4-15-1971

The Role of Compulsory Sealanes in Resolving Multiple-Use Conflict on the Continental Shelf

Alfred P. Manning
University of Rhode Island

NAVAL WAR COLLEGE
Newport, R.I.

THESIS

THE ROLE OF COMPULSORY SEALANES IN RESOLVING MULTIPLE-USE CONFLICT ON THE CONTINENTAL SHELF

by

Alfred P. Manning

CDR., U.S. COAST GUARD

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

Signed_____

_____

Date_____

15 April 1971

A supervised writing submitted to the Faculty of the University of Rhode Island in partial fulfillment of the requirements for the Degree of Master of Marine Affairs.

Abstract of

THE ROLE OF COMPULSORY SEALANES
IN RESOLVING MULTIPLE-USE CONFLICT
ON THE CONTINENTAL SHELF

An analysis of the nature of multiple-use conflict on the continental shelf developed with particular emphasis on the involvement of ocean transportation and offshore oil recovery. The wide-ranging effects which offshore marine accidents may have on coastal residents is discussed. Trends indicate a growth in the level of conflict stemming from competition between those wishing to use the same ocean space for the same purpose, the same ocean space for different purposes, and different but related ocean space for incompatible purposes. Ocean transportation is identified as the single common element in all three conflict categories. It is the most significant contributor to dis-economies for third parties, as a result of offshore accidents. Restriction on traditional concepts of "freedom of the seas" is seen as the only way to reverse current trends. Compulsory vessel routing schemes, or "Sealanes," are proposed as the most promising means of preventing accidents. They are recommended both as a measure to control vessel movements and as a means of preserving safe shipping routes which are free of man-made hazards. Recent experience in Sealane usage is discussed and some weaknesses pointed out.

PREFACE

I have been convinced for some time that Grotian concepts of freedom of the seas are only applicable on a macro scale as regards the rights of nations to exploit the sea and its resources. Taken at the level of individual operators, whether they be ship's masters or offshore oil companies, it is nonsense to apply these concepts without significant modification. It is unreasonable to grant to the master of a giant tanker the unfettered right to sail it wherever and whenever he sees fit. The consequences of his mistakes can be too far-reaching as was so amply proven in the Torrey Canyon case. The same holds true for offshore oil operators.

The world has readily accepted the imposition of stringent controls upon those who operate commercial aircraft. I maintain that this is because the consequences of a mistake are spectacular and have an obvious capability for involving those who live on the ground below. There is a parallel in offshore marine operations, insofar as they affect those who live in adjacent coastal areas. I have attempted to show that this is so and that present trends dictate a need for strong action at the international level to regulate the movement of vessels and the emplacement of offshore structures, whether it be in territorial waters or on the high

seas. I have chosen compulsory "Sealanes" or vessel routing schemes as the least objectionable form of restriction on marine operators.

One of the problems which I ran into in my research was that of terminology. The term "Sealanes" is commonly used in the United States to designate a vessel routing scheme which incorporates separation of opposing traffic streams and safe routing through natural or man-made hazards. A "sea lane" is a lane or corridor within which all ship traffic moves in the same direction. These terms are not internationally accepted, but, for reasons which I will explain, I have chosen to use them. International usage prefers the terms "traffic separation scheme" and "traffic lane" to make the same designations.

My main problem in addressing my research was in determining how serious the problem really is and how effective past efforts have been in reducing the consequences of multiple-use conflicts. Most of the material which is contained in the body of the thesis has been obtained by researching various newspapers and other types of factual reports of marine accidents and public reaction to them. Very little has been written which views such accidents as stemming from or contributing to multiple-use conflict. I have taken the liberty to infer that multiple-use conflict is the root of the issue which must be addressed.

Good factual information and statistical data have been hard to come by. I have been fortunate in gaining the assistance of several individuals without whom I could never have undertaken the effort. I am grateful for the significant help provided by Cdr. John M. Duke, of the Merchant Vessel Inspection Division, U.S. Coast Guard Headquarters, who provided much advice and background material on the development of modern Sealanes in the United States. I also received valuable assistance from Rear Admiral G.S. Ritchie, Hydrographer of the Royal Navy and President of the Institute of Navigation; Mr. L. Goll, Head of the Navigation Section of the Maritime Safety Committee of IMCO; Capt. A.C. Manson, Head of the Marine Division, United Kingdom Board of Trade; Capts. R.N. Mayo and J.E. Bury of The Trinity House and Honourable Company of Master Mariners; and Capt. I.F. Sommerville and Mr. David Deacon of the United Kingdom Chamber of Shipping; all of whom took time out from busy schedules to provide me with unpublished information, of a first-hand nature, on the involvement of their respective organizations in the problem of shipping accidents and the implementation of Sealanes to prevent them. Special thanks is also extended to Lloyd's of London, which allowed me free access to its casualty statistics and report files.

TABLE OF CONTENTS

CHAPTER PAGE

LIST OF TABLES

LIST OF ILLUSTRATIONS

THE ROLE OF COMPULSORY SEALANES IN RESOLVING MULTIPLE-USE CONFLICT ON THE CONTINENTAL SHELF

CHAPTER I

INTRODUCTION

Introduction. To the landsman, familiar with the traffic congestion of freeways and city streets, the broad expanse of the ocean must appear as a region free of competition for space. When one considers that the sea comprises about 72% of the earth's surface, and that at any given time it is inhabited by less than one tenth of one percent of the world's population, he would appear to be correct. Nature, however, has concentrated her ocean resources in a few relatively small areas, generally on or over the continental shelves. Man's activities on land have also been concentrated in a relatively few locations, most of which border the sea. His sea lines of communication tend to converge at these locations resulting in high concentrations of shipping, frequently in busy offshore areas of resource exploitation.

As a result of population growth and industrial development, offshore activities are increasing to the point where congestion and competition for space is a growing source of conflict. The nature of the conflict may be political, as the governments seek to assert their national claims to the

use of the sea and its resources; or it may be economic as entrepreneurs seek to exploit the same or competing resources. The latter is normally referred to as multiple-use conflict.

This paper addresses multiple-use conflict, particularly as it relates to the social impact of offshore marine accidents. Recent experience has shown that the deleterious effects of such accidents can be wide-ranging, affecting the ecology and a broad spectrum of human activities in the coastal areas of the world. This has resulted in a growing tendency on the part of coastal states to consider measures to prevent, rather than to correct, these objectionable and often costly results. In doing so, they are likely to restrict the freedom of action of marine operators off their coasts, even on the high seas. The shipping industry, being the largest single user of the oceans, will be the prime target for restrictive measures taken in the forseeable future.

Background. A brief resumé of some typical offshore accidents will serve to introduce the reader to the nature of the growing use conflict and to the social impact which it may have in coastal areas. The broader aspects of the problems which they typify will also be discussed.

On the morning of 18 March 1967, while proceeding on a course determined by her master to be suitable in terms

of least time track and ship safety, the S.S. Torrey Canyon ran aground off the southwest coast of England.[1] She was a supertanker of 120,890 deadweight tons capacity and one of the world's largest ships. As a result of her misfortune, she ultimately released some 117,000 tons (36,000,000 gallons) of crude oil into the sea.[2] The ensuing large-scale efforts to prevent or remedy serious ecological damage to the coasts of England and France vividly demonstrated that the consequences of major offshore accidents may deeply involve parties other than the ship's owner, its crew, and its master. In May of 1967, referring to the extensive havoc caused by the Torrey Canyon's grounding, Prime Minister Harold Wilson of the United Kingdom stated that his government was considering any action which lay within its control to prevent a recurrence of the episode.[3] He raised the possibility of controlling the routes taken by giant tankers and other ships carrying dangerous cargo, without waiting for international agreement. He stated, "The old concept of territorial waters is not enough." A Government White Paper proposed that the law of the sea, regarding shipping on the high seas, was " . . . quite out of date."[4]

Early on the morning of 18 January 1971, the 17,000 ton tanker, Arizona Standard, proceeding into San Francisco Bay, collided with her sister ship, Oregon Standard, which was outbound with a cargo of bunker oil. As a result, some

840,000 gallons of oil were released into the bay and along the Pacific coast.[5] It took the efforts of government agencies, workmen from Standard Oil Company, and thousands of citizen volunteers to minimize the consequences of the accident, which are not yet fully known. The impending collision was observed by a helpless operator at an experimental Harbor Advisory Radar installation, operated by the United States Coast Guard in San Francisco Bay. Had both vessels been required to maintain radio communications with the radar operator, and had he the authority to direct their movements, it is unlikely that the accident would ever have occurred.[6] Once again, an accident resulted from errors in judgement on the part of experienced seamen exercising their traditional rights to proceed without externally imposed controls. Once again, parties not directly involved in the process which led to the catastrophe were required to exert a major effort to protect the public good.

During the period from 1 July 1962 to 30 June 1965, an average of three collisions per year occurred between seagoing vessels and offshore oil structures in the Gulf of Mexico, many of them in international waters.[7] In one such collision, the vessel backed away from the oil platform carrying burning oil tanks which had been deposited on her foredeck.[8] All of the elements needed for a major marine disaster were present. In another instance, a large

sea-going vessel struck and virtually destroyed an unmanned offshore oil platform, toppling it into the sea and releasing large quantities of oil.[9] The danger to mariners and platform crews from such occurrences is obvious, but it is the well publicized Santa Barbara oil spill of 1969 which more nearly typifies the consequences to coastal residents. As a result of this oil well blow-out, between one and three million gallons of oil were spilled into the sea, causing extensive pollution of the adjoining coastal area.[10] While this particular accident was not the result of a collision between a vessel and an offshore oil rig, it bears witness to the degree of third party involvement which might result should such an accident occur.

Forms of Multiple-Use Conflict. Each of the incidents described above is an example of the growing problem of multiple-use conflict in the coastal areas of the world. They represent forms which specifically involve ocean transportation and which represent conflicts with a maximum potential for creating disaster or dis-economies for third parties.

Griffin[11] and Clingan[12] have categorized such multiple-use conflicts into three major groupings:

> Transitory use of the same ocean space for the same purpose.

Use of the same ocean space for different purposes.

Use of different but related ocean space for different and obnoxious purposes.

Use of the Same Space for the Same Purpose. Competition for transitory use of the same space for the same purpose primarily involves ocean transportation, and, to a lesser extent, such activities as commercial fishing and recreational boating. At its worst, it results in collisions between major sea-going vessels such as that between the Arizona Standard and Oregon Standard. As a minimum, it leads to uncertainty, inconvenience, and lost time enroute. Despite the existence of internationally accepted Rules of the Nautical Road, implementation of voluntary traffic separation schemes and technological advances such as radar, collision at sea occurs at an alarming rate. It constitutes the leading class of maritime casualty.[13]

Different Uses of the Same Space. Conflicts between different users of the same ocean space most frequently involve ocean transportation, offshore oil recovery, and commercial fishing. To a lesser extent, they also include recreation, scientific research and military operations. A typical example is presented in the Gulf of Mexico where thousands of oil recovery platforms exist in open waters. Of these, almost 2,000 exist in water which is navigable by

deep draft vessels.[14] They, therefore, constitute an impediment to navigation and a hazard to ocean transportation.

The conflicts resulting from offshore oil activities also exist in the Santa Barbara Channel off the coast of California. They are expected to extend to George's Bank, off the coast of New England, and to the fishing grounds off Canada's Maritime Provinces. Exploration leases have already been let and exploratory drilling has started in the latter area.[15] Active offshore drilling has been underway in the North Sea for some time.

Another example of this type of conflict has existed for years in offshore regions such as George's Bank and the Grand Banks of Newfoundland. It involves both ocean transportation and commercial fisheries.[16] The accepted North Atlantic track routes should normally take trans-oceanic traffic south of the banks*, however, the opening of the St. Lawrence Seaway in 1959 has increased the level of large ship traffic through the fishing grounds. Another complicating factor has been the growing tendency of ship operators

*This conflict has been internationally recognized for some time. Safety of Life at Sea Convention, 17 June 1960 (16 U.S.T. 185, T.I.A.S. 5780.) Chapter V, reg. 8 provides "(c) The Contracting Governments . . . will also induce owners of all ships crossing the Atlantic to or from parts of the United States or Canada via the vicinity of the Grand Banks of Newfoundland to avoid, as far as practicable, the fishing banks of Newfoundland north of latitude 43° N. during the fishing season, ..."

to employ weather routing in preference to the track routes.[17] Any North Atlantic sailor who has dodged trawlers on the banks off Canada and New England is well aware of the danger and confusion which exists there, particularly in poor visibility which is so common.

The Use of Different Space for Different Purposes. The use of different ocean space for different and obnoxious purposes normally involves polluting or otherwise rendering adjacent ocean space or the seabed unfit for other desired activities. Several activities such as dredging, offshore mining, and waste disposal are factors in this class of conflict, but it is oil which is the subject of growing and often emotional concern throughout the world. The harmful consequences of oil pollution extend to practically all activities both in the vicinity of the land-sea interface and further offshore.

The furor resulting from the Santa Barbara oil spill in 1969 stimulated executive action at the highest levels in the federal government.[18] The detrimental effects of offshore oil operations on fisheries in the Gulf of Mexico have long concerned conservationists there. The New England Fisheries and Conservation Committee, expecting an expansion of offshore oil recovery into the region of George's Bank, has raised the question of possible harm to fisheries should a major oil well blowout occur.[19]

It is not offshore oil production, however, which is the prime contributor to the world-wide problem of oil pollution. The ocean transportation industry has been the prime source of oil pollutants along the coastlines of the world for years.[20] The problem is growing despite the existence of international conventions and controls which have been unilaterally imposed by coastal states.* It is estimated that one tenth of one percent of the volume of oil transported by sea is discharged into it as a pollutant.[22] A paper presented to the North Atlantic Treaty Organization (NATO) in November 1970 stated that at least one million tons of oil were released into the sea annually as a result of strandings, collisions, and other shipping losses.[23] Routine oil spillage resulting from deballasting and tank cleaning is estimated in the President's Report on Oil Pollution to have reached a potential annual average of 100,000 tons.[24] Massive oil spills, resulting from strandings like those of the Torrey Canyon, Ocean Eagle, Arrow, and Esso

*Typical examples of unilateral actions by coastal states are the "Oil Pollution Act, 1924," (33 USC 431-437) and Canada's Bill C-202, Arctic Water Pollution Prevention Bill, enacted in August 1970.[21] International conventions dealing with oil pollution include the 1954 International Convention for the Prevention of Pollution of the Sea by Oil (12 UST 1523, TIAS 4 900,600 UNTS 205) Article 24 of which provides a basis for pollution control within the contiguous zone by authorizing a coastal state to regulate activities therein to prevent infringement of its "sanitary regulations."

Gettysburg, and collisions such as that between the Arizona Standard and the Oregon Standard, are the major causes of public concern.* The rapid onslaught of pollution resulting from such incidents is devastating and requires huge expenditures of time, manpower, and money to mitigate the results.

Public Reaction. The Torrey Canyon incident truly awakened the world to the consequences of massive oil spills immediately offshore. Perhaps the attention which her misfortune has focused on the problem has resulted in a distorted public impression that the frequency of such incidents is growing. It cannot be denied, however, that the elements for increased risk and level of danger are present. Modern industry demands increasing amounts of hazardous or obnoxious bulk materials to feed it. For the foreseeable future the major share of these materials will be carried by sea. At present one out of five vessels is engaged in transporting petroleum products or other dangerous cargo.[25] In 1968, 1120 million metric tons of oil were carried by sea, amounting to 55%, by volume, of all ocean cargo.[26]

*Each of these incidents resulted in rapid release of oil in the vicinity of populated coastal areas. Estimated spills amounted to Torrey Canyon, 18 March 1967, 36,000,000 gallons; Ocean Eagle, 3 March 1968, 3,000,000 gallons; Arrow, 4 February 1970, 3,800,000 gallons; Esso Gettysburg, 21 January 1971, 386,000 gallons; and Oregon Standard, 18 January 1971, 840,000 gallons.

In a speech before the New York Oil Pollution Conference in December 1969, Under-Secretary of the Interior Russel E. Train, in discussing the growing threat, stated that our increasing energy requirements would force us to go to more remote areas, including deeper offshore waters, to meet our needs. Referring to the difficulty in cleaning up spilled oil, he stated that society ". . . must determine what level of risk is acceptable . . ." and take appropriate "preventive" action.[27]

The Thesis. The key word in Under-Secretary Train's speech is "preventive." Multiple-use conflict will not disappear of its own accord. Also, it is clear that the problem is international in nature and will, therefore, require international cooperation for its solution. What is not so clear is that an effective solution, which prevents rather than corrects the consequences, is very likely to challenge many aspects of the traditional and inter-nationally agreed upon concepts of freedom of the seas.

It is the position of the author that the well-being of those who inhabit the margins of the world's oceans supercedes these traditional concepts as they are currently exercised by individual operators. The prerogative of the master to sail his ship wherever and whenever he sees fit, or for an offshore oil operator to erect a structure without

regard for other users, should be reviewed and reassessed in the context of the times. There is no intent to challenge the rights of nations to use the world ocean. Within the limits of agreed-upon conventions, transportation, exploitation of resources, science, defense, and other legal uses should remain unimpaired. It is, however, only reasonable that coastal states should be afforded the means to protect their citizens and resources from the depredations of disinterested non-nationals. If they are unable to do so through international machinery, they are likely to do so on a unilateral basis.

It is in the best interests of the maritime nations and the shipping industry to implement a truly effective solution to the problem of offshore collisions and strandings. Nations which have large numbers of offshore oil structures are well advised to take action at an early stage to limit the degree of conflict between shipping and oil recovery operations. The most logical approach to address the broadest spectrum of conflicts is a system of compulsory vessel routing schemes, or "Sealanes," which are protected from encroachment by other users of ocean space. Admittedly this will be restrictive to both forms of activities, however, if properly managed it need not cost either unduly.

CHAPTER II

THE NEED FOR ACTION

The Common Element. Obviously ocean transportation is the major common element in all three conflict categories. In the first two categories, ship-ship collisions and ship-structure collisions lead to direct losses for those who own the vessels, the cargoes or offshore structures. They may also lead to significant loss of life for those on board. Vessel strandings and deballasting operations are the main factors in the third conflict category, that of obnoxious use of different ocean space. Whenever vessel collisions result in large-scale releases of obnoxious or hazardous materials, the first two categories overlap into the third.

Economically speaking, ocean transportation is the most productive user of ocean space.[1] It is, therefore, reasonable and proper to ask whether it is really necessary to take some form of restrictive action to reduce the incidence of accidents involving shipping. How many collisions or strandings occur? What are the trends? Will the problem resolve itself without action on the part of the maritime community?

In order to answer these questions, it is worthwhile to examine the situation which currently exists, the trends, and the actions which have already been taken to address the problem. Figures 1 and 2 are plots of vessels totally lost,

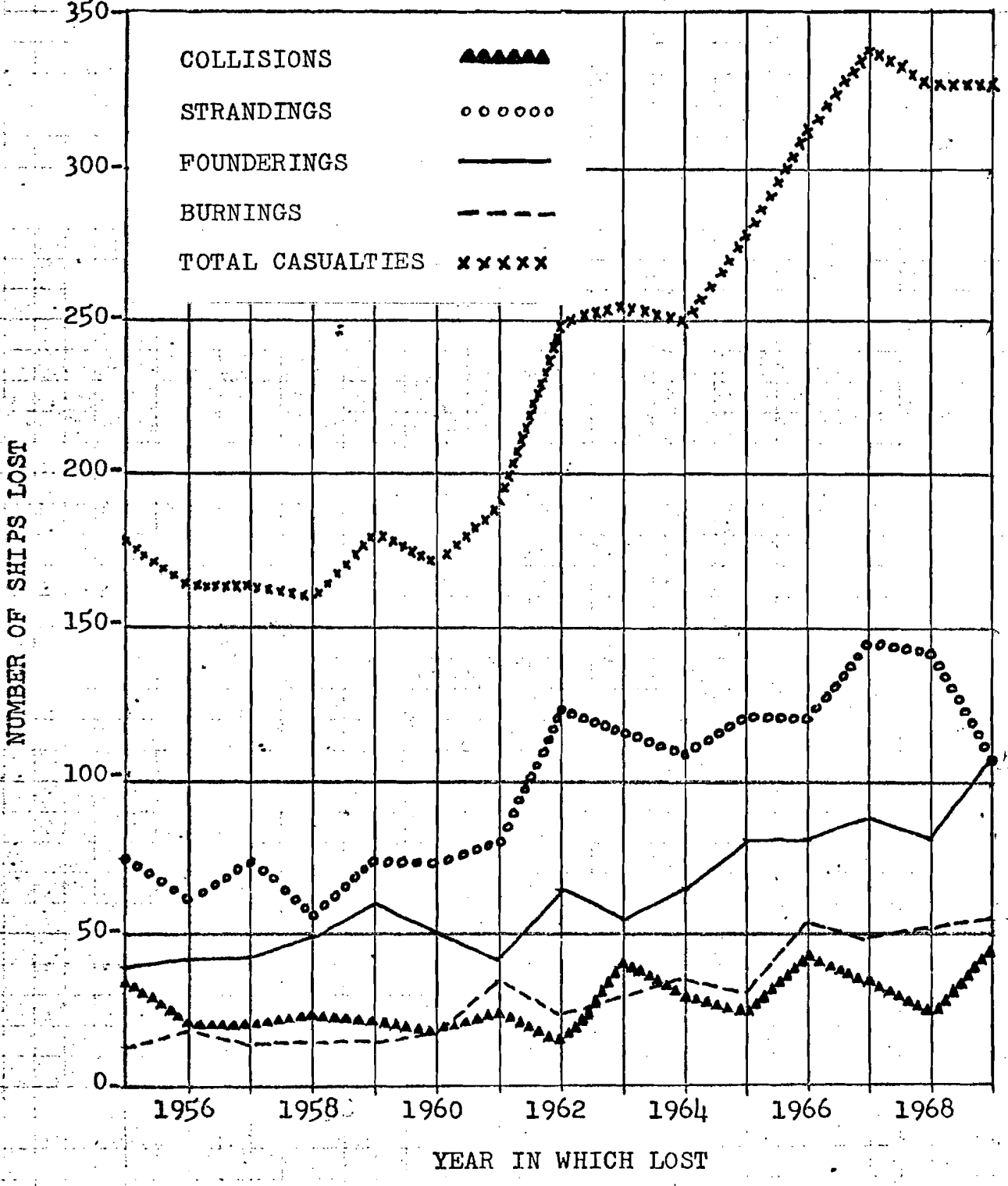
in terms of tonnage and individual ships, from 1955 through 1969.[2] Partial losses due to various causes are plotted in Figure 3 for the same period.[3]

The Vessel Stranding Hazard. Stranding has been a major category of marine casualty since the days when man first put to sea. The first seamen truly sailed into the unknown. Lacking charts, timepiece, or compass, they were in no position to know where they were let alone what dangers existed beneath the surface of the sea. Much of the romance which is presently associated with the mariners of old can be attributed to the danger and uncertainty which they faced, and rightly so, for many never returned as their small vessels stranded or foundered off strange shores.

