979, as a result of comments from the Council on Wage and Price Stability, the State Department, and several foreign governments. These comments indicated that actual ownership information would be impractical and in some cases nearly impossible to obtain, such as when vessel ownership is evidenced solely by bearer certificates.

The Coast Guard is satisfied that the information now contained in the Marine Safty Information System is sufficient to identify those vessels which pose risks to the marine environment or the safety of port areas by virtue of their pollution, violation, casualty and boarding/inspection histories. Oil tanker ownership information for foreign flag vessels has been obtained by the Coast Guard from Lloyd's Register of Shipping, is updated quarterly. Additional ownership information would not be of significant additional value. Thus, further action on this subject is not contemplated.

Comment - Lightering

Environmental organizations are concerned by the lack of uniform standards to govern the practice of lightering.

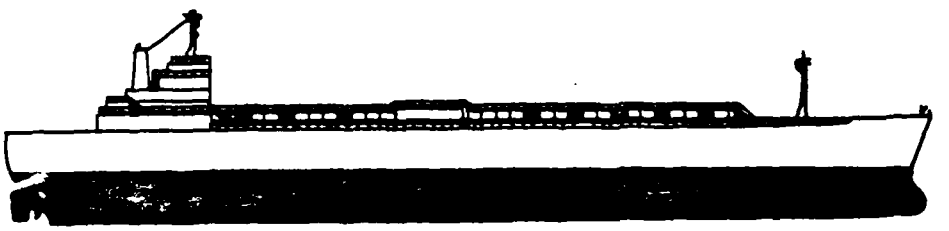
Response

Proposed rules governing cargo lightering operations were published on May 31, 1979.

The Tanker Standards Rulemaking Petition was filed by the Commonwealth of Massachusetts and is being considered as comments on the Notice of Proposed Rulemaking for this regulatory action.

The petition is long (64 pages) and space considerations would not permit reprinting it in its entirety. Thus this document contains only the introduction. The major recommendations have been rewritten in condensed form along with the response to these comments. The complete Rulemaking Petition is available for public inspection in the regulatory docket.

TANKER STANDARDS RULEMAKING PETITION



Filed by Commonwealth of Massachusetts

Michael S. Dukakis, Governor
Thomas P. O'Neill, Lt. Governor
Edward M. Kennedy, Senator (D-Mass.)
Michael J. Harrington, Congressman (D-Mass.)
Evelyn F. Murphy, Secretary of Environmental Affairs
Terrence P. McCarthy, Representative (I-Martha's Vineyard)

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Executive Summary

The growth of tank vessel transportation has closely paralleled accelerated world consumption of oil and other petroleum products. With greater volumes of crude and product petroleum shipped among nations, the probability of operational and accidental cargo discharges has increased proportionately. Today, operational discharges account for more than 1,000,000 tons of oil lost annually to the marine environment; and tanker mishaps are responsible for another 200,000 tons of annual cargo outflow.[1/]

The response to this problem has been rather tentative at both the national and international levels. The Intergovernmental Maritime Consultative Organization (IMCO), which provides the official forum for negotiating world maritime standards, is inherently conservative and slow to impose stringent and economically burdensome regulations on members of the world maritime community. The Coast Guard, even with its clear mandate under the Ports and Waterways Safety Act,[2/] has been similarly reluctant to act unilaterally in imposing more stringent regulations on all vessels entering U.S. ports. The result has been interminable delays in implementing effective tanker standards and a continued absence of adequate protection for the invaluable resources of the marine environment.

Massachusetts has consistently advocated direct and immediate action by the United States Coast Guard and has heartily endorsed all administrative efforts to promote a higher level of operational safety among tank vessels in U.S. coastal waters. At the same time we have been gravely disappointed by the Coast Guard's failure to adopt the very regulations which it admits would significantly reduce both operational and accidental pollution from tankers.

The most recent IMCO convention (February, 1978) provided another opportunity for the world maritime community to adopt those standards which the U.S. has been reluctant to impose unilaterally. The results of the conference were encouraging, but fall short of desirable goals both nationally and internationally. The IMCO resolutions are substantively less rigorous than earlier

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Approved by Alfred C. Holland, State Purchasing Agent

Coast Guard proposals and are not likely to become fully effective for several years. As a result, Massachusetts is taking this opportunity to file a formal rulemaking petition, incorporating those recommendations which it has supported over the past two years. It is feared that without additional administrative or legislative incentive, the Coast Guard will acquiesce to standards which fall considerably below those proposed by the President last March. The attached petition contains some modifications and additions to the Coast Guard's rulemaking proposal of May 16, 1977; but is considered by this state to represent a reasonable and well considered position in support of more stringent tanker regulations.

Specific rulemaking proposals are summarized below.

1) Segregated Ballast (SBT): The proposed rule would require segregated ballast capacity on all new and existing tank ships, 20,000 DWT and above, entering U.S. ports. The rule would further apply to all tank barges certificated to carry oil and other hazardous cargo in coastal trade, providing that the barge is designed to accept and discharge water ballast in normal operations.

2) Double Bottoms: The proposed rule would require a double bottom beneath the cargo area of all new tank ships, 20,000 DWT and above, entering U.S. ports. The rule would further require double hulls on all new tank barges certificated to carry oil or other hazardous cargo in coastal trade.

3) Collision Avoidance (CAS) and Dual Radar: The proposed rule would require collision avoidance and dual radar on all self-propelled vessels (not only tank vessels) 10,000 gross tons and above, entering U.S. ports. The provision for dual radar would be enacted concurrently for both U.S. and affected foreign vessels. The CAS provision would be implemented initially for U.S. vessels and would become effective for foreign vessels within one year of the completion of IMCO's study on CAS specifications (July, 1979).

4) LORAN C Long Range Navigational Equipment: The proposed rule would require a LORAN C or equivalent long range position fixing device on all self-propelled vessels, 1600 gross tons and above, entering U.S. ports.

5) Atmospheric Control in Cargo Tanks (Inert Gas Systems): The proposed rule would require a gas inerting system on all tank ships or combination carriers, 20,000 DWT and above, which enter U.S. ports. The rule would further require a gas inerting system or its equivalent on all tank barges certificated to carry oil or hazardous cargo in coastal trade.

6) Vessel Maneuverability: The proposed rule would require that the Captain of the Port in conjunction with the District Commander establish a minimum level of tug assistance for each vessel class, by weight, under a variety of weather conditions. Exceptions are provided for ports with operational VTS syste and for vessels with auxiliary maneuvering or braking equipment (specified in the rule).

7) Vessel Inspection: The proposed rule would require an annual inspection and certification of foreign tank ships entering U.S. waters. A "Certificate of Inspection for Foreign Vessels" would be issued when it is determined that the vessel is in compliance with IMCO certifications issued by the flag nation and all U.S. provisions which are extended unilaterally to foreign vessels. The rule would reaffirm the Coast Guard's responsibility to undertake more detailed inspections when any inconsistencies with IMCO certification are evident. A similar procedure is established for the supplementary inspection required of all vessels over ten years of age.

Comment - SBT, New Product Vessels

All new product tank vessels of 20,000 DWT and above, entering U. S. ports should be required to have segregated ballast tanks. The proposed threshold of 30,000 DWT is not an acceptable standard for U. S. ports because there are many vessels in the 20-30,000 range presently carrying oil into U. S. ports and there is no indication that many domestic ports will accommodate larger vessels in the near future.

Response - See response on page 148

Comment - New Tank and Existing Barges

All new tank barges carrying oil or hazardous cargo and contracted after December 1979 should be equipped with double hulls, including a double bottom. Existing barges 12 years or older should, by January 1983 or on the date on which it reaches 12 years of age, whichever is later, be equipped with a double hull.

Response

The Coast Guard published a notice of proposed rulemaking for new barges on June 14, 1979. At the same time, an advance notice of proposed rulemaking regarding existing tank barges was published. Please refer to the Federal Register, Volume 44, Number 116, dated June 14, 1979, for pertinent details.

Comment - CBT, Existing Crude Carriers

CBT is the least effective of the alternatives and should be allowed only as a brief interim measure (not 2-4 years) as vessels retrofit.

Response - See response on page 150.

Comment - COW, Existing Crude Carriers

COW should be considered a companion to SBT and not a substitute for it. COW is not foolproof and requires a dedicated, highly trained crew to ensure its effectiveness.

Response - See response on page 148.

It is recognized that some aspects of COW are operational in nature. In this regard, there are requirements contained in the regulatory package that are intended to ensure the COW operation is carried out in a manner to give the desired effectiveness. These requirements are somewhat self-enforcing because of the economic benefit derived from greater cargo out turn.

Comment - CBT, Existing Product Carriers

CBT does not provide the necessary assurance that oil outflows will be reduced and, as a result, should not be permitted as an alternative to SBT.

Response

It is recognized that CBT is more operator dependent than SBT. See page 27. However various requirements are contained in the regulatory package that will help insure compliance. These requirements include an operating manual tailored specifically for each tanker fitted with CBT.

Comment - Double Bottoms

Double bottoms should be required on all new vessels that enter U. S. ports. It has been shown that in nearly all tanker groundings in which oil outflow followed a grounding, a double bottom would have prevented or significantly reduced the spillage. The cost of a DB vessel of 250,000 DWT ranges between 3.0 and 4.0 percent of the cost of a single hull vessel. Double bottoms will provide added hull strength which will enhance a vessel's chances for surviving a stranding in high seas. A double bottom will generally reduce the percentage of oil outflow in a grounding situation due to the entrapment of oil by the double bottom.

Response - See response on page 150.

While there is no question that double bottoms would reduce oil outflows resulting from groundings, there is a question whether more total outflow would be prevented by double bottoms, staggered wing tanks, double sides, or some other type of design. This uncertainty was expressed in Resolution 17 of the TSPP Conference. Presently the Coast Guard, in conjunction with IMCO, is attempting to obtain sufficient data to develop statistical distribution for damage location, extent of damage, and depth of penetration. This information will help reduce this uncertainty.

It should be pointed out that, while many of the larger pollution incidents have resulted from grounding - either directly or indirectly through an equipment failure - double bottoms would not have reduced the oil outflow in many of these cases. Double bottoms would probably not have reduced the amount of oil pollution that resulted from the grounding of the ARGO MERCHANT, the largest polluting incident along the U. S. coast, or the AMACO CADIZ, the largest oil polluting incident in the world.

Additional discussion of the impact of double bottom on strength has been added to Section 4.2.2.5.

Comment - Collision Avoidance Systems and Dual Radar

All vessels 10,000 gross tons and above should have a second radar. Additionally all vessels 10,000 gross tons and above should, by July 1980, be equipped with collision avoidance equipment that meets or is equivalent to "Performance Specifications for a Computer Aided Collision Avoidance System for Merchant Ships" published by the Radio Technical Commission for Marine Services.

Response - See response on page 152.

Comment - LORAN C

Loran C or other equivalent long range navigation equipment should be required for each vessel 1600 gross tons and above.

Response

Interim Final Rules were issued in the May 31, 1979, Federal Register requiring all vessels 1600 GRT or more, when calling at ports in the continental U. S. including Alaska, to have installed a Loran-C or specified alternative electronic navigation receiver.

Comment - IGS

All tankships of 20,000 DWT or more should have an IGS by December 31, 1981. The IMCO schedule of implementation for existing vessels is too gradual.

Response

The IGS rules would be applicable to all new tankships 20,000 DWT and

above; all existing crude carriers 20,000 DWT and above; and all existing product carriers 40,000 DWT and above. The effective dates of June 1, 1981, for vessels over 70,000 DWT and June 1, 1983, for the smaller existing vessels are considered a suitable balance between environmental concerns and owner's planning and ordering capabilities.

Comment - IGS, barges

All U. S. barges in coastal trade should be equipped with an inert gas system or an equivalent means of reducing the potential for cargo tank explosions.

Response

The need for an increase in the level of fire and explosion safety on tank barges has not been demostrated. Casualty records indicate that many of the fires and explosions on tank barges occur in shipyards due to welding or other hot work where an inert gas system would not be in use. Another major source of fires and explosions on tank barges are the heating boilers which an IGS system would not prevent. A detailed study of tank barge fire and explosion records will be undertaken. If this study indicates a need for a higher than present level of safety, alternatives will be examined to increase the safety level. An IGS would be one of the methods examined. An IGS on most barges would require the fitting of an inert gas generator. The introduction of this heat producing device on a barge however, may more than offset any increase in the vessel's overall safety level derived from the use of inert gas in the cargo tanks.

Comment - Vessel Maneuverability

All tankships and tank barges entering or departing U. S. ports should receive tug assistance. The number of tugs a vessel would need would depend on vessel class, weight , the weather conditions, etc. The actual number would be determined by the Captain of the Port for the specific location. A vessel could be exempted from these requirements if it had a lateral thruster and either a controllable pitch propeller or twin screws. The advantage of these active devices are that they generate their own inertia and are not dependent on ship speed as are rudders, flaps, water parachutes, etc.

Response

The Presidential Initiative for an Evaluation of Devices and Techniques to Improve Maneuvering and Stopping Ability of Large Tank Vessels, which will be published in the near future, will address these concerns. The purpose of this evaluation is to develop information for making decisions on

further action to reduce accidental oil pollution resulting from vessel collisions, rammings, and groundings. These actions could include regulatory proposals, engineering studies, research and development projects, or other administrative action (e.g. training facility agreements).

Comment - Vessel Inspection

Each foreign tank vessel should be inspected by the Coast Guard on a vessel's first visit to a U. S. port in each calendar year. Vessels possessing certificates issued in accordance with SOLAS 60 and found to be in compliance with such certificates and any U. S. requirements applicable to foreign vessels should be issued a Coast Guard "Certificate of Inspection for Foreign Vessels." Foreign vessels registered in countries which are not parties to SOLAS 60 or who are exempted from all or part of the Convention must comply with all inspection requirements applicable to U. S. tank vessels.

All U. S. flag tank vessels must undergo a drydock structural analysis at least every three years.

Each foreign flag tank vessel of ten years of age or older must undergo a drydock structural analysis at least every three years. A "Cargo Ship Safety Construction Certificate" issued by an approved classification society in accordance with SOLAS 60 shall be accepted as evidence of compliance with this rule. Tank vessels not subject to SOLAS 60 must undergo a structural analysis in accordance with and endorsed by the American Bureau of Shipping.

Response

Each foreign flag tank vessel is examined on its initial visit to the United States. Subsequently, each foreign flag tank vessel is examined at least once each calendar year with reexaminations conducted as necessary to insure the correction of outstanding deficiencies. Tank vessels to which SOLAS 60 does not apply, except Canadian vessels and vessels of countries not parties to SOLAS 60, must meet the inspection requirements of U. S. flag vessels. A vessel examination letter is issued at the completion of each examination listing any deficiencies. The present procedures generally exceed those proposed and are felt to be satisfactory.

Presently, oceangoing U. S. flag tank vessels must be drydocked at intervals not to exceed 24 months in accordance with 46 CFR 31.10 - 20(a)(1). The Coast Guard feels there is no justification for relaxing this existing requirement.

The SOLAS Protocol of the TSPP Conference (Regulation 10) would require all tank vessels to have a periodical survey at least every five years. Vessels more than 10 years old would be required to have an intermediate survey at approximately the mid period (2.5 years). One of the requirements of each of these surveys would be an inspection of the vessel's external bottom shell. The Coast Guard's foreign tanker boarding program will provide an enforcement mechanism for these new standards for foreign vessels.

OFFICE OF
NATURAL RESOURCES
MANAGEMENT

GOVERNMENT OF THE VIRGIN ISLANDS OF THE UNITED STATES

Department of Conservation and Cultural Affairs

P. O. BOX 4340
CHARLOTTE AMALIE, ST. THOMAS

May 17, 1979

Commandant
(G-CMC/81) 'CGD 77-058(b); CGD 77-063)
U.S. Coast Guard
Room 8117
Department of Transportation
Nassif Building, 400 7th Street, S.W.
Washington, D.C. 20590

Re: Proposed Rules for Tank Vessels of 10,000 Gross Tons or More and Tank Vessels of 20,000 DWT or More Carrying Oil in Bulk (CGD 77-058b and CGD 77-063)

Dear Admiral Hayes:

The Government of the Virgin Islands is in agreement with the measures proposed by the Center for Law and Social Policy, namely:

1. Stricter standards than are provided in the 1978 IMCO Protocol for all U.S. domestic fleet vessels. New tankers over 20,000 DWT should be built with segregated ballast tanks, double bottoms, and fully redundant steering gear; all existing tankers over 20,000 DWT should be required to retrofit segregated ballast capacity by 1981;

2. Stricter standards than are provided in the 1978 IMCO Protocol for international fleet vessels calling at U.S. ports, including segregated ballast tanks on all new tankers over 20,000 DWT, both product and crude carriers, dedicated clean ballast tanks on all existing tankers over 20,000 DWT, with retrofit of segregated ballast capacity on existing tankers over 20,000 DWT by 1981;

3. Equipment to improve maneuverability and stopping capacity and to provide a sophisticated, computer-assisted collision avoidance capacity for all new and existing tank vessels calling at U.S. ports, and

4. Stringent and comprehensive personnel qualification and manning requirements for all tank vessels which seek to operate in the navigable waters of the United States, including use of simulation training.

The need exist and should be mandated for numerous reasons. All of which are important to existance of the Virgin Islands and for the protection of the coastal waters which are the prime asset to the number one (1) industry, tourisim.

The following points are some of the reasons for the position taken and the need for adopting and implementing the proposed measures:

1. Oil pollution in the Virgin Islands is not only a global problem but also a very serious domestic problem requiring prompt and effective action by the federal government. This is due to the location of the largest refinery in the Western hemisphere on the island of St. Croix. This refinery operates at 660,000 bbl/day through put capability.

2. Tanker traffic has increased over the years from an average of 40 ships per month to 100 ships per month for an average of 3 per day. This not only increases navigation problems but also the probability of spills.

3. Supper tankers are included in tankers using the port facilities at the refinery. This means tons of oil must be alighted prior to entry into the port and all the problems associated with super tankers. The other prime problem being the inability to make an immediate stop instead of two to three mile distance.

4. Spills have occurred on St. Croix requiring extensive clean effort and causing damage to the ecosystem.

5. All petroleum products in and out of HOVIC port is via vessel transportation. Due to the site location there are no pipelines nor any other method of surface transportation. Another alarming condition is the totally inadequate resources of the Coast Guard on St. Croix to investigate and direct spill operation. This work force consist of two men and a Boston Whaler.

6. Each year the economic loss to fishermen continue to increase due to traffic resulting in destruction to fishermen traps.

7. Finally the potential for severe economic losses to the coastal zones and hence recreational, fishing and aquaculture industries as a result of oil pollution are great and increases as the oil industry grows.

On the average there are (5) to (6) small spills per month at the Hess Oil Virgin Islands Corporation (HOVIC) which are all reported. These spills are usually no greater than 20 gallons and occur while the ships are in port hence are confined to that area and cleaned up by HOVIC. Roughly 90% of these spills are the ship responsibility and are attributed to one of three conditions (1) deballasting; (2) ballasting, and (3) overflow from a tank compartment.

In 1972 the Santa Augusta ran into an abandoned dredge anchor in the channel resulting in a spill of some 50,000 barrels. This was a major clean up operation that affected several beaches on the Southshore.

In 1975 the Lemos a super tanker of the 250,000 DWT class hit a side of the channel resulting in a spill of 5,000 barrels. Due to high winds and tide conditions none of the spill came ashore. Nevertheless, this occurrence pointed out the many sources of a possible spill from a super tanker, of which 8 to 10 a month are

seen at Hess Oil Virgin Islands Corporation. Incidentally, prior to entering the HOVIC port an average of 500,000 barrels must be alighted from each super tanker, and the problems here are self explanatory.

In view of these known conditions and problems peculiar to the Virgin Islands, it is urged that the most stringent proposed regulations be adopted as preventative measures to minimize the occurrence of both operational and accidental oil discharges. The proposed measures should be implemented for all vessels calling at Hess Oil Virgin Islands Corporation port and as a minimum should be adopted for the Jones Act fleet.

Sincerely,

Darlan Brin
Commissioner

DB/DCF/jjt

cc: Center for Law and
Social Policy

Comment

The Virgin Islands has a large volume of tanker traffic to the largest refinery in the Western Hemisphere which is located on the island of St. Croix. This traffic is a threat to the islands' prime industry - tourism. There have been vessel casualties in 1972 and 1975 that have resulted in major oil spills. Consequently the Government of the Virgin Islands is in agreement with the measures proposed by the Center for Law and Social Policy.

Response

It is recgonized that large tankships enter St. Croix and pose a possible threat to the Islands' environments. The Coast Guard feels that these regulations are an important step in reducing the oil entering the Islands' waters from accidents as well as from operational evolutions. Also it is important to balance costs of various pollution prevention measures against the benefits considering that inflation is one of the major problems facing the United States.

See pages 147 through 153 for response to the comments made by the Center for Law and Social Policy.

STATE OF
WASHINGTON

Dixy Lee Ray
Governor

DEPARTMENT OF ECOLOGY
Olympia, Washington 98504 206/753-2800
Mail Stop PV-11

April 24, 1979

Executive Secretary
Marine Safety Council
U. S. Coast Guard (G-CMC 181)
Washington, D. C. 20590

Dear Sir:

This is in response to your request for our comments on your draft "Regulatory Analysis" and "EIS" entitled "Regulations to Implement the Results of the International Conference on Tanker Safety and Pollution Prevention." In a recent telephone conversation with Mr. Sheehan of your office, we indicated that these comments were forthcoming.

We feel that it is a very positive step to have these standards implemented on an international scale and endorse the adoption of the standards as they appear in the Federal Register.

Looking to the future, we believe that the U. S. Should press for the development of collision avoidance systems and the inclusion of them in the international agreement. In addition, we think that segregated ballast tanks should be pursued for existing crude carriers in the 20-40 thousand ton range. This latter point is important to us since many of these smaller vessels operate on Puget Sound.

I hope these comments are useful to you. We commend those who are responsible for this agreement. If you have any questions regarding our comments please contact Mr. Harry Tracy of our department at 206/753-6880.

Sincerely,

T. L. Elwell
Environmental Review Section

TLE:bjw

cc: Harry Tracy, Southwest Region, DOE
Mike Mills, Governor's Office

Comment

U. S. should press for the development of collision avoidance systems and the inclusion of them in the international agreement.

Response

The Coast Guard is presently participating in the development of international standards for collision avoidance aids. See Section 2.4.7 of this document.

Comment

SBT requirements should be pursued for existing crude carriers in the 20-40,000 DWT range.

Response

See comments on page 3 and 149.

12. LIST OF PREPARERS

The document was prepared under the supervision and guidance of Commander George F. Ireland. The main text and the Oil Outflow Analysis (Appendix A) were prepared by Lieutenant Commander Richard S. Tweedie. The Economic Analysis (Appendix B) was prepared by Mr. Paul V. Ponce. Graph preparation and editing assistance was provided by Lieutenant Richard M. Cool. Ms. Gladys A. Hammond provided the typing expertise in preparing the document.

Commander George Ireland is the Chief of the Marine Systems Evaluation Branch in the Merchant Marine Technical Division, was a member of the U. S. delegation to the TSPP Conference, and regularly serves as a member of the U. S. delegation to the IMCO Marine Environment Protection Committee. Cdr. Ireland graduated from the Coast Guard Academy in 1960. He has had both deck and engineering assignments afloat. His other assignments have been in the Coast Guard Commercial Vessel Safety Program. Cdr. Ireland holds Masters Degrees in Public Administration and Business Administration from American University.

Lieutenant Commander Richard Tweedie is a Naval Architect in the Marine Systems Evaluation Branch of the Merchant Marine Technical Division. Lcdr. Tweedie graduated from the Coast Guard Academy in 1967. Subsequently he has had shipboard engineering assignments as well as two tours in a Merchant Marine Technical Field Office. Lcdr. Tweedie has Master of Science Degrees in Mechnical Engineering and Naval Architecture from Massachusetts Institute of Technology and a Masters Degree in Business Administration from New York Institute of Technology.

Mr. Paul Ponce is an Operations Research Analyst in the Marine Systems Evaluation Branch. He has had extensive experience in the application of system and operations analysis methods in satellite, missile, fire control, and transportation systems. Since 1967, Mr. Ponce's work has included the economic and risk analysis of transportation systems. Mr. Ponce's degrees include a Bachelor of Science in Physics and a Masters of Science in Physics from the University of Colorado and a Masters of Science in Biophysics from Iowa State University.

Lieutenant Richard Cool is a Staff Engineer in the Marine Systems Evaluation Branch. Lt. Cool graduated from the Coast Guard Academy in 1970 and has a Bachelor Degree in Naval Architecture from the University of Michigan. He has had shipboard assignments in engineering and a tour at a Merchant Marine Technical Field Office.

Ms. Gladys Hammond is a Clerk-Stenographer in the Marine Systems Evaluation Branch. She has 6 years of typing and word processing experience. Ms. Hammond is a graduate of Opportunities Industrialization Center. Additionally, she has taken several courses in technical report writing, secretarial practices and correspondence review.

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APPENDIX A

OPERATIONAL OIL OUTFLOW MODEL

November 1978

AD-A085 460 COAST GUARD WASHINGTON DC F/G 13/10
REGULATORY ANALYSIS AND ENVIRONMENTAL IMPACT STATEMENT, REGULAT--ETC(U)
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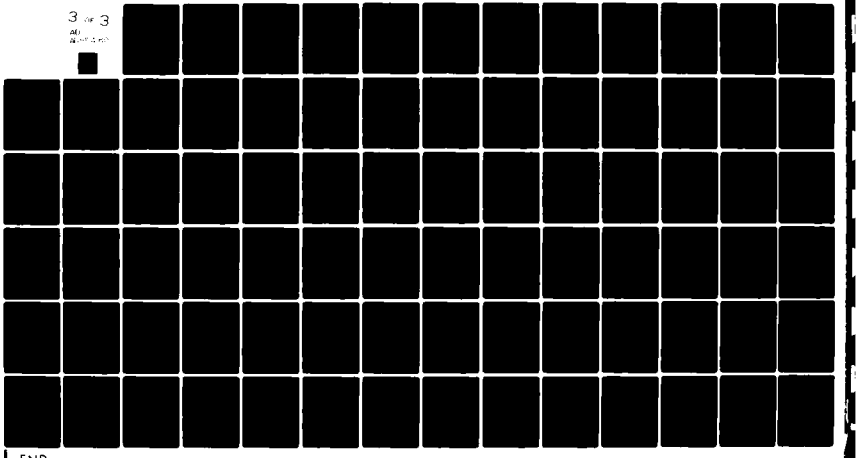

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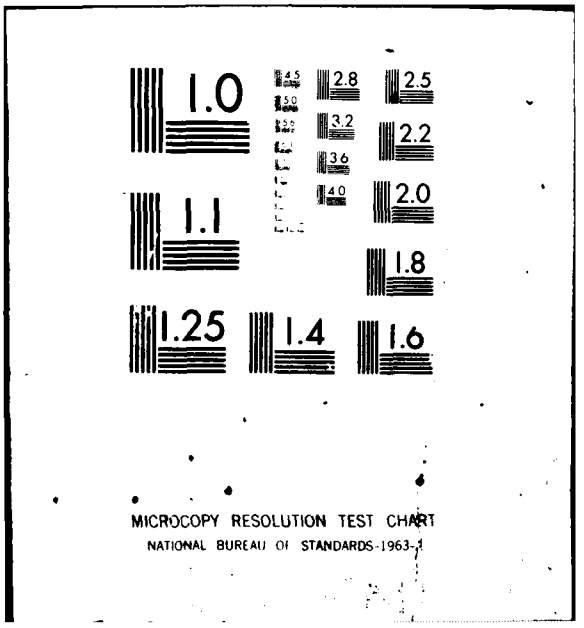
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2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

TABLE OF CONTENTS

1. INTRODUCTION

An oil outflow model for tank vessels calling at U. S. ports was developed to;

a. better quantify the short-term effects of the proposed regulations and the alternatives, and to

b. help classify the major sources of oil outflow so that the regulations could focus on the most effective solutions.

2. COMPUTER MODEL OF OPERATIONAL OIL OUTFLOW

The objective of the model was to break down operational oil pollution into its component parts and to then examine the role that each operation played in the overall problem of operational pollution. Individual control measures designed to minimize the various forms of operational pollution were examined to determine their efficiencies in terms of potential. Additionally, the probable effectiveness of each measure, accounting for such factors as crew training, management support, and enforcement measures, were determined. This information, in conjunction with a baseline oil outflow, was then used to calculate the estimated outflows that result from the various alternatives considered in this Environmental Impact Statement. IT SHOULD BE EMPHASIZED THAT, DUE TO THE LIMITED INFORMATION AVAILABLE, THE MODEL RESULTS ARE ESTIMATES.

A four level operational oil outflow model was developed to depict operational oil outflows according to type of oil movement, oil type, operation resulting in outflow, deadweight category, and type of operator. A flow chart of the oil outflow model is shown in Figure A-1.

The uppermost level, the product level, indicates outflow as to type of oil movement (domestic or import-export) and type of oil (crude, black product or white product). These particular oil categories were chosen because of their distinct properties. Crude oils are hydrocarbon mixtures which occur naturally in the earth and contain many oil fractions. Product oils are the result of the refining process. White product oils are basically distillates which would be clear and have very few suspended solid particles. Black product oils are the residual oils which would be opaque and would contain suspended solid particles.

The second level, the operation level, breaks down each of the six product level categories into the following three operational divisions:

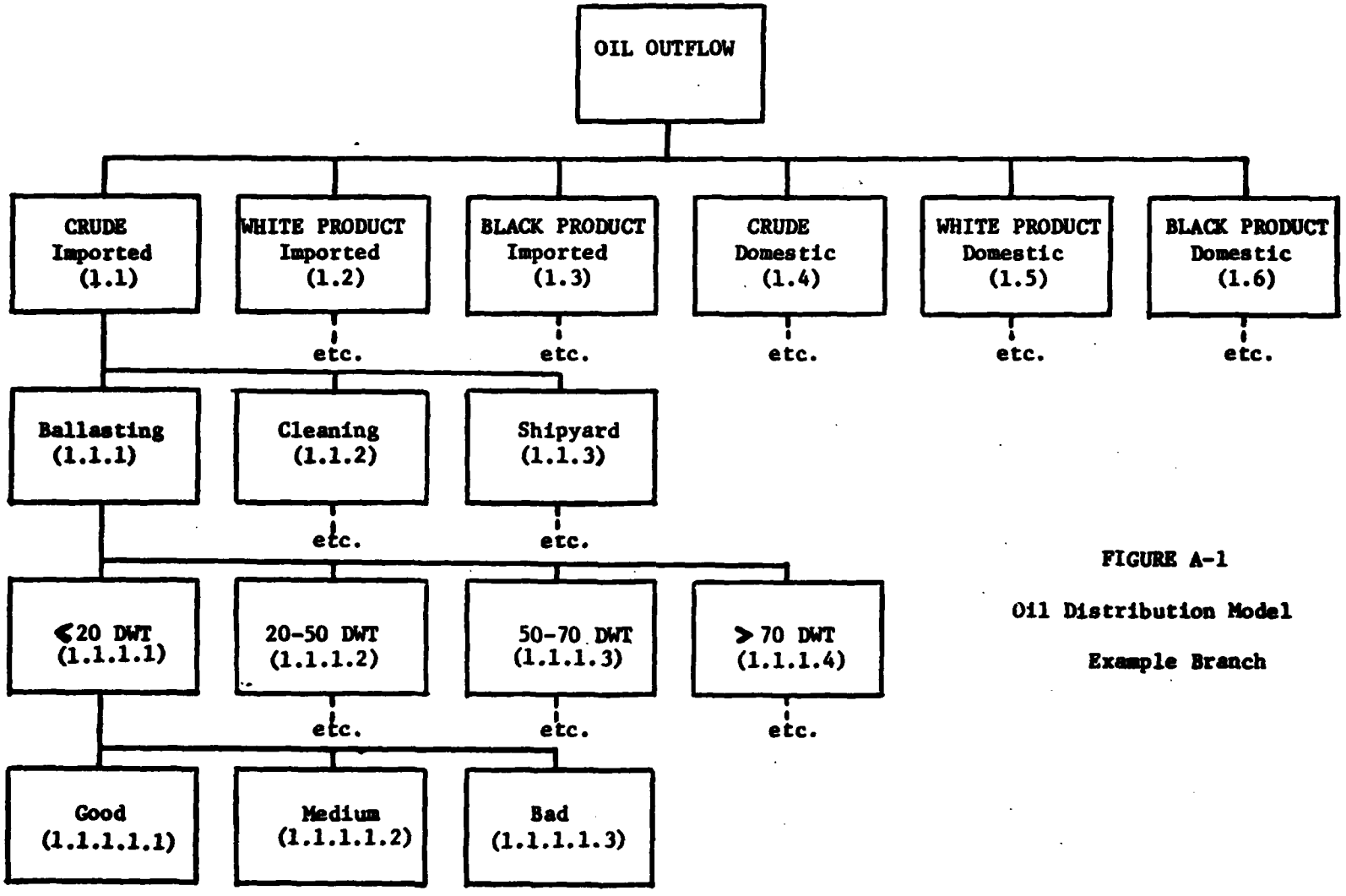

FIGURE A-1

Oil Distribution Model

Example Branch

a. Ballasting operations.

b. Tank cleaning for cargo purity reasons.

c. Sludge removal prior to shipyard entry.

The third level further breaks down the oil outflow resulting from the above operations into the following deadweight categories:

a. Less than 20,000 DWT.

b. 20,000 to 40,000 DWT.

c. 40,000 to 70,000 DWT.

d. Greater than 70,000 DWT.

The fourth level of the model breaks down each category of the third level according to the quality of the operator as related to environmental considerations. These categories were labeled "good", "medium", and "bad".

Thus, the model has 216 different outflow sources at the lower level (6 X 3 X 4 X 3 = 216).

2.1 Oil Distribution

The second step in developing the model was to establish an operational oil outflow baseline. This baseline volume is an estimate of the volume of oil that would enter the water from tankships if no pollution prevention measures were practiced. The baseline volume assumes that neither load-on-top procedures nor segregated ballast tanks are used. This baseline is a natural point of reference from which the effectiveness of equipment and construction standards can be measured.

These baseline oil outflows were calculated at the operational level in the model for deballasting, tank cleaning and sludge removal prior to shipyard entry. The estimated oil outflows for white products were calculated, based on tank cleaning only, inasmuch as most white product tanks are cleaned each voyage for cargo purity reasons. These calculations are contained in Attachment 1 of this Appendix. It is estimated that 1055 thousand metric tons/year of oil outflow would result from U. S. flag vessels and foreign flag vessels that call on U. S. ports if no pollution prevention measures were utilized. The calculations were based on data for the 1976 calender year, which is the latest year for which accurate information is available.

The baseline oil outflows must be distributed to the lowest level in order to be of use in the model. The baseline outflows of the ballasting and tank cleaning categories were distributed downward on the basis of deadweight carried by the vessels in each deadweight category. For example, in the crude oil imported branch, the percentage of oil carried by vessels under 20,000 DWT was 2% ; 10% for vessels between 20,000 and 40,000 DWT; 45% for vessels between 40,000 and 70,000 DWT; and 43% for vessels greater than 70,000. DWT. The baseline oil outflows in the shipyard sludge removal categories were based on the deadweight capacity in each category. For example, in the crude oil imported branch, the deadweight capacity of vessels under 20,000 DWT was 1%; 11% for vessels between 20,000 and 40,000 DWT; 28% for vessels between 40,000 and 70,000 DWT; and 60% for vessels greater than 70,000 DWT. The percentages used in these breakdowns are contained in Tables A-1 and A-2.

The distribution was further broken down by quality of operator. The Coast Guard subjectively estimates that "good" operators carry 65% of the oil, "medium" operators carry 34% and the remaining 1% is carried by "bad" operators. See chain 1.1.1.1 in Figure A-1.

2.2. Oil Outflow Model

Results were obtained from the model by multiplying this calculated baseline oil outflow by an effectiveness value. It was necessary to assess the expected effectiveness of the regulatory action and various alternative actions over the baseline and to use this information to calculate the expected reduction in oil outflows. Assessments of expected reductions at each level in the model are made by considering the change in oil outflow which would be expected from adoption of the proposed regulatory action and the alternatives. The amount of oil outflow expected as a result of the pollution prevention alternative under consideration was determined by multiplying the baseline oil outflow of a specific category by a value setting for that category.

The value setting was determined in the following manner:

Value setting = 1 - (efficiency) x (effectiveness)

Where efficiency is a measure of the technical capability of the equipment or construction requirement's ability to prevent oil outflow and

Effectiveness is a measure of the crew's ability to use the equipment, as affected by preventive maintenance, motivation of crew, etc.

As can be seen from the definition of effectiveness, the value settings were quite subjective. Additionally, the information

Table A-1

Percent of Various Oil Movements by Various Size Vessels

DWT Category / Movements	less than 20,000 DWT	20,000 to 40,000 DWT	40,000 to 70,000 DWT	greater than 70,000 DWT
Import-Export Crude Oil	2	10	45	43
Import-Export Product Oil	6	63	27	4
Domestic Crude Oil	8	34	14	44
Domestic Product Oil	25	59	11	5

Note: Information was derived from data contained in references 1 and 2 of this Appendix.

Table A-2

Breakdown of DWT Capacity Engaged in Various Oil Trades

DWT Category / Trade	less than 20,000 DWT	20,000 to 40,000 DWT	40,000 to 70,000 DWT	greater than 70,000 DWT
Import-Export Crude Oil	1	11	28	60
Import-Export Product Oil	6	47	32	15
Domestic Crude Oil	7	45	23	24
Domestic Product Oil	10	63	15	12

Note: Information was derived from data contained in references 1 and 2 of this Appendix.

regarding the efficiency of some pollution prevention measures was not known with complete certainty.

The value setting calculations for the LOT procedure are shown below as an example:

a. It was felt that the possible efficiency of this measure could be 98%.

b. Effectiveness of 92% was assumed for "good" operators, 75% for "medium" operators, and 60% for "bad" operators.

c. Thus, the value settings used in the model were
   i. value setting "good" operators = 1-(0.98)(0.92) = 0.10
   ii. value setting "medium" operators = 1-(0.98)(0.75) = 0.27
   iii. value setting "bad" operators = 1-(0.98)(0.60) = 0.41

These numbers can be interpreted to mean that, for "medium" operators, 27% of the operational oil outflow that would have been discharged if no pollution reduction measures were utilized would continue to be discharged into the oceans if LOT were employed.

For example, for vessels in the 20,000 to 40,000 DWT range, importing or exporting crude oil, operated by "medium" operators and utilizing LOT, the amount of outflow due to ballasting can be calculated in the following manner (See branch 1.1.1.2 of Attachment 2):

value setting = 0.27

baseline volume = 8.09 thousand metric tons/year

estimated outflow = 0.27 x 8.09
= 2.18 thousand metric tons/year

The computer calculations from the outflow model for the proposed regulatory action are shown as an example calculation as Attachment 2 to this Appendix. The operation of the model can best be explained with an example.

Branches 1.1.1.1 and 1.1.1.2 show the value settings (under column labeled "WT") for "good", "medium", and "bad" operators when LOT procedures are used to reduce oil outflows from ballasting. These values are 0.10 for "good" operators, 0.27 for "medium" operators, and 0.41 for "bad" operators. (It should be noted that the proposed construction and equipment standards are not applicable to existing vessels under 40,000 DWT which branches 1.1.1.1 and 1.1.1.2 address, thus, LOT is the only preventive measure that would be used.)

Branches 1.1.1.3 and 1.1.1.4, which apply to vessels of 40,000 DWT and above, indicate the value settings used for COW and LOT in

combination. These settings are 0.06 for "good" operators, 0.21 for "medium" operators, and 0.31 for "bad" operators.

The model multiplies these value settings by the baseline outflows shown under the column marked "OUTFLOW" and sums them to calculate a total as shown below for branch 1.1.1.3:

"good" operators	0.06 x 69.6 = 4.2
"medium" operators	0.21 x 36.4 = 7.6
"bad" operators	0.31 x 1.1 = 0.3
TOTAL	12.1

This number is interpreted to mean that if COW were utilized an estimated 12,100 metric tons/year of oil outflows would result from ballasting operations aboard vessels in the 40,000 to 70,000 DWT range that import crude oil.

The four branches dealing with ballasting operations aboard vessels importing crude oil are summed in Branch 1.1.1 to give outflows from all deadweight categories. The three operations considered by the model are summed in Branch 1.1, which indicates operational outflows resulting from importing and exporting crude oil. Branch 1 is then the sum of all outflows from all types of oil movements. As can be seen from Branch 1, the estimated total outflows would be 175 thousand metric tons/year if the proposed regulatory action were required.

3. SUMMARY

In addition to the proposed regulatory action, each alternative considered in the Environmental Impact Statement which dealt with existing vessels was evaluated. The alternatives and results of the model are summarized Table A-3.