Things began to develop rapidly with the dawning of the age of discovery in the fifteenth century. As man girdled the globe and came to covet the exotic products of distant lands, the volume of seaborne trade steadily increased. The loss of ships due to stranding was intolerable and the headlands, rocks and shoals in the vicinity of the world's busy ports became veritable graveyards for ships. Prior to the advent of the steamship, the maritime community devoted the major part of its safety efforts to minimizing this costly danger. Some of the more obvious efforts included better charting, more accurate position fixing, and aids to navigation to warn mariners away from unknown hazards.

FIGURE 1

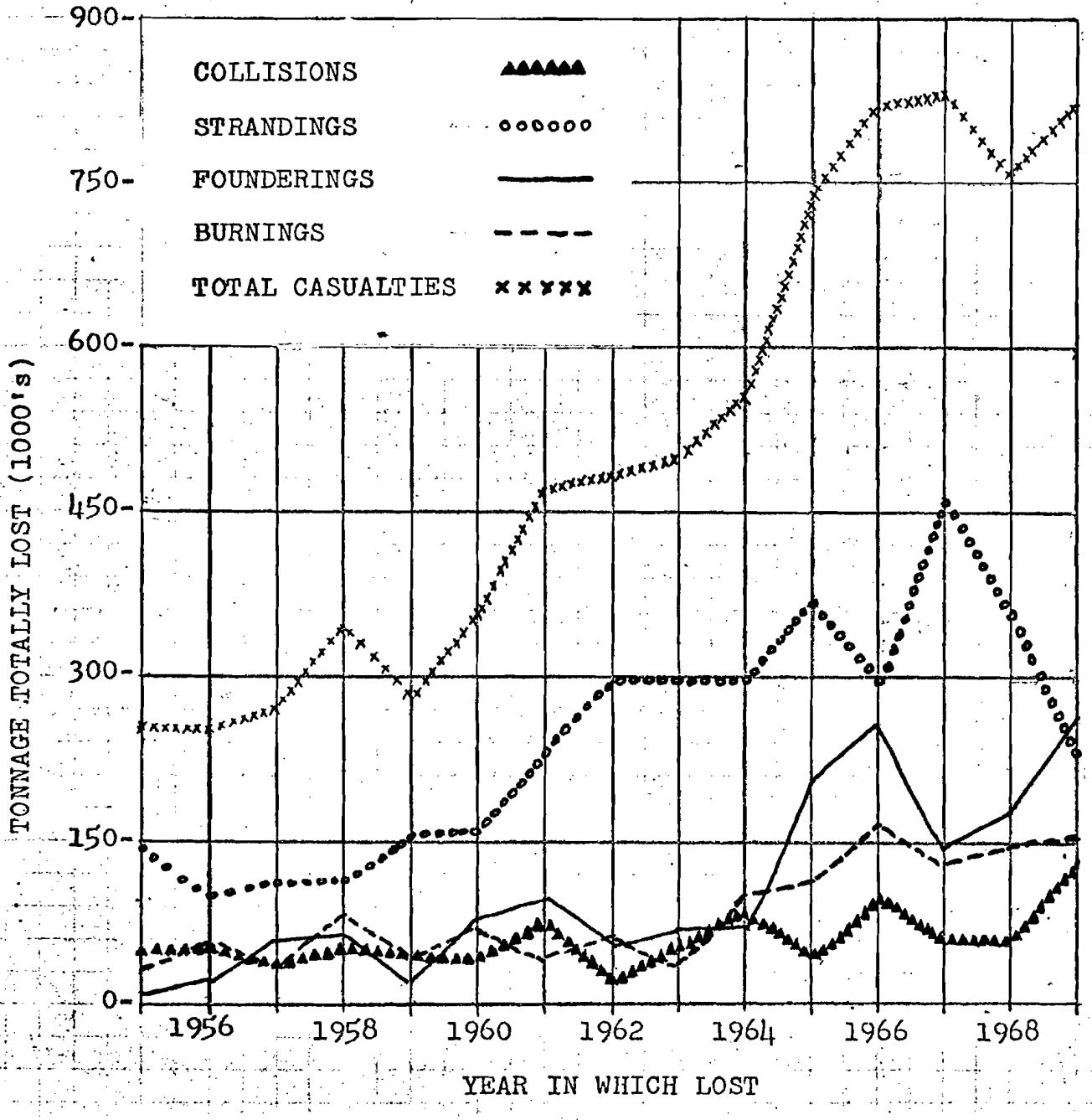
SHIPS TOTALLY LOST DUE TO VARIOUS CAUSES
1955 THROUGH 1969



Source: Lloyd's Register of Shipping, "Statistical Summary of Merchant Ships Totally Lost, Broken Up, etc." (London: Lloyd's, 1956 through 1970), Table 1.

FIGURE 2

TONNAGE TOTALLY LOST DUE TO VARIOUS CAUSES
1955 THROUGH 1969



Source: Lloyd's Register of Shipping, "Statistical Summary of Merchant Ships Totally Lost, Broken Up, Etc." (London: Lloyd's, yearly issues, 1956 through 1970), Table 1.

Efforts to reduce strandings continued without letup into the steamship era. Better charts, extensive buoyage, and all-weather electronic aids such as radio beacons, LORAN and DECCA were implemented. Yet, despite the best efforts of modern man, stranding continues to be a major problem, not only for those who operate ships, but also for those who inhabit the coastlines adjacent to busy shipping routes.

Figures 1 and 2 clearly show that stranding is the most significant cause of total loss of vessels. In terms of partial damage to vessels over 500 gross tons it ranks third, following collisions and contact damage.* There was a clear upward trend in losses due to stranding until 1967 at which time a reversal occurred; hopefully, a permanent one. The reason for the reversal is not fully clear, however, it may be more than just a coincidence that commencing in June of that year the first in a worldwide series of vessel routing schemes was implemented in the Strait of Dover.[5]

A vessel may become stranded due to an "act of God," improper charting of navigational hazards, or a variety of other reasons beyond the control of her master. In the majority of cases, however, errors in judgement on the part

*Contact damage falls short of total loss of a vessel. It is a term used by the Liverpool Underwriters to designate damage resulting from a vessel striking objects such as piers, submerged wrecks, rocks, and offshore structures, to mention but a few.[4]

of ship's personnel are the cause. A review of statistics compiled by the U.S. Coast Guard reveals that in the period from 1 July 1969 to 30 June 1970 personnel fault was the primary cause of 329 of 531 groundings for which cause was determined. Of the vessels involved, 48 were tankers and 122 were of over 10,000 gross tons displacement. Most of the groundings occurred in U.S. inland waters, however, a surprising 71 occurred on the open seas off the coast.[6]

The most significant concern of coastal states, with regard to stranding, other than loss of life, is the threat of massive pollution of their coastlines. The Torrey Canyon incident, which has been previously discussed, focused the attention of coastal states on the degree of possible damage to the coastal environment and the cost to correct it.[7] The reaction which this monster spill evoked in the British government was duplicated elsewhere. South Africa proposed legislation in 1968 which would have denied the right of innocent passage for tankers within 12 miles of its coast. Since the Summer Loadline Zone comes to within 13 miles at some points off the coast, vessels complying with the International Loadline Convention of 1966 would have been funneled through a corridor no more than one mile wide as they rounded the southern tip of Africa. The International Chamber of Shipping (ICS) called this potentially dangerous situation to the attention of the government which amended its

legislation. With the cooperation of the ICS, the government developed a vessel routing scheme which includes traffic separation and which, in some places, comes within 12 miles of the coast.[8]

In the case of South Africa, the threat of prohibitive legislation caused the shipping industry not only to accept rigid vessel routing, but to propose it. This departure from a traditional position of resisting all efforts to curb the freedom of the ship's master to sail his vessel wherever and however he chooses may become increasingly necessary. Canada's Bill C-202, Arctic Waters Pollution Act, represents another unilateral action on the part of a coastal state to protect its coastal environment by regulating vessel movements on the high seas.[9] By enacting this legislation in August 1970 Canada extended its authority to impose regulations on foreign shipping out to a distance of 100 miles from her coast, north of the sixtieth parallel. Bill C-202 was enacted over the protest of the United States, which characterized it as a unilateral infringement on the freedom of the seas which would restrict merchant shipping.[10] The Canadian government has responded by claiming that present international law is not adequate to protect coastal states from damage due to oil pollution. It proposes to develop new concepts to correct the deficiencies.[11]

The United States, which objected so promptly to Canada's action in passing the Arctic Waters Pollution Act, has within its own Executive Branch elements which would impose controls on vessels on the high seas. In its first report, the President's Panel on Oil Spills pointed to the inability of a sovereign state, under international law, to control the movements of a vessel which constitutes a pollution threat to its coastal areas, until it is within the Contiguous Zone. Accordingly, the panel recommended that:

> Further study be made on designation of sea lanes for control of tanker routing and that steps be taken to develop and implement a U.S. plan for avoidance of hazardous or unique areas by tankers carrying oil and other hazardous substances. Every effort should be made to make use of designated sea lanes mandatory rather than at the option of the tanker Captain.[12]

There is, implicit in the foregoing statements and government actions, a strategic warning to ship operators and major shipping nations. Unless they, in cooperation with international bodies such as the Intergovernmental Maritime Consultative Organization (IMCO), take the lead in developing acceptable and effective measures to prevent massive oil spills, coastal states will take unilateral action to restrict their freedom of movement, even on the high sea. There is a strong possibility that such actions could result in large dis-economies for the industry.

Collisions Between Vessels. Strandings have been shown to be the most significant cause of total loss of vessels and massive oil spills. When considered on an overall basis, however, collisions are the most common cause of ship casualty.

Prior to the advent of the steamship, collision between seagoing vessels was a rare occurrence. Sailing vessels, by the nature of their means of locomotion, were hardly likely to encounter one another head to head, a situation which has been proven by experts to be the most conducive to collisions at sea.[13] Within a short time after its arrival, the steamship had injected a new and significant dimension into the problem of safe navigation. Freed of the need to conform to weather patterns, those who navigated mechanically propelled vessels took the most direct routes between ports of origin and destination. Making accurate use of the growing system of aids to navigation, both as landfalls and points of departure, opposing streams of traffic tended to concentrate at specific locations at the approaches to major ports. The collision rate took a precipitous upward turn resulting in many spectacular accidents toward the end of the nineteenth century. As collisions continued to grow in frequency and cost, the maritime community began to develop a system of procedures and ship construction standards to reduce both the occurrence and consequences.

On an international basis, the first steps taken to curb the collision danger were done at the urging of the President of the United States. In Washington, in 1889, the Conference of all Maritime Nations codified the International Regulations for Preventing Collisions at Sea.[14] Subsequent Safety of Life at Sea (SOLAS) conferences were held in London in 1913, 1928, 1948, and 1960, all of which have addressed the collision problem, among other things. At the present time the primary international forum for matters concerning the safety of life at sea is the Maritime Safety Committee (MSC) of the Inter-governmental Maritime Consultative Organization (IMCO). Since its formation in 1959, as a result of ratification of the 1948 Geneva Convention, IMCO has grown in stature and effectiveness in most matters relating to international shipping. The collision problem has a high place on its list of priorities.

In addition to the procedural and regulatory remedies which he has sought, man has applied his developing technology to the problem of preventing collisions. With the introduction of radar, it was felt that a large percentage of collisions which are attributed to poor visibility could be substantially reduced. This hope is far from being realized; indeed, some studies have pointed to just the opposite result which has led to the coining of the term, "radar assisted collision."[15]

Despite all of the activities described above, and many more which are too numerous to mention, man has been unable to reduce the long term upward trend in collision statistics. From Figure 3 it can be seen that this type of casualty involves the greatest number of ships of all categories of marine accidents. It is the most frequent and costly form of multiple-use conflict on the world's oceans.

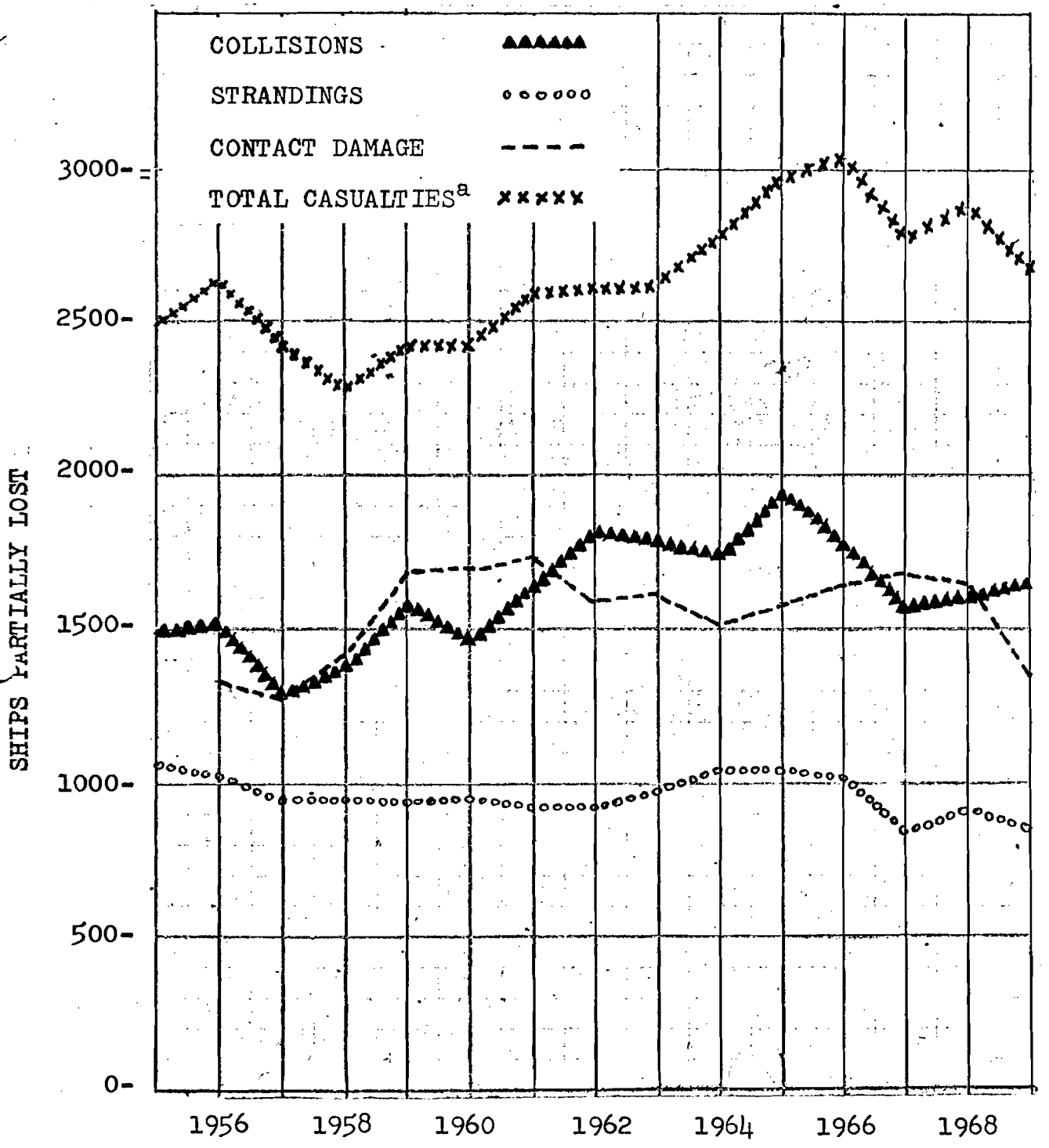
The statistics of the Liverpool Underwriters* show that over the period from 1956 to 1969, 33% of the world merchant fleet, of vessels over 500 gross tons, suffered partial losses as a result of some form of marine accident. Over the same period, 20.6% of all vessels damaged were involved in a collision. Commencing in 1965, the percentage of the world fleet involved in accidents began to decline; however, it is disturbing to note that the percentage of damage resulting from collision has increased slightly. A simple mathematical calculation shows that, in the long term, somewhere between six and seven percent of the total world fleet can be expected to be involved in a collision. In light of the present growth trends, in size and number of merchant vessels, this is not a very comforting thought.

The concern expressed above is borne out by the fact that in 1969 collisions resulted in the partial or total

*See Appendix I.

FIGURE 3

SHIPS OVER 500 GROSS TONS PARTIALLY LOST
DUE TO VARIOUS CAUSES, 1955 THROUGH 1969



[a] For total casualties, multiply vertical scale by 3.

Source: The Liverpool Underwriters Association, Annual Report of the Committee, A Summary of the 154th through the 169th Annual Reports, (London: Liverpool Underwriters, 1956 through 1971).

loss of 1,669 vessels of over 500 gross tons.[16] This is a decrease from the post-World War II peak of 1,970 casualties, which occurred in 1965, and speaks well for the measures which the maritime community and IMCO have taken to improve maritime safety. Unfortunately, in terms of tonnage and ships totally destroyed, it was the worst year on record, doubling the figure of 1968.[17] Incomplete returns for 1970 indicate a significant reduction, at least in terms of partial losses, however, collisions still acounted for 20.6% of all damage suffered, right on the 15 year average.[18]

Collisions, to a much greater extent than strandings, are primarily a result of personnel error. Statistics published by the U.S. Coast Guard for the period 1 July 1969 to 30 June 1970 show that 232 reporting vessels experienced casualties as a result of collisions. A total of 735 vessels were involved, of which 18 were tankers and 38 displaced over 10,000 gross tons.* Considering that it takes at least two ships to create a collision, it can be seen that the maximum possible number of collisions in the set is 367. Personnel fault was assessed as the primary cause in 306 or 84% of the

*The figures which are quoted here are based on the sums of two separate collision categories which the Coast Guard has titled "Collisions; crossing, meeting and over-taking" and "Collision, fog." For the purposes of this discussion, it makes no difference whether visibility was good or poor; it is the consequences which are important.

cases.[19] There is no reason to doubt that this assessment of cause should be extrapolated on a world-wide basis.

States which experience a large volume of ship traffic in the proximity of their coasts are becoming increasingly alarmed at the high incidence of collisions. Although massive oil spills from collisions such as that resulting from the Arizona Standard/Oregon Standard incident are rare, there is a high potential risk of such an occurrence. A recent sequence of accidents in the Dover Strait has aroused grave public concern in the United Kingdom. As a result of a collision with the Peruvian freighter, Paracas, on 11 January 1971, the unladen Liberian tanker, Texaco Caribbean, broke in two and sank. Following this initial incident, two additional vessels, the Brandenburg and the Nikki, struck the submerged wreckage and were also sunk. In all, 53 persons lost their lives within a three week period. Had the 18,000 dwt Texaco Caribbean been fully laden, serious pollution would also have resulted.[20] This unfortunate series of accidents has aroused strong sentiments in the British Parliament to compel vessels transiting the English Channel to comply with the routing schemes which presently exist there regardless of their nationality.[21]

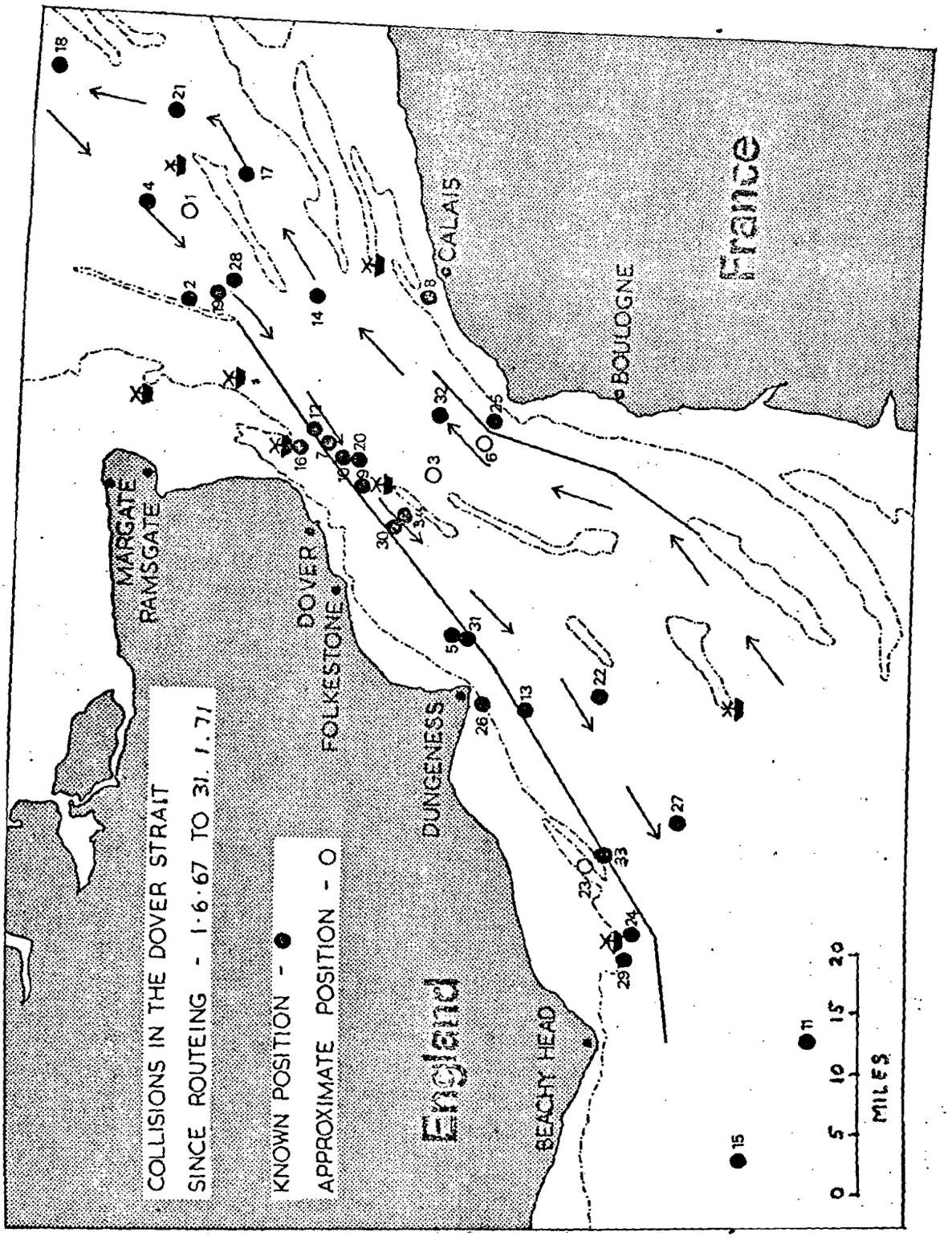
Admittedly, the Dover Strait is a special case, both in terms of geography and traffic density. In fact, the entire marine region of northwestern Europe from the Dover Strait

past the Hook of Holland to the entrance of the Kiel Canal supports the greatest volume of seaborne traffic anywhere in the world. It has been shown that close to 60% of all collisions occur in those waters, of which 5% of the total occur on the open sea.[22] Figure 4 shows the distribution of collisions which occurred in the Strait in the three year period between 1 January 1967 and 31 January 1971. The concentration on the English side is noteworthy.