Estimated Operational Oil Outflows

of Alternatives to the Proposed Action for Existing Vessels

Alternative \ Type of Oil Movement	Operational Oil Outflows (thousands of metric tons)				
	Imported Crude	Domestic Crude	Imported Product	Domestic Product	TOTALS
No Action (Section 4.1) Present Measures in effect	117.5	5.5	48.3	52.9	224.2
Proposed Regulatory Action (Section 3)	71.9	4.5	46.5	52.3	175.2
Original US Proposal to IMCO (Section 4.8)	80.3	3.0	40.7	48.6	172.6
Proposed Action but Deleting COW Option (Section 4.4)	84.1	3.9	46.5	52.3	186.8
Proposed Action Plus SBT on Crude Carriers 20,000 DWT and above Section 4.5)	80.3	3.0	46.5	52.3	182.1
Proposed Action Plus SBT on Product Carriers 20,000 DWT (Section 4.6)	71.9	4.5	40.7	48.6	165.7
Proposed Action Plus CBT on Product Carriers greater than 20,000 DWT (Section 4.6)	71.9	4.5	42.9	49.9	169.2

TABLE A-3

REFERENCES

1. Department of the Army, Corps of Engineers, Waterborne Commerce of the United States, Part 5, National Summaries, 1976.

2. Department of Commerce, Maritime Administration, Characteristics of Tankers Entering U. S. Ports during 1976, 1978.

3. Department of Transportation, U. S. Coast Guard, Final Environmental Impact Statement, Regulations for Tank Vessels Engaged In the Carriage of Oil in Domestic Trade, Washington, D. C., August 1975, available from the National Technical Information service, Springfield, VA. 22151, Government Accession No. AD A036769.

Attachment 1

Baseline Outflow Calculations

This attachment contains the calculations used as the outflow baseline for the model. The oil movements and deadweight capacity used in these calcultions are based on 1976 statistics from references 1 and 2 of this Appendix. The other assumptions are from reference 3 of this Appendix and represent an estimate of average tanker operations. Little information has been published on clingage factors and amount of sludge removed periodically from cargo tanks. The assumptions indicated are the Coast Guard's best estimates of actual tanker operations.

1. Crude Oil Import and Export Outflow Calculations

1.1 Assumptions

The assumptions used in these calculations are as set forth in reference 3, except as noted:

a. Oil movements = 337.5 million short tons/year (ref. 1).

b. No tankers use LOT.

c. Clingage factor is 0.004 of tank's cargo.

d. 1/3 of tanks cleaned and ballasted during the trip (half for clean ballast, half for sediment control).

e. 1/5 of tanks ballasted prior to departure (dirty ballast).

f. 15% of clingage taken out of tank upon pumping out of oily ballast.

g. Deadweight in trade = 59.92 million long tons (ref. 2).

h. The average tankship will have cleaned each tank for shipyard entry purposes once every 21 months. Thus the fraction of DWT in trade cleaned for shipyard entry each year is 12/21.

1.2 Ballasting Outflows

= (337.5 M) (.004) (.33) (.5) + (337.5 M) (.004) (.2) (.15)

= (222.7 + 40.5) (1000)

= 263,000 short tons/year = 238,000 metric tons/year

1.3 Tank Cleaning Outflows

= (337.5 M) (.004) (.33) (.5)

= 223,000 short tons/year = 202,000 metric tons/year

1.4 Shipyard Entry Outflows

= (59.92 M) (12/21) (.004)

= 137,000 long tons/year = 139,000 metric tons/year

2. Product Oil Import and Export Outflow Calculations

2.1 Black Products

2.1.1 Assumptions:

a. Black Oil Movements = 68.9 million short tons/year (ref. 1).

b. Clingage factor is 0.0004 of tanks cargo.

c. 1/5 of tanks ballasted prior to departure.

d. 1/6 of tanks cleaned for ballast purposes.

e. 3/5 of tanks cleaned for sludge buildup and cargo purity reasons.

f. Deadweight of vessels in trade = 16.49 million long tons (ref. 2).

g. 15% of clingage taken out of tank while pumping out oily ballast.

h. The average tankship will have cleaned each tank for shipyard purposes once every 21 months. Thus the fraction of DWT in trade cleaned for shipyard entry each year is 12/21.

2.1.2 Ballasting Outflows

= (68.9 M) (.004) (0.2) (0.15) + (68.9 M) (.004) (1/6)

= 54,300 short tons/year = 49,500 metric tons/year

2.1.3 Tank Cleaning Outflows

= (68.9 M) (.004) (.60)

= 165,000 short tons/year = 150,000 metric tons/year

2.1.4 Shipyard Entry Outflows

= (16.49 M) (12/21) (.004)

= 37,700 long tons/year = 38,300 metric tons/year

2.2 White Products

2.2.1 Assumptions:

a. White Oil Movements = 8.4 million short tons/year.

b. Clingage factor is 0.00075 of tanks cargo.

c. 80% of tanks are cleaned each trip.

d. All tank washings dumped at sea, no reception facilities used.

2.2.2 White Oil Outflows

= (8.4 M) (.00075) (.8)

= 5,000 short tons/year = 4,600 metric tons/year

3. Domestic Movements of Crude Oil Outflow Calculations

3.1 Assumptions:

a. Domestic Movements of Crude Oil = 24.3 million short tons/year (reference 1).

b. No tankers use LOT.

c. Clingage factor is 0.004 of tank's cargo.

d. 1/3 of the tanks cleaned and ballasted during the trip (half for clean ballast, half for sediment control).

e. 1/5 of the tanks ballasted prior to departure (dirty ballast).

f. 15% of clingage taken out of tank upon pumping out of oily ballast.

g. Deadweight in trade = 0.531 million long tons.

h. The average tankship will have cleaned each tank for shipyard entry purposes once every 21 months. Thus the fraction of the DWT cleaned each year is 12/21.

3.2. Ballasting Outflows

= (24.3 M) (.004) (.33) (.5) + (24.3 M) (.004) (.2) (.15)

= (16.04 + 2.92) (1000)

= 19,000 short tons/year = 17,200 metric tons/year

3.3 Tank Cleaning Outflows

= (24.3 M) (.004) (.33) (.5)

= 16,000 short tons/year = 14,500 metric tons/year

3.4. Shipyard Entry Outflows

= (0.531 M) (12/21) (.004)

= 1,200 long tons/year = 1,230 metric tons/year

4. Domestic Movements of Product Outflow Calculations

4.1 Domestic Black Products

4.1.1 Assumptions:

a. Black Oil Movements = 51.1 million short tons (ref. 1).

b. Clingage factor is 0.004 of tanks cargo.

c. 1/5 of tanks ballasted prior to departure.

d. 1/6 of tanks cleaned for ballast purposes.

e. 3/5 of tanks cleaned for sludge buildup and cargo purity reasons.

f. Deadweight of vessels in trade = 1.85 million long tons (ref. 2).

g. 15% of clingage taken out of tank while pumping out oily ballast.

h. The average tankship will hve cleaned tanks for shipyard entry purposes once every 21 months. Thus the fraction of the DWT cleaned for shipyard entry each year is 12/21.

4.1.2 Ballasting Outflows

= (51.1 M) (.004) (.2) (.15) + (51.1 M) (.004) (1/6)

= 40,500 short tons/year = 36,800 metric tons/year

4.1.3. Tank Cleaning Outflows

= (51.1 M) (.004) (.6)

= 122,600 short tons/year = 111,200 metric tons/year

4.1.4 Shipyard Entry Outflows

= (1.85 M) (12/21) (.004)

= 4,230 long tons/year = 4,300 metric tons/year

4.2 Domestic White Products

4.2.1 Assumptions:

a. Domestic White Oil Movements = 87.2 million short tons/year.

b. Clingage factor is 0.00075 of tanks cargo.

c. 80% of the tanks are cleaned each trip.

d. All tank washings dumped at sea, no reception facilities are used.

4.2.2 Domestic White Oil Outflows

= (87.2 M) (.00075) (.8)

= 52,300 short tons/year = 47,400 metric tons/year

OPERATIONAL OIL OUTFLOW MODEL

COMPUTER OUTPUT FOR PROPOSED REGULATIONS

1.

	FACTOR	PROB.	BASE	OUTFLOW
1)	CRUDE IMPORT	1.00	71.91	71.91
2)	WHITE PRODUCT IMPORT	1.00	2.65	2.65
3)	BLACK PRODUCT IMPORT	1.00	43.88	43.88
4)	CRUDE DOMESTIC	1.00	4.50	4.50
5)	WHITE PRODUCT DOMESTIC	1.00	27.72	27.72
6)	BLACK PRODUCT DOMESTIC	1.00	24.55	24.55
	TOTAL			175.24

1. 1 . US OPS -CRUDE IMPORT

	FACTOR	PROB.	BASE	OUTFLOW
1)	BALLAST	1.00	28.36	28.36
2)	CLEANING	1.00	24.07	24.07
3)	SHIPYARDS	1.00	19.48	19.48
	TOTAL			71.91

1. 1 . 1 . US OPS -CRUDE IMPORT - BALLAST

	FACTOR	PROB.	BASE	OUTFLOW
1)	< 20 DWT	1.00	0.76	0.76
2)	20 - 40 DWT	1.00	3.82	3.82
3)	40 - 70 DWT	1.00	12.15	12.15
4)	> 70 DWT	1.00	11.61	11.61
	TOTAL			28.36

1. 1 . 1 . 1 . US OPS -CRUDE IMPORT - BALLAST - < 20 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.10	3.09	0.30
2)	MEDIUM OPERATOR	0.27	1.62	0.43
3)	BAD OPERATOR	0.41	0.05	0.02
	TOTAL			0.76

1. 1 . 1 . 2 . US OPS -CRUDE IMPORT - BALLAST - 20-40 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.10	15.47	1.54
2)	MEDIUM OPERATOR	0.27	8.09	2.18
3)	BAD OPERATOR	0.41	0.24	0.09
	TOTAL			3.82

1.1.1.3. US OPS -CRUDE IMPORT - BALLAST - 40-70 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.06	69.60	4.17
2)	MEDIUM OPERATOR	0.21	36.41	7.64
3)	BAD OPERATOR	0.31	1.07	0.33
	TOTAL			12.15

1.1.1.4. US OPS -CRUDE IMPORT - BALLAST - > 70 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.06	66.52	3.99
2)	MEDIUM OPERATOR	0.21	34.78	7.30
3)	BAD OPERATOR	0.31	1.02	0.31
	TOTAL			11.61

1.1.2. US OPS -CRUDE IMPORT - CLEANING

	FACTOR	PROB.	BASE	OUTFLOW
1)	< 20 DWT	1.00	0.64	0.64
2)	20 - 40 DWT	1.00	3.24	3.24
3)	40 - 70 DWT	1.00	10.31	10.31
4)	> 70 DWT	1.00	9.85	9.85
	TOTAL			24.07

1.1.2.1. US OPS -CRUDE IMPORT - CLEANING - < 20 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.10	2.62	0.26
2)	MEDIUM OPERATOR	0.27	1.37	0.36
3)	BAD OPERATOR	0.41	0.04	0.01
	TOTAL			0.64

1.1.2.2. US OPS -CRUDE IMPORT - CLEANING - 20-40 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.10	13.13	1.31
2)	MEDIUM OPERATOR	0.27	6.87	1.85
3)	BAD OPERATOR	0.41	0.20	0.08
	TOTAL			3.24

1. 1 . 2 . 3 . US OPS -CRUDE IMPORT - CLEANING - 40-70 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.06	59.08	3.54
2)	MEDIUM OPERATOR	0.21	30.91	6.49
3)	BAD OPERATOR	0.31	0.91	0.28
	TOTAL.			10.31

1. 1 . 2 . 4 . US OPS -CRUDE IMPORT - CLEANING - > 70 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.06	56.46	3.38
2)	MEDIUM OPERATOR	0.21	29.53	6.20
3)	BAD OPERATOR	0.31	0.87	0.26
	TOTAL.			9.85

1. 1 . 3 . US OPS -CRUDE IMPORT - SHIPYARDS

	FACTOR	PROB.	BASE	OUTFLOW
1)	< 20 DWT	1.00	0.46	0.46
2)	20 - 40 DWT	1.00	5.13	5.13
3)	40 - 70 DWT	1.00	4.41	4.41
4)	> 70 DWT	1.00	9.46	9.46
	TOTAL.			19.48

1. 1 . 3 . 1 . US OPS -CRUDE IMPORT - SHIPYARDS - < 20 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.30	0.90	0.27
2)	MEDIUM OPERATOR	0.40	0.47	0.18
3)	BAD OPERATOR	0.50	0.01	0.00
	TOTAL.			0.46

1. 1 . 3 . 2 . US OPS -CRUDE IMPORT - SHIPYARDS - 20-40 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.30	9.94	2.98
2)	MEDIUM OPERATOR	0.40	5.20	2.08
3)	BAD OPERATOR	0.50	0.15	0.07
	TOTAL			5.13

1. 1 . 3 . 3 . US OPS -CRUDE IMPORT - SHIPYARDS - 40-70 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.06	25.30	1.51
2)	MEDIUM OPERATOR	0.21	13.23	2.77
3)	BAD OPERATOR	0.31	0.39	0.12
	TOTAL			4.41

1. 1 . 3 . 4 . US OPS -CRUDE IMPORT - SHIPYARDS - > 70 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.06	54.21	3.25
2)	MEDIUM OPERATOR	0.21	28.36	5.95
3)	BAD OPERATOR	0.31	0.83	0.25
	TOTAL			9.46

1. 2 . US OPS -WHITE PRODUCT IMPORT

	FACTOR	PROB.	BASE	OUTFLOW
1)	BALLAST	1.00	0.00	0.00
2)	CLEANING	1.00	2.65	2.65
3)	SHIPYARDS	1.00	0.00	0.00
	TOTAL			2.65

1. 2 . 1 . US OPS -WHITE PRODUCT IMPORT - BALLAST

	FACTOR	PROB.	BASE	OUTFLOW
1)	< 20 DWT	1.00	0.00	0.00
2)	20 - 40 DWT	1.00	0.00	0.00
3)	40 - 70 DWT	1.00	0.00	0.00
4)	> 70 DWT	1.00	0.00	0.00
	TOTAL			0.00

1. 2 . 1 . 1 . US OPS -WHITE PRODUCT IMPORT - BALLAST - < 20 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.00	0.00	0.00
2)	MEDIUM OPERATOR	0.00	0.00	0.00
3)	BAD OPERATOR	0.00	0.00	0.00
	TOTAL			0.00

1. 2 . 1 . 2 . US OPS -WHITE PRODUCT IMPORT - BALLAST - 20-40 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.00	0.00	0.00
2)	MEDIUM OPERATOR	0.00	0.00	0.00
3)	BAD OPERATOR	0.00	0.00	0.00
	TOTAL			0.00

1. 2 . 1 . 3 . US OPS -WHITE PRODUCT IMPORT - BALLAST - 40-70 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.00	0.00	0.00
2)	MEDIUM OPERATOR	0.00	0.00	0.00
3)	BAD OPERATOR	0.00	0.00	0.00
	TOTAL			0.00

1. 2 . 1 . 4 . US OPS -WHITE PRODUCT IMPORT - BALLAST - > 70 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.00	0.00	0.00
2)	MEDIUM OPERATOR	0.00	0.00	0.00
3)	BAD OPERATOR	0.00	0.00	0.00
	TOTAL			0.00

1. 2 . 2 . US OPS -WHITE PRODUCT IMPORT - CLEANING

	FACTOR	PROB.	BASE	OUTFLOW
1)	< 20 DWT	1.00	0.15	0.15
2)	20 - 40 DWT	1.00	1.24	1.24
3)	40 - 70 DWT	1.00	0.84	0.84
4)	> 70 DWT	1.00	0.40	0.40
	TOTAL			2.65

1. 2 . 2 . 1 . US OPS -WHITE PRODUCT IMPORT - CLEANING - < 20 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.52	0.17	0.08
2)	MEDIUM OPERATOR	0.70	0.09	0.06
3)	BAD OPERATOR	0.88	0.00	0.00
	TOTAL			0.15

1. 2 . 2 . 2 . US OPS -WHITE PRODUCT IMPORT - CLEANING - 20-40 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.52	1.39	0.72
2)	MEDIUM OPERATOR	0.70	0.72	0.50
3)	BAD OPERATOR	0.88	0.02	0.01
	TOTAL			1.24

1. 2 . 2 . 3 . US OPS -WHITE PRODUCT IMPORT - CLEANING - 40-70 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.52	0.94	0.48
2)	MEDIUM OPERATOR	0.70	0.49	0.34
3)	BAD OPERATOR	0.88	0.02	0.01
	TOTAL			0.84

1. 2 . 2 . 4 . US OPS -WHITE PRODUCT IMPORT - CLEANING - > 70 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.52	0.44	0.22
2)	MEDIUM OPERATOR	0.70	0.24	0.16
3)	BAD OPERATOR	0.88	0.01	0.00
	TOTAL			0.40

1. 2 . 3 . US OPS -WHITE PRODUCT IMPORT - SHIPYARDS

	FACTOR	PROB.	BASE	OUTFLOW
1)	< 20 DWT	1.00	0.00	0.00
2)	20 - 40 DWT	1.00	0.00	0.00
3)	40 - 70 DWT	1.00	0.00	0.00
4)	> 70 DWT	1.00	0.00	0.00
	TOTAL			0.00

1. 2 . 3 . 1 . US OPS -WHITE PRODUCT IMPORT - SHIPYARDS - < 20 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.00	0.00	0.00
2)	MEDIUM OPERATOR	0.00	0.00	0.00
3)	BAD OPERATOR	0.00	0.00	0.00
	TOTAL			0.00

1. 2 . 3 . 2 . US OPS -WHITE PRODUCT IMPORT - SHIPYARDS - 20-40 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.00	0.00	0.00
2)	MEDIUM OPERATOR	0.00	0.00	0.00
3)	BAD OPERATOR	0.00	0.00	0.00
	TOTAL			0.00

1. 2 . 3 . 3 . US OPS -WHITE PRODUCT IMPORT - SHIPYARDS - 40-70 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.00	0.00	0.00
2)	MEDIUM OPERATOR	0.00	0.00	0.00
3)	BAD OPERATOR	0.00	0.00	0.00
	TOTAL			0.00

1. 2 . 3 . 4 . US OPS -WHITE PRODUCT IMPORT - SHIPYARDS - > 70 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.00	0.00	0.00
2)	MEDIUM OPERATOR	0.00	0.00	0.00
3)	BAD OPERATOR	0.00	0.00	0.00
	TOTAL			0.00

1. 3 . US OPS -BLACK PRODUCT IMPORT

	FACTOR	PROB.	BASE	OUTFLOW
1)	BALLAST	1.00	6.42	6.42
2)	CLEANING	1.00	24.60	24.60
3)	SHIPYARDS	1.00	12.84	12.84
	TOTAL			43.88

1. 3 . 1 . US OPS -BLACK PRODUCT IMPORT - BALLAST

	FACTOR	PROB.	BASE	OUTFLOW
1)	< 20 DWT	1.00	0.49	0.49
2)	20 - 40 DWT	1.00	5.16	5.16
3)	40 - 70 DWT	1.00	0.66	0.66
4)	> 70 DWT	1.00	0.09	0.09
	TOTAL			6.42

1.3.1.1. US OPS -BLACK PRODUCT IMPORT - BALLAST - < 20 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.10	1.99	0.19
2)	MEDIUM OPERATOR	0.27	1.04	0.28
3)	BAD OPERATOR	0.41	0.03	0.01
	TOTAL.			0.49

1.3.1.2. US OPS -BLACK PRODUCT IMPORT - BALLAST - 20-40 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.10	20.88	2.08
2)	MEDIUM OPERATOR	0.27	10.92	2.94
3)	BAD OPERATOR	0.41	0.32	0.13
	TOTAL.			5.16

1.3.1.3. US OPS -BLACK PRODUCT IMPORT - BALLAST - 40-70 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.02	8.95	0.17
2)	MEDIUM OPERATOR	0.10	4.68	0.46
3)	BAD OPERATOR	0.15	0.14	0.02
	TOTAL.			0.66

1.3.1.4. US OPS -BLACK PRODUCT IMPORT - BALLAST - > 70 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.02	1.32	0.02
2)	MEDIUM OPERATOR	0.10	0.69	0.06
3)	BAD OPERATOR	0.15	0.02	0.00
	TOTAL.			0.09

1.3.2. US OPS -BLACK PRODUCT IMPORT - CLEANING

	FACTOR	PROB.	BASE	OUTFLOW
1)	< 20 DWT	1.00	1.47	1.47
2)	20 - 40 DWT	1.00	15.50	15.50
3)	40 - 70 DWT	1.00	6.64	6.64
4)	> 70 DWT	1.00	0.98	0.98
	TOTAL.			24.60

1.3.2.1. US OPS -BLACK PRODUCT IMPORT - CLEANING - < 20 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.10	5.97	0.59
2)	MEDIUM OPERATOR	0.27	3.12	0.84
3)	BAD OPERATOR	0.41	0.09	0.03
	TOTAL			1.47

1.3.2.2. US OPS -BLACK PRODUCT IMPORT - CLEANING - 20-40 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.10	62.63	6.26
2)	MEDIUM OPERATOR	0.27	32.76	8.84
3)	BAD OPERATOR	0.41	0.96	0.39
	TOTAL			15.50

1.3.2.3. US OPS -BLACK PRODUCT IMPORT - CLEANING - 40-70 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.10	26.84	2.68
2)	MEDIUM OPERATOR	0.27	14.04	3.79
3)	BAD OPERATOR	0.41	0.42	0.17
	TOTAL			6.64

1.3.2.4. US OPS -BLACK PRODUCT IMPORT - CLEANING - > 70 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.10	3.97	0.39
2)	MEDIUM OPERATOR	0.27	2.08	0.56
3)	BAD OPERATOR	0.41	0.06	0.02
	TOTAL			0.98

1.3.3. US OPS -BLACK PRODUCT IMPORT - SHIPYARDS

	FACTOR	PROB.	BASE	OUTFLOW
1)	< 20 DWT	1.00	0.76	0.76
2)	20 - 40 DWT	1.00	6.03	6.03
3)	40 - 70 DWT	1.00	4.11	4.11
4)	> 70 DWT	1.00	1.92	1.92
	TOTAL			12.84

1.3.3.1. US OPS -BLACK PRODUCT IMPORT - SHIPYARDS - < 20 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.30	1.49	0.44
2)	MEDIUM OPERATOR	0.40	0.78	0.31
3)	BAD OPERATOR	0.50	0.02	0.01
	TOTAL			0.76

1.3.3.2. US OPS -BLACK PRODUCT IMPORT - SHIPYARDS - 20-40 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.30	11.70	3.51
2)	MEDIUM OPERATOR	0.40	6.11	2.44
3)	BAD OPERATOR	0.50	0.17	0.08
	TOTAL			6.03

1.3.3.3. US OPS -BLACK PRODUCT IMPORT - SHIPYARDS - 40-70 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.30	7.96	2.38
2)	MEDIUM OPERATOR	0.40	4.16	1.66
3)	BAD OPERATOR	0.50	0.12	0.06
	TOTAL			4.11

1.3.3.4. US OPS -BLACK PRODUCT IMPORT - SHIPYARDS - > 70 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.30	3.73	1.11
2)	MEDIUM OPERATOR	0.40	1.95	0.78
3)	BAD OPERATOR	0.50	0.06	0.03
	TOTAL			1.92

1.4. US OPS -CRUDE DOMESTIC

	FACTOR	PROB.	BASE	OUTFLOW
1)	BALLAST	1.00	2.29	2.29
2)	CLEANING	1.00	1.93	1.93
3)	SHIPYARDS	1.00	0.27	0.27
	TOTAL			4.50

1. 4 . 1 . US OPS -CRUDE DOMESTIC - BALLAST

	FACTOR	PROB.	BASE	OUTFLOW
1)	< 20 DWT	1.00	0.22	0.22
2)	20 - 40 DWT	1.00	0.94	0.94
3)	40 - 70 DWT	1.00	0.27	0.27
4)	> 70 DWT	1.00	0.85	0.85
	TOTAL			2.29

1. 4 . 1 . 1 . US OPS -CRUDE DOMESTIC - BALLAST - < 20 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.10	0.90	0.09
2)	MEDIUM OPERATOR	0.27	0.47	0.12
3)	BAD OPERATOR	0.41	0.02	0.00
	TOTAL			0.22

1. 4 . 1 . 2 . US OPS -CRUDE DOMESTIC - BALLAST - 20-40 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.10	3.81	0.38
2)	MEDIUM OPERATOR	0.27	2,00	0.54
3)	BAD OPERATOR	0.41	0.05	0.02
	TOTAL			0.94

1. 4 . 1 . 3 . US OPS -CRUDE DOMESTIC - BALLAST - 40-70 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.06	1.57	0.09
2)	MEDIUM OPERATOR	0.21	0.82	0.17
3)	BAD OPERATOR	0.31	0.03	0.00
	TOTAL			0.27

1. 4 . 1 . 4 . US OPS -CRUDE DOMESTIC - BALLAST - > 70 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.06	4.93	0.29
2)	MEDIUM OPERATOR	0.21	2.57	0.53
3)	BAD OPERATOR	0.31	0.07	0.02
	TOTAL			0.85

1.4.2. US OPS -CRUDE DOMESTIC - CLEANING

	FACTOR	PROB.	BASE	OUTFLOW
1)	< 20 DWT	1.00	0.18	0.18
2)	20 - 40 DWT	1.00	0.79	0.79
3)	40 - 70 DWT	1.00	0.23	0.23
4)	> 70 DWT	1.00	0.72	0.72
	TOTAL			1.93

1.4.2.1. US OPS -CRUDE DOMESTIC - CLEANING

< 20 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.10	0.75	0.07
2)	MEDIUM OPERATOR	0.27	0.40	0.10
3)	BAD OPERATOR	0.41	0.01	0.00
	TOTAL			0.18

1.4.2.2. US OPS -CRUDE DOMESTIC - CLEANING

20-40 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.10	3.21	0.32
2)	MEDIUM OPERATOR	0.27	1.68	0.45
3)	BAD OPERATOR	0.41	0.05	0.02
	TOTAL			0.79

1.4.2.3. US OPS -CRUDE DOMESTIC - CLEANING

40-70 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.06	1.32	0.07
2)	MEDIUM OPERATOR	0.21	0.69	0.14
3)	BAD OPERATOR	0.31	0.02	0.00
	TOTAL			0.23

1.4.2.4. US OPS -CRUDE DOMESTIC - CLEANING

> 70 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.06	4.15	0.24
2)	MEDIUM OPERATOR	0.21	2.17	0.45
3)	BAD OPERATOR	0.31	0.06	0.01
	TOTAL			0.72

1. 4 . 3 . US OPS -CRUDE DOMESTIC - SHIPYARDS

	FACTOR	PROB.	BASE	OUTFLOW
1)	< 20 DWT	1.00	0.03	0.03
2)	20 - 40 DWT	1.00	0.18	0.18
3)	40 - 70 DWT	1.00	0.02	0.02
4)	> 70 DWT	1.00	0.03	0.03
	TOTAL			0.27

1. 4 . 3 . 1 . US OPS -CRUDE DOMESTIC - SHIPYARDS - < 20 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.30	0.06	0.01
2)	MEDIUM OPERATOR	0.40	0.03	0.01
3)	BAD OPERATOR	0.50	0.00	0.00
	TOTAL			0.03

1. 4 . 3 . 2 . US OPS -CRUDE DOMESTIC - SHIPYARDS - 20-40 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.30	0.35	0.10
2)	MEDIUM OPERATOR	0.40	0.19	0.07
3)	BAD OPERATOR	0.50	0.00	0.00
	TOTAL			0.18

1. 4 . 3 . 3 . US OPS -CRUDE DOMESTIC - SHIPYARDS - 40-70 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.06	0.18	0.01
2)	MEDIUM OPERATOR	0.21	0.09	0.01
3)	BAD OPERATOR	0.31	0.00	0.00
	TOTAL			0.02

1. 4 . 3 . 4 . US OPS -CRUDE DOMESTIC - SHIPYARDS - > 70 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.06	0.19	0.01
2)	MEDIUM OPERATOR	0.21	0.10	0.02
3)	BAD OPERATOR	0.31	0.00	0.00
	TOTAL			0.03

1. 5 . US OPS -WHITE PRODUCT DOMESTIC

	FACTOR	PROB.	BASE	OUTFLOW
1)	BALLAST	1.00	0.00	0.00
2)	CLEANING	1.00	27.72	27.72
3)	SHIPYARDS	1.00	0.00	0.00
	TOTAL			27.72

1. 5 . 1 . US OPS -WHITE PRODUCT DOMESTIC - BALLAST

	FACTOR	PROB.	BASE	OUTFLOW
1)	< 20 DWT	1.00	0.00	0.00
2)	20 - 40 DWT	1.00	0.00	0.00
3)	40 - 70 DWT	1.00	0.00	0.00
4)	> 70 DWT	1.00	0.00	0.00
	TOTAL			0.00

1. 5 . 1 . 1 . US OPS -WHITE PRODUCT DOMESTIC - BALLAST - < 20 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.00	0.00	0.00
2)	MEDIUM OPERATOR	0.00	0.00	0.00
3)	BAD OPERATOR	0.00	0.00	0.00
	TOTAL			0.00

1. 5 . 1 . 2 . US OPS -WHITE PRODUCT DOMESTIC - BALLAST - 20-40 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.00	0.00	0.00
2)	MEDIUM OPERATOR	0.00	0.00	0.00
3)	BAD OPERATOR	0.00	0.00	0.00
	TOTAL			0.00

1. 5 . 1 . 3 . US OPS -WHITE PRODUCT DOMESTIC - BALLAST - 40-70 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.00	0.00	0.00
2)	MEDIUM OPERATOR	0.00	0.00	0.00
3)	BAD OPERATOR	0.00	0.00	0.00
	TOTAL			0.00

1. 5 . 1 . 4 . US OPS -WHITE PRODUCT DOMESTIC - BALLAST - > 70 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.00	0.00	0.00
2)	MEDIUM OPERATOR	0.00	0.00	0.00
3)	BAD OPERATOR	0.00	0.00	0.00
	TOTAL			0.00

1. 5 . 2 . US OPS -WHITE PRODUCT DOMESTIC - CLEANING

	FACTOR	PROB.	BASE	OUTFLOW
1)	< 20 DWT	1.00	2.77	2.77
2)	20 - 40 DWT	1.00	17.47	17.47
3)	40 - 70 DWT	1.00	4.15	4.15
4)	> 70 DWT	1.00	3.31	3.31
	TOTAL			27.72

1. 5 . 2 . 1 . US OPS -WHITE PRODUCT DOMESTIC - CLEANING - < 20 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.52	3.08	1.60
2)	MEDIUM OPERATOR	0.70	1.61	1.12
3)	BAD OPERATOR	0.88	0.05	0.04
	TOTAL			2.77

1. 5 . 2 . 2 . US OPS -WHITE PRODUCT DOMESTIC - CLEANING - 20-40 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.52	19.42	10.09
2)	MEDIUM OPERATOR	0.70	10.16	7.11
3)	BAD OPERATOR	0.88	0.30	0.26
	TOTAL			17.47

1. 5 . 2 . 3 . US OPS -WHITE PRODUCT DOMESTIC - CLEANING - 40-70 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.52	4.62	2.40
2)	MEDIUM OPERATOR	0.70	2.42	1.69
3)	BAD OPERATOR	0.88	0.07	0.06
	TOTAL			4.15

1.5.2.4. US OPS -WHITE PRODUCT DOMESTIC - CLEANING - > 70 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.52	3.70	1.92
2)	MEDIUM OPERATOR	0.70	1.93	1.35
3)	BAD OPERATOR	0.88	0.05	0.04
	TOTAL			3.31

1.5.3. US OPS -WHITE PRODUCT DOMESTIC - SHIPYARDS

	FACTOR	PROB.	BASE	OUTFLOW
1)	< 20 DWT	1.00	0.00	0.00
2)	20 - 40 DWT	1.00	0.00	0.00
3)	40 - 70 DWT	1.00	0.00	0.00
4)	> 70 DWT	1.00	0.00	0.00
	TOTAL			0.00

1.5.3.1. US OPS -WHITE PRODUCT DOMESTIC - SHIPYARDS - < 20 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.00	0.00	0.00
2)	MEDIUM OPERATOR	0.00	0.00	0.00
3)	BAD OPERATOR	0.00	0.00	0.00
	TOTAL			0.00

1.5.3.2. US OPS -WHITE PRODUCT DOMESTIC - SHIPYARDS - 20-40 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.00	0.00	0.00
2)	MEDIUM OPERATOR	0.00	0.00	0.00
3)	BAD OPERATOR	0.00	0.00	0.00
	TOTAL			0.00

1.5.3.3. US OPS -WHITE PRODUCT DOMESTIC - SHIPYARDS - 40-70 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.00	0.00	0.00
2)	MEDIUM OPERATOR	0.00	0.00	0.00
3)	BAD OPERATOR	0.00	0.00	0.00
	TOTAL			0.00

1. 5 . 3 . 4 . US OPS -WHITE PRODUCT DOMESTIC - SHIPYARDS - > 70 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.00	0.00	0.00
2)	MEDIUM OPERATOR	0.00	0.00	0.00
3)	BAD OPERATOR	0.00	0.00	0.00
	TOTAL			0.00

1. 6 . US OPS -BLACK PRODUCT DOMESTIC

	FACTOR	PROB.	BASE	OUTFLOW
1)	BALLAST	1.00	5.22	5.22
2)	CLEANING	1.00	17.88	17.88
3)	SHIPYARDS	1.00	1.44	1.44
	TOTAL			24.55

1. 6 . 1 . US OPS -BLACK PRODUCT DOMESTIC - BALLAST

	FACTOR	PROB.	BASE	OUTFLOW
1)	< 20 DWT	1.00	1.47	1.47
2)	20 - 40 DWT	1.00	3.47	3.47
3)	40 - 70 DWT	1.00	0.19	0.19
4)	> 70 DWT	1.00	0.08	0.08
	TOTAL			5.22

1. 6 . 1 . 1 . US OPS -BLACK PRODUCT DOMESTIC - BALLAST - < 20 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.10	5.94	0.59
2)	MEDIUM OPERATOR	0.27	3.11	0.83
3)	BAD OPERATOR	0.41	0.09	0.03
	TOTAL			1.47

1. 6 . 1 . 2 . US OPS -BLACK PRODUCT DOMESTIC - BALLAST - 20-40 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.10	14.02	1.40
2)	MEDIUM OPERATOR	0.27	7.33	1.97
3)	BAD OPERATOR	0.41	0.22	0.09
	TOTAL			3.47

1.6.1.3. US OPS -BLACK PRODUCT DOMESTIC - BALLAST - 40-70 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.02	2.61	0.05
2)	MEDIUM OPERATOR	0.10	1.37	0.13
3)	BAD OPERATOR	0.15	0.04	0.00
	TOTAL			0.19

1.6.1.4. US OPS -BLACK PRODUCT DOMESTIC - BALLAST - > 70 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.02	1.19	0.02
2)	MEDIUM OPERATOR	0.10	0.62	0.06
3)	BAD OPERATOR	0.15	0.02	0.00
	TOTAL			0.08

1.6.2. US OPS -BLACK PRODUCT DOMESTIC - CLEANING

	FACTOR	PROB.	BASE	OUTFLOW
1)	< 20 DWT	1.00	4.47	4.47
2)	20 - 40 DWT	1.00	10.55	10.55
3)	40 - 70 DWT	1.00	1.96	1.96
4)	> 70 DWT	1.00	0.89	0.89
	TOTAL			17.88

1.6.2.1. US OPS -BLACK PRODUCT DOMESTIC - CLEANING - < 20 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.10	18.07	1.80
2)	MEDIUM OPERATOR	0.27	9.45	2.55
3)	BAD OPERATOR	0.41	0.28	0.11
	TOTAL			4.47

1.6.2.2. US OPS -BLACK PRODUCT DOMESTIC - CLEANING - 20-40 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.10	42.66	4.26
2)	MEDIUM OPERATOR	0.27	22.31	6.02
3)	BAD OPERATOR	0.41	0.65	0.26
	TOTAL			10.55

1.6.2.3. US OPS -BLACK PRODUCT DOMESTIC - CLEANING - 40-70 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.10	7.95	0.79
2)	MEDIUM OPERATOR	0.27	4.16	1.12
3)	BAD OPERATOR	0.41	0.12	0.04
	TOTAL.			1.96

1.6.2.4. US OPS -BLACK PRODUCT DOMESTIC - CLEANING - > 70 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.10	3.57	0.35
2)	MEDIUM OPERATOR	0.27	1.89	0.51
3)	BAD OPERATOR	0.41	0.06	0.02
	TOTAL.			0.89

1.6.3. US OPS -BLACK PRODUCT DOMESTIC - SHIPYARDS

	FACTOR	PROB.	BASE	OUTFLOW
1)	< 20 DWT	1.00	0.14	0.14
2)	20 - 40 DWT	1.00	0.90	0.90
3)	40 - 70 DWT	1.00	0.21	0.21
4)	> 70 DWT	1.00	0.17	0.17
	TOTAL.			1.44

1.6.3.1. US OPS -BLACK PRODUCT DOMESTIC - SHIPYARDS - < 20 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.30	0.28	0.08
2)	MEDIUM OPERATOR	0.40	0.14	0.05
3)	BAD OPERATOR	0.50	0.00	0.00
	TOTAL			0.14

1.6.3.2. US OPS -BLACK PRODUCT DOMESTIC - SHIPYARDS - 20-40 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.30	1.76	0.52
2)	MEDIUM OPERATOR	0.40	0.91	0.36
3)	BAD OPERATOR	0.50	0.03	0.01
	TOTAL.			0.90

1.6.3.3. US OPS -BLACK PRODUCT DOMESTIC - SHIPYARDS - 40-70 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.30	0.42	0.12
2)	MEDIUM OPERATOR	0.40	0.22	0.08
3)	BAD OPERATOR	0.50	0.01	0.00
	TOTAL			0.21

1.6.3.4. US OPS -BLACK PRODUCT DOMESTIC - SHIPYARDS - > 70 DWT

	FACTOR	PROB.	BASE	OUTFLOW
1)	GOOD OPERATOR	0.30	0.34	0.10
2)	MEDIUM OPERATOR	0.40	0.17	0.06
3)	BAD OPERATOR	0.50	0.01	0.00
	TOTAL			0.17

APPENDIX B

COST MODEL AND ANALYSIS FOR ESTIMATING COSTS FOR IMPLEMENTATION OF THE RESULTS OF THE INTERNATIONAL CONFERENCE ON TANKER SAFETY AND POLLUTION PREVENTION

November 1978

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COST MODEL FOR ESTIMATING TSPP IMPLEMENTATION COSTS

1. Introduction

The purpose of this section is to describe the procedure used to estimate the incremental costs that are incurred by the ship owner due to implementation of the various combinations of TSPP requirements for certain U. S. flag tankers and certain foreign flag tankers which enter U. S. ports. This analysis estimates the costs for the ship construction and equipment standards due to TSPP and the costs for the proposed regulations. It should be understood that the cost estimates derived from the procedure discussed below are approximations and can never be exact.

It is felt that the costing procedure must, among other factors, take into account the following:

(a) Costs incurred by imposing various TSPP requirements on vessels in specific DWT classes.

(b) The effect on costs of initiating TSPP requirements at different points in time after adoption of the 1978 protocols to the SOLAS 1974 and the MARPOL 1973 Conventions.

(c) The assumption that the proposed regulations will not cause new tanker construction. Since many vessels will be reaching their retirement (scrappage) age, some of these will be scrapped and will not be replaced, while others will probably be replaced. The incremental costs due to TSPP requirements for these replacement vessels, which may be built as the 1978 TSPP Protocols come into force, should be considered as an impact of the new regulations even though these replacement tankers (if new) cannot be directly attributed to the TSPP Protocols.

2. Costing Procedure

Sections 2.1 through 2.4 give a description of the procedures employed in the costing of foreign flag tankers which trade in U. S. ports. The same procedures were employed for U. S. flag vessels, however, a repetition of the detailed procedures is not made. Differences between the costing of U. S. flag tankers and foreign flag tankers are pointed out in section 2.5.

2.1 Estimates of Foreign Tanker Population Trading in U. S. Ports

The first step in estimating compliance cost is to identify the ships to

which the regulations will apply. There is ample information to identify the ships which now engage in the U. S. foreign trade. Since all of these ships are not dedicated to this trade, a fleet identified on this basis would have excess capacity for the U. S. trade. When one takes the aggregate deadweight tonnage of this fleet as a given measure of demand in the U. S. trade, an overestimate of the tonnage required is obtained and, therefore, an upper limit of the compliance cost.

The tonnage required is a function of both the quantity of oil imported and the pattern of trade routes. While there are estimates of current and future import levels, the pattern of trade routes is subject to much speculation. The effects on the tanker population of future developments in deepwater ports, transhipment terminals, pipelines, and refineries are open to conjecture.

The deadweight tonnage of the existing fleet should be taken as an objective measure of the upper limit of tonnage required for the U. S. trade and the basis of an upper limit for estimating total compliance cost. The degree to which the trading fleet adjusts toward a minimum fleet of dedicated ships will determine to what degree actual costs fall below the upper limit.

2.1.1 Distribution of Foreign Tankers Entering U. S. Ports

It is difficult to project with certainty the absolute number of foreign tankships to which these proposed regulations will apply. A reasonable approximation can be made, however, by using data which shows the number of vessels which have called at U. S. ports in recent years.

Two independent data sources exist. One is maintained by the Coast Guard in support of the Foreign Tanker Boarding Program, and the other resulted from an analysis by the Trade Studies and Statistics Office of the Maritime Administration.