A review of casualty statistics assembled by the U.S. Coast Guard and the Liverpool Underwriters shows that collision is no stranger to the waters adjacent to the United States.[33] Approximately 15% of the world's total occur in these waters; of which number some 15% occur in the open sea. Comparison of these figures with those of northwestern Europe shows that, of the total number of collisions occurring in each area, the proportion of those which occur on the open sea is three times greater in American waters. Several spectacular collisions, many of which have involved large passenger liners, have occurred on the high seas approaches to New York. Fortunately, in recent history none has resulted in the huge loss of life that was potential in the situation, even though one ship or the other was totally destroyed. In two fairly recent cases, the danger was heightened considerably

FIGURE 4

DISTRIBUTION OF COLLISIONS IN THE DOVER STRAIT



Source: J.H. Beattie, "Collisions in the Dover Strait." Presented to a Meeting of the Institute of Navigation, (London: 3 February 1971), citing Lloyd's Casualty Statistics.

as a result of one of the vessels being a tanker.*

British maritime safety officials have expressed a belief that it may be necessary to impose positive traffic control on vessels transiting the Dover Strait.[25] In as much as there exists no precedent for implementing such a scheme in international waters, the thought raises the possibility of Britain and France extending the limits of their territorial seas to 12 miles and terminating the high seas status of this busiest of all international waterways. Unless the collision rate, which now averages one per month,[26] is significantly reduced, public reaction may force these governments into taking such action.

Once again, as in the case of public reaction to strandings, the ocean transportation industry is running the risk of navigation restrictions as a result of unilateral government action. This possibility is also implicit in the "Declaration of Latin American States on the Law of the Sea," in Lima, 8 August 1970. The perception of a threat can be a highly subjective judgement on the part of the coastal state. Maritime operators should need little incentive to take whatever measures are necessary to permanently reverse

*Some of the more spectacular collisions which involved passenger liners were those between the liners Stockholm and Andria Doria, July 1956; liner Santa Rosa and tanker Valchem, March 1959; and liner Shalom and tanker Stolt Dagli, November 1964.[24]

the unacceptable long-term trend in collision statistics. After all, it is they who are the biggest long-term losers.

Shipping and Offshore Structures. Statistically speaking, the problem of vessel collisions with offshore oil structures is a minor one compared to stranding and ship-ship collisions. Geographically speaking, only the Gulf of Mexico presents a problem of significant concern to maritime safety officials and ship operators. Nevertheless, the Coast Guard, American Institute of Merchant Shipping (AIMS)*, and shipping underwriters have branded offshore oil structures as navigation hazards.[27]

Coast Guard statistics show an average of about three collisions per year between ships and offshore structures in the Gulf of Mexico. Figures are based only upon reported accidents which means that those involving foreign vessels beyond the limit of the territorial sea are not included.[28] It is difficult to say how many accidents such as that which involved the Greek Freighter, Olympic Flame, on 19 October 1970 would add to the overall statistics.[29] Considering that over 300 deep draft ships operate daily out of Gulf ports and that over 75% of them are foreign, one can only conclude that the Coast Guard statistics are conservative.

*Formerly the American Merchant Marine Institute (AMMI).

Oil recovery operations first moved off shore in 1947 in the Gulf of Mexico. At first they presented no problem to the mariner; in fact, oil structures were welcomed by local seamen as a form of aid to navigation. Technology limited them to shallow water and they were, therefore, no threat to large ocean-going vessels. The honeymoon was short-lived for several reasons. The principle ones were the push into deeper water, which improving technology permitted, and the appearance of mobile platforms which are used for exploratory drilling. Stationary platforms permitted the mariner to familiarize himself with the hazards in a particular area. The mobile platform was a will-o-the-wisp, disappearing from one spot and appearing in another between the departure and return of a ship on a single voyage.[30] They were particularly bothersome to foreign vessels which, more often than not, lacked appropriate Notices to Mariners and up-to-date navigation charts.

With the passage of the Submerged Lands Act[31] and the Outer Continental Shelf Lands Act[32] in 1953, the push into deeper water was accelerated. Federal jurisdiction, which had previously been somewhat uncertain, was extended to all structures or "artificial islands" on the continental shelf for the purpose of navigational safety. The U.S. Army Corps of Engineers was empowered to restrict the erection of structures which would constitute a navigational hazard.[33] The

U.S. Coast Guard was given the authority to prescribe its "Rules and Regulations for Artificial Islands and Fixed Structures on the Outer Continental Shelf," by which it prescribes light and sound signals to be carried to warn shipping.[34] The Corps of Engineers, after discussions with concerned interests, established structure-free lanes or "fairways" at the approaches to major Gulf ports in order to provide safe access for shipping. Despite the legislation and activities of government agencies, Gulf shippers find themselves, today, in a position where coastwise shipping must make wide deviations to seaward to avoid the hazards of offshore structures.*

Setting aside the ship-structure collision, which is only regionally significant at the present time, one should be able to look at the broader problem in its developing perspective. At its root is encroachment, by offshore resource exploiters, on large navigable areas of the sea so as to make them unusable or hazardous for shipping. If uncontrolled, the process creates a condition whereby vessels must maneuver deviously to approach a port or round a headland. As a minimum, this results in lost time and significant dis-economies for ship operators over the long term. Given heavy ship traffic and frequent poor visibility, the results

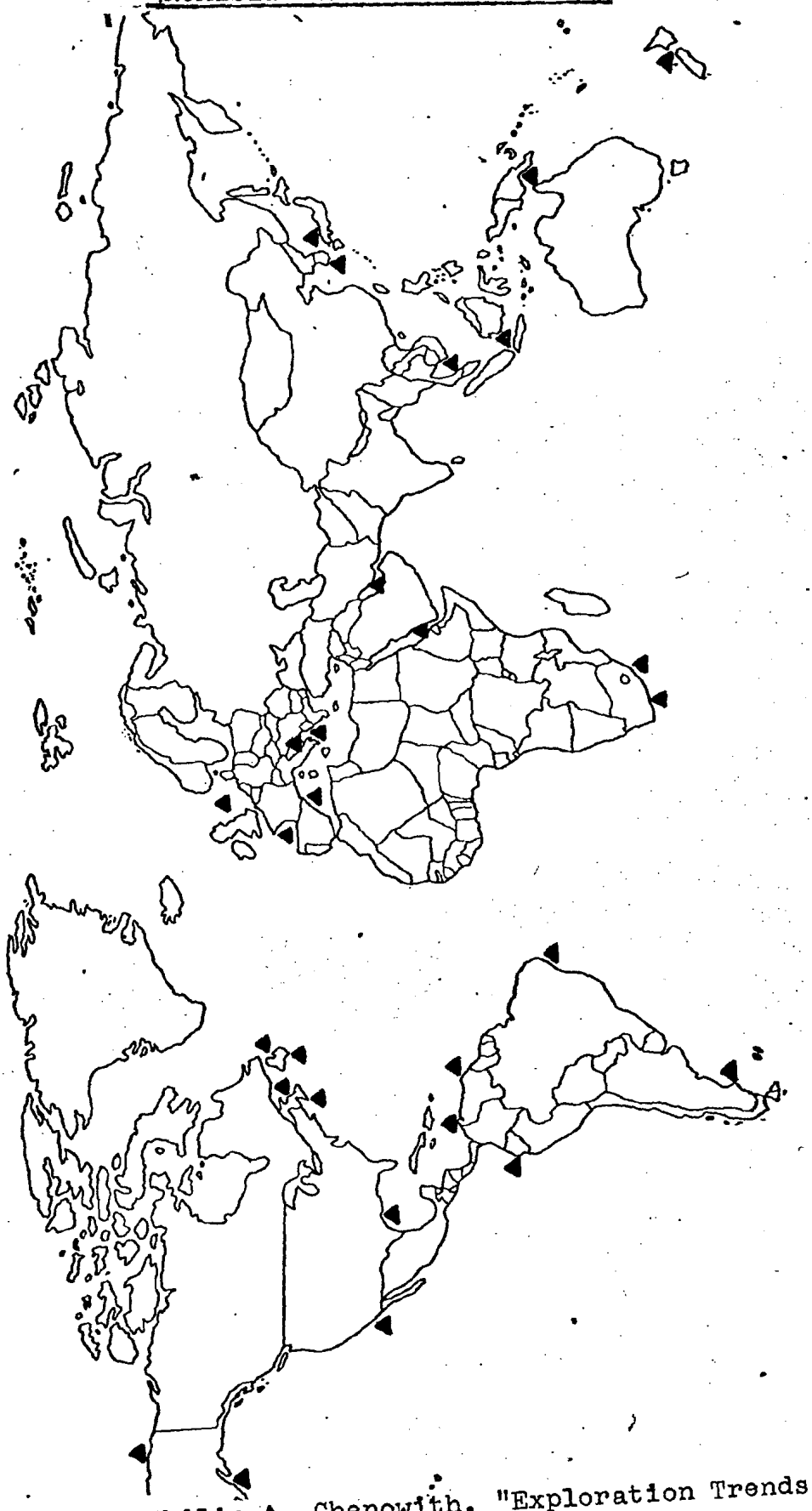
*See the discussion in Appendix II.

are as likely to be sunk or damaged ships and oil rigs. As pointed out in Chapter I, this raises a considerable threat of coastal pollution due to large oil spills from damaged ships or oil platforms.

The growth rate of these structures creates the greatest alarm in shipping circles. Over the period from 1961 to 1969, the rate at which new wells were completed off the U.S. coast increased from a little over 500 to over 1200 per year. At the present time there are over 8000 oil platforms in the Gulf of Mexico alone and over 16,000 estimated world-wide.[35] Producing wells exist out to nearly 100 miles from shore in up to 340 feet of water.[36] The pace is increasing all over the globe and is expected to continue as the world's energy demands deplete onshore resources. Figure 5 identifies some of the most promising offshore oil areas. Based on existing shipping patterns, one might predict conflict in the North Sea, Gulf of Mexico, East China Sea, Indonesia, and the Gulf of St. Lawrence, as well as off the coasts of the southwestern United States, South Africa, eastern Canada, and the northeastern United States. The potential magnitude and complexity of the problem can be seen by referring to Figure 6, which is a map of oil exploration leases which have been granted off eastern Canada. Should these prove to be fruitful deposits, they will bring shipping, oil, and fishing together in one of all time great

FIGURE 5

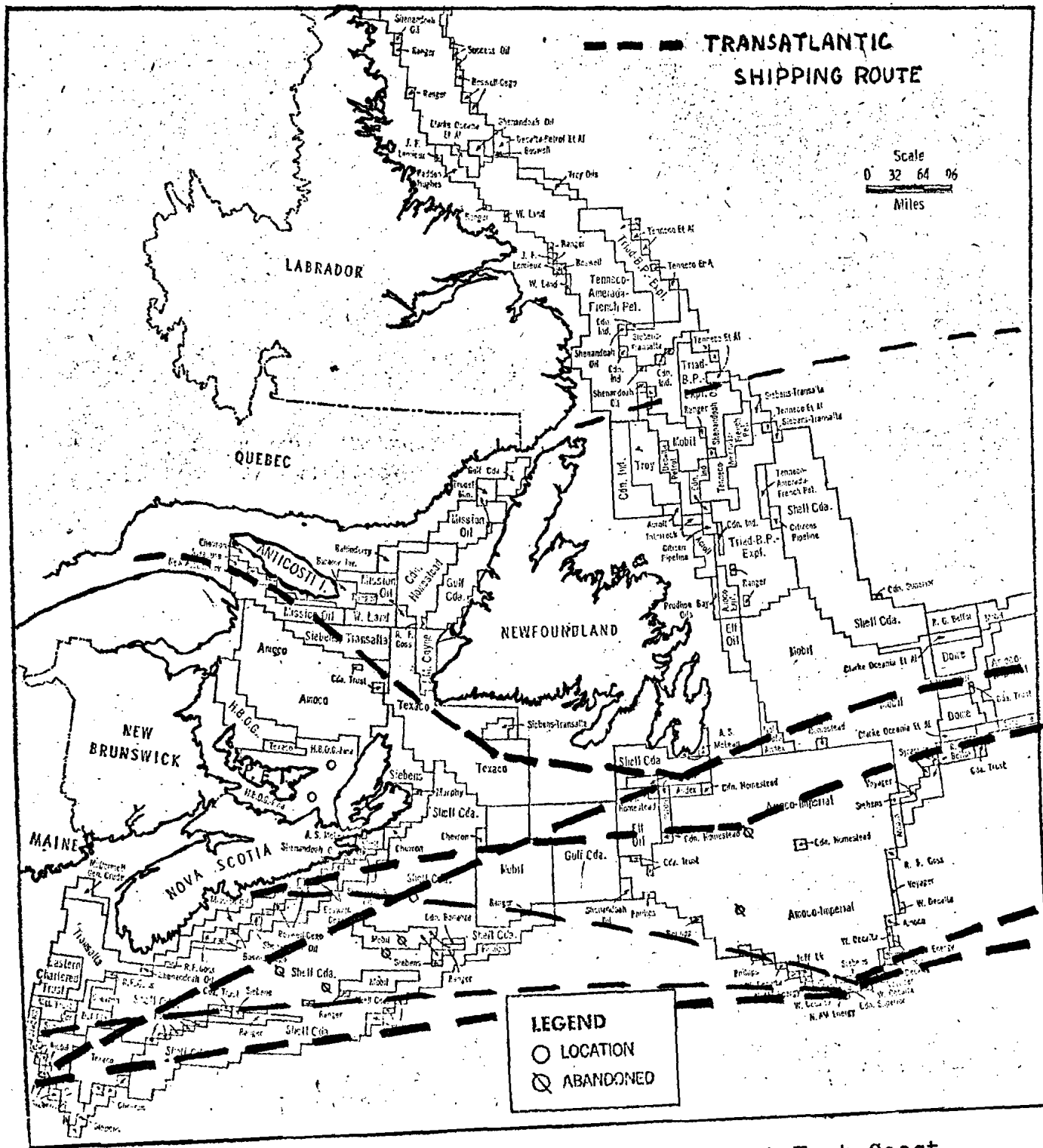
PROMISING OFFSHORE OIL AREAS



Source: Philip A. Chenowith, "Exploration Trends Optimistic for 1970." World Oil, April 1970, p. 58, 59.

FIGURE 6

OIL EXPLORATION LEASES - EAST COAST OF CANADA



Source: "Major Oil Companies Excited About East Coast Prospects." The Financial Post (Canada), 2 May 1970, p. A-2.

use conflicts. The prospect of trying to develop a workable accommodation which involves multi-nation distant water fishing fleets, international shipping, and Canadian and American oil interests boggles the imagination.

It is perhaps appropriate at this point in time to look upon this relatively new form of multi-use conflict as adding a new dimension to the problem of maritime safety, much like the advent of the steamship did about a hundred years ago. In other words, while it has not yet developed into crisis proportions, the existence of a growing number of man-made navigation hazards in or near busy shipping routes and port approaches has the potential for creating a serious problem. It is clear that an acceptable form of accommodation must be internationally acceptable and that it should be arrived at prior to the generation of a crisis. Both the offshore operators and the shipping interests should know the rules of the game as they invest in their respective technologies.

The discussion has properly centered on the shipping-oil conflict, which is the only aspect of this class of conflict of current concern. Other versions are on the horizon, however, and should be considered in the same context. Offshore operations such as hard mineral recovery and underwater habitats also contain the elements for spatial conflict with shipping operators. It seems unlikely that they will require anything near the level of effort which must be exerted in

the case of offshore oil, at least for the foreseeable future, and a workable management scheme for the latter should be equally applicable to them.

Trends. What of the future? Will the problems go away if nothing is done, or will they grow worse? To answer this question, one need but look at the trends in the two major elements--ocean transportation and offshore oil.

Table I shows the growth by year of world international seaborne trade.

TABLE I

DEVELOPMENT OF WORLD INTERNATIONAL SEABORNE TRADE, 1959-1968

	TANKER CARGO		TOTAL CARGO	
Year	Metric tons, millions	% change from last year	Metric tons, millions	% change from last year
1959	480	9	970	5
1960	540	13	1080	11
1961	580	7	1150	6
1962	650	12	1250	9
1963	710	9	1350	8
1964	790	11	1510	12
1965	870	10	1640	9
1966	950	9	1770	8
1967	1020	7	1860	5
1968	1120	10	2050	10

Source: United Nations, Conference on Trade and Development, Review of Maritime Transport, 1969, TD/B/C 4/66 (New York: 1969), p. 3.

During the period from 1959 through 1968 trade developed at a rate of 8.3% per year in terms of tonnage of all goods loaded. Tanker loadings increased at an average annual rate of 9.7%. Growth has been steady and most experts predict that it will continue that way for the foreseeable future. For the United States, it is estimated that total waterborne foreign trade will more than quadruple from 1970 to the year 2000, growing from 391 to 1,252 long tons.[37]

In anticipation of this growth, shipbuilders have forecast tonnage requirements through 1980, as shown in Table II. It is interesting to note that in 1969, when these forecasts were made, the predicted tanker deadweight tonnage for 1970 was 127.8 million. According to Lloyd's of London, the amount of tonnage actually registered in 1970 was 148.5 million tons.[38]

TABLE II

MAXIMUM PROJECTED WORLD FLEET TONNAGE,
1970, 1975, and 1980
(Million deadweight tons at year end)

YEAR	TANKERS	DRY CARGO VESSELS	TOTAL
1970	127.8	157.5	285.3
1975	193.8	211.3	405.1
1980	289.7	384.3	574.0

Source: United Nations, Conference on Trade and Development, Review of Maritime Transport, 1969, TD/B/C. 4/66 (New York: 1969), p. 15.

The nature of the world fleet is changing rapidly also. Most significant is the appearance of a growing number of giant tankers. These superships, or "oilbergs" as some have described them, are capable of carrying over 200,000 tons of liquid cargo. As of 15 February there were 61 such vessels in the world fleet and 294 were on current order.[39] Projections for 1980 call for tankers which will displace one million dwt., and be a quarter of a mile long. When one considers that the Torrey Canyon was only one tenth the displacement of one of these monsters, it is not too difficult to foresee the magnitude of the consequences which would result should one be destroyed in coastal waters.

It is clear that the trend in volume of ocean trade is increasing and that the tonnage of the world fleet will grow to accommodate it. Shipping technology will also change as seen in the developments in the tanker field. Specialized ship configurations such as a LASH and containerships will concentrate traffic at major ports and along specific routes. Large investments in these new vessels and in the port facilities to handle them will place greater emphasis on maintaining schedules, giving rise to greater speeds and perhaps more calculated risks on the part of masters.[40] Obviously, factors for increasing conflict and risk are plentiful.

The trends in offshore oil exploitation have been adequately covered and need no further discussion. It is

sufficient to mention here that in the next 20 years the free world energy demand will be about triple that of the past 100 years. When taken together with the fact that the ratio of proven domestic reserves to annual production was reduced from 13 to 10 in the United States from 1950 to 1967,[41] it is clear alternative sources are necessary. If they exist in the sea and are exploitable, there will be continued expansion of offshore activity.

Summary. Ocean transportation has been identified as the single common element in all three categories of multiple-use conflict in offshore areas. It has been shown that despite a host of regulatory and technological measures taken by the maritime community, the long-term trends in ship-ship collisions and strandings has steadily moved upward. The consequences to coastal states, in terms of pollution and loss of life, are giving rise to thoughts of unilateral action to restrict vessel movements even in international waters. It is in the interest of maritime operators to take the lead in developing adequate measures to control shipping so as to reduce present casualty trends.

The conflict between shipping and offshore oil exploitation is presently minor in terms of casualties to either element when compared to the first two categories. The primary source of contention is competition for unimpeded

use of ocean space. Growth trends in shipping and offshore oil recovery do present a significant potential for increased risk of mutual hazard unless practical measures can be established to accommodate both.

Conclusions. The present level of offshore marine accidents is unacceptable to coastal states. The trends point to increased potential for such accidents unless preventive measures are taken.

Vessel routing has been applied, in one way or another, to address each form of multiple-use conflict and its related categories of marine accidents. The recent reactions of public officials to marine accidents indicate a growing interest in vessel routing schemes, or "Sealanes" as the author prefers to call them.

The maritime community must take the lead in developing acceptable and effective "Sealanes" or run the risk of coastal states taking the initiative and implementing a system which will be unreasonably prejudicial to shipping interests.

CHAPTER III

THE CASE FOR MANDATORY "SEALANES"

Basic Approach to Conflict Resolution. Unless preventive measures are taken the level and complexity of the multiple-use conflicts previously discussed will grow. An acceptable approach to the problem will be one which addresses all three conflict categories and, at the same time, minimizes the contribution of major causative factors. It should do so without undue penalty to any particular use and at minimum cost to coastal states. To be effective it must be enforceable without discrimination in a manner acceptable both to the coastal states and to those operating off their shores. The nature of the conflicts and their far-reaching consequences dictates a regime which transcends the boundary between territorial sea and international waters.

It is obvious that the most promising approach toward accommodation will involve measures to reduce accidents involving ocean-going vessels. The most desirable measure or measures will simultaneously address all three categories of accidents which have been identified: ship-ship collisions, ship-structure collisions, and strandings.

Prevention of Ship-Ship Collisions. Head to head meeting situations create the greatest danger of collisions between

vessels. Since the relative speeds are the highest in this situation, it carries with it the greatest potential for serious damage or loss of life.[1] The danger is particularly significant in poor visibility which increases uncertainty as to the intentions of the other vessel, thus delaying preventive action until it is too late.

The obvious approach to prevent this type of accident is to separate opposing streams of ship traffic widely enough so as to minimize the chances for head-on encounters. This conclusion was first reached in 1855 by Lt. Matthew Fontaine Maury of the U.S. Navy. It led to the first North Atlantic Track Agreement in 1898 which separated opposing streams of vessels crossing the North Atlantic.[2] Commencing in 1911, separate "upbound" and "downbound" courses were established in the Greak Lakes and, more recently, several coastal states have implemented a series of IMCO approved "Traffic Separation Schemes."[3]

It is safe to say that the maritime community is generally agreed that a form of vessel routing or traffic separation is needed to reduce the frequency of collisions. Unfortunately, it has not been so consistent in its support for implementing compulsory schemes which are needed to ensure the success of this approach.

Prevention of Stranding. Most stranding incidents occur in congested harbors and narrow channels, however, statistics compiled by the U.S. Coast Guard show that over 13% occur in the open ocean.[4] It is the latter which result in the greatest loss, primarily because the vessel is likely to break up due to tide and wave action. The principle cause has been shown to be personnel error, particularly in open water.[5] Some of the more specific factors are sloppy navigation, lack of local knowledge, adverse weather, and unknown tide and current effects. To these can be added a growing tendency on the part of masters to take calculated risks in order to meet schedules, and a deterioration in their general competence to handle today's larger and faster vessels.[6]

There are several steps which might be taken to reduce the frequency of strandings such as improved aids to navigation, more effective dissemination of information on local navigation hazards, and better tide and current information. These steps do not address the competency of the master, his willingness to take risks nor adverse weather.

Since the coastal state should have the most complete knowledge of all factors affecting navigation safety off its coast, it should be in a position to develop routes which, if followed, would ensure safe passage of vessels under all conditions. If adherence was compulsory, and the existing aids to navigation were adequate to guarantee the

mariner's ability to use them in all weather, they should virtually eliminate strandings such as that of the Torrey Canyon.

Prevention of Vessel-Structure Collisions. The recovery of offshore resources will continue to grow. The mariner, albeit grudgingly, has come to realize this as a fact of life. He realizes that the sea is no longer solely his domain and that he is on the defensive against the encroachers. Accommodation is inevitable and with every accommodation the mariner will be the one who is giving up something which has always been his--navigable ocean space. The main thrust of his activities will be to preserve the maximum possible amount of structure-free water along major sea routes and at the approaches to ports. He will resist being constrained to areas which will not accommodate growth in the size and speed of his ships. He will also resist being forced to follow circuitous routes such as presently exist in the Gulf of Mexico, or routes which are not serviced by adequate aids to navigation.[7]

Oil exploration is expensive and the location of productive deposits uncertain. For these reasons oil interests will insist on the widest possible latitude in carrying out their offshore operations. They will resist attempts to close off areas of the continental shelf which look promising

prior to having sunk test wells from mobile rigs. Also, having determined that oil does exist in an area, they will press for drilling rights even in heavily traveled shipping routes.

At the present time international law does not assign primacy in use of the sea to either of these two competing uses. The main instrument which addresses this form of conflict is the Convention on the Continental Shelf.[8] Article 5 (2) authorizes coastal states to erect structures on the continental shelf and to establish safety zones which must, under Article 5 (3), be observed by ships of all nationalities. Article 5 (1) makes a very subjective statement to the effect that exploration and exploitation shall not cause "unjustifiable" interference with navigation, without qualification. The only apparent support in favor of the shipping industry is contained in Article 5 (6) which prohibits offshore installations where ". . . Interference may be caused to the use of recognized sealanes essential to international navigation." But here again the statement is caveated with subjective terms such as "recognized" and "essential." The question is: who is authorized to interpret these terms? Are there any recognized "sealanes?"

At this point in time it appears as though the interpretation is made by the coastal state, as has been done by the United States in the Gulf of Mexico and in the Santa Barbara

Channel, and as is about to be done by the United Kingdom in the North Sea.* So far no one has challenged this assumption of authority to take unilateral actions which have such an obvious impact on international shipping.

The approach which is apparently developing to resolve this form of use conflict has two distinct objectives; that of preventing ship collisions with structures that already exist; and that of preventing the emplacement of structures which will unjustifiably impede navigation. Both objectives are served by a form of vessel routing called Shipping Safety Fairways.[10] In the first case, vessels are routed around those structures which already exist. In the second case, pre-determined vessel routes are to be kept clear of structures to prevent future hazard. As with all other existing routing schemes, adherence to these schemes by masters is voluntary.

Mandatory Sealanes - the Logical Answer. It is quite clear that vessel routing schemes, if properly developed and adhered to, have the potential to significantly reduce all

*The Chamber of Shipping of the United Kingdom has proposed to the Board of Trade a series of "clearways" off the east coast of Britain, which are recommended to be kept free of offshore structures. This approach very much resembles the system of Shipping Safety Fairways which exist in the Gulf of Mexico, except that they will not be overprinted on navigational charts, at least for the present.[9]

forms of marine accidents which have been previously discussed. The fact that such schemes are already in use has been mentioned, though only in passing.* It is safe to say that, until recently, there had been no effort to standardize on vessel routing schemes nor to require masters of vessels to adhere to them. Those which presently exist vary widely in structure and application. In some cases, where they have been implemented to resolve one particular limited type of conflict, they have succeeded in creating another.

What is required in order to effectively address the problem of marine accidents is a standardized system of "Sealanes" which combines traffic separation, safe routes through natural and man-made hazards, and security from encroachment by competing users of ocean space. The term "Sealanes" has been deliberately chosen over others such as Traffic Separation Scheme or Shipping Safety Fairway. The principle reason for this is that the language of Article 5 (6) of the Convention on the Continental Shelf uses it, albeit undefined, in addressing the problem of conflict between shipping and the exploitation of shelf resources. No other descriptive terms are used in any of the applicable

*The details of the development and structure of vessel routing schemes are discussed in Appendix II.

conventions dealing with shipping problems.*

It might be appropriate to merely classify Shipping Safety Fairways, Traffic Separation Schemes, and others as forms of "Sealanes" for purposes of international law. The main point is that they must be given some legal status both for the purpose of protecting them from encroachment and to provide a means for requiring their observance by masters. It is the position of the author that "Sealanes" will only be successful in reducing marine accidents if adherence to them is made compulsory at least by some classes of vessels, particularly those which by virtue of their size, speed, or nature of cargo pose a major threat to the well-being of coastal inhabitants. Perhaps even more importantly, ALL vessels which operate within "Sealanes" must be compelled to adhere to lane discipline.

*The term "fairway" is used in Rule 26 of the International Regulations for the Prevention of Collision at Sea, 1960, which states, "This Rule shall not give to any vessel engaged in fishing the right of obstructing a fairway used by vessels other than fishing vessels."[11]

CHAPTER IV

RECENT EXPERIENCE WITH SEALANES

The Involvement of IMCO. Commencing in May 1967, the first in a series of modern Sealane Systems was implemented by the U.S. Coast Guard at the approaches to the Port of New York. This was followed one month later by a traffic separation scheme in the Strait of Dover.[1] Both of these schemes have several things in common: (1) they are approved by IMCO; (2) they incorporate traffic separation; (3) they conform to standards laid down by IMCO; (4) they are overprinted on regular navigation charts; (5) they are served by adequate aids to navigation; and (6) they are merely recommended routes with no legal status in international law.* The purpose of these and many other vessel routing schemes which have since been adopted by IMCO is to,

> . . . produce an orderly flow of traffic for the purpose of reducing the risk of collisions and/or strandings, mainly in areas of converging routes or high traffic density.[2]

IMCO is the only international body with responsibility for establishing and recommending, on an international level, vessel routing schemes or areas to be avoided by certain

*The development and structure of these schemes is discussed in Appendix II.

classes of vessels. The principles which underly its approval of schemes, proposed by member governments, are contained in its publication, "Ship's Routing and Traffic Separation Schemes,"* which is now in its second edition.[3] IMCO recognizes the multiple-use conflicts and the trends which have been discussed in earlier chapters. The schemes which it has approved so far incorporate features which simultaneously address the maritime safety aspects of all forms of conflict, and it is hoped that this will continue to be the case.

The Question of Effectiveness. A natural question to be asked is whether or not this new approach has any hope of success where so many others have failed. What are its weaknesses? Do masters comply with the recommended schemes? Can IMCO-approved schemes be encroached upon? Has there been a reduction of shipping accidents since the various schemes were implemented?

Problems of Non-compliance. In a survey conducted by the U.S. Coast Guard in 1968 it was determined that 90% of the 250 masters who responded always used the Sealanes when approaching the Port of New York. Eight percent used them

*This publication may be procured from the Publication Section, Inter-governmental Maritime Consultative Organization, 101-104 Piccadily, London, WIV OAE, England. A good discussion is also contained in H.O. 1400, "Pilot Chart of the North Atlantic," February 1971.

part of the time and two percent stated they did not use them at all.[4] The greatest single complaint was that other vessels were not complying with lane discipline. One third of those who responded to the questionnaires urged that the Sealanes should be made compulsory, even though this question was not specifically asked of them. Surveys have also been conducted in the Strait of Dover to determine the degree of compliance there. One such survey, conducted by the British government, showed 10% of the vessels in the Strait traveling against the normal flow of traffic in the routing scheme.[5] Such statistics have not been reported for other Sealane systems, however, many masters have pointed to passenger and cargo vessels as major violators of lane discipline in the Persian Gulf area and off western Europe.[6] It would appear from most indications, on both sides of the Atlantic, that about 9 out of 10 masters are complying with recommended routes which have been approved by IMCO.

The Problem of Encroachment. Two principle activities exist which might encroach upon established Sealanes. These are oil recovery, which has been previously discussed, and commercial fishing.

To date oil has made no attempt to move into IMCO approved schemes. The most likely areas in which this type of controversy might erupt in the near future are in the

Santa Barbara Channel, where Sealanes traverse a rapidly developing oil recovery area, and in the North Sea. IMCO recognizes that the U.S. failure to take early action in the Gulf of Mexico has created a potentially dangerous situation. Accordingly, the General Assembly of IMCO, in October 1969, adopted a resolution calling upon member states to ensure the existence of unobstructed shipping routes and sea approaches through offshore recovery areas at all stages of exploitation. Action is to be taken to implement routing schemes at an early stage, taking into account principles adopted by IMCO.[7] The rights of governments to exploit the resources of their shelf is recognized by a provision for adjusting established routing systems as necessary.[8] The strength of this resolution remains to be demonstrated.

The problem of encroachment upon Sealanes by commercial fishermen and pleasure boaters already exists and may well be more difficult for IMCO to address, let alone remedy. The first notable incident within U.S. Sealanes occurred in May 1967. The S.S. Christoforo Colombo, enroute to New York, encountered a fleet of Russian trawlers operating in the inbound lane.[9] This vessel was forced to maneuver continuously to avoid numerous small vessels, not all of which were Russian. Since there was a dense fog at the time, the accident potential was quite high. Similar complaints have been received from the other side of the Atlantic, where suggestions

have even been made to restrict fishermen from operating in Sealanes.[10] The impracticality of such a suggestion is obvious, given the freedom of fish to move about without regard to man's artificial boundaries. Nevertheless, in the view of the Coast Guard, some solution is required. The obstruction of Sealanes by fishing vessels and pleasure craft remains as the most serious problem being encountered by vessels using them in the approaches to U.S. ports.[11] Pleasure craft are operated by a rapidly expanding population of what constitutes the most immature and unmanageable group of seafarers on the world's oceans. If they had the best of intentions, it is unlikely that they could navigate with sufficient accuracy to remain out of Sealanes, even if they knew they existed. The problem is somewhat mitigated by the fact that they seldom travel far out to sea and are thus encountered in more or less predictable locations. In addition, they are: (1) indigenous to the coastal state and thus somewhat controllable; (2) maneuverable so that they can usually avoid danger at the last moment; and (3) unbelievably lucky. Most encounters can be expected to end up with nothing worse than a badly frightened ship's master, provided he has maneuvering room and there are no other large ships about.

With commercial fishing vessels the problem is more significant. There exists a large growing fleet of distant

water fishing vessels, international in character, often quite large and comprising a significant financial investment. As has been shown, they can be encountered anywhere on the high seas where fish are present. When engaged in fishing operations their maneuverability is restricted. This is recognized by Rule 26 of the International Rules for Preventing Collision at Sea, 1960, which requires all other vessels, except those not under effective control, to remain clear. If this rule is applied rigidly to vessels which are proceeding in recognized Sealanes, much of their value in reducing the collision hazard will have been lost. This will be particularly true when the non-fishing vessel is forced into maneuvering close to the opposite lane as was the Cristoforo Colombo.

Effectiveness of Sealanes in Reducing Accidents. At this point in time no "expert" will step forward and point to the success of Sealanes in reducing shipping accidents. There are too many factors involved in present accident statistics such as growth trends in shipping and deteriorating capabilities of masters, particularly those of the growing "flag of convenience" fleets. The first place to look for significant improvement is in the Strait of Dover, which has had such a poor long-term record. There are those who claim that vessel routing has indeed resulted in fewer

accidents in the Strait.[12] Others deny it vehemently, pointing to indefensible caveats used by proponents in qualifying their conclusions.[13] The unqualified fact of the matter is that for the 44 months before and after the Dover Strait scheme was implemented the collision rate has been about constant. The best that has been said for it is that the number of accidents per fog day has been reduced. Despite conflicting views on the success of the present scheme, all agree that separation is necessary. It is only the mechanics of the system which is the subject of controversy. The Coast Guard has pointed out that no collisions have occurred within the Sealanes which it has established. Its confidence in the concept is well founded on the long-term success of the traffic separation schemes which were established in the Great Lakes.[14]

As pointed out in the discussion in Chapter II, there was a change in stranding trends starting in 1967. The time frame is too short to determine whether or not this is a long-term change attributable to vessel routing. Nevertheless, it did commence with the year following the implementation of the original schemes. Unfortunately, overall collision statistics have not yet taken an identifiable downward turn.

Weaknesses in Present Schemes. Setting aside differences of opinion over the physical structure of particular traffic separation schemes, the overwhelming majority of those who have been involved with them support their need. The support of ship's masters was established at an early point in time by the Institute of Navigation[15] and has been verified by several administrations. Indeed, it has been the administrations which have taken the more conservative approach, especially with regard to compulsory use of Sealanes.[16] This being the case, why have they not been more effective in reducing the number of collisions?

The author contends that experience in the Strait of Dover clearly proves that even as little as 10% non-compliance by vessels operating in a Sealane can render it incapable of meeting its objective. In fact, one might even consider the situation worse than no Sealane at all. Those who do comply might well be lulled into a false sense of security and, thus, not be as alert as they should for oncoming vessels.

It is obvious that the lack of authority to enforce mandatory compliance with lane discipline has weakened the effectiveness of the Sealane concept. It is, perhaps, not realistic or necessary to require all vessels to use established Sealanes. It is, however, both realistic and necessary

to require all vessels which operate within them to comply with rules meant to ensure safety of navigation.

The fact that Sealanes are not presently protected from encroachment by fishing vessels and pleasure craft is another very significant weakness, and one which will be difficult to remedy. Article 1 (1) of the Convention on Fishing and Conservation of the Living Resources of the High Seas[17] and Article 2 (2) of the Convention on the High Seas[18] will limit the actions which the coastal state may take to keep fishing vessels from operating in the Sealanes which it establishes beyond its territorial sea. The author knows of no provision in conventions dealing with the Law of the Sea which addresses this problem, other than Rule 26 of the Regulations for Preventing Collision at Sea, 1960, which restrains fishing vessels from obstructing "fairways" which are used by vessels other than fishing vessels. Had the term "Sealane" or "vessel routing scheme" been used there would be some basis for resolving the conflict.

Present schemes do not address the problem of crossing traffic adequately. Under the existing International Regulations for Preventing Collision at Sea, a vessel proceeding in accordance with the prescribed traffic pattern may be forced to give way to vessels crossing the lane. Under conditions where there is heavy crossing traffic, it could well be forced out of the lane in carrying out prescribed maneuvers.

This is precisely the point which has been at issue in the controversy between the Trinity House and the United Kingdom Board of Trade.[19] The problem is exacerbated by the trend toward increased size and reduced maneuverability of giant vessels. Furthermore, while the vessel crossing a Sealane system is aware of the possibility of oncoming traffic, those which are in it may not be quite as alert to impending crossing situations. This can be a factor of significance in areas like the Strait of Dover where so much cross-channel traffic exists.

Problems also exist with visual aids to navigation used to mark vessel routing schemes. As various nations develop their own Sealanes they will service them with the buoyage and other aids to navigation which have been locally adopted. At present there exists a wide variety of such systems. They differ enough so as to make it impractical for the international maritime community to familiarize itself with all of them. Of particular concern is the marking of hazards such as sunken vessels which might exist within a Sealane. Lack of standardization of this particular aspect of visual aids to navigation may have contributed to a series of recent accidents in the Strait of Dover, where entirely different systems of buoyage exist on the French and British sides.[20]

Recent Actions of the United Kingdom. Is 90% compliance adequate to insure the success of traffic separation schemes? The government of the United Kingdom thinks not. It analyzed 40 collisions which occurred in the English Channel after the implementation of vessel routing in 1967. Seventeen of them involved vessels which were clearly in the wrong lane.[21] In other words, of the total analyzed, nearly half the accidents were caused by that 10% of the total vessel population which failed to comply with lane discipline. One of these was the Peruvian freighter, Paracas, which has been previously mentioned in connection with the sinking of the tanker, Texaco Caribbean, and the disastrous sequence of accidents which followed early in 1971.[22] Collisions have not been the only form of casualty which resulted from non-use of the approved routing scheme. The Liberian tanker, Panther, grounded in the Strait of Dover on 8 March 1971. She leaked only a small amount of oil, but was barely pulled free before she broke her back.[23] This grounding would never have occurred had she not been well outside the established traffic lane.[24]

Recognizing that non-compliance with Sealane discipline is the major factor in degrading their effectiveness, the United Kingdom moved in March 1971 to correct this weakness. It presented a resolution to the 23rd Session of the Maritime Safety Committee (MSC) of IMCO, 15-19 March 1971, calling for member governments to make it an offense for vessels carrying

their flag to proceed against the established flow of traffic in the Dover Strait. This was the first proposal ever presented to IMCO to compel vessels to adhere to Sealane discipline. It was amended, at the urging of the United States Delegation, to include all IMCO-approved routing schemes. The amended proposal was unanimously approved, with a minimum of debate, by the MSC.[25] It has been recommended for adoption by all IMCO member governments. This action by IMCO is strongly supported by the International Chamber of Shipping (ICS) which represents over half of world shipping tonnage. ICS has cautioned member governments that such measures, as they relate to the high seas, are useless unless the governments of the world develop means to ensure compliance.[26]

The 23rd Session of MSC addressed some of the other weaknesses of the present system of vessel routing schemes by: (1) recommending that the International Association of Lighthouse Authorities (IALA) extend the scope of ongoing studies to include the problem of unifying buoyage in international waters, especially for marking wrecks and other hazards; (2) improving the dissemination of navigational warnings to shipping; and (3) by instructing its Working Group on Revision of Collision Regulations to consider the inclusion of rules compelling observance of approved traffic

separation schemes.[27] The problem of encroachment remains to be squarely addressed.

Summary. The world maritime community and interested coastal states are alert to the consequences of multiple-use conflict over the continental shelf. Attempts are being undertaken through IMCO to standardize both the structure and application of vessel routing schemes. Several weaknesses exist in the present system, primarily because many of the related conventions which have been adopted have been drafted and approved as though they were unrelated. Semantic problems stemming from non-uniform terminology weaken the interpretation of these conventions as they apply to the regulation of offshore activities which conflict.

Maritime nations and private interest are aware that laissez faire can no longer be tolerated on the high seas in the vicinity of coastlines. Accordingly, measures are being proposed through the international forum provided by IMCO to regulate more strictly the activities of maritime operators.