For the 18 month period from January 1977 to July 1978, the Coast Guard data shows that 1471 foreign tankers, 175 of which were chemical carriers, called on U. S. ports. Thus, during this period, 1,296 foreign oil tankers called on U. S. ports. The Coast Guard data (Reference 1 to this Appendix) includes many vessel characteristics but does not presently include amount of cargo carried or description of cargo, i.e., whether crude oil or petroleum products are carried.

The Maritime Administration data for calendar year 1976 shows that 1,341 foreign tankers, (878 crude carriers and 463 product carriers) called on U. S. ports. This data cites specifically the cargo carried, deadweight, and port (or ports) of discharge. Vessel characteristics are defined in less detail than in the Coast Guard data.

The higher number, 1,341, is probably a closer estimate to the number of vessels to which these proposed regulations would apply. The reasons for this choice are enumerated in the following paragraphs.

The TSPP Conference contains new standards for inspection and certification of oil tankers. These standards are very similar to procedures carried out now by the U. S., both with regard to the U. S. fleet and to those foreign ships which call at U. S. ports. It is expected that countries implementing the Conference standards will do so by 1981. As the world fleet is 'upgraded' through inspection and certification it can be expected that more vessels will be placed in service to the U. S.

These TSPP standards are to be implemented in accordance with Resolutions 1 and 2 of the 1978 Conference. Because the same standards are expected to come into force world-wide at about the same time, owners are expected to upgrade their fleets accordingly. Having international standards which come into effect world-wide will provide a great amount of flexibility for the owner. Once in compliance, ships should be free to trade to the U. S. as well to other countries which have implemented the same standards without additional expense to the owner. Because owners are expected to choose to maintain fleet flexibility, i.e., comply with the new international standards so that more trading is available to them, the fleet of ships expected to call on U. S. ports in the future is expected to be larger than the number which called here in 1977 provided that the demand for petroleum, as described above, continues to increase.

For these reasons, the number of tankers expected to call at U. S. ports in the near future is expected to approximate the number which called in 1976 more closely than the number which called in 1977. Therefore, the number of foreign tankers used in this analysis was this 1,341 minus tankers under 20,000 DWT. This results in a total of 1,227.

The above statistics were used to correct the DWT distribution of foreign flag crude oil carrying tankers obtained from Coast Guard data. Similar calculations were performed for foreign flag product tankers.

As stated above, the U. S. Coast Guard Foreign Tanker Boarding Program data was used to estimate the distribution of crude oil tankers by DWT classes, the average age and deadweight for each class, the population of each class, the total DWT for each class and the average financing period available for each DWT class in 1978. Similar estimates were obtained for product carriers by means of the Coast Guard and the MARAD data bases described above. The resulting DWT classes and other pertinent data are shown in Tables B-1 and B-2.

The DWT classes shown in these tables were obtained by assuming that tankers 15 years old or older would not be retrofitted to comply with TSPP options. It was further assumed that crude oil and products will be delivered to the U. S. by vessels of similar DWT classes and class population, i.e. the total DWT for each class will remain constant. Those vessels that would be diverted to other trades or scrapped because of age would be replaced by surplus tankers or tankers diverted from other trades. It was further assumed that the age of tankers used to replace scrapped or diverted tankers would equal the average age of those vessels remaining in each DWT class after applying the 15 year age limit.

2.2. Estimates of Costs for TSPP Options

This section presents estimates of costs to retrofit the tanker fleet entering U. S. ports to comply with the 1978 TSPP Protocols. Individual tanker cost estimates were obtained from both MARAD and IMCO data. These unit cost estimates were then expressed in functional form in terms of DWT (when possible) to facilitate the calculation of total costs. With the exception of SBT costs, it was assumed that comparable U. S. TSPP equipment costs would be similar to foreign equipment costs. It was assumed that all vessels could be retrofitted during scheduled shipyard maintenance periods and that no cost associated with time loss for retrofit would be incurred. No shipyard congestion is expected to result due to retrofitting of segregated ballast since few existing vessels are expected to be retrofitted with this option. Further costing assupmtions are given in the discussion of each option or individual measure.

IT MUST BE EMPHASISED THAT THE COST ESTIMATES OPTAINED THROUGH THIS ANALYSIS CAN NEVER BE EXACT. ONLY ROUGH ESTIMATES SHOULD BE EXPECTED. There are many uncertainties in the inputs to such a costing procedure. Some of the variations experienced by the shipbuilding industry are created or exagerated by owner's preference, material shortages, shipyard workload, government support, strikes, inflation and tanker inventory. Thus, exact costs can be expected to vary from these estimates, both in the United States and worldwide.

TABLE B-1

EXISTING FOREIGN CRUDE TANKERS
ENTERING U. S. PORTS

CLASS of DWT x10 ^{3}	AVERAGE DWT for CLASS $(DWT)_a$	POPULATION of CLASS (1) (N_e)	TOTAL DWT for CLASS (LT x 10^6) $(DWT)_t$	AVERAGE AGE (Yrs)	AVERAGE FINANCING PERIOD (Yrs)
20-40					
20-29	23,940	98	2.346	8	17
30-39	34,515	144	4.970	5	20
40-70					
40-49	48,185	93	4.481	8	17
50-59	53,877	90	4.849	10	15
60-69	67,150	77	5.170	13	12
70+					
70-79	74,838	90	6.735	10	15
80-89	86,207	78	6.724	7	18
90-99	95,617	46	4.398	9	16
100-109	103,645	38	3.939	9	16
110+	133,313	77	10.265	6	19

(1) Excludes tankers under 20K DWT

TABLE B- 2

EXISTING FOREIGN PRODUCT TANKERS
ENTERING U. S. PORTS

CLASS of (DWT x10 ^{3})	AVERAGE DWT for CLASS $(DWT)_a$	POPULATION of CLASS (N_e)	TOTAL DWT for CLASS (LT x 10^6) $(DWT)_t$	AVERAGE AGE (Yrs)	AVERAGE FINANCING PERIOD (Yrs)
20-40					
20-29	23,940	121	2.897	8	17
30-39	34,515	137	4.729	5	20
40-70					
40-49	48,185	61	2.939	8	17
50-59	53,877	29	1.562	10	15
60-69	67,150	18	1.209	13	12
70+					
70-79	74,838	11	0.832	10	15
80-89	86,207	12	1.034	7	18
90-99	95,617	5	0.478	9	16
100-109	103,645	2	0.207	9	16

2.2.1 Inert Gas System (IGS) Costs

The unit costs used for inert gas systems are those for an independent plant inert gas system from Reference 3 of this Appendix. The unit cost for this type of IGS was used because in Reference 3 MARAD estimates that most product carriers and diesel powered tankers will retrofit spearately fired plants. MARAD further estimated that the cleaner gas and freedom from boiler control difficulties experienced by steam powered tankers will influence many owners of crude carriers to retrofit with independent plants in spite of higher cost. Some of the foreign tankers which enter U. S. ports already have IGS systems installed. The number of tankers with installed IGS is distributed by tanker DWT class. A rough estimate of this distribution was derived from data obtained from the American Bureau of Shipping in Reference 4 of this Appendix. The distribution used to estimate foreign tanker IGS retrofit costs for each DWT class is as follows:

DWT Class (thousand tons)	% with IGS
20-40	1
40-70	2
70+	25

The cost of this system varies with tanker DWT. This functional relationship is shown in Figure B-1.

2.2.2 Crude Oil Washing System (COW) costs

To employ the COW option, a tanker must be retrofitted with tank cleaning machines, fixed-in-place and permanently connected to the cargo pumping system, and an inert gas system. The unit costs for COW are a function of tanker DWT and include the cost of washing machines, installation and piping. Inert gas systems, though required with COW, are not included in the costing of COW. COW costs were provided by MARAD in Reference 3 and are shown in graphical form in Figure B-2.

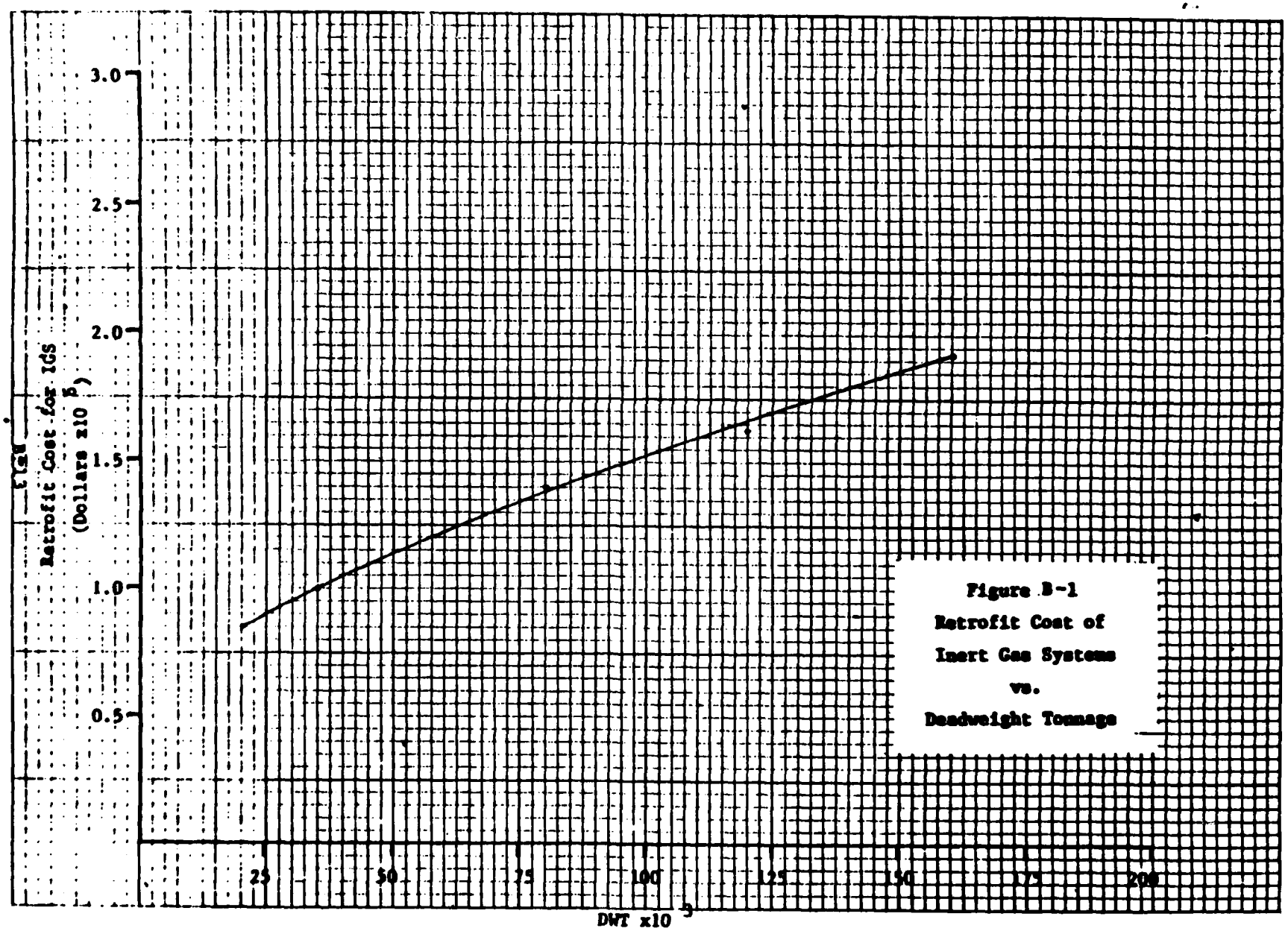


Figure B-1
Retrofit Cost of
Inert Gas Systems
vs.
Deadweight Tonnage

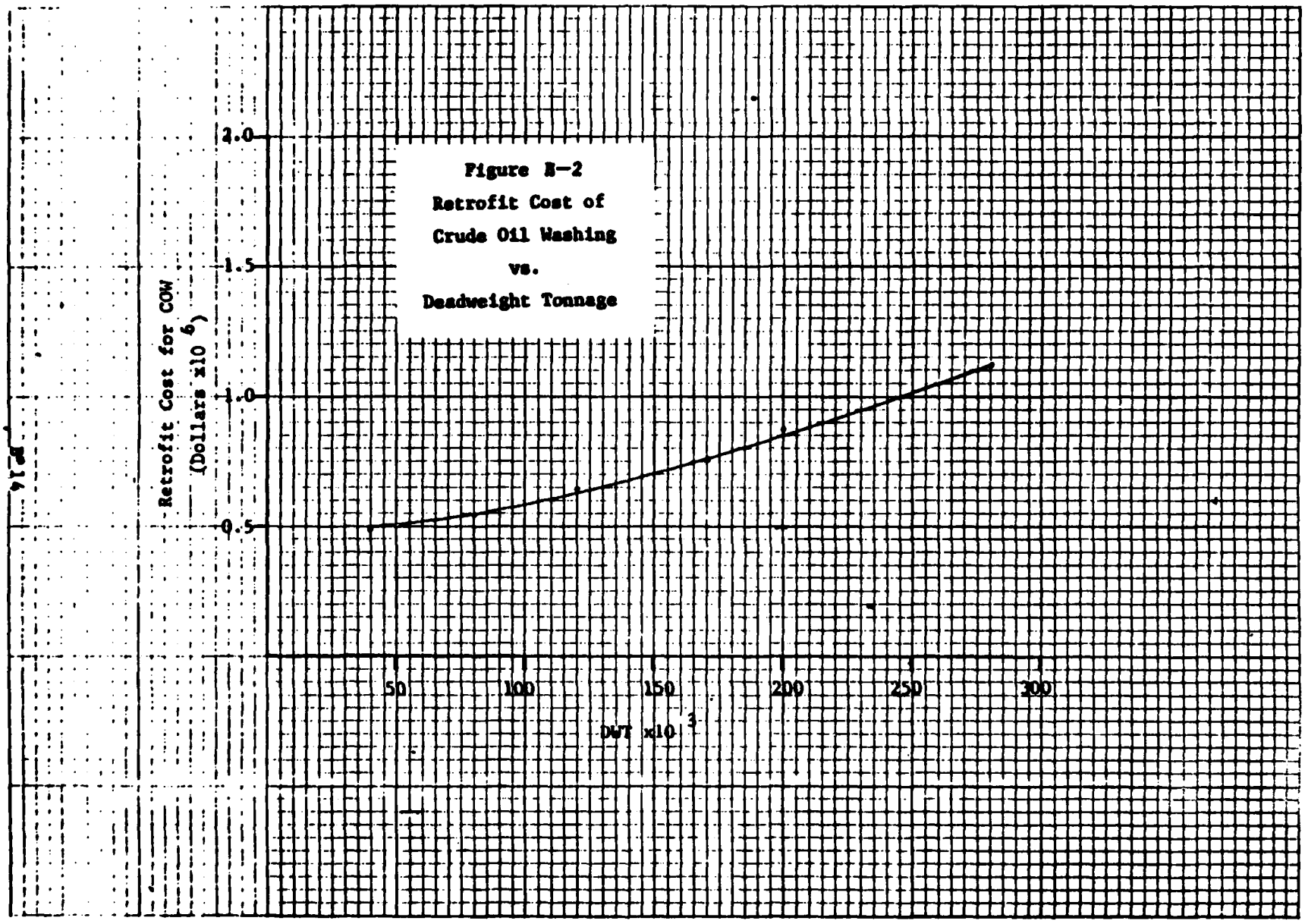


Figure B-2
Retrofit Cost of
Crude Oil Washing
vs.
Deadweight Tonnage

2.2.3 Segregated Ballast (SBT) Retrofit Costs

2.2.3.1 Retrofit Costs

The cost of converting a tanker to segregated ballast varies, depending on tanker deadweight and how close to an optimum solution is effected. An optimum solution was assumed for cost of SBT converson for foreign flag tankers. An optimum SBT solution requires, for most tankers, installation of new bulkheads in addition to the piping and pumping changes required for conversion to SBT. The cost for converting to optimum SBT is a function of deadweight. A curve showing this functional relationship was obtained from an IMCO document,TSPP/CONF/7/1, listed as Reference 5 to this Appendix. This cost curve is shown in Figure B-3. Another optimum SBT curve was developed from data obtained in Reference 7 to this Appendix. These results, applicable to U. S. flag tankers, are given in Figure B-4.

There is a large difference in the retrofitting cost of optimum SBT for U. S. flag tankers and for foreign flag tankers (Figures B-3 and B-4). There are two readily apparent causes for this difference. These are the wage differential for U. S. yards versus foreign yards and the differential cost of materials in U. S. and foreign yards.

In the absence of any basis for estimating the proportion of the optimum SBT cost over the cost of SBT, the full cost of optimum SBT is assumed as an upper limit.

2.2.3.2 Cost of DWT Carrying Capacity Loss

Existing tankers that meet the ballast requirements through SBT retrofit lose effective DWT carrying capacity due to increased ballast volume. The loss in tanker carrying capacity is a function of tanker DWT. This functional relationship is shown in Figures B-5 and B-6. The DWT loss given by the MARAD data as shown in both figures was used in this costing analysis. Figure B-5 was obtained from a Figure 3E of Reference 7. Figure B-6 is an extension of the MARAD data shown in Figure B-5 in a lower DWT range. The curves showing the variation of DWT loss as a function of tanker DWT for CBT and SBT are very similar in magnitude. For this reason, Figures B-5 and B-6 were also used to determine loss of cargo capacity for the CBT requirement.

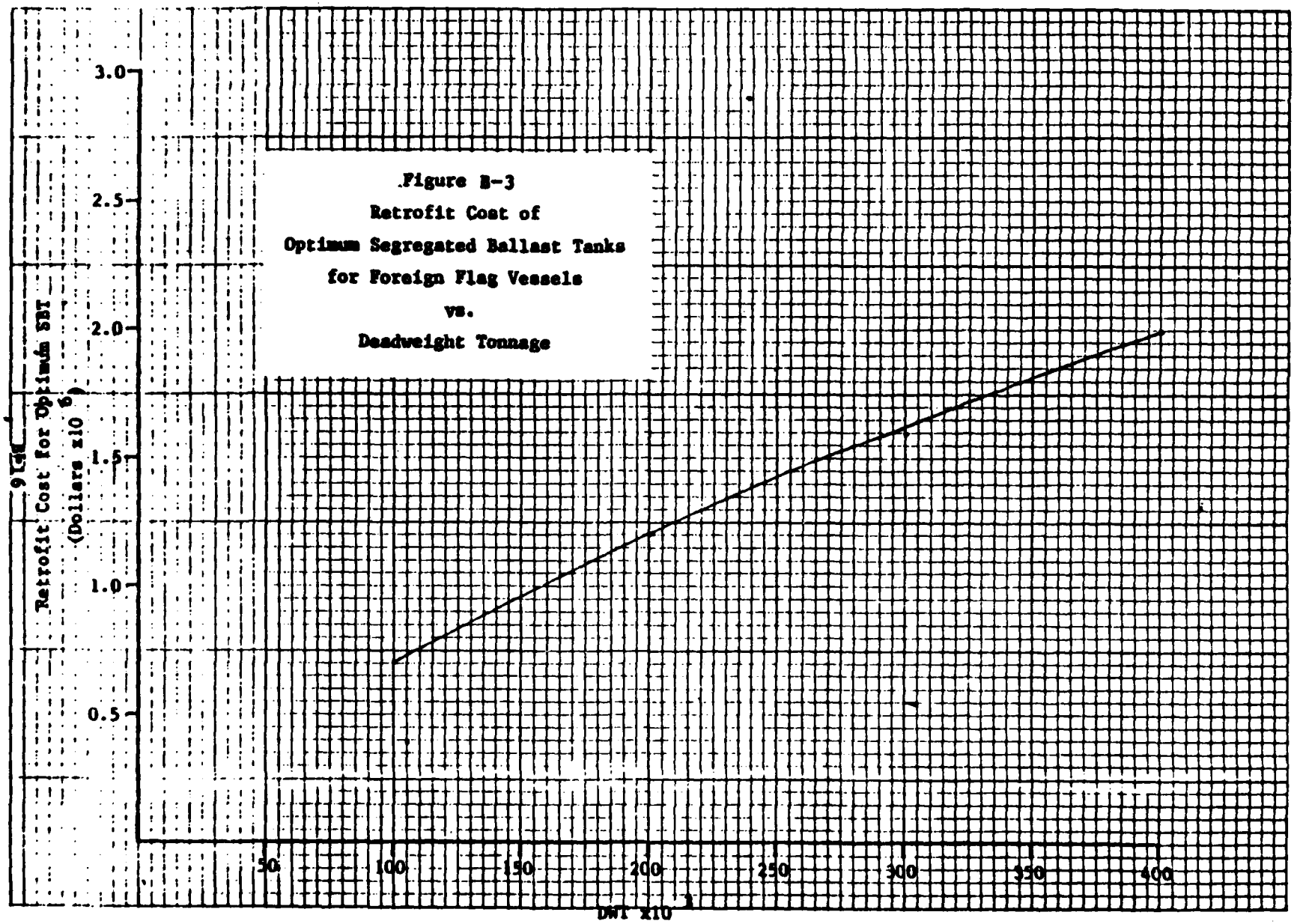


Figure B-3
Retrofit Cost of
Optimum Segregated Ballast Tanks
for Foreign Flag Vessels
vs.
Deadweight Tonnage