Conclusions. For the first time in documented history maritime nations and private shipping operators are assuming the lead in implementing measures which will restrict traditional aspects of "freedom of the sea." These measures must

be effective in order to preclude unilateral restrictions being imposed by coastal states. To be effective, the international community must develop regimes which will permit their enforcement regardless of the limitations of national jurisdiction.

CHAPTER V

PROBLEMS TO BE SOLVED

Introduction. It has been argued that Sealanes can be a useful device in resolving multiple-use conflict on the continental shelf. It has also been argued that in order to be effective those who operate within them must be compelled to adhere to applicable procedures. Some vessels, by the nature of their potential for creating hazards or dis-economies for third parties, must be required to use routing schemes which have been adopted by IMCO. Prior to achieving these goals some problems remain to be worked out.

The author does not presume to be learned enough in all of the various ramifications to propose acceptable solutions to the many problems which surround effective implementation of compulsory Sealanes. There are some areas which can be pointed out which deserve the attention of those who are.

Problems in Application. The first and most important step has been taken to compel adherence to prescribed rules for vessels operating within a routing scheme. The next step, where pollution prevention is concerned, is to require certain classes of vessels, for example tankers, to use adopted routes. This problem has not yet been addressed but

it cannot be avoided. It has already been pointed out that stranding is the greatest cause of total loss and has contributed more to coastal pollution than has collision between vessels. Mandatory compliance will also be an absolute necessity for vessels proceeding through areas which are densely populated with offshore oil structures. Major tanker operators have realized the advantages in complying and have instructed their masters to follow approved routes.[1]

It appears sensible at this point in time to amend the International Regulations for Preventing Collision at Sea, 1960, so as to require all vessels within a scheme to comply with prescribed traffic flow and for certain classes of vessels to be required to use adopted schemes.

The structure of Sealanes, as approved by IMCO, has failed to address the crossing problem. Apparently, this has been left to the existing International Regulations for Preventing Collision at Sea, 1960. The consequences of this deficiency may not show up until more significant problems, such as compulsory adherence and mandatory use, are ironed out. Nevertheless, the crossing problem exists now and may well be a significant factor in those collisions in the Strait of Dover which have not been attributed to vessels running counter to prescribed traffic flow.

A system of "controlled" crossing zones is required in areas such as the Strait of Dover. Crossing vessels must be compelled to enter Sealanes at minimum prescribed angles, preferably at designated crossing points. Canada has addressed this problem in its recent Sealane proposal to IMCO.[2] It is the Canadian government's intention to strictly control junctions and areas where routes cross so as to prevent "Stray" crossings.[3] This may inconvenience some mariners, but if adhered to it should improve the workability of the scheme. It is not enough, however. The International Regulation for Preventing Collision at Sea must be amended so as to give primacy to vessels which are proceeding in a Sealane over those that would cross. The concept of "burdened vessel" should be amended such that crossing vessels are automatically "burdened" and, therefore, required to give way. Such a departure from the age-old rule of giving way only to a vessel on the starboard hand will meet with fierce resistance from the conservative maritime community. If they can accept the concept of compulsory Sealanes, they should be able to see the need for respecting the rights of those who use them.

The problem of encroachment by fishing vessels has the potential for creating some serious accidents in which the fisherman is more apt to be the loser. A workable solution would seem to be one which permits the fishermen to operate

within a traffic separation scheme provided that they move in a direction consistent with the prescribed flow of traffic. They should not be permitted to operate in controlled crossing areas or route junctions. It should be possible to amend the Regulations for Preventing Collision at Sea, 1960, by expanding Rule 26 to include the behavior of fishing vessels within IMCO-approved vessel routing schemes.

Problems of Enforcing Compliance. The proposal which the MSC has approved calls for member nations to make it an offense for vessels flying their flag to violate Sealane discipline.[4] The nature of punishing violators is not prescribed nor is there any implication that coastal states may proceed against violators. Indeed, the latter is expressly prohibited by Article 11 (1) of the Convention on the High Seas which states that only the flag state or state nationality may proceed against a master for incidents involving navigation or collision.

It is unlikely that the Convention on the High Seas can be modified to accommodate the need of the coastal state to protect itself. It would, therefore, be wiser for IMCO to agree on some specific minimum penalties which flag states would be required to assess against masters found guilty of non-compliance where it is required. This approach should also be applicable to the problem of encroachment by fishing vessels.

Given the lack of a firm stand on the part of a flag state to compel its vessels to adhere to Sealanes, what can be done? Some thought has been given to encouraging underwriters to tailor their premiums to reflect the record of a shipping company or state in complying with schemes. Unfortunately, the way the business is run, rates are based solely upon accident statistics and are applied to a vessel rather than the master. Thus, underwriting being a competitive business, this form of leverage would be applied after the fact of an accident. It would be too late to benefit the offended state or states.

A more likely approach would be for member nations of IMCO to collectively refuse violators access to their ports. This form of coercion could be applied to either the master or the organization for which he works. Such a policy should be adopted as a formal Resolution by IMCO and proposed to the General Assembly.

The alternative to effective enforcement of vessel routing schemes is clearly unacceptable to shipping nations. Should shipping accidents continue without a clear reversal in trend, coastal states may well create new regimes by unilaterally extending their territorial jurisdiction to the limit of the continental shelf, including the super-adjacent waters.

Technological Problems of Enforcement. For the coastal state, one of the more significant enforcement problems will be that of policing the Sealanes to detect and report violators. The magnitude of such a job can be appreciated when one considers that the Sealanes leading to the Port of New York extend 200 miles to sea, well beyond the range of land-based radar. The cost of this aspect of enforcement can be quite high and must be considered in the context of the threat to the coastal area. In order to retain respect for the status of Sealanes, they should not be implemented where they cannot be kept under some form of surveillance, at least occasionally.

The problem of standardizing visual aids to navigation has been mentioned, but there is another aspect to the problem. In order to be effective when they are needed the most, Sealanes must be serviced by a system of all-weather aids. This implies electronic aids in some instances. The cost of such systems could be quite high and should be considered when structuring routing schemes. They must have sufficient dimensions to permit navigators to remain within them, using available aids. If this is not done it will be difficult to fault the master who is involved in an accident because he is in the wrong lane.

The Next Law of the Sea Conference. Many Conventions exist which relate to the subject of multiple-use conflict.

They are not consistent in their views of priorities nor in the terminology which they employ. It would be wise to review all of them prior to the next Law of the Sea Conference to determine where they conflict and/or where semantic problems inhibit their sensible application to real world problems. Those who attend the preliminary sessions prior to the Conference might do well to develop an internationally acceptable glossary of all terms relating to Law of the Sea matters. They should be understandable to the layman as well as the international lawyer.

Notes

Chapter I

1. P.M. Alderton, "Disaster Stirred World Action Against a Peril of the Sea," Safety at Sea International, March-April 1970, p. 8-13.

2. J.E. Smith, 'Torrey Canyon' Pollution and Marine Life (Cambridge: University Press, 1968), p. 1.

3. "Torrey Canyon," Lloyd's, 5 April 1967, p. 1:8.

4. Ibid.

5. "Disaster in the Bay," Newsweek, 1 February 1971, p. 48.

6. "Tanker Collision in San Francisco Bay Spurs Demands for Stiff Harbor Controls," The New York Times, 14 February 1971, p. 1:1.

7. U.S. Coast Guard, "Shipping Lanes in the Gulf of Mexico," Briefing Memorandum from Chief, Merchant Vessel Inspection Division (Washington: 18 July 1965), p. 3.

8. J.E. Baker, "Navigation Hazards in the Gulf," Navigation, Summer, 1969, p. 168-172.

9. Interview with Captain Kingdrel N. Ayers, U.S. Coast Guard, former Legal Officer of the Eighth Coast Guard District, New Orleans, Louisiana, 22 April 1971.

10. President's Panel on Oil Spills, The Oil Spill Problem, Washington: 1969, p. 4.

11. William L. Griffin, "Accommodation of Conflicting Uses of Ocean Space with Special Reference to Navigation Safety Lanes," The Law of the Sea: The Future of the Sea's Resources, ed., Lewis M. Alexander (Kingston, R.I.: University of R.I., 1968), p. 73.

12. Thomas A. Clingan, "The Transportation Industry and the Continental Shelf," The Law of the Sea: International Rules and Organizations for the Sea, ed., Lewis M. Alexander (Kingsont, R.I.: University of R.I., 1969), p. 210, 211.

13. U.S. Navy Oceanographic Office, Pilot Chart of the North Pacific: Collisions, 1969, Washington: 1969.

14. Baker, p. 169; Griffin, p. 76.

15. "Major Oil Companies Excited About East Coast Prospects," The Financial Post of Canada, 2 May 1970, p. A-1:1.

16. Lewis M. Alexander, "Marine Regions of the United States," Unpublished Report, University of R.I., Kingston, R.I., June 1969, p. 13.

17. J.H.Beattie, "Safer, Saner Seaways," Proceedings: United States Naval Institute, December 1970, p. 38-45.

18. National Council on Marine Resources and Engineering Development, Marine Science Affairs-Selecting Priority Programs (Washington: U.S. Govt. Print. Off., 1970), p. 41-43.

19. Commission on Marine Science, Engineering and Resources, Science and Environment (Washington: U.S. Govt. Print. Off., 1969), p. 111-122.

20. President's Panel on Oil Spills, The Oil Spill Problem, p. 19.

21. W.H. Baxter, "Bill C-202 Annoys the Americans - But What Else Could Canada Do?" Commentator (Canada), May 1970, p. 3; "Law of the Sea" External Affairs (Canada), August 1970, p. 250-257.

22. Max Blumer, "Oil Pollution on the Ocean," David P. Hould, ed., Oil on the Sea, (New York-London: Plenum Press, 1969), p. 6.

23. "Coast Guard Gets Appeal on Oil Spills," The New York Times, 1 April 1971, p. 74:6.

24. U.S. Dept. of Interior and U.S. Dept. of Transportation, A Report on Pollution of the Nation's Waters by Oil and Other Hazardous Substances (Washington: U.S. Govt. Print. Off., 1968), p. 6.

25. Max N. Edwards, "The Role of the Federal Government," David P. Hould, ed., Oil on the Sea (New York-London: Plenum Press, 1969), p. 106.

26. United Nations, UNCTAD, Review of Maritime Transport, 1969, New York: 1969, p. 3.

27. "Still More Trouble on Oily Waters," Business Week, 20 December 1969, p. 18-19.

Chapter II

1. Clingan, p. 207.

2. Lloyd's Register of Shipping, "Casualty Returns: Statistical Summary of Merchant Ships Totally Lost, Broken Up, Etc., During 1969," London: 1970.

3. The Liverpool Underwriters' Association, "One Hundred and Sixty Ninth Annual Report of the Committee" (London: February 1971).

4. Interview with Mr. Thomas Dynan, Shipping Editor, Lloyd's Register of Shipping, London, 20 April 1971.

5. Beattie, "Safer, Saner Seaways," p. 43.

6. U.S. Coast Guard, "Statistical Summary of Casualties to Commercial Vessels," Proceedings of the Merchant Marine Council, December 1970, p. 228.

7. J.E. Smith, p. 174-184; P.M. Alderton, p. 13; Norman J. Paddelford, Public Policy and the Use of the Seas (Cambridge: Mass. Institute of Technology, 1968), p. 273-276.

8. A.H. Stephens, "A Case for Mandatory Use of Sea Lanes," Paper, Annual Tanker Conference: American Petroleum Institute, Absecon, N.J., 28 April 1970, p. 5.

9. Canada, Bill C-202, Arctic Waters Pollution Prevention Bill, 8 April 1970, (first reading), Second Session, 28th Parl., 18 & 19 Eliz. II, 1969-1970.

10. Robert H. Neuman, "Oil on Troubled Waters: The International Control of Marine Pollution," Journal of Maritime Law and Commerce, January 1971, p. 349-361.

11. Ibid.

12. President's Panel on Oil Spills, p. 20.

13. Frederick W. Fricker, "Regional Incidence of Collisions," Proceedings of the Merchant Marine Council, July 1965, p. 150-155; E.J. Roland, "Sealanes," Proceedings of the Merchant Marine Council, July 1965, p. 147-149.

14. Austin M. Knight, Modern Seamanship (Princeton: Van Nostrand, 1956), p. 297.

15. "Collisions Between Radar-Equipped Merchant Ships," Journal of the Institute of Navigation, October 1970, p. 454-463.

16. The Liverpool Underwriters' Association.

17. Lloyd's Register of Shipping, p. 2.

18. Ibid.

19. U.S. Coast Guard, p. 228.

20. Alex Hendry, "Urgent Moves to Make Channel Safer," The Times, London, 2 March 1971, p. 2:1; "Death Alley," Oceanology, April 1971, p. 22.

21. The Times, 2 March 1971, p. 10:1.

22. Fricker, p. 151.

23. Ibid.; The Liverpool Underwriters' Association; U.S. Coast Guard, p. 228, 229.

24. Thomas Buckley, "The Shalom and a Tanker Collide at Sea," The New York Times, 26 November 1964, p. 1:2.

25. Interview with Captain A.C. Manson, Chief, Marine Division, United Kingdom Board of Trade, London, 21 April 1971.

26. Joseph Collins, "Wrecks in Channel Stir Britain," The New York Times, 8 March 1971, p. 54:1.

27. Tania Long, "Coast Guard Says Gulf Oil Rigs Create Grave Shipping Hazard," The New York Times, 16 April 1967, p. 80:2; "Steamship Line Says Offshore Oil Rigs Obstruct Gulf of Mexico," The New York Times, 23 May 1965, p. 86:2; "Oil Drilling Curb at Sea Advocated," The New York Times, 16 September 1965, p. 93:4; "Oil Platforms - A Hazard," Santa Barbara News Press, 20 October 1967, Editorial.

28. Telephone conversation with LCDR Michael H. Dennis, U.S.C.G., Statistics Branch, Merchant Marine Casualty Division, U.S. Coast Guard Headquarters, 14 May 1971.

29. Casualty Report Scrapbook, 1970, Lloyd's Shipping Editors, London, 20 April 1971.

30. Baker, p. 169.

31. An Act to Confirm the Title of States to Lands Beneath the Navigable Waters Within State Boundaries and to Confirm United States Jurisdiction and Control Over Resources of the Seabed and the Continental Shelf Seaward of the State Boundaries, Public Law 31, 83rd Congress (Washington: U.S. Govt. Print. Off., 1953), v.

32. An Act to Provide for the Jurisdiction of the United States Over the Submerged Lands of the Outer Continental Shelf, Public Law 212, 83rd Congress (Washington: U.S. Govt. Print. Off., 1953), v.

33. H. Gary Knight, "Shipping Safety Fairways: Conflict Amelioration in the Gulf of Mexico," Journal of Maritime Law and Commerce, October 1970, p. 1-20, citing 43 U.S.C. 1333 (f) (1964).

34. K.F. Franke, "Steel Islands in the Gulf," Proceedings of the Merchant Marine Council, July 1961, p. 135, 141.

35. Commission on Marine Science, Engineering and Resources, Science and Environment (Washington: U.S. Govt. Print. Off., 1969), p. III-24.

36. Commission on Marine Science, Engineering and Resources, Industry and Technology (Washington: U.S. Govt. Print. Off., 1969), p. VI-163.

37. Commission on Marine Science, Engineering and Resources, Science and Environment, p. III-67.

38. Lloyd's Register of Shipping, Statistical Tables, 1970 (London: Lloyd's, 1970), p. 31.

39. Liverpool Underwriters, "One Hundred and Sixty Ninth Annual Report," p. 10.

40. A. Wepster, "The Future of Merchant Marine Navigation," Journal of the Institute of Navigation, Special Issue, January 1969, p. 92-107; John D. Hays, "A Maritime Survey for 1970: Seamen, Fishermen, Prospectors; Who Will Own the Oceans?" Naval War College Review, December 1969, p. 31-40.

41. Commission on Marine Science, Engineering and Resources, Science and Environment, p. III-67.

Chapter III

1. J.H. Beattie, "The Separation of Traffic at Sea," Journal of the Institute of Navigation, October 1966, p. 1-40, citing Thorolf Wikborg, "Radar and Collision at Sea," paper presented to a meeting of the Institute of Navigation, London, November 1954; Roland, p. 147.

2. Roland, p. 147; Beattie, "Safer, Saner Seaways," p. 40.

3. Ibid.

4. U.S. Coast Guard, "Statistical Summary of Casualties to Commercial Vessels," Proceedings of the Merchant Marine Council, December 1970, p. 228-229.

5. Ibid.

6. Joseph Collins, "Wrecks in Channel Stir Britain," The New York Times, 8 March 1971, p. 54:1; "Mistake Led to Ship's Sinking," The Guardian (Manchester, U.K.), 11 May 1971, p. 9:6.

7. Baker, p. 171.

8. United Nations, Conference on the Law of the Sea, Convention on the Continental Shelf, A/CONF, 13/1.55 (1958).

9. Baker, p. 168-172; Griffin, p. 76.

10. Interview with Capt. I.F. Sommerville and Mr. David Deacon, Chamber of Shipping of the United Kingdom, London, 23 April 1971; Baker, p. 168-172.

11. United Nations, IMCO, "International Regulations for Preventing Collision at Sea," Safety of Life at Sea Convention (London: 1960).

Chapter IV

1. J.H. Beattie, "Safer, Saner Seaways,"

2. United Nations, IMCO, Ship's Routing and Traffic Separation Schemes (London: 1971), p. 5.

3. Ibid.

4. Memorandum from Chief, Merchant Vessel Inspection Division, U.S. Coast Guard to Chief, Office of Merchant Marine Safety, U.S. Coast Guard, "New York and Delaware Sealanes Survey," Washington, 8 March 1968.

5. Mark Arnold-Foster, "Channel Shipping Lanes Ignored by 10 pc. of Traffic," The Guardian (United Kingdom), 11 May 1971, p. 2:1.

6. A.H. Stephens, p. 9; United Nations, IMCO, MSC, Ship's Routing (Evaluation of Observance of Traffic Separation Principles), U.N. Doc. Nav. X/5, London, 31 July 1970, p. 1-9.

7. United Nations, IMCO, Recommendation on Establishment of Fairways Through Offshore Exploration Areas, A VI/Res. 179, London, 28 October 1969.

8. IMCO, Traffic Separation Schemes, p. 10.

9. Letter from Luigi Oneto, Master, S.S. Cristoforo Colombo, to Commandant, U.S. Coast Guard, Naples, 26 May 1967, p. 1-3.

10. "An Inquiry Into Traffic Separation at Sea," Journal of the Institute of Navigation, London, July 1970, p. 342-349.

11. "Sealanes Established to Prevent Collisions," Rough draft of Coast Guard input to Lyndon B. Johnson's, "History," Washington, 25 October 1968, p. 5.

12. J.H. Beattie, "Two Years of Routing in the Dover Strait," Journal of the Institute of Navigation, London, October 1970, p. 442-446; Beattie, "Safer, Saner Seaways," p. 44-45; Interview with Rear Adm. G.S. Ritchie, President of the Institute of Navigation, Hydropgrapher of the Royal Navy, London, 19 April 1971.

13. The Trinity House and the Honourable Company of Master Mariners, "The Case for Revision of Routing in the Dover Strait and Southern North Sea and Consideration of Some of the Objections Raised," Paper, The Institute of Navigation, London, 3 February 1971, p. 1-8; John M. Lee, "Channel Accidents Revive Question Whether Keep-Right Rule is Safe There," The New York Times, 14 January 1971, p. 11:1.

14. E.J. Roland, "Sealanes," p. 148; Memorandum, "U.S. Traffic Routing Schemes," Merchant Vessel Inspection Division, U.S. Coast Guard, Washington, 3 July 1969, p. 2.

15. Beattie, "Safer, Saner Seaways," p. 43.

16. Letter from Capt. W.S.G. Morrison, Superintendent, Marine Crews and Navigation Safety, Ministry of Transport, Canada to CDR A.P. Manning, U.S.C.G., Ottawa, 30 March 1971.

17. United Nations, Conference on the Law of the Sea, Convention on Fishing and Conservation of the Living Resources of the High Seas, A/CONF. 13/L.54 and Add. 1 (1958).

18. United Nations, Conference on the Law of the Sea, Convention on the High Seas, A/CONF. 13/L.53 and Corr. 1 (1958).

19. Lee, "Channel Accidents Revive Questions . . . ."

20. Interview with Capt. R.N. Mayo, The Trinity House.

21. Mark Arnold-Foster, The Guardian.

22. Collins, "Wrecks in Channel Stir Britain."

23. John Allen May, "Britain's Urgent Maritime Plea," The Christian Science Monitor, 7 April 1971; "Death Alley," Oceanology, April 1971, p. 22.

24. Interview with Capt. A.C. Manson, Chief, Marine Division, United Kingdom Board of Trade, London, 21 April 1971.

25. Interview with L.M. Goll, Head of Navigation Section, Maritime Safety Committee of the Intergovernmental Maritime Consultative Organization, London, 19 April 1971.

26. International Chamber of Shipping, "World-Wide Action Urged on Marine Casualties," Press Release, London, 15 April 1971.

27. United Nations, IMCO, Report of the Twenty Third Session of the Maritime Safety Committee, MSC XXIII/19, London, 30 March 1971, p. 8-10; MSC, Recommendation: Observance of Traffic Separation Schemes, from the Secretary General to the Membership, T2/2.05 (NV. 1), London, 2 April 1971.

Chapter V

1. Stephens, p. 8, 9.

2. United Nations, IMCO, "Proposed Ship Routing Provisions for the Grand Banks of Newfoundland, East Coast of Canada and Lower St. Lawrence River and Gulf," NAV X/5/2/Add. 1, London, 15 October 1970.