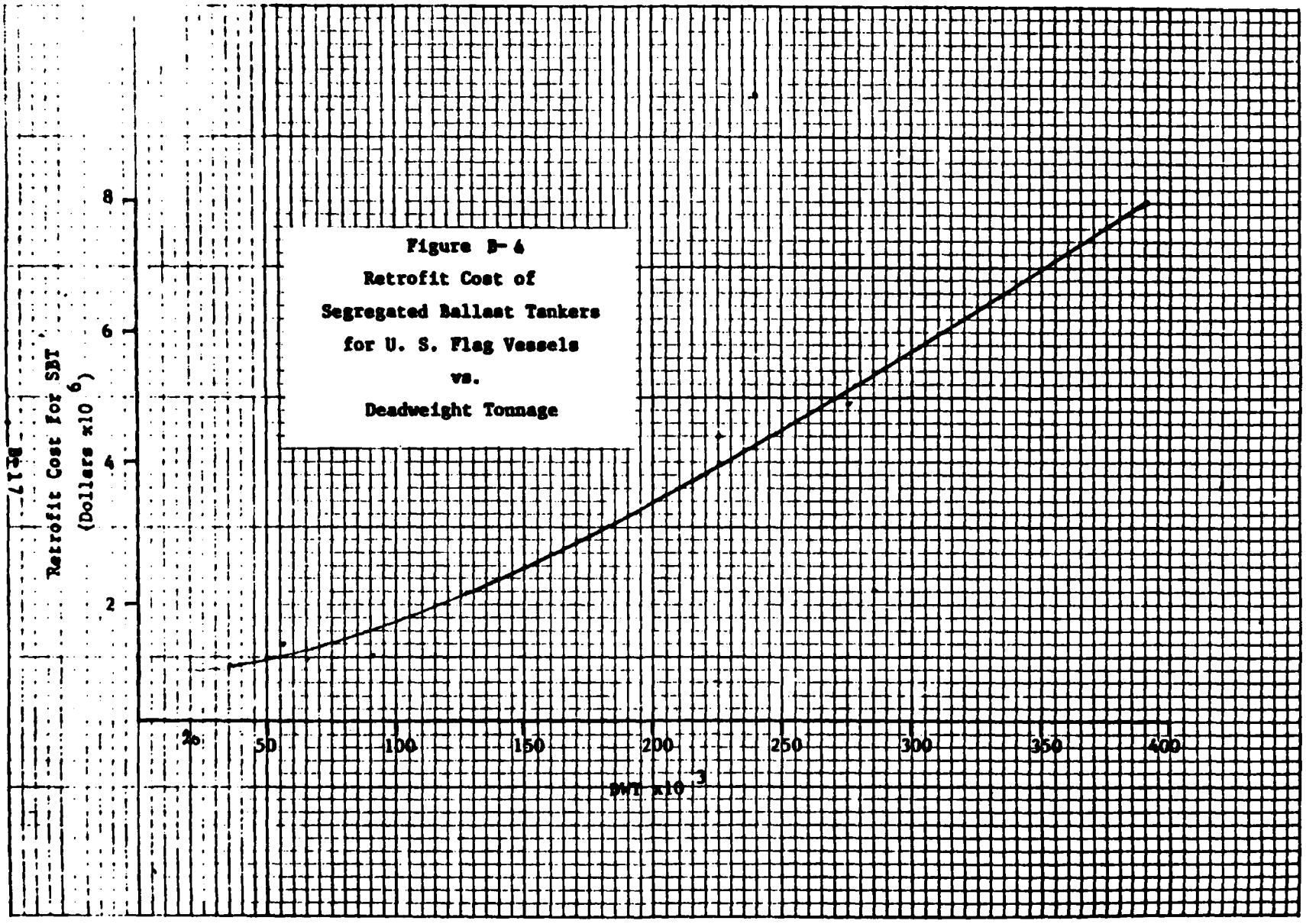


Figure B-4
Retrofit Cost of
Segregated Ballast Tankers
for U. S. Flag Vessels
vs.
Deadweight Tonnage

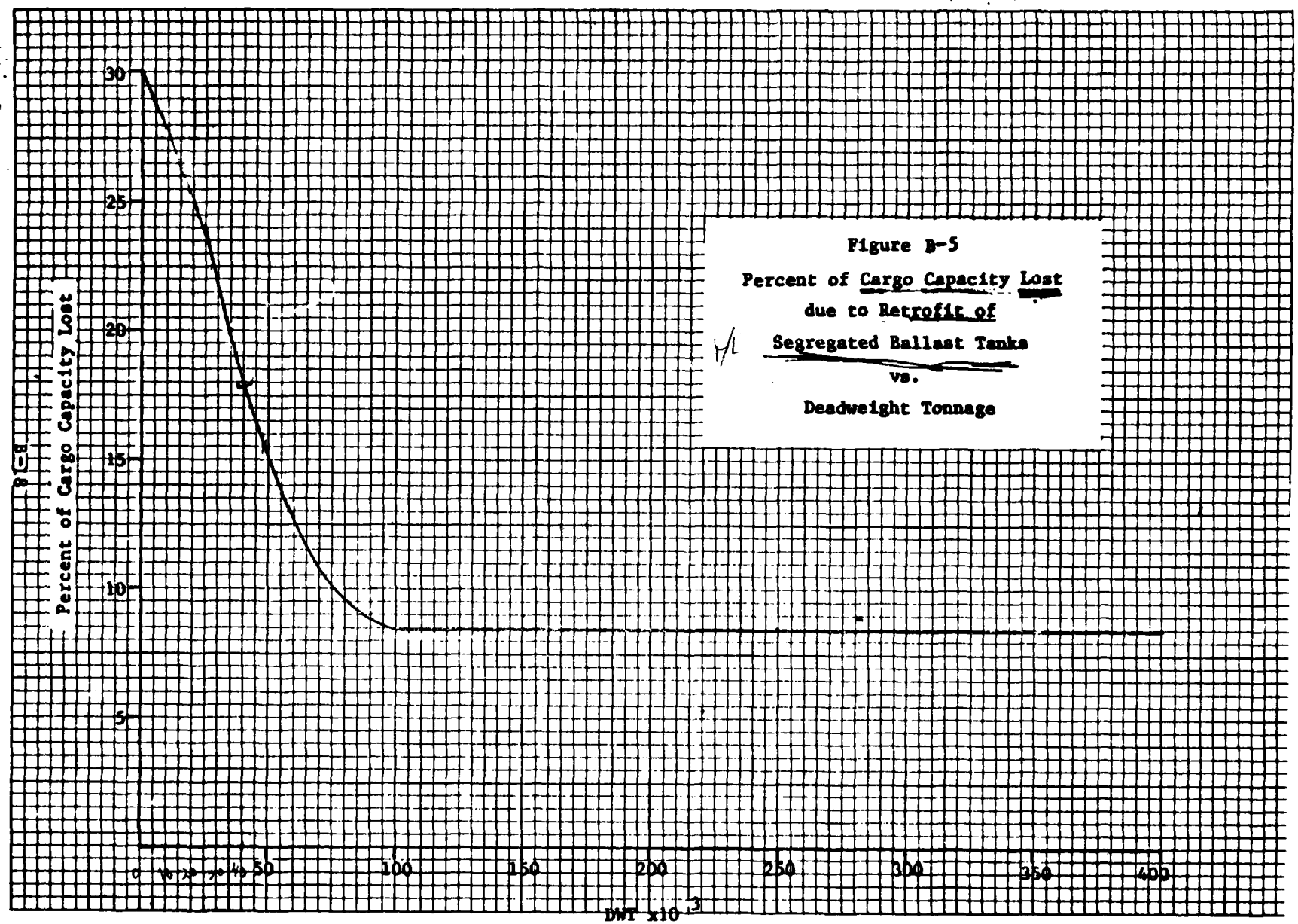


Figure B-5

Percent of Cargo Capacity Lost

due to Retrofit of

Segregated Ballast Tanks

vs.

Deadweight Tonnage

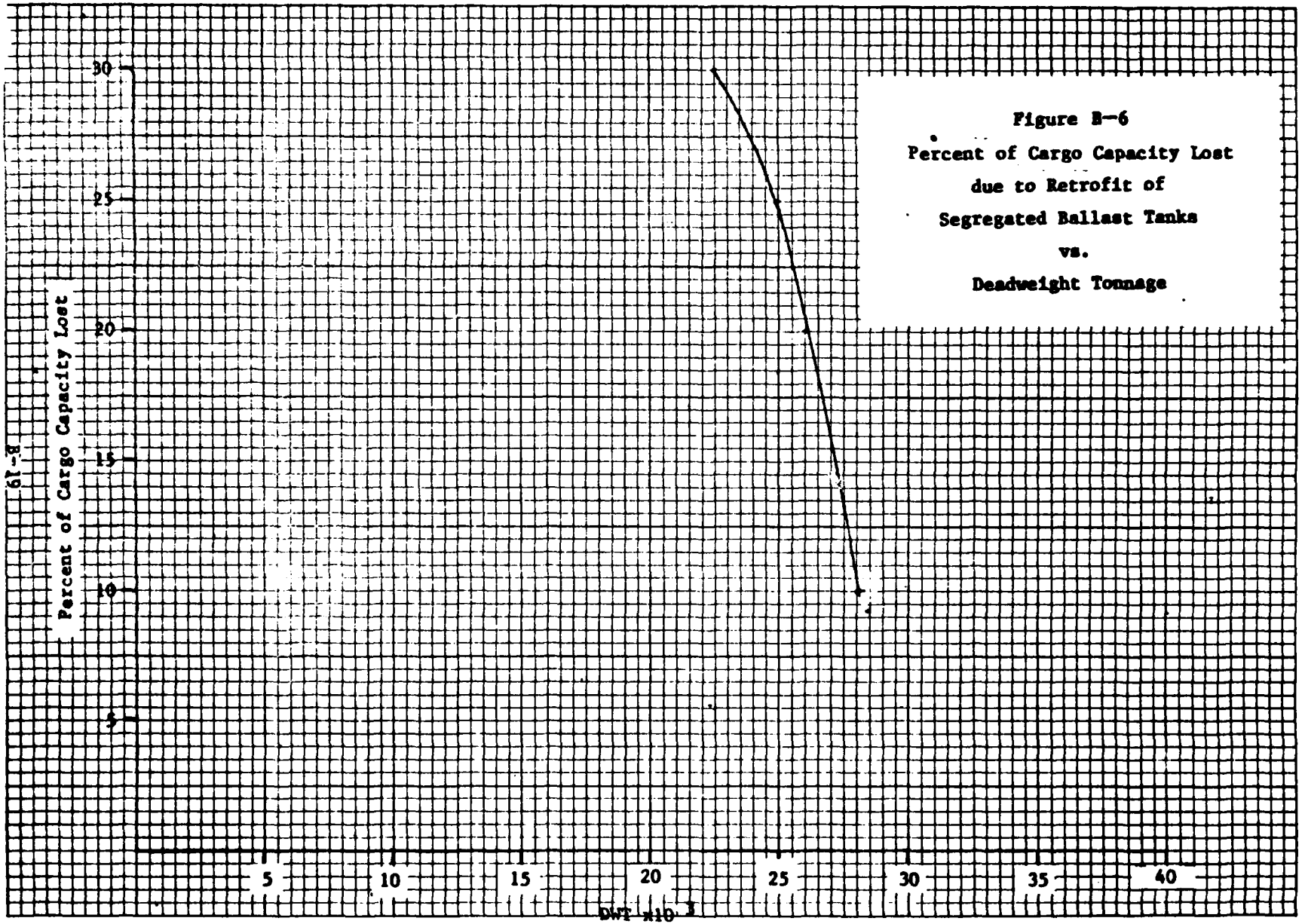


Figure B—6
Percent of Cargo Capacity Lost due to Retrofit of Segregated Ballast Tanks vs. Deadweight Tonnage

The dollar cost of lost cargo carrying capacity was estimated first by calculating the number of additional vessels required to make up the capacity loss and then computing the incremental cost incurred due to retrofit of the additional vessels plus the cost of associated equipment required by TSPP. The total DWT loss in cargo carrying capacity for each DWT class or subclass was obtained by means of Figures B-5 and B-6. The total capacity loss was obtained for each subclass in Tables B-1 and B-2 by using the average DWT for each class to obtain the percent of DWT capacity lost from Figures B-5 and B-6, depending on the DWT range of interest. The DWT capacity loss was then computed by multiplying the total DWT for each subclass in Tables B-1 and B-2 by the percent of capacity loss obtained from Figures B-5 or B-6.

2.2.4 Secondary Radar (RADAR) Retrofit Costs

The cost of a second radar was assumed to be independent of tanker DWT and was assumed constant at $50,000 per tanker. It was assumed that each foreign tanker would require a second radar. A second radar is already required on U. S. flag vessels over 10,000 gross tons. This requirement for U. S vessels is attributable to implementation of Presidential Initiatives rather than TSPP.

2.2.5 Improved Steering (IS) Costs

The costs of the improved steering requirements are one-time costs that, for the most part, are independent of vessel size. The cost of the second steering gear control system and required alarms are estimated to be approximately $30,000 per vessel. It is estimated that approximately 40 percent of the foreign vessels entering U. S. ports and 30 percent of U. S. flag vessels will require improved steering control subsystems. Further, it is estimated that 90 percent of the foreign flag vessels and 70 percent of the U. S. flag vessels will need some additional alarms and/or circuit arrangement modifications. These improved steering requirements will also apply to non-oil carrying tankers.

2.2.6 Incremental Cost of PL/SBT for New Tankers

The incremental costs for implementing protective location of segregated ballast tanks on new tankers has been estimated by MARAD in the tanker pollution abatement study (Reference 8). The variation of these costs as a function of DWT is shown in Figure B-7. It is seen that smaller vessels are expected to have smaller incremental costs to implement PL/SBT than are larger vessels. This analysis considers the cost of PL/SBT to be the cost of converting SBT to include protective location. Smaller vessels, mostly product carriers, are presently designed with very little segregated ballast. When the high expense is incurred to incorporate segregated ballast in new designs, then protective location of this segregated ballast

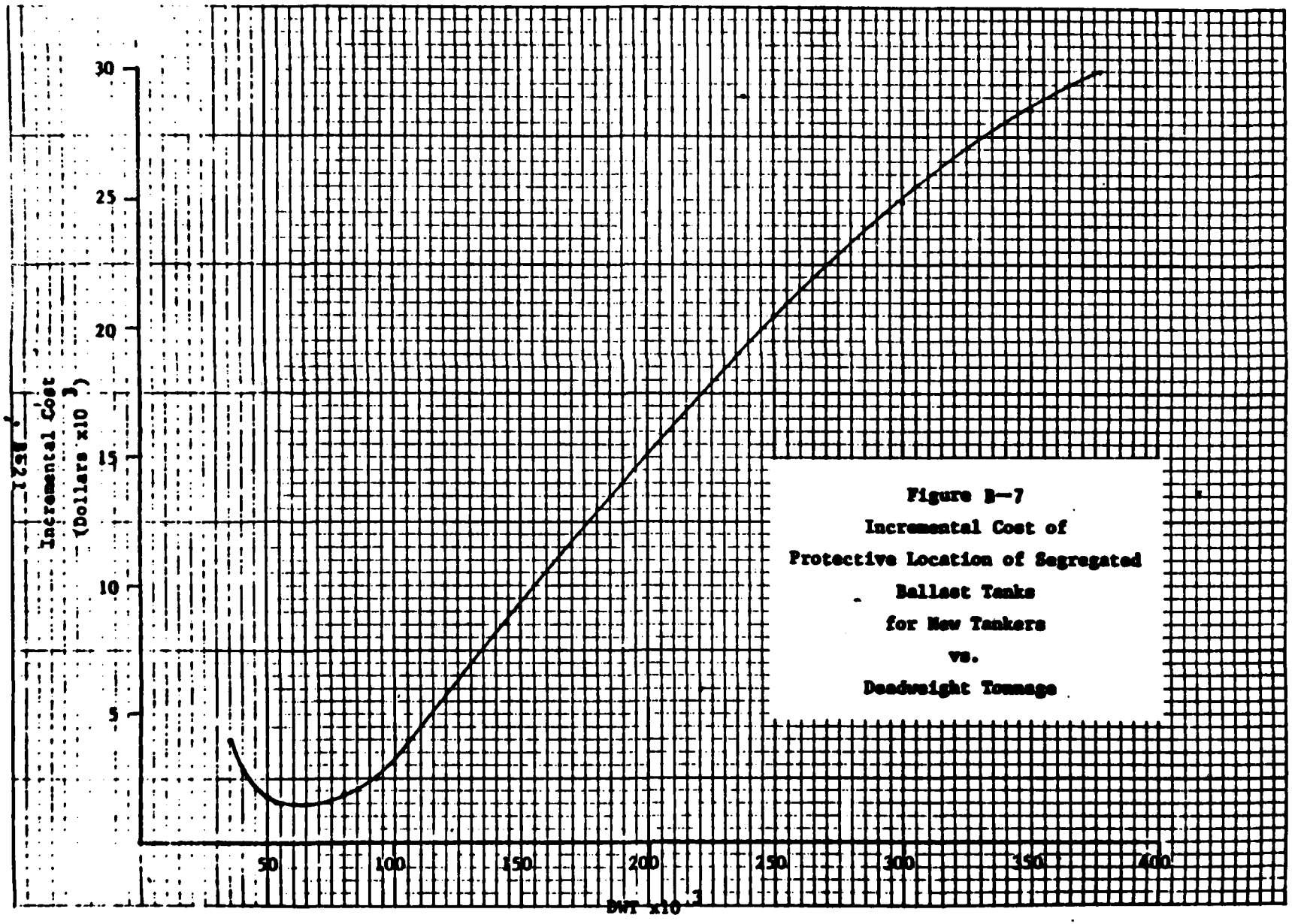


Figure B—7
Incremental Cost of
Protective Location of Segregated
Ballast Tanks
for New Tankers
vs.
Deadweight Tonnage

can be included at little additional cost. The situation for larger tankers is just the opposite. Larger tankers are usually crude carriers which normally will loose little capacity in incorporating segregated ballast in some tanks. But incorporating protective location to this SBT design will require major design changes, therefore, high costs.

The costs shown in Figure B-7 for tankers of 200,000 DWT may be high, however, by as much as a factor of two since these calculations do not reflect the reduced area coverage factors for large vessels which resulted from the 1978 TSPP Convention. Note that the costs for PL/SBT shown in Figure B-7 include the cost of making a vessel deeper to compensate for the volume of cargo lost and that the overall cost of PL/SBT represents a fraction of the total cost of a new tanker.

2.2.7 Incremental Costs For Double Bottoms on New Tankers

The incremental costs for double bottoms on new tankers were obtained from Table II-6 of Reference 7, which gave costs for seven specific designs that incorporated segregated ballast. In order to obtain the cost for double bottoms only, it was necessary to subtract the cost of segregated ballast from the costs shown in Table II-6 of Reference 8. The incremental costs for double bottoms only are shown in Figure B-8. These costs include costs that result from increasing the depth of the vessel to regain as much cargo capacity as possible. The costs for double bottoms plus segregated ballast (as given in Table II-6) are also shown in Figure B-8. These costs include those costs due to constructing the tanker larger in order to obtain equal cargo capacity.

2.2.8 Cost of New Tankers Foreign and Domestic

With the exception of costs for retrofit of segregated ballast on existing tankers, most of the incremental cost data presented above were obtained from MARAD and represent primarily U. S. costs for operational and structural features.

It is felt that foreign costs for most operational features would be similar in magnitude to U. S. costs. The costs for structural features, in particular major construction or structural modifications (such as new tanker construction and optimum segregated ballast modifications for existing tankers) are expected to differ. The cost data for optimum segregated ballast for existing tankers was presented above for both foreign and U. S. yards. The cost for new tankers in U. S. yards vary considerably from new tanker costs in foreign yards. These costs are shown in Figure B-9. The U. S. costs represent estimates derived by MARAD. The foreign costs are estimates obtained from Fearnley and Egers Chartering Co. Ltd., Review 1978, which do not include SBT and assume cash payment at delivery with financing costs prior to delivery. Figure B-9 also shows the MARAD estimate for foreign costs of new tankers.