3. Letter, Capt. Morrison to CDR. A.P. Manning.

4. United Nations, IMCO, Report of the Twenty Third Session of the Maritime Safety Committee.

Appendix II

1. Charles L. Lewis, Matthew Fontaine Maury: Pathfinder of the Seas (Annapolis: U.S. Naval Institute, 1927), p. 53, 55.

2. Ibid.

3. Diana F.M. Corbin, Life of Matthew Fontaine Maury (London: Sampson, Low, Marston, Searle and Rivington, 1888), p. 56.

4. Lewis, p. 83.

5. Frances L. Williams, Matthew Fontaine Maury, Scientist of the Sea (New Brunswick: Rutgers Univ. Press, 1963), p. 266.

6. Lewis, p. 83.

7. A.H. Stephens, "A Case for Mandatory Use of Sealanes," Paper, Annual Tanker Conference, American Petroleum Institute, Absecon, N.J., 28 April 1970, p. 2.

8. E.J. Roland, "Sealanes," Proceedings of the Merchant Marine Council, July 1965, p. 147-149.

9. Werner Bamberger, "Lines Seek to End Prescribed Lanes," The New York Times, 19 May 1968.

10. Roland, p. 148; Stephens, p. 1; Beattie, p. 40.

11. Roland, p. 148.

12. Ibid.

13. Beattie, "Safer, Saner Seaways," p. 38-45.

14. Ibid.

15. Beattie, p. 41; Stephens, p. 3.

16. John S. Cowie, "The Role of the U.S. Navy in Mine Warfare," Proceedings, U.S. Naval Institute, May 1965.

17. Beattie, p. 41.

18. Stephens, p. 3.

19. Ibid., p. 4.

20. Beattie, p. 41.

21. Ibid.

22. Ibid.; Stephens, p. 4.

23. Ibid.

24. Stephens, p. 4.

25. Interview with Capt. J.E. Bury and Capt. R.N. Mayo, Elder Brothers, The Trinity House and the Honourable Company of Master Mariners, London, 19 April 1971; "Wrecks in Channel Stir Britain," The New York Times, 8 March 1971, p. 54:1.

26. The Trinity House and the Honourable Company of Master Mariners, "The Case for Revision of Routing in the Dover Straits and Southern North Sea and Consideration of Some of the Objections Raised," Paper, The Institute of Navigation, London, 3 February 1971, p. 4.

27. Stephens, p. 4; "The Separation of Traffic at Sea," The Journal of the Institute of Navigation (London), October 1966, p. 10, 11.

28. Interview with Capt. I.F. Sommerville and Mr. David Deacon, Chamber of Shipping of the United Kingdom, London, 23 April 1971.

29. Inter-governmental Maritime Consultative Organization, Ship's Routing and Traffic Separation Schemes, London, 1971, p. 6.

30. H. Gary Knight, "Shipping Safety Fairways: Conflict Amelioration in the Gulf of Mexico," Journal of Maritime Laws and Commerce, October 1969, p. 1-20.

31. Ibid.

32. 30 C.F.R. 250.18, 250.34 (a) (1969), cited by Knight, p. 13.

33. 33 U.S.C. 401 et. seq. (1964), cited by Knight, p. 5.

34. 43 U.S.C. 1333 (f) (1964), cited by Knight, p. 13.

35. "Santa Barbara Channel - Promises and Problems," Ocean Industry, May 1968, p. 42-44.

36. Baker, p. 170.

37. Letter from the Director of Civil Works, U.S. Army Corp of Engineers to the Director, U.S. Coast and Geodetic Survey, Washington, 10 November 1964.

38. Knight, p. 4.

39. Ibid., p. 7.

40. Corp of Engineers Letter, 10 November 1964.

41. Lorne G. Taylor, "Safety Lanes for Marine Navigation," Paper, National Marine Meeting of the Institute of Navigation, Kings Point, New York, 14 October 1966.

42. Knight, p. 10; 31 Fed. Reg. 955 (1966).

43. Baker, p. 171.

44. Cited in a letter from Ralph E. Casey, President, American Merchant Marine Institute, "Establishment of Sealanes in Approaches to Major U.S. Ports," to Commandant, U.S. Coast Guard, New York, 26 June 1967.

45. U.S. Coast Guard, "Statistical Summary of Casualties to Commercial Vessels," Proceedings of the Merchant Marine Council, December Issues, 1966-1970.

46. Memorandum, from Commandant, U.S. Coast Guard to Commander, Seventh Coast Guard District, Washington, 17 November 1966.

47. Letter from Ralph E. Casey, President, American Merchant Marine Institute, "Establishment of Sealanes in Approaches to Major U.S. Ports," to Commandant, U.S. Coast Guard, New York, 26 June 1967.

48. "The Separation of Traffic at Sea," The Journal of the Institute of Navigation, October 1966, p. 1-40; J.H. Beattie, "Safer, Saner Seaways;" A.H. Stephens.

49. E.J. Roland, "Sealanes," Lecture, Marine Society of New York, 11 January 1965.

50. Stephen Seledee, "Report Sealanes Committee," The Manifest, The Maritime Society of the City of New York, January 1966, p. 3, 4.

51. "The Separation of Traffic at Sea."

52. United Nations, IMCO, Ship's Routing and Traffic Separation Schemes (London: 1971).

53. U.S. Coast Guard, Office of Merchant Marine Safety, Merchant Vessel Inspection Division, "U.S. Traffic Routing Schemes," Memorandum for record (Washington: 3 July 1969).

54. Letter from Commander, Eleventh Coast Guard District to Commandant, Coast Guard (M), "Sea Lanes, Santa Barbara Channel," Long Beach, Calif., 20 February 1968.

55. Letter from Commander, Eleventh Coast Guard District to Commandant, Coast Guard (CCS), "Proposal for Recommended Sealanes," Long Beach, Calif., 2 April 1968; Letter from Mr. Ralph B. Dewey, President, Pacific American Steamship Association to Commandant, Coast Guard, "Sea Lanes - Southern California," San Francisco, Calif., 24 April 1968.

56. Interview with Captain R.N. Mayo, The Trinity House; Interview with Capt. A.C. Manson, Maritime Safety Division, Board of Trade of the United Kingdom, London, 21 April 1971.

57. Letter from Commandant, Coast Guard to Commander, First Coast Guard District and Commander, Third Coast Guard District, "Aids to Navigation to Mark Sea Lanes for New York and Philadelphia," Washington, 22 December 1966; "Sea Lanes Established to Prevent Collisions," Rough draft of Coast Guard input into Lyndon B. Johnson's "History," Washington, 25 Octoner 1968, p. 3.

BIBLIOGRAPHY

Alderton, P.M. "Disaster Stirred World Action Against a Peril of the Sea." Safety at Sea International, March-April 1970, p. 8-13.

Alexander, Lewis M., ed. The Law of the Sea: International Rules and Organizations for the Sea. Kingston, R.I.: University of R.I., 1969.

_____. The Law of the Sea: The Future of the Sea's Resources. Kingston, R.I.: University of R.I., 1968.

_____. "Marine Regions of the United States." Unpublished Paper, University of R.I., Kingston, R.I.: June 1969.

An Act to Confirm the Title of States to Lands Beneath the Navigable Waters Within State Boundaries and to Confirm United States Jurisdiction and Control Over Resources of the Seabed and the Continental Shelf Seaward of State Boundaries. Public Law 31. 83rd Congress. Washington: U.S. Govt. Print. Off., 1953.

An Act to Provide for the Jurisdiction of the United States Over the Submerged Lands of the Outer Continental Shelf. Public Law 212. 83rd Congress. Washington: U.S. Govt. Print. Off., 1953.

"An Inquiry Into Traffic Separation at Sea." Journal of the Institute of Navigation (London), July 1970, p. 342-349.

Arnold-Foster, Mark. "Channel Shipping Lanes Ignored by 10 pc. of Traffic." The Guardian (Manchester), 11 May 1971, p. 2:1.

Baker, J.E. "Navigation Hazards in the Gulf." Navigation, Summer 1969, p. 168-172.

Bamberger, Werner. "Lines Seek to End Prescribed Lanes." The New York Times, 19 May 1968.

Baxter, W.H. "Bill C-202 Annoys Americans - But What Else Could Canada Do?" Commentator (Canada), May 1970, p. 3.

Beattie, J.H. "Safer, Saner Seaways." Proceedings of the United States Naval Institute, December 1970, p. 38-45.

_____. "The Separation of Traffic at Sea." Journal of the Institute of Navigation (London), October 1966, p. 1-40.

_____. "Two Years Routing in the Dover Strait." Journal of the Institute of Navigation (London), October 1970, p. 442-446.

Buckley, Thomas. "The Shalom and a Tanker Collide at Sea." The New York Times, 26 November 1964, p. 1:2.

Canada. Bill C-202, Arctic Waters Pollution Prevention Bill. 8 April 1970, 2nd Session, 28th Parliament, 18 & 19 Eliz. II, 1969-1970.

"Coast Guard Gets Appeal on Oil Spills." The New York Times, 1 April 1971, p. 74:6.

Collins, Joseph. "Wrecks in Channel Stir Britain." The New York Times, 8 March 1971, p. 54:1.

"Collisions Between Radar-Equipped Merchant Ships." Journal of the Institute of Navigation (London), October 1970, p. 454-463.

Commission on Marine Science, Engineering and Resources. Industry and Technology. Washington: U.S. Govt. Print. Off., 1969.

_____. Science and Environment. Washington: U.S. Govt. Print. Off., 1969.

Corbin, Diana F.M. Life of Matthew Fontaine Maury. London: Sampson, Low, Marston, Searle and Rivington, 1888.

Cowie, John S. "The Role of the U.S. Navy in Mine Warfare." Proceedings: U.S. Naval Institute, May 1965.

"Death Alley." Oceanology, April 1971, p. 22.

"Disaster in the Bay." Newsweek, 1 February 1971, p. 48.

Franke, K.F. "Steel Islands in the Gulf." Proceedings of the Merchant Marine Council, July 1961, p. 135-141.

Fricker, Frederick W. "Regional Incidence of Collisions." Proceedings of the Merchant Marine Council, July 1965, p. 150-155.

Hays, John D. "A Maritime Survey for 1970: Seamen, Fishermen, Prospectors: Who Will Own the Oceans?" Naval War College Review, December 1969, p. 31-40.

Hendry, Alex. "Urgent Moves to Make Channel Safer." The Times (London), 2 March 1971, p. 2:1.

Hould, David P., ed. Oil on the Sea. New York-London: Plenum Press, 1969.

International Chamber of Shipping. "World-Wide Action Urged on Marine Casualties." Press Release, London: 15 April 1971.

Interview with Capt. Kingdrel N. Ayers, U.S. Coast Guard, former Legal Officer, Eighth Coast Guard District, London: 22 April 1971.

Interview with Captain J.E. Bury and Captain R.N. Mayo, Elder Brothers, The Trinity House and the Honourable Company of Master Mariners, London: 19 April 1971.

Interview with Mr. Thomas Dynan, Shipping Editor, Lloyd's Register of Shipping, London: 20 April 1971.

Interview with L.M. Goll, Head of Navigation Section, Maritime Safety Committee, IMCO, London: 19 April 1971.

Interview with Captain A.C. Manson, Chief, Marine Division, United Kingdom Board of Trade, London: 21 April 1971.

Interview with Rear Admiral G.S. Ritchie, President, Institute of Navigation, Hydrographer of the Royal Navy, London: 19 April 1971.

Interview with Captain I.F. Sommerville and Mr. David Deacon, Chamber of Shipping of the United Kingdom, London: 23 April 1971.

Knight, Austin M. Modern Seamanship. Princeton: Van Nostrand, 1956.

Knight, H. Gary. "Shipping Safety Fairways: Conflict Amelioration in the Gulf of Mexico." Journal of Maritime Law and Commerce, October 1970, p. 1-20.

"Law of the Sea." External Affairs (Canada), August 1970, p. 250-257.

Lee, John M. "Channel Accidents Revive Question Whether Keep-Right Rule is Safe There." The New York Times, 14 January 1971, p. 11:1.

Letter from Captain W.G.S. Morrison, Superintendent, Marine Crews and Navigation Safety, Ministry of Transport, Canada, to CDR. A.P. Manning, Ottawa: 30 March 1971.

Letter from Commandant, U.S. Coast Guard to Commander, First Coast Guard District and Commander, Third Coast Guard District. "Aids to Navigation to Mark Sealanes for New York and Philadelphia." Washington: 22 December 1966.

Letter from Commander, Eleventh Coast Guard District to Commandant, U.S. Coast Guard (CCS). "Proposal for Recommended Sealanes." Long Beach, Calif.: 2 April 1968.

Letter from Commander, Eleventh Coast Guard District to Commandant, U.S. Coast Guard (M). "Sea Lanes, Santa Barbara Channel." Long Beach, Calif.: 20 February 1968.

Letter from Luigi Oneto, Master, S.S. Cristoforo Colombo to Commandant, U.S. Coast Guard, Naples, 26 May 1967.

Letter from Ralph E. Casey, President, American Merchant Marine Institute, "Establishment of Sea Lanes in Approaches to U.S. Ports," to Commandant, U.S. Coast Guard, New York: 26 June 1967.

Letter from the Director of Civil Works, U.S. Army Corp of Engineers to the Director, U.S. Coast and Geodetic Survey, Washington: 10 November 1964.

Lewis, Charles L. Matthew Fontaine Maury: Pathfinder of the Seas. Annapolis: U.S. Naval Institute, 1927.

Lloyd's Register of Shipping. "Casualty Returns: Statistical Summary of Merchant Ships Totally Lost, Broken Up, etc., During 1969." London: 1970.

Lloyd's Shipping Editors. Casualty Report Scrapbook, 1970. London: 20 April 1971.

Long, Tania. "Coast Guard Says Gulf Oil Rigs Create Grave Shipping Hazard." The New York Times, 16 April 1967, p. 80:2.

"Major Oil Companies Excited About East Coast Prospects." The Financial Post (Canada), 2 May 1970, p. A-1:1.

May, John Allen. "Britain's Urgent Maritime Plea." The Christian Science Monitor, 7 April 1971.

Memorandum from Commandant, U.S. Coast Guard to Commander, Seventh Coast Guard District, Washington: 17 November 1966.

"Mistake Led to Ship's Sinking." The Guardian (Manchester), 11 May 1971, p. 9:6.

National Council on Marine Resources and Engineering Development. Marine Science Affairs-Selecting Priority Programs. Washington: U.S. Govt. Print. Off., 1970.

Neuman, Robert H. "Oil on Troubled Waters: The International Control of Marine Pollution." Journal of Maritime Law and Commerce, January 1971, p. 349-361.

"Oil Drilling Curb at Sea Advocated." The New York Times, 16 September 1965, p. 93:4.

"Oil Platforms - A Hazard." Santa Barbara News Press, 20 October 1967.

Paddelford, Norman J. Public Policy on the Use of the Seas. Cambridge: Mass. Institute of Technology, 1968.

President's Panel on Oil Spills. The Oil Spill Problem. Washington: 1969.

Roland, Edwin J. "Sealanes." Proceedings of the Merchant Marine Council, July 1965, p. 147-149.

"Santa Barbara Channel - Promises and Problems." Ocean Industry, May 1968, p. 42-44.

Seledee, Stephen. "Report Sealanes Committee." The Manifest, The Maritime Society of the City of New York, January 1966, p. 3, 4.

Smith, J.E. 'Torrey Canyon' Pollution and Marine Life. Cambridge: University Press, 1968.

"Steamship Line Says Offshore Oil Rigs Obstruct Gulf of Mexico." The New York Times, 23 May 1965, p. 86:2.

Stephens, A.H. "A Case for Mandatory Use of Sea Lanes." Paper presented to the Annual Tanker Conference: American Petroleum Institute, Absecon, N.J.: 28 April 1970.

"Still More Trouble on Oily Waters." Business Week, 20 December 1969, p. 18-19.

"Tanker Collision in San Francisco Bay Spurs Demands for Stiff Harbor Controls." The New York Times, 14 February 1971, p. 1:1.

Taylor, Lorne G. "Safety Lanes for Marine Navigation." Paper presented to the National Marine Meeting of the Institute of Navigation, Kings Point, N.Y.: 14 October 1966.

Telephone conversation with LCDR. Michael Dennis, U.S.C.G., Statistics Branch, Merchant Marine Casualty Division, U.S. Coast Guard Headquarters, Washington, 14 May 1971.

"The Separation of Traffic at Sea." The Journal of the Institute of Navigation (London), October 1966, p. 1-40.

The Trinity House and the Honourable Company of Master Mariners. "The Case for Revision of Routing in the Dover Strait and Southern North Sea and Consideration of Some Objections Raised." Paper presented to the Institute of Navigation, London: 3 February 1971.

"Torrey Canyon." Lloyd's, 5 April 1967, p. 1:8.

The Liverpool Underwriters' Association. "One Hundred and Sixty Ninth Annual Report of the Committee." London: 1971.

United Nations. Conference on the Law of the Sea. Convention on the Continental Shelf, A/CONF. 13/1.55 (1958).

_____. _____. Convention on the High Seas, A/CONF. 13/1.53 and Corr. 1 (1958).

_____. _____. Convention on Fishing and Conservation of the Living Resources of the High Seas, A/CONF. 13/1.54 and Add. 1 (1958).

_____. IMCO. Proposed Ship Routing Provisions for the Grand Banks of Newfoundland, East Coast of Canada and Lower St. Lawrence River and Gulf. NAV X/5/2/Add. 1, London: 15 October 1970.

_____. _____. Recommendation on Establishment of Fairways Through Offshore Exploration Areas. A VI/Res. 179, London: 28 October 1969.

_____. _____. Report on the Twenty Third Session of the Maritime Safety Committee. MSC XXIII/19, London: 30 March 1971, p. 8-10.

_____. _____. Ship's Routing and Traffic Separation Schemes. London: IMCO, 1971.

_____. _____. MSC. Recommendation: Observance of Traffic Separation Schemes. From the Secretary General to the Membership. T2/2.05 (NV. 1), London: 2 April 1971.

_____. _____. _____. Ship's Routing (Evaluation of Observance of Traffic Separation Principles). U.N. doc. NAV X/5, London: 31 July 1970.

_____. UNCTAD. Review of Maritime Transport, 1969. New York: 1969.

U.S. Coast Guard. "New York and Delaware Sealanes Survey." Memorandum from Chief, Merchant Vessel Inspection Division to Chief, Office of Merchant Marine Safety, Washington: 8 March 1968.

_____. "Sealanes Established to Prevent Collisions." Rough draft of input to Lyndon B. Johnson's, "History," Washington: 25 October 1968.

_____. "Shipping Lanes in the Gulf of Mexico." Briefing Memorandum from Chief, Merchant Vessel Inspection Division. Washington: 18 July 1965.

_____. "Statistical Summary of Casualties to Commercial Vessels." Proceedings of the Merchant Marine Council. December 1970, p. 228, 229.

_____. "Statistical Summary of Casualties to Merchant Vessels." Proceedings of the Merchant Marine Council. December Issues, 1966-1970.

_____. "U.S. Traffic Routing Schemes." Memorandum for Record, Merchant Vessel Inspection Division. Washington: 3 July 1969.

U.S. Dept. of the Interior and U.S. Dept. of Transportation. A Report on Pollution of the Nation's Waters by Oil and Other Hazardous Substances. Washington: U.S. Govt. Print. Off., 1968.

U.S. Navy Oceanographic Office. Pilot Chart of the North Pacific: Collisions 1969. Washington: 1969.

Wepster, A. "The Future of Merchant Marine Navigation." Journal of the Institute of Navigation (London) Special Issue. January 1969, p. 92-107.

Williams, Francis L. Matthew Fontaine Maury, Scientist of the Sea. New Brunswick: Rutgers Univ. Press, 1963.

APPENDIX I

APPENDIX I

TABLE III

SUMMARY OF VESSEL LOSSES DUE TO COLLISION, STRANDING, AND CONTACT DAMAGE, 1956-1969[a]
(Number of Vessels)

Year	Collision		Stranding		Contact	Total		% of Total[c] Fleet Damaged	% damage[b] due to Collision
	Partial Loss	Total Loss	Partial Loss	Total Loss	Partial Loss	Partial Loss	Total Loss		
1956	1506	20	1026	61	1322	7912	163	39.0	19.1
1957	1272	20	960	73	1277	7243	163	34.6	17.5
1958	1368	23	959	56	1413	6857	160	31.3	20.0
1959	1577	22	948	73	1686	7259	181	32.2	21.7
1960	1460	19	962	72	1699	7254	171	32.2	20.2
1961	1621	23	922	80	1723	7740	189	33.62	20.9
1962	1804	16	925	123	1590	7814	249	33.47	23.2
1963	1793	40	978	116	1607	7860	254	33.21	22.8
1964	1753	29	1041	108	1512	8317	249	34.61	21.0
1965	1945	25	1038	121	1583	8884	277	36.26	22.0
1966	1768	42	1013	120	1646	9088	312	36.03	19.5
1967	1566	34	848	146	1674	8333	337	32.18	18.8
1968	1595	23	909	142	1647	8627	326	32.54	18.5
1969	1624	45	854	107	1359	8024	327	29.21	20.2
1970	1471	-	800	-	1136	7170	-	25.27	20.6

[a]Losses due to foundering, burning or missing are not included.

[b]Percent of total vessels damaged which was due to collision.

[c]Percent of total world fleet damaged from all causes.

Source: Annual Reports of the Committee, The Liverpool Underwriters Association, 1957-1971 (London: 1971), v.p.

APPENDIX II

APPENDIX II

THE HISTORY OF SEALANES

Introduction. The term "Sealanes" can mean different things to different people. In general, it brings to mind a system of vessel routing which exists either by design or because trade patterns dictate that it be so. Sealanes may be developed for the purpose of separating opposing traffic streams, in which case they are called Traffic Separation Schemes; they may be designed to route ships through or around man-made hazards, in which case they are called "fairways" or "clearways"; or they may be intended to constrain certain types of vessels to follow minimum risk paths to avoid natural hazards, in which case they are referred to as Routing Schemes.

For the purpose of the discussion which follows, the term Sealanes refers to those vessel routing schemes which have been specifically designed to cause vessels to conform to pre-determined paths. When used without qualification, the term refers to schemes which perform all three of the above functions.

It should be pointed out that the term Sealane is used primarily in the United States to identify only those schemes which incorporate traffic separation. The IMCO does not use the term at all in describing any of the systems which it

approves to perform the above functions. IMCO-approved terminology for international usage was arrived at as a result of a poll conducted by the International Hydrographic Bureau among its members. IMCO's failure to adopt the term "Sealanes" is unfortunate. Had it done so, its approved schemes would have fallen under the protective umbrella of Article 5 (6) of the Convention on the Continental Shelf. The difference between "Sealane system" and "traffic separation scheme" is admittedly semantic; however, semantics play a significant role in matters of law and jurisdiction.

An Old Concept. The concept of sealanes or traffic separation schemes is not a new one, however, the structure and applications have gone through many changes. The first proposal for ship routing was made by Lt. Matthew Fontaine Maury, of the U.S. Navy, in 1847. On the basis of an exhaustive study of weather and current observations from thousands of ships' log books, Maury developed his "Wind and Current Charts of the North Atlantic."[1] He supplemented these in 1848 with his "Track Charts," "Pilot Charts," and "Sailing Directions," which recommended, according to seasonal weather patterns, least time tracks between major ports.[2] His work was published by the Naval Observatory and Hydrographical Office, and it is the basis upon which the U.S. Navy Oceanographic Office produces its current

series of "Pilot Charts."* The primary goal of this first attempt at ship routing was to achieve reduced time enroute rather than safety, and it is claimed to have saved ship operators millions of dollars per year in trans-Atlantic crossings.[3]

The North Atlantic Track Agreement. The first proposal to separate ship traffic for safety reasons was also made by Maury in 1855. The advent of steam-powered vessels had relieved ship's masters of the need to follow the previously developed weather routing schemes, which tended naturally to separate opposing traffic streams. They preferred, instead, to use more direct great circle routes which consumed less time and conserved precious fuel. This practice, however, increased the probability of head to head meeting situations. In the case of ship traffic between northern Europe and North America, it also meant crossing the Grand Banks of Newfoundland, all too frequently in thick fog. Thus, the invention of the steamship, the most significant advance in ocean technology since man had learned to use the sail centuries earlier, created the situation which led to the

*All of the current series of "Pilot Charts" produced by the U.S. Navy Oceanographic Office bear the following inscription, "Founded upon the researches made in the early part of the nineteenth century by Matthew Fontaine Maury, while serving as a Lieutenant in the United States Navy."

disastrous collision between the United States mail steamer, Arctic, and the French steamship, Vesta, in October 1854. This collision, which occurred in a thick fog 50 miles east of Cape Race, Newfoundland, cost the lives of over 300 people.

The collision between the Arctic and the Vesta highlighted the fact that numerous collisions had already occurred on the same North Atlantic route. It prompted a Boston underwriter, Robert B. Forbes, to suggest to Maury that he develop a traffic separation scheme for the North Atlantic.[4] He did so, and the following year the Boston underwriters published his work titled, "Lanes for Steamers Crossing the Atlantic."[5] In it Maury proposed a 20 mile wide eastbound lane passing just south of Cape Race and a westbound lane 200 miles to the south, just touching the tail of the Grand Banks.[6] The U.S. Navy immediately directed its vessels to comply with Maury's proposed scheme, but it was 36 years and many collisions later before commercial ship operators saw the need.

In 1891, the U.S. Navy Hydrographic Office obtained agreements from five major North Atlantic passenger lines to use the proposed lanes.[7] Finally, in 1898, the first international attempt to prescribe high seas shipping lanes resulted in the North Atlantic Track Agreement, which directly involved 16 shipping companies flying six different flags.[8]

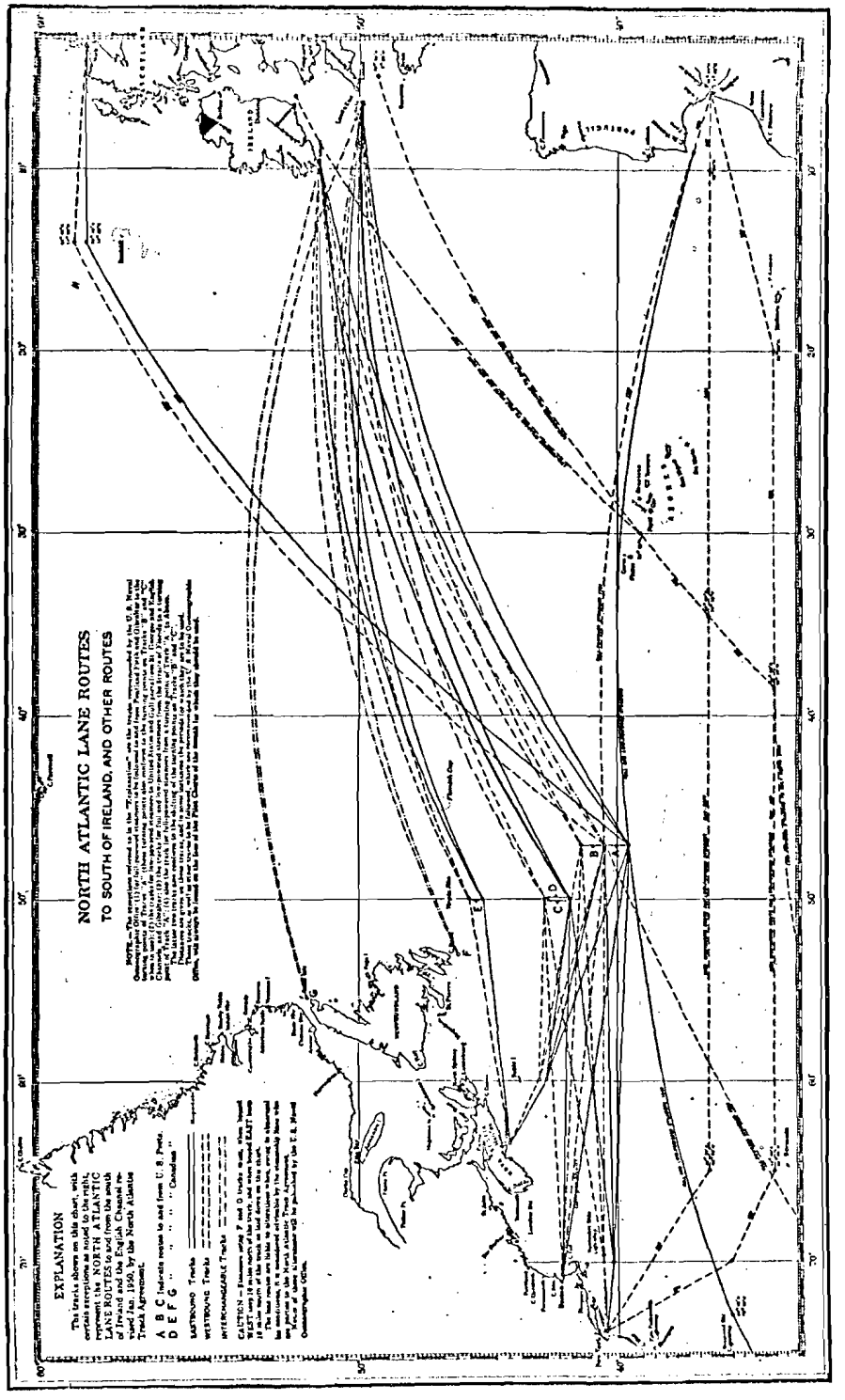
Unfortunately, it was weakened by its non-mandatory nature and limited participation.* The Agreement, which was based on Maury's work, is still in effect, although the lane structure has undergone several revisions. The most recent Atlantic Lane Routes are shown in Figure 7. Recently shipping companies have indicated a desire to abrogate the Agreement in favor of weather routing,[9] an interesting reversion to the older Maury concept.

The Great Lakes Routing System. The next significant attempt to reduce ship collisions by means of traffic separation schemes occurred in the Great Lakes. During the period from 1900 to 1910, 22 vessels were totally lost on the Lakes due to collisions.[10] As a result, in 1911, the Lake Carriers' Association established separate upbound and downbound courses for member vessels on Lakes Huron and Superior. These were actual prescribed courses to be followed, as opposed to the previously described traffic lanes, and were overprinted on charts by the U.S. Lake Survey.[11] The Lake Superior routes are shown in Figure 8. Since they

*At the time of the Andrea Doria/Stockholm collision in 1956, neither of the parent steamship lines was a party to the North Atlantic Track Agreement. The 1957 House of Representatives Safety of Life at Sea Study Report stated that adherence to the published sealanes would have prevented this tragic accident, which took the lives of 44 persons.

FIGURE 7

NORTH ATLANTIC TRACK ROUTES



Source: U.S. Navy Oceanographic Office, Track Chart of the World, H.O. 1262, (Washington: 1966).

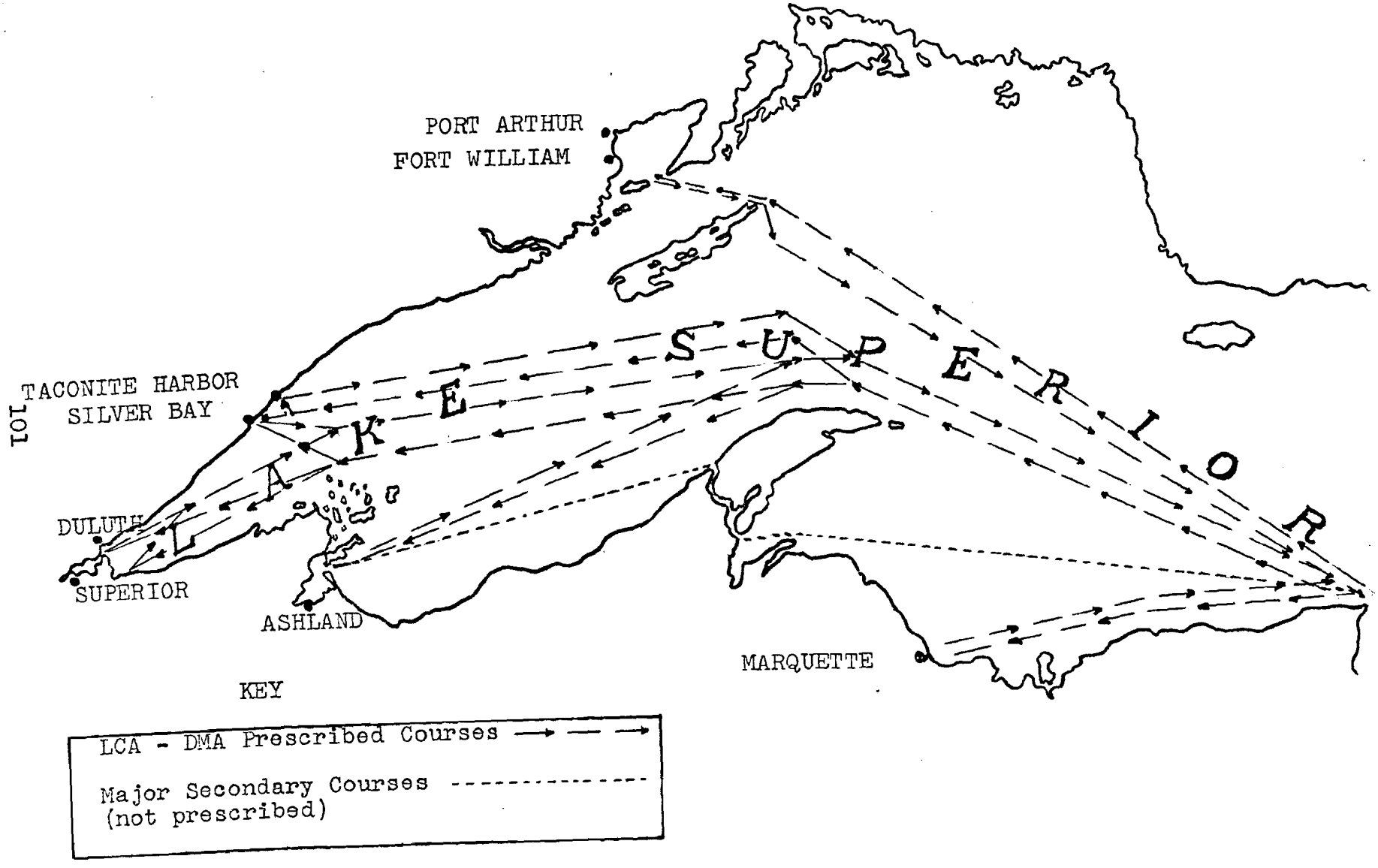


FIGURE 8

LAKE SUPERIOR, PRESCRIBED SHIP ROUTES

were devised by the masters of ships engaged in the Great Lakes trade, they were quickly accepted by both United States and Canadian operators.[12] Convinced of the success of this pioneering effort, the Lake Carriers' Association and the Dominion Marine Association of Canada expanded the schemes to Lake Michigan, in 1926; Lake Erie, in 1947; and Lake Ontario, in 1949. One of the more interesting aspects of the Great Lakes scheme is that it was privately conceived of and implemented in the interests of safety, without the need for legislative action. The U.S. government has supported it in various ways: by recognition in Admiralty courts; overprinting on Lake Survey Charts; inclusion in the Great Lakes Pilot; and by citing failure to adhere to prescribed routes as a causal factor in Coast Guard Marine Boards of Investigation into collisions.[13] The success of the traffic separation scheme on the Great Lakes is a generally accepted fact which is borne out by the significant reduction in the rate of collision since its implementation. Despite the injection of ocean shipping through the St. Lawrence Seaway in 1959, and a significant growth in the volume of normal lake shipping over the years, the decade from 1954 through 1963 saw only two major ship losses as a result of collision. In both cases failure to adhere to prescribed routes was cited as a contributing factor.[14]

NEMEDRI Routes. World War II led to the next major requirement for a ship routing scheme. During the war, both Allied and Axis naval forces extensively mined the waters of the North Sea, Mediterranean Sea, and Black Sea. As the tide of battle turned in favor of the Allies, the need for seaborne traffic increased in these areas. The Allied navies swept mine-free channels, as traffic patterns dictated, and established buoys and other aids to enable navigators to locate them. The Royal Navy issued a system of publications called Northern European and Mediterranean Routing Instructions (NEMEDRI) which identified swept channels and contained sailing directions and hydrographic information to aid mariners in avoiding danger areas. The system of routes described in these publications became known as NEMEDRI lanes, obviously taking their name from the title of the publication.[15]

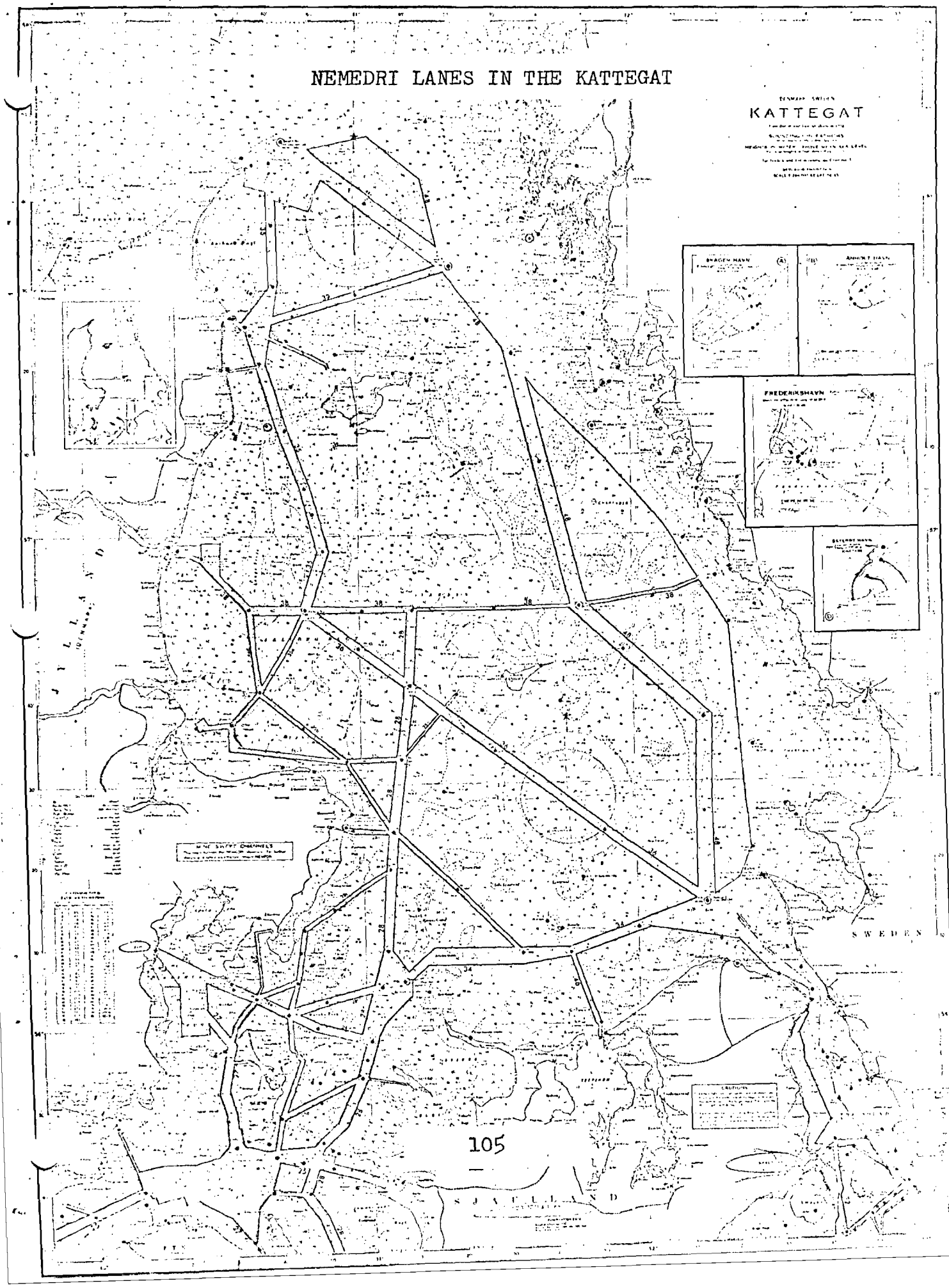
When they were originally conceived the NEMEDRI routes were not expected to remain in effect indefinitely. Following the war, however, it was clear that they must remain in use until the full extent of the mine threat could be determined, and adequate mine clearance effected. The magnitude of the peacetime threat can be appreciated when one considers that the British alone planted over 76,000 mines on the sea bottom and that only about 1,600 were known to have been detonated by enemy vessels.[16] To deal with the problem,

the Royal Navy conceived of the International Routing and Reporting Authority (IRRA), which was composed of naval representatives of ten nations, including the United States, Great Britain, and Russia. Until its dissolution in 1963, IRRA functioned as an international forum in which mine dangers, mine clearance, and ship routing problems were discussed. The IRRA was also responsible for promulgating, to the mariner, ship routing schemes and relevant hydrographic data in the form of the NEMEDRI publication, which is now in its tenth edition.[17]

The NEMEDRI lanes served the purpose for which they were primarily intended, that of minimizing the risk from mines.* As post-war trade patterns developed, additional lanes were swept to accommodate a growing volume of seaborne traffic. Unfortunately, those who established them could not foresee that they would become virtually a permanent ship routing scheme, carrying one of the world's greatest volumes of seaborne traffic. They, therefore, structured and marked them so as to provide mine-safe routes between major European ports rather than to prevent collisions at sea.[18] Figure 9 depicts the system of NEMEDRI lanes which

*Beattie states that explodable mines are still being recovered, but that the last known mine casualty occurred off North Holland in 1962. This testifies to the effectiveness of the NEMEDRI system when one considers that over 350 ships were lost to mines off Denmark alone after the war. supra, Ch. 2, n. 9 at 41.

FIGURE 9


NEMEDRI LANES IN THE KATTEGAT
KATTEGAT
FREDERIKSHAVN
SWEDEN
SJAELLAND

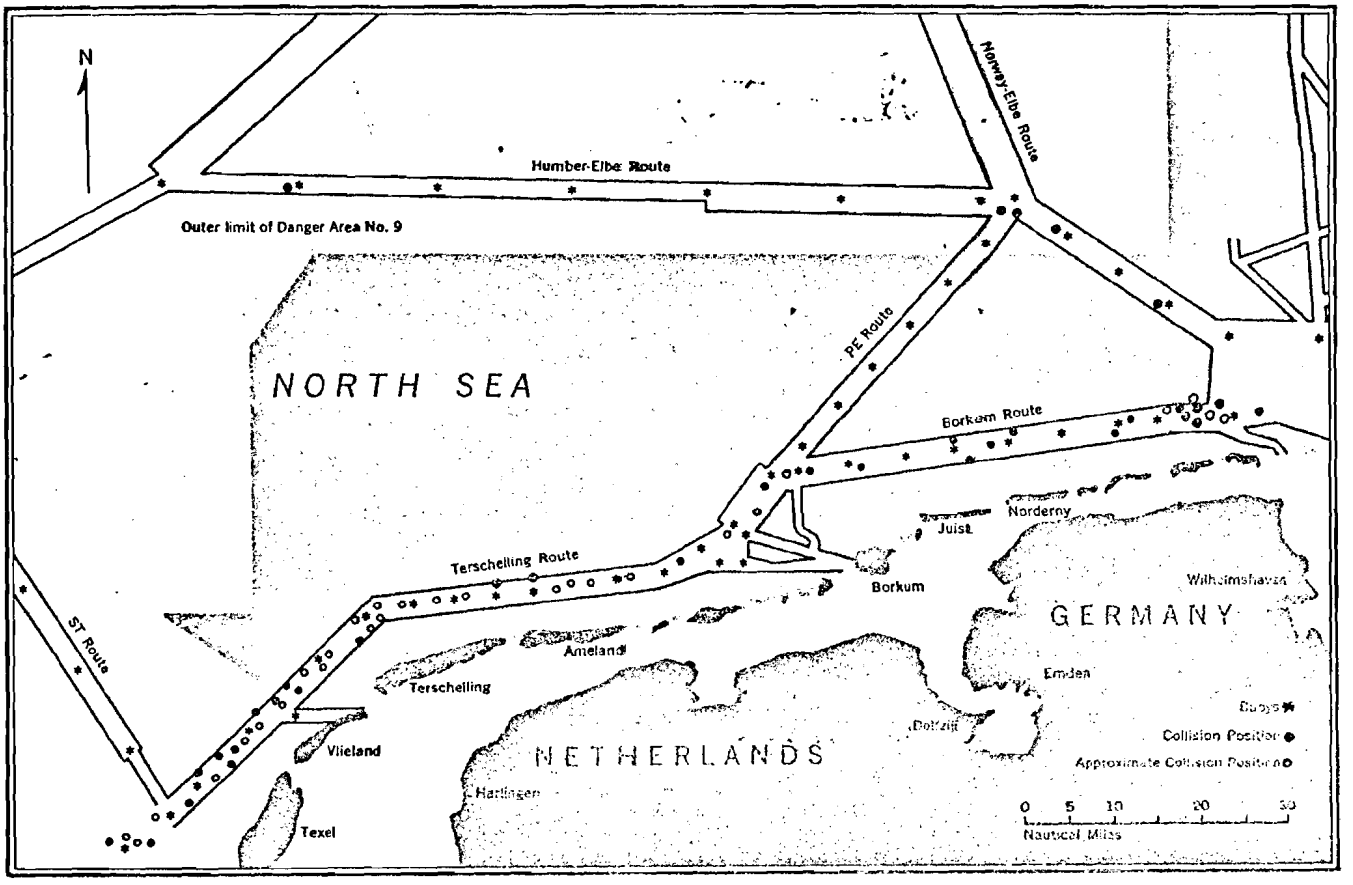
exists in the Kattegat, between Denmark and Sweden. They are axially buoyed with the main routes varying in width from one to five miles, depending on the traffic volume.

The combination of the previously described growth in shipping volume and a residual mine threat has tended to create large concentrations of shipping in some of the main NEMEDRI routes. The highest density of traffic exists on the Borkum and Terschelling route from Rotterdam to the Kiel Canal.[19] An estimated 400 ships per day use this route and collisions occur as frequently as on any other water-way in the world, including the infamous Strait of Dover.[20] Figure 10 shows the location of some 57 collisions which occurred there between 1959 and 1963.[21] Most of these occurred in reduced visibility as a result of head to head meeting situations off the centerline of the lane. Radar surveys have shown that in poor visibility approximately 10% of the vessels in the lane operate on the wrong side of the axial line of buoys, against the main flow of traffic.[22] This apparent failure of vessels to comply with Rule 25* by remaining on the starboard side of the channel is attributed to a tendency on the part of masters to sail from buoy to buoy in poor visibility.[24]

*The instructions contained in the NEMEDRI publication call for vessels to remain on the starboard side of the lane (buoys to port). Additionally, most masters consider the routes as narrow channels where Rule 25 "The Narrow Channel Rule" would apply.[23]

FIGURE 10

COLLISIONS IN THE NORTH SEA NEMEDRI ROUTES



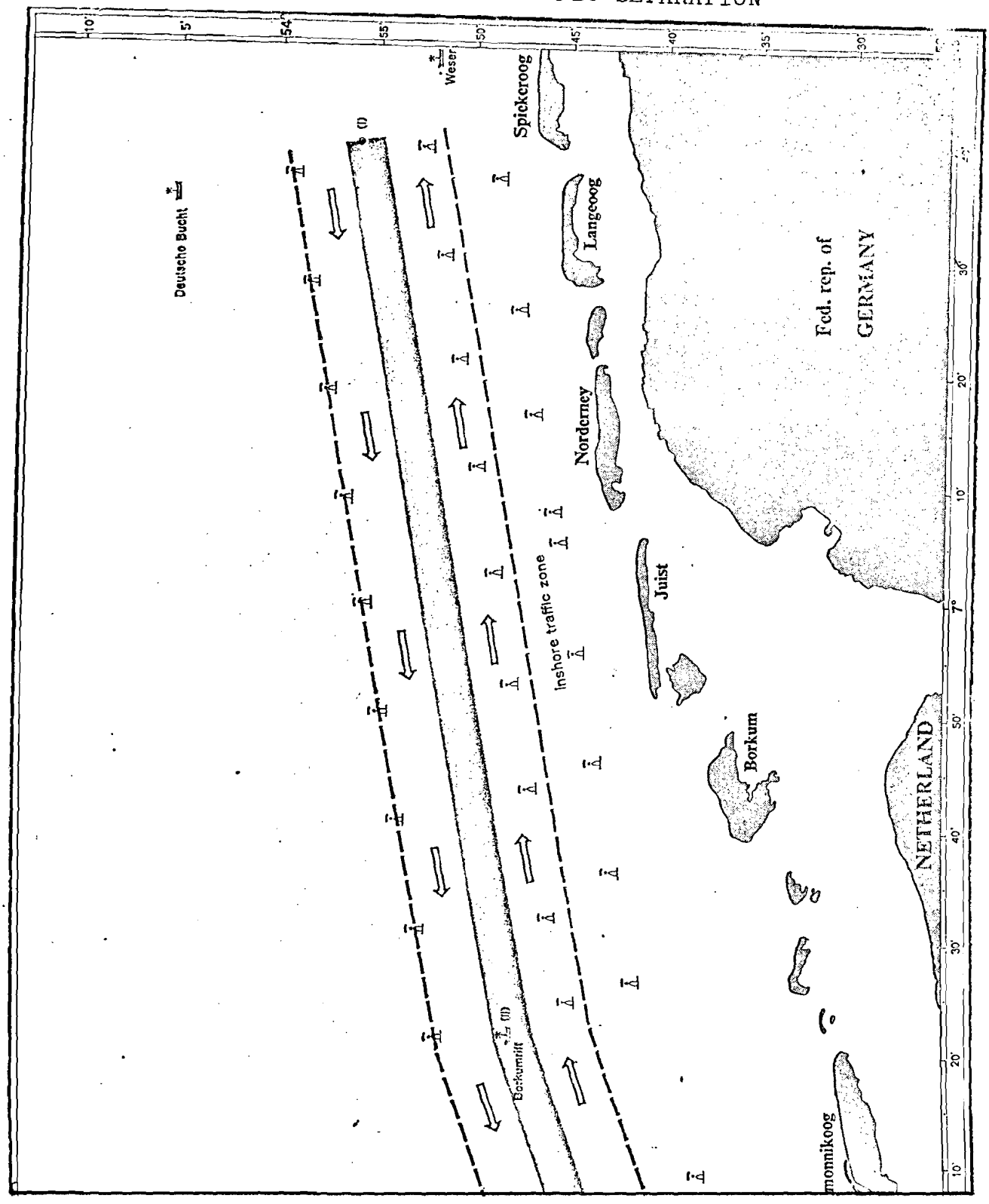
Source: J.H. Beattie, "Safer, Saner Seaways." U.S. Naval Institute Proceedings, December 1970, p. 42.

The NEMEDRI routing system has successfully met the safety requirements for which it was established. In doing so, however, it has contributed to yet another danger, that of collision at sea. Several factors can be identified as aggravating the situation. The previously cited tendency to concentrate traffic in restricted areas is compounded by a generally agreed-upon deficiency in the capabilities of many masters.[25] The existing system of aids to navigation does not appear to provide sufficient accuracy under all conditions of visibility. Although most of the area is covered by Decca Navigation System, which can provide sufficient all-weather accuracy, it has been estimated that only 25% of the vessels entering these waters are equipped to use it.[26] The location of the system of visual aids to navigation along the center of the lane tends to draw opposing traffic streams together in poor visibility. Failure to observe or enforce Rule 25 and the lack of a traffic separation or buffer zone increases the probability of head to head meeting situations which have been shown to be the major category of collision at sea.

In recognition of the increasing threat of collision in the North Sea, proposals have been developed to widen the NEMEDRI routes and transform them into traffic separation schemes. This will call for sweeping new lanes clear of mines and marking off a buffer zone with parallel lines of buoys, as shown in Figure 11.[27]

FIGURE 11

MODIFICATION OF BORKUM - TERSCHELLING NEMEDRI ROUTE, TO PROVIDE TRAFFIC SEPARATION



Source: IMCO, Ship's Routeing and Traffic Separation Schemes, (London: IMCO, 1971), p. 28.

Shipping Safety Fairways Systems. The effort to establish a system of "shipping safety fairways" or "clearways" for shipping actually pre-dates the better known work of the Institutes of Navigation of Britain, France, and the Federal Republic of Germany. As a practical matter, however, "fairways" were not conceived as vessel routing schemes in the sense of those previously described. They came into being as a result of agitation by the shipping industry, which perceived a growing encroachment, by the oil industry, on ocean space that had previously been its virtually uncontested domain. They were not originally meant to route vessels safely through existing navigation hazards, but, rather, to set aside ocean areas which would be maintained free of man-made hazards, specifically offshore drilling platforms.*

As early as August 1948, the American Merchant Marine Institute (AMMI), alarmed at the potential navigation hazard posed by offshore oil platforms, objected to the possible issuance of a blanket permit by the U.S. Army Corps of Engineers to Stanolind Oil and Gas Company to drill off the

*The terms "fairway" and "shipping safety fairway" are used in this context by the U.S. government and by American shipping and oil interests. In the United Kingdom the term "clearway" is preferred when referring to such schemes.[28] IMCO defines a "fairway" as "An area within defined limits inside which two-way traffic normally may be expected." The terms "clearway" and "shipping safety fairway" do not appear in the IMCO glossary.[29]

entrance to Galveston harbor.[30] After a series of conferences with the oil and shipping interests, the Corps District Engineer, Galveston District, recommended a fairway five nautical miles wide in which no structures would be permitted. Stanolind was issued a number of single drilling permits outside of the recommended fairway and the first hopeful step toward conflict resolution had been taken.[31] Further recognition of the problem was contained in a letter from the Corps Division Engineer, Lower Mississippi Valley, to the District Engineer, New Orleans, dated 27 October 1948, in which he stated:

> This office has been giving some thought to the necessity for providing adequate navigation fairways between the open water of the Gulf and the various waterways and bays that empty into or connect with the Gulf of Mexico . . . . As the offshore oil activities increase . . . . The establishment of definite criteria with respect to the location and width of essential navigation fairways for use in approving permits appears to be necessary for the protection of navigation . . . .

As offshore drilling operations increased in the Gulf over the following years, several additional fairways were implemented, normally on an ad hoc basis. The sequence of events leading to the establishment of a new fairway normally commenced with the leasing, by the United States Geological Survey, of offshore areas for oil exploration and recovery.[32] The lease also authorized offshore drilling structures, however, under the provisions of the Rivers and Harbors Act

and state and local interests. The positions of the participants at these conferences were consistent and logical from their own particular points of view. The shipping and fishing interests desired to reserve the maximum possible of unencumbered ocean space. The oil interests wished to make maximum use of the sub-surface lands for which they had paid so dearly.* Government representatives strove for maximum resource utilization consistent with safe navigation. The compromises which resulted did not fully satisfy any of the parties involved.[36] The Corps considered itself to be an informal mediator, without legal authority to "designate formally" fairways, except within the territorial seas of the United States. As a result, it considered the arrangements which were reached to be a strictly "informal" agreement between the parties concerned. The agreement was implemented simply by the Corps refusing to issue offshore structure permits within the agreed-upon areas.[37]

The development of fairways proceeded informally and at a leisurely pace until 1953, when the passage of the Outer Continental Shelf Lands Act stimulated an increase in

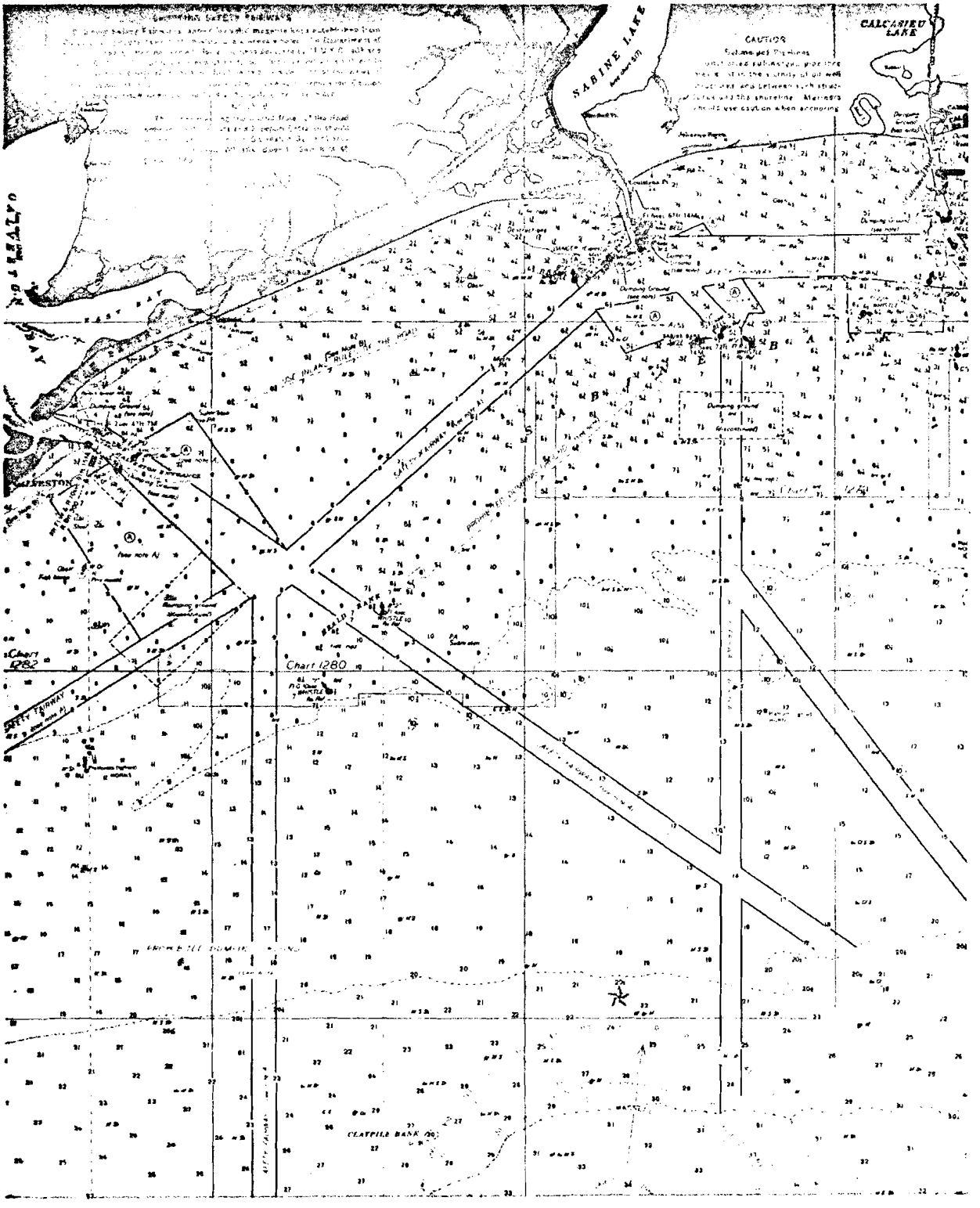
*The prices paid to lease exploitable offshore lands can be astronomical if sufficient potential is considered to exist. In bidding for Federal lands in the Santa Barbara Channel in February of 1968, $602,719,261.60 was bid for 363,181 acres. One 5,400 acre tract went for $61,418,000.00, an average of $11,373.70 per acre.[35]

the level of offshore drilling. Agreed-upon schemes were generally two miles wide, ten miles long, and perpendicular to the coastline.[38] Landward points of origin were at selected Gulf ports and included anchorages where traffic volume called for them. The schemes did not appear on navigation charts, were not published in the Federal Register, and were not marked by aids to navigation.* Ship's masters, unfamiliar with the area, had no way of knowing they existed, let alone where they were. In July 1953, the Corps published its first "official" map of the existing system of Gulf fairways. Subsequent revisions were issued as new fairways were implemented.[39] In 1966, the U.S. Coast and Geodetic Survey, assured of the stability of the existing fairways and anchorages, agreed to a suggestion by the Corps to overprint them on its navigation charts of the Gulf.[40] Figure 12 is a portion of C. & G.S. Chart 1116 showing "Shipping Safety Fairways" and anchorage areas off Texas and Louisiana.[41] The first publication in the Federal Register concerning fairways also occurred in 1966, on 25 January.[42]

*The responsibility for establishing aids to navigation rests with the United States Coast Guard. (14 U.S.C. 81). It was not until October 1966, however, that the Coast Guard received authority to establish maritime aids, generally, in the waters above the Continental Shelf. (PL 89-622; 14 U.S.C. 81).

FIGURE 12

DETAILS OF SHIPPING SAFETY FAIRWAYS, GULF OF MEXICO

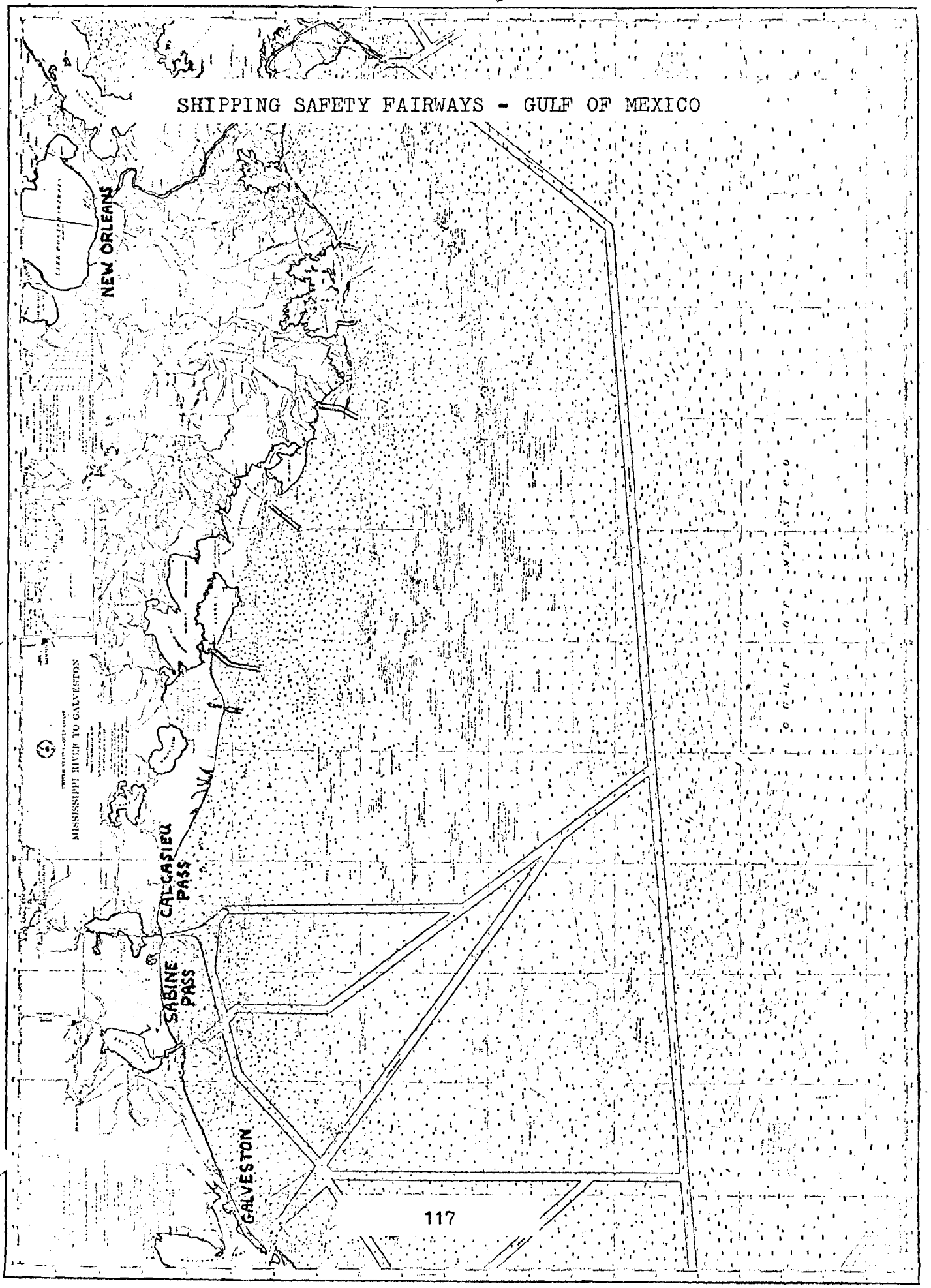


Source: U.S. Coast and Geodetic Survey, Chart C&GS 1116

The combination of rapid development of offshore oil recovery technology and the passage of the Outer Continental Shelf Lands Act gave impetus to a southward movement of drilling platforms into the deeper waters of the Gulf. Some existing fairways were extended further to seaward and additional ones were added as necessary, according to the procedures described above. A number of them ultimately extended to the 100 fathom curve. So gradual was the process that ship operators did not seem to realize the ultimate consequences of such an ad hoc approach. In 1965, however, the fact struck home that although access to major ports had been protected, no fairways had been established to accommodate coastwise ship traffic.[43] At the urging of the maritime interests, the American Merchant Marine Institute (AMMI) and the Offshore Operator's Committee (OOC) put together a joint proposal for a revised fairways scheme which would correct the deficiency. This was presented to the Corps District Engineer in May 1967, and on 6 June 1967 he issued a Public Notice describing the proposed revision.[44] The new scheme, which is shown in Figure 13, was approved and published in the Federal Register in October 1968.

As can be seen, the development of the present system of fairways took place over a 20 year period. The result is hardly a model upon which to base future schemes meant to achieve the same goals. They resemble the NEMEDRI lanes in

FIGURE 13


SHIPPING