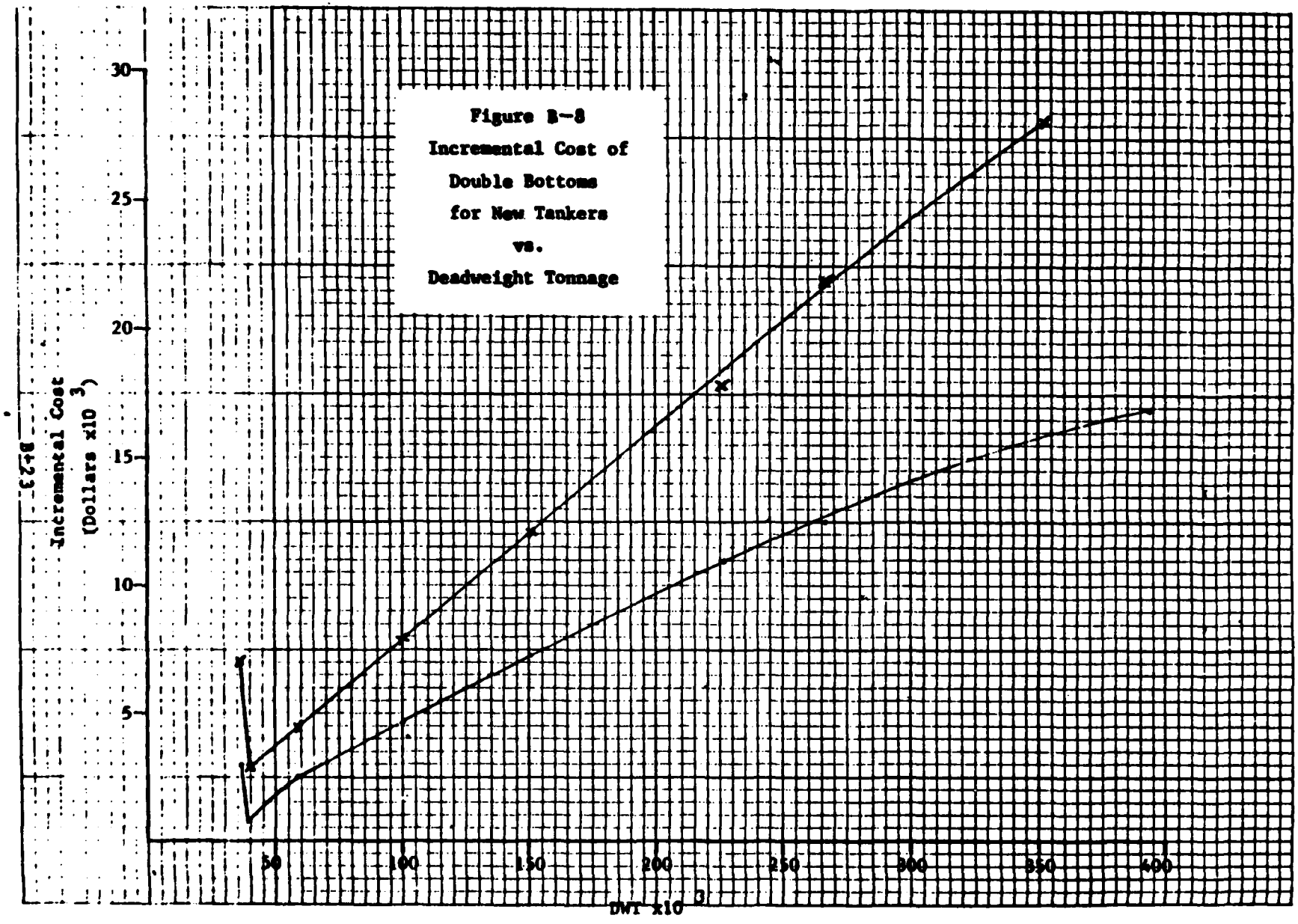


Figure B-8
Incremental Cost of
Double Bottoms
for New Tankers
vs.
Deadweight Tonnage
Incremental Cost
(Dollars x10 3)
30
25
20
15
10
5
50
100
150
200
250
300
350
400
DWT x10 3

Figure B-9

U. S. and Foreign

New Tanker Costs

2.2.9 Relative Costs

The relative costs of the TSPP measures were compared to new tanker costs (both foreign and domestic) and to the salvage value of existing vessels. Results of these comparisons are given in Table B-3 and Table B-4 for three vessel sizes - 30,000; 60,000 and 120,000 DWT.

Table B-3 shows the relative cost of each individual TSPP measure - second radar, improved steering, inert gas, dedicated clean ballast, segregated ballast, crude oil washing and protective location of segregated ballast. The relative costs were obtained at each of the three tonnages by comparing the given data (1) to the new vessel costs from Figure B-9 and (2) to the scrap value of the light displacement weight at $61 per long ton.

Table B-4 shows the relative costs of the TSPP options. The cost of the option is the summed costs of the individual measures required when the basic SBT, CBT, COW or PL/SBT option is chosen. It was assumed that each tanker would be equipped with a second radar, improved steering and inert gas; additionally, each PL/SBT tanker was assumed to have a crude oil washing system.

The relative investment for new U. S. tankers fitted with the TSPP options could represent from 2 to 22 percent of the new tanker cost, depending on the size of vessel and the option chosen. The TSPP options for new foreign tankers could represent from 7 to 75 percent of the new tanker cost. The relative cost of the TSPP options fitted to existing tankers represents a higher percentage of each tanker's value than for new construction. The TSPP options could represent 285 to 625 percent of the salvage value of each existing tanker.

2.2.10 Operating Costs

If one assumes that the additional vessels used to make up the DWT lost due to the CBT or SBT options are obtained from laid up tonnage, then the cost of operating these additional tankers must be considered as an impact of this rulemaking activity. This cost was classified as an incremental cost for those alternatives resulting in loss of DWT carrying capacity.

For foreign tankers, estimates of yearly operating costs as a function of DWT were obtained from Reference 8. The average escalating rate for foreign tanker yearly operating costs was estimated from the data given in the above reference. This rate was then used to estimate operating costs for 1978.

The yearly operating costs for U. S. tankers were estimated by means of data obtained from the MARAD publication given in Reference 9. These data were used to obtain a yearly operating cost per DWT class. These costs are approximate since they include the major components of tanker daily operating costs. These costs are total daily operating expenses and fuel consumption costs. Voyage expenses and fixed costs were not included.

The total outlays in terms of operating costs were estimated by means of the number of additional tankers required for each DWT class, the yearly operating cost for that DWT class, and the payback period. The total operating cost for each DWT class represents the yearly discounted cost to the base year. The base year is 1978. The results of these calculations are shown in Tables B-5 and B-6.

2.3 Time Sequencing of TSPP Costs

The time sequence diagrams for TSPP costing are based on the assumption that the requirements contained in the 1978 Protocols become effective on the dates recommended in Resolutions 1 and 2 of the Conference.

These time sequence diagrams are shown in Figure B-10 for new and existing product and crude tankers for each DWT class. The TSPP requirements, the implementation dates for each DWT class and vessel type are also shown. The financing period (at 10% interest) for each TSPP requirement is based on the implementation date, the average age for each DWT class and the available amortization period as of 1978 for each DWT class. This assumes that U. S. implementing regulations will contain effective dates cited in Resolutions 1 and 2 of the Protocols. In costing IGS for existing crude tankers in the 20-40 thousand ton DWT class, it was assumed that all tankers in this class could implement IGS since it is not known what proportion of these tankers contain high capacity washing machines. For existing product tankers, it was assumed that none of the tankers in the 20-40 thousand DWT class would be fitted with IGS since most would be equipped with low capacity machines.

TABLE B-3

Costs of Pollution Prevention Measures For Tank Vessels as a Percentage of Cost of New Vessel and Salvage Value U. S. and Foreign Tankers

DWT Measure	30,000 DWT			60,000 DWT			120,000 DWT		
	% New U. S.	% New Foreign	% Salvage	% New U. S.	% New Foreign	% Salvage	% New U. S.	% New Foreign	% Salvage
Second Radar	0.14	0.50	12.59	0.11	0.33	11.79	0.05	0.20	8.91
Improved Steering	0.08	0.30	7.56	0.06	0.20	7.06	0.03	0.12	5.35
IGS	2.70	9.50	239.30	2.98	9.33	330.20	1.77	6.52	290.60
CBT	.29	1.00	25.19	0.21	1.43	23.58	0.11	0.40	17.83
SBT	2.29	8.00	201.5	2.34	7.33	259.40	1.96	7.20	320.90
COW	1.43	5.00	125.9	1.11	3.47	122.60	0.70	2.56	114.10
PL/SBT	17.00	17.14	N	3.00	3.19	N	N/A	N/A	N

NOTES:

Tanker DWT	30,000	60,000	120,000
Cost U. S. New	35M	47M	92M
Cost Foreign New	10M	15M	25M
Salvage Value	.397M	.424M	.561M

M = one million dollars

TABLE B-4

Costs of Pollution Prevention Options For Tank Vessels
as a Percentage of Cost of New Vessel and Salvage Value
U. S. and Foreign Tankers

DWT Measure	30,000 DWT			60,000 DWT			120,000 DWT		
	% New U. S.	% New Foreign	% Salvage	% New U. S.	% New Foreign	% Salvage	% New U. S.	% New Foreign	% Salvage
CBT	3.21	11.30	284.6	3.35	11.29	372.6	1.96	7.24	322.6
SBT	5.21	18.30	461.0	5.48	17.19	608.5	21.00	14.04	625.7
COW	4.35	15.30	385.4	4.26	13.33	471.7	2.55	9.42	418.9
PL/SBT	21.35	21.51	N	7.26	7.47	N	N/A	N/A	N

NOTE: Each option includes a second radar, improved steering, and inert gas system.

PL/SBT applies to new tankers and includes COW, Second radar, improved steering, and inert gas system.

N/A indicates that PL/SBT is already required on that particular size vessel.

N indicates that PL/SBT would not apply to an existing vessel.

TABLE B-5

U. S. TANKER INCREMENTAL OPERATING COSTS FOR OPERATION OF ADDITIONAL TANKERS DUE TO LOSS OF DWT CAPACITY

Tanker Type	TSPP Option	DWT (Thousand)	Total Outlay Operating Costs (Million Dollars)
Existing Crude	CBT/SBT	20-40	134.00
Existing Crude	CBT/SBT	40-70	46.06
Existing Crude	CBT/SBT	70+	276.95
Existing Crude	CBT/COW	20-40	76.62
Existing Crude	CBT/COW	40-70	29.99
Existing Crude	CBT/COW	70+	54.46
Existing Product	CBT/SBT	20-40	99.73
Existing Product	CBT/SBT	40-70	22.93
Existing Product	CBT/SBT	70+	00.00

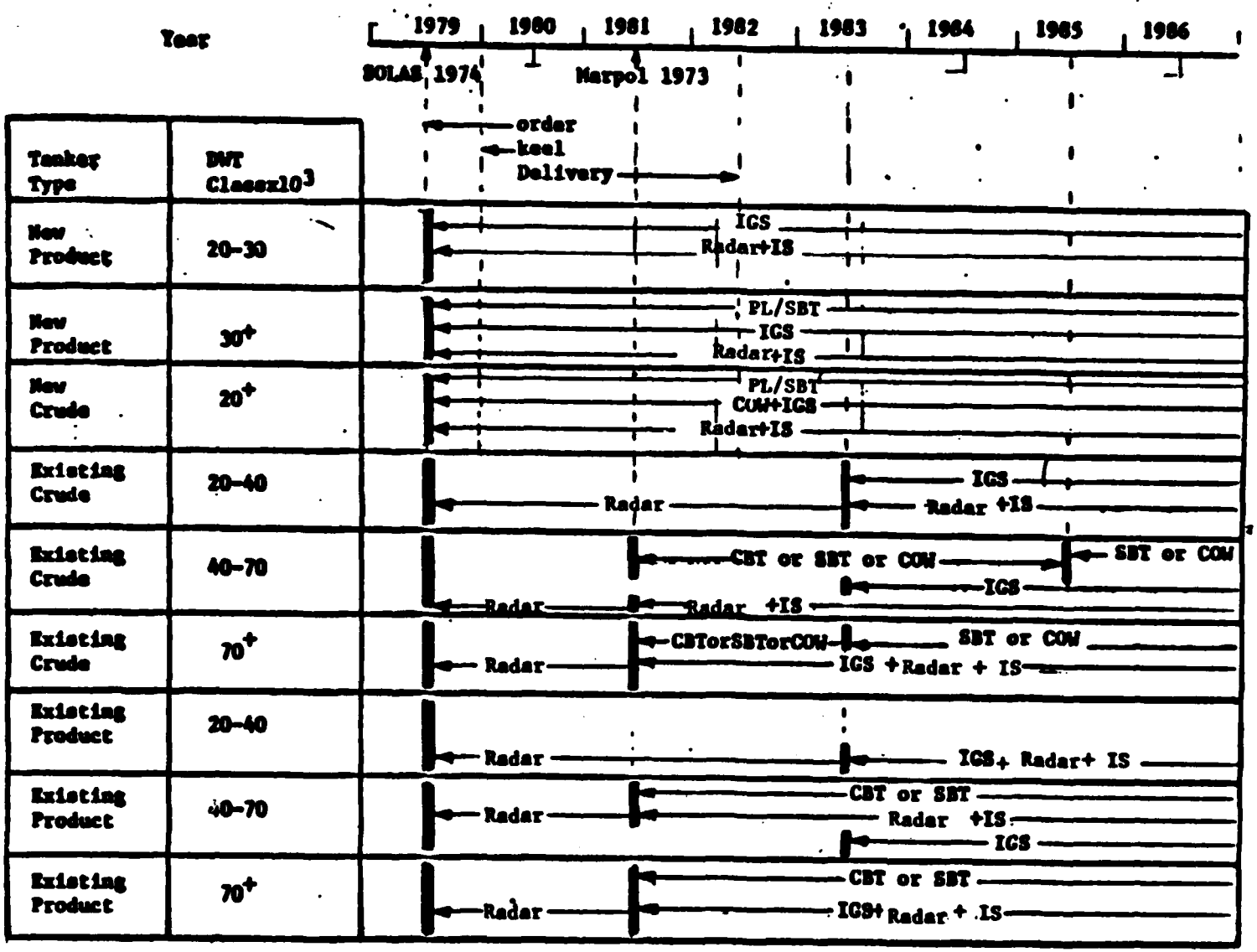
TABLE B-6

FOREIGN TANKER INCREMENTAL OPERATING COSTS

FOR OPERATION OF ADDITIONAL TANKERS

DUE TO LOSS OF DWT CAPACITY

Tanker Type	TSPP Option	DWT (Thousand	Total Outlay Operating Costs (Million Dollars)
Existing Crude	SBT CBT/SBT	20-40	484.17
Existing Crude	SBT CBT/SBT	40-70	258.73
Existing Crude	SBT CBT/SBT	70+	296.72
Existing Crude	CBT/COW	40-70	145.14
Existing Crude	CBT/COW	70+	80.04
Existing Product	CBT/SBT	20-40	521.09
Existing Product	CBT/SBT	40-70	139.93
Existing Product	CBT/SBT	70+	21.10



Time Sequence Diagram for TSPP Costing

FIGURE B-10

2.4 Estimates of Incremental Costs

The TSPP options for which costs must be estimated are shown in Table B-11 on page B-41. Each TSPP option is composed of one or more equipment subsystems and a single or combination of retrofit subsystems. For this reason, costs were estimated on a per subsystem basis so they could then be combined to form the cost for a combination of TSPP requirements.

It was felt that for comparative purposes four costs should be used for each TSPP combination. These are as follows:

(a) Initial capital costs.

(b) Total outlay.

(c) Average annual cost.

(d) Average cost per tanker.

The above costs are computed as explained below.

2.4.1 Initial Capital Costs

These costs are computed for each subsystem or retrofit requirement by means of the following equation:

$$(ICC)_i = \sum_k \sum_j n_{jk} c_{ij}$$

Where, n_{jk} = number of tankers in the jth subclass of the kth DWT class.

c_{ij} = unit cost of the ith subsystem in the jth DWT subclass category.

i,j,k = summation indices for subsystems, DWT subclasses and DWT class catogories, respectively.

(ICC)i= initial capital cost for ith subsystem.

2.4.2 Total Outlay

The total outlay is the dollar investment, including 10% interest, for each subsystem over the payback period. These costs are computed on a subsystem basis from annual costs that are spread out over a specified amortization period. For those alternatives that require additional tankers to compensate for loss of deadweight capacity, the total outlays include the operating costs of the additional tankers. The following equation was used to estimate these costs:

$$(TO)_i = \sum_k \sum_j P_{jk} n_{jk} c_{ij} (CRF)_{jk}$$

Where, $(TO)i$ = total outlay over ship life for ith subsystem.

Pjk = amortization period for jth DWT subclass in the Kth DWT class category.

$(CRF)jk$ = capital recovery factor for jth subclass in the kth DWT class at 10% interest.

All other factors are as previously defined.

2.4.3 Average Annual Cost

The average annual cost was estimated by computing an average payback period (in years) for all payback periods of TSPP requirements in each DWT subclass and then computing the expected value of the payback period for all crude tanker or product carrier subclasses. The expected amortization period was then divided into the total outlay to obtain an average annual cost for a TSPP combination. An example of how the expected amortization period was computed may be helpful at this point. Consider the following table:

DWT Class	Ne	P2R	PIS	$\bar{P}$
20K-40K				
20K-29K	n_{11}	P(r)	P(I)	$\bar{P}_{11}$
30K-39K	n_{12}	P(r)	P(I)	$\bar{P}_{12}$
Total	N_1			
40K-70K				
40K-49K	n_{21}	P(r)	P(I)	$\bar{P}_{21}$
50K-59K	n_{22}	P(r)	P(I)	$\bar{P}_{22}$
60K-69K	n_{23}	P(r)	P(I)	$\bar{P}_{23}$
Total	N_2			
70K+				
70K-79K	n_{31}	P(r)	P(I)	$\bar{P}_{31}$
80K-89K	n_{32}	P(r)	P(I)	$\bar{P}_{32}$
90K-99K	n_{33}	P(r)	P(I)	$\bar{P}_{33}$
Total	N_3			

The first column contains three DWT categories: 20-40 thousand DWT, 40-70 thousand DWT and over 70 thousand DWT. The first category contains two DWT subclasses, while each of the other two categories contains three DWT subclasses.

The second column (Ne) gives the population of each DWT subclass and the total for each DWT category. For example, in the first category, 20K-40K, the subclass populations are specified as n_{11} and n_{12}; their total is indicated as N_1. Similarly for the second DWT category, 40K-70K.

The third column (P2R) and fourth column (PIS) give the payback period for each deadweight subclass P(r) for second radar and P(I) for improved steering. In the costing procedure effected for this analysis, similar columns were used for the other TSPP requirements in each DWT Category.

The fifth column gives the average payback period for all TSPP payback periods in each DWT subclass. For example $\bar{P}_{11}$ in the 20k-29k subclass is calculated as follows:

$$\bar{P}_{11} = \frac{1}{2}\left[P_1(r) + P_1(I)\right]$$

Similar calculations give the average payback period for all TSPP requirements in each DWT subclass as shown in column five.

Once all the quantities shown in the sample table are computed, the expected payback period for all crude or product carriers is computed by obtaining the total population as the sum of all DWT categories population:

$$N_T = N_1 + N_2 + N_3$$

The expected payback period is then computed:

$$E(P) = \frac{1}{N_T}\left[n_{11}\bar{P}_{11} + n_{12}\bar{P}_{12} + n_{21}\bar{P}_{21} + n_{22}\bar{P}_{22} + n_{23}\bar{P}_{23} + n_{31}\bar{P}_{31} + n_{32}\bar{P}_{32} + n_{33}\bar{P}_{33}\right]$$

Once E(P) is computed, the average annual cost is obtained by dividing the total outlay for a specified TSPP combination by E(P).

2.4.4 Average Cost Per Tanker

This cost was obtained by dividing the total outlay by the number of tankers assumed to comply with a particular combination of TSPP options. Note that the total number of vessels varies depending on the TSPP requirement and the TSPP implementation dates shown in Figure B-10.

The variation in tanker requirements, and consequently costs as a function of specified TSPP requirements for a given DWT class category of crude or product tankers, may be made more clear by discussing three possible TSPP requirements.

2.4.4.1 CBT/SBT Option for Existing Crude Oil Tankers

The TSPP implementation sequencing diagram is shown in Figure B-10. It is

assumed that a tanker owner will choose to use CBT in Ne crude oil tankers in the 40-70 thousand DWT class, where Ne is the number of existing tankers. This owner will be able to operate these CBT tankers from 1981 to 1985. During that period, in order to meet the demand for crude oil delivery, the tanker market will need Nr additional CBT tankers, where Nr is the number of tankers required, due to the DWT capacity lost by having dedicated clean ballast. In this costing analysis, the number of additional CBT tankers required from laid up tonnage was estimated for each subclass from data in Tables B-1 and B-2. The DWT loss in each subclass was divided by the average tanker deadweight, (DWT)a, for that subclass. This quotient is the average number of tankers required, Nr. This number of tankers was then costed for CBT followed by SBT, CBT/SBT, in terms of the additional TSPP equipment required in order to operate in the period 1981 to 1985.

Thus, in this time period, from 1981 to 1985, the tanker operator in this example must operate a total of Ne +Nr crude tankers in the 40-70 thousand DWT category with Nr tankers incurring an additional capital and total outlay indicated as CBT/SBT (Nr) in Table B-9.

Starting in 1985 the tanker operator must retrofit his crude tankers in order to change from CBT to SBT. Again, because of lost DWT capacity, the tanker operator must retrofit a total of Ne + Nr crude tankers in the 40-70 thousand DWT category. In this cost analysis, the initial and total outlay incurred by adopting this requirement is indicated as CBT/SBT (R), where R stands for retrofit cost, and Nr stands for additional tankers required due to lost DWT capacity.

To summarize for this example, if a tanker owner chooses the CBT/SBT option, he will incur the cost of providing Nr additional tankers with TSPP required subsystems for 1981 through the economic life of the vessels, and from 1985 the tanker owner will incur the additional conversion costs for Ne + Nr tankers.

2.4.4.2 CBT/COW Option for Existing Crude Oil Tankers

If tanker owners choose to install CBT as an interim measure, followed by COW, CBT/COW, they will incur the cost of operating Nr additional tankers from 1981 to 1985. In this analysis this cost is indicated as CBT/COW(Nr), which is identical to the cost incurred for SBT following CBT, CBT/SBT(Nr). In 1985 the tanker owners must convert Ne tankers to COW. At this time he will no longer require the additional Nr tankers, thus, this cost will not be incurred from 1985 through the economic life of the tankers. The cost to retrofit COW after operating with CBT is indicated in this analysis as CBT/COW(R).

2.4.4.3 SBT or CBT Option for Existing Crude and Product Oil Tankers

Figure B-10 shows that it is possible for owners of crude and product tankers to start operating as SBT or CBT tankers in 1981 (mandatory for

product carriers and an option for crude carriers). In this case, the owners incur the cost of operating N_r additional tankers required due to lost DWT capacity. This cost is due to supplying N_r additional tankers with TSPP subsystems and is indicated in this analysis as SBT(Nr) or CBT(Nr). In addition to this cost, the tanker owner will incur the cost of converting Ne + Nr tankers to SBT or CBT. This cost is denoted as SBT(R) or CBT(R). Both of the above costs will exist from 1981 through the economic life of each tanker.

In this analysis, the cost of all capital was assumed at 10 percent interest.

2.5. Estimates of Incremental Costs For U. S. Tankers

Estimates of costs for implementation of TSPP requirements to U. S. flag crude and product tankers were obtained by applying the same procedure delineated above for existing foreign crude and product tankers. In obtaining these estimates, the data published by MARAD in Reference 2 of this Appendix was used extensively. The tanker population in this MARAD reference was obtained using the assumption that no tankers are scrapped or replaced by new tonnage. For this reason the assumption in the foreign estimate - that tankers 15 years or older would not be retrofitted - was not applied to U. S. crude and product carriers.

2.5.1. Existing U. S. Flag Crude and Product Tankers

Some of the data used in costing the TSPP requirements for U. S. tankers is shown in Tables B-7 and B-8. These data were obtained from Reference 3, and were put in a form identical to that shown for foreign tankers in Tables B-1 and B-2.

2.5.2. TSPP Equipment Needs For U. S. Crude and Product Tankers

The MARAD report cited in Reference 3 of this Appendix presents detailed information related to availability and needs of TSPP equipments on U. S. tankers. These data are summarized below. The requirements for each tanker in each DWT category are indicated.

Crude Tankers Requirements	Product Tankers Requirements
20K-40K DWT	20K-40K DWT
1) No 2nd radar	1) No 2nd radar
2) No IGS	2) No IGS
3) 69% require IS	3) 69% require IS
40K-70K DWT	40K-70K DWT
1) No 2nd radar	1) No 2nd radar
2) all require IGS except 2.	2) all require IGS
3) 69% require IS	3) 69% require IS

Above 70K DWT
1) No 2nd radar
2) 27 have IGS
3) 3 have COW
4) 69% require IS

Above 70K DWT
1) No 2nd radar
2) 100 % IGS except 1
3) 69% require IS

The above data and the data in Tables B-7 and B-8 were used to obtain estimates of costs to implement TSPP requirements on U. S. crude and product tankers. The results of these calculations are presented below for existing U. S. and foreign tankers.

2.6 Results

2.6.1 Foreign Crude and Product Tankers

The unit cost data and the costing procedure described in the previous sections were used to compute the initial capital costs and the total outlay for each TSPP option. These costs are shown in Table B-9 for foreign crude tankers, and in Table B-10 for foreign product carriers. These costs were then used to compute costs for combinations of TSPP options as shown in Table B-11. The total outlay and the expected amortization period were then used to compute the average annual cost for each combination. In computing the per tanker costs for crude oil tankers, the number of vessels in the 20K-40K DWT class were included since the cost of the IGS was assumed to apply to this DWT class (this cost did not apply to product tankers). In those combinations where TSPP was assumed to apply down to 20K DWT, or in considering SBT, CBT or a combination of these with COW, the cost of tankers required to make up lost capacity was included in the calculation of the average cost per tanker.

2.6.2 U. S. Tankers

The results of the cost analysis for U. S. tankers are shown in Tables B-12 and B-13. These costs can be expressed in a form similar to that used in Table B-11. These costs are shown in Table B-14.

TABLE B-7

EXISTING U. S. FLAG CRUDE TANKERS					
CLASS of DWT x10 ^{3}	POPULATION of CLASS (N_e)	TOTAL DWT for CLASS (LT x 10^3) $(DWT)_t$	AVERAGE DWT for CLASS $(DWT)_a$	AVERAGE AGE (Yrs)	AVERAGE FINANCING PERIOD (Yrs)
20-40	23	761	33	14	11
40-70	17	920	54	15	10
70+	57	8,386	147	3	22

TABLE B-8

EXISTING U. S. FLAG PRODUCT TANKERS					
CLASS of DWT x10 ^{3}	POPULATION of CLASS (N_e)	TOTAL DWT for CLASS (LT x 10^3) $(DWT)_t$	AVERAGE DWT for CLASS $(DWT)_a$	AVERAGE AGE (Yrs)	AVERAGE FINANCING PERIOD (Yrs)
20-40	122	3,573	29.3	22	3
40-70	12	566	47	19	6
70+	1	75.6	75.6	8	17

Cost of TSPP Options for Existing Foreign Flag Crude Tankers

CLASS of DWT	Second Radar (10^6 Dollars) (RADAR)	Cost of Improved Steering (10^6 Dollars) (IS)	Cost of Inert Gas System (10^6 Dollars) (IGS)	Cost for Add'l Tankers due to SBT fitted after CBT (10^6 Dollars) CBT/SBT(N_E)	Retrofit Cost of SBT fitted after CBT (10^6 Dollars) CBT/SBT(R)	Cost for Add'l Tankers due to COW fitted after CBT (10^6 Dollars) CBT/COW(N_E)	Retrofit Cost of COW fitted after CBT (10^6 Dollars) CBT/COW(R)	Retrofit Cost of SBT (10^6 Dollars) SBT(R)	Cost Add'l Tankers due to DWT Loss to SBT (10^6 Dollars) SBT(N_E)	Retrofit Cost of COW (10^6 Dollars) COW(R)
20K - 40K DWT										
Initial Capital Cost	12.10	2.91	221.16					106.57	55.00	
Total Outlay	26.42	6.39	417.03					215.53	296.81	
40K - 70K DWT										
Initial Capital Cost	13.00	3.12	292.95	44.18	144.09	44.18	133.21	144.09	44.18	133.21
Total Outlay	24.63	5.46	471.63	336.30	214.16	200.81	197.59	251.27	336.30	231.06
Above 70K DWT										
Initial Capital Cost	16.45	3.93	372.58	47.14	248.97	47.14	191.87	248.97	47.14	191.87
Total Outlay	33.58	8.07	705.46	385.83	431.19	134.35	336.24	472.41	385.83	382.85

Note: 10^6 = one million

TABLE B-9

Cost of TSPP Options for Existing Foreign Flag Product Tankers

CLASS of DWT	Second Radar (10^6 Dollars) (RADAR)	Cost of Improved Steering (10^6 Dollars) (IS)	Cost of Inert Gas System (10^6 Dollars) (IGS)	Cost for Add'l Tankers due to DWT Loss to SBT (10^6 Dollars) $SBT(N_r)$	Retrofit Cost of SBT (10^6 Dollars) SBT(R)	Cost for Add'l Tankers due to DWT Loss to CBT (10^6 Dollars) $CBT(N_r)$	Retrofit Cost of CBT (10^6 Dollars) CBT(R)
20K - 40K DWT							
Initial Capital Cost	12.90	3.09	233.92	60.33	113.47	60.33	6.1
Total Outlay	28.01	6.71	439.15	641.99	227.93	641.99	12.18
40K - 70K DWT							
Initial Capital Cost	4.85	1.29	121.00	19.52	58.79	19.52	1.6
Total Outlay	9.60	2.52	205.85	175.31	105.27	175.31	2.90
Above 70K DWT							
Initial Capital Cost	1.50	0.36	32.43	2.90	20.01	2.90	0.2
Total Outlay	3.02	0.73	60.39	26.50	37.13	26.50	0.36

TABLE B-10

Incremental Costs of TSPP for Foreign Flag Crude & Product Tankers

Tanker Type	Combination of TSPP Options	Capital Cost (10^6 Dollars)	Total Outlay (10^6 Dollars)	Average Annual Cost (10^6 Dollars)	Average Cost per Tanker (10^6 Dollars)
Crude	IS & RADAR IGS (≥ 20K DWT) CBT (then SBT, ≥ 40K DWT)	1423.38	3219.14	218.14	4.17
Crude	IS & RADAR IGS (≥ 20K DWT) CBT (then COW, ≥ 40K DWT)	1354.60	2663.95	181.10	3.41
Crude	IS & RADAR IGS (≥ 20K DWT) SBT (≥ 40K DWT)	1423.38	3297.47	224.17	4.29
Crude	IS & RADAR IGS (≥ 20K DWT) SBT (≥ 20K DWT)	1585.75	4222.45	287.05	4.45
Crude	IS & RADAR IGS (≥ 20K DWT) COW (≥ 40K DWT)	1263.28	2279.69	154.98	3.09
Product	IS & RADAR IGS (≥ 40K DWT) CBT (≥ 40K DWT)	201.70	562.70	36.42	3.53
Product	IS & RADAR IGS (≥ 40K DWT) CBT (≥ 20K DWT)	267.23	1337.76	86.59	4.03
Product	IS & RADAR IGS (≥ 40K DWT) SBT (≥ 40K DWT)	278.70	701.81	45.42	4.43
Product	IS & RADAR IGS (≥ 40K DWT) SBT (≥ 20K DWT)	452.5	1692.63	109.59	4.25
Product	IS & RADAR IGS (≥ 20K DWT) CBT (≥ 40K DWT)	435.62	1001.85	64.84	3.25

Cost of TSPP Options for Existing U. S. Flag Crude Tankers

CLASS of BWT	Cost of Improved Steering (10^6 Dollars)	Cost of Inert Gas System (10^6 Dollars)	Cost for Add'l Tankers due to SBT fitted after CBT (10^6 Dollars)	Retrofit Cost of SBT fitted after CBT (10^6 Dollars)	Cost for Add'l Tankers due to COW fitted after CBT (10^6 Dollars)	Retrofit Cost of COW fitted after CBT (10^6 Dollars)	Cost for Add'l Tankers due to BWT Loss to SBT (10^6 Dollars)	Retrofit Cost of SBT (10^6 Dollars)	Retrofit Cost of COW (10^6 Dollars)
	(IS)	(IGS)	CBT/SBT(N_E)	CBT/SBT(R)	CBT/COW(N_E)	CBT/COW(R)	SBT(N_E)	SBT(R)	COW(R)
20K - 40K BWT									
Initial Capital Cost	.46	21.85	5.88	26.10	5.88	14.21	5.88	26.10	11.27
Total Outlay	.78	29.76	141.86	32.89	87.03	17.90	141.86	34.87	15.06
40K - 70K BWT									
Initial Capital Cost	.34	16.50	2.26	19.00	2.26	9.69	2.26	19.00	8.67
Total Outlay	.48	21.80	49.30	22.91	32.84	11.69	49.30	27.27	12.44
Above 70K BWT									
Initial Capital Cost	1.14	54.60	9.25	136.40	9.25	42.48	9.25	136.40	41.84
Total Outlay	2.60	124.49	298.04	289.85	68.12	90.27	298.04	310.99	93.57

Note: 10^6 = one million

TABLE B-12

Cost of TSPP Options for Existing U. S. Flag Product Tankers

CLASS of DWT	Cost of Improved Steering (10^6 Dollars) (IS)	Cost of Inert Gas System (10^6 Dollars) (IGS)	Retrofit Cost of CBT (10^6 Dollars) CBT(R)	Cost for Add'l Tankers due to DWT Loss to CBT (10^6 Dollars) CBT(N_r)	Cost for Add'l Tankers due to DWT Loss to SBT (10^6 Dollars) SBT(N_r)	Retrofit Cost of SBT (10^6 Dollars) SBT(R)
20K - 40K DWT						
Initial Capital Cost	2.52	110.	2.7	25.65	25.65	135.60
Total Outlay	2.77	121.	2.97	127.95	127.95	149.16
40K - 70K DWT						
Initial Capital Cost	.24	12.60	0.2	2.16	2.16	13.86
Total Outlay	.30	13.86	0.24	25.53	25.53	16.72
Above 70K DWT						
Initial Capital Cost	.03	0.0	0.0	0.0	0.0	1.10
Total Outlay	.06	0.0	0.0	0.0	0.0	2.09

Incremental Costs of TSPP for U. S. Flag Crude and Product Tankers

Tanker Type	Combination of TSPP Options	Capital Cost (10^6 Dollars)	Total Outlay (10^6 Dollars)	Average Annual Cost (10^6 Dollars)	Average Cost per Tanker (10^6 Dollars)
Crude	IS (≥ 10K GRT) IGS (≥ 20K DWT) CBT (then SBT, ≥ 40K DWT)	265.80	864.34	71.72	10.87
Crude	IS (≥ 10K GRT) IGS (≥ 20K DWT) CBT (then COW, ≥ 40K DWT)	158.57	396.34	32.89	5.23
Crude	IS (≥ 10K GRT) IGS (≥ 20K DWT) SBT (≥ 40K DWT)	261.80	889.84	73.84	11.18
Crude	IS (≥ 10K GRT) IGS (≥ 20K DWT) SBT (≥ 20K DWT)	293.78	1074.43	89.15	10.56
Crude	IS (≥10K GRT) IGS (≥ 20K DWT) COW (≥ 40K DWT)	144.60	285.92	23.73	4.15
Product	IS (≥ 10K GRT) IGS (≥ 40K DWT) CBT (≥ 40K DWT)	17.75	45.12	36.6[illegible]	2.9[illegible]
Product	IS (≥ 10K GRT) IGS (≥ 40K DWT) CBT (≥ 20K DWT)	45.90	201.29	163.65	2.15
Product	IS (≥ 10K GRT) IGS (≥ 40K DWT) SBT (≥ 40K DWT)	32.51	63.93	51.98	4.15
Product	IS (≥ 10K GRT) IGS (≥ 40K DWT) SBT (≥ 20K DWT)	194.76	369.26	300.21	3.15

TABLE B-14

2.6.3 Total TSPP Costs

Tables B-11 and B-13 show the costs for combinations of TSPP requirements. Both tables show that the TSPP combination for crude oil tankers of 40K DWT or greater which effects minimum cost is the COW requirement. For product tankers of 40K DWT or greater, the minimum cost TSPP requirement is obtained when CBT is selected. Thus, the total outlays (in constant 1978 dollars) for implementing the minimum cost TSPP requirements are as follows:

a. Capital Investment Cost	Million Dollars	
Foreign Tankers		
Crude	1263.28	
Product	201.70	
Subtotal, Foreign		1464.98
U. S. Tankers		
Crude	144.60	
Product	17.75	
Subtotal, U. S.		162.35
World Total Capital Investment Cost		1627.33
b. Financing Costs		
Foreign Tankers		
Crude	1016.41	
Product	361.00	
Subtotal, Foreign		1377.41
U. S. Tankers		
Crude	141.32	
Product	27.37	
Subtotal, U. S.		168.69
World Total Financing Costs		1546.10
c. World Total Dollar Investment Outlay		3173.43

Note that the above costs apply to the option of minimum cost. The selection of the most desirable combination requires additional data on the amount of oil outflow reduction and safety considerations.

2.6.4 Estimated Increase in Cost Per Gallon of Gasoline Due to TSPP

An estimate of the increase in cost per gallon of gasoline to the U. S. consumer can be computed as discussed below.

For 1976 the imports to the United States of crude and white product

have been estimated to be 113,207 million gallons and 28,550 million gallons by foreign and U. S. flag tankers, respectively. Estimates obtained from the Department of Energy indicate that 45.5 percent of crude volume and 50 percent of white product represent gasoline. By the application of these percentages to the import volumes for 1976 and summing, a total volume of 65,784 million gallons is obtained for an estimate of the yearly consumption of gasoline transported by tankers to the U. S.

An expected payback period was computed for both U. S. and foreign tankers. This was found to be approximately 14 years. This payback period and the 3,173.4 million dollar cost obtained for the minimum cost TSPP option were then used to obtain an average annual transportation cost of 115.8 million dollars for gasoline. This calculation assumes that approximately 50 percent of the cost is for gasoline.

Based on the above results, the incremental cost of transportation to owners of vessels affected by this proposed regulatory action, would be about 0.2 cents per gallon of gasoline. This increased transportation cost, when proportioned to the volume of gasoline from all sources, would result in an average increase in cost to the U. S. public of about 0.1 cents per gallon.

Though not at the gasoline pump, the consumer will still pay for non-gasoline petroleum products through marked-up fuel oil, petrochemical products, jet fuel, etc.

Secondary impacts to other sectors of the economy were not investigated in detail. The input-output model available to trace these impacts requires a regulatory action yearly cost of about 700 million dollars before any significant impact can be traced to other industries or economic sectors. The estimated yearly costs for the TSPP alternatives are about one third of the magnitude required for significant output, thus, expected secondary impacts of this action were not investigated further and are presummed to be minimal.

3. Summary

Based on the results of the analysis described above, it is estimated that the implementation of the requirements of the TSPP Protocols for existing foreign and domestic tankers trading in U. S. ports could cost 3.0 billion dollars or more, spread out over a period of about 15 years, and would require an initial investment of 1.6 billion dollars or more. An upper estimate of the total number of tankers affected could range from 731 to 953 for foreign crude tankers, and from 396 to 475 for foreign product tankers, depending on the TSPP options adopted by tanker owners. The average cost per tanker will vary between 3 to 4 million dollars. About 232 U. S. product and crude tankers could be affected.

The proportional increase in cost per gallon of gasoline to the U. S. consumer due to the minimum cost TSPP option for foreign and U. S. tank vessels is estimated as one-tenth of a cent.

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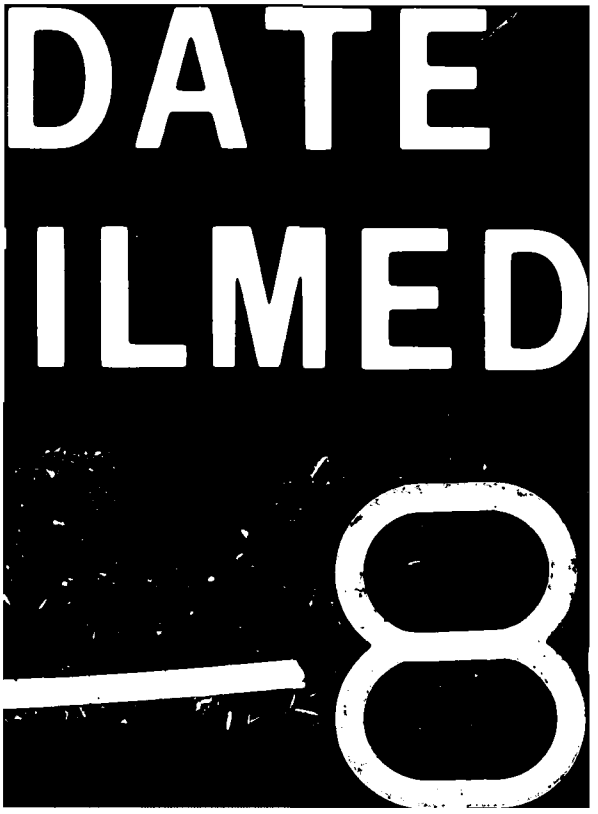
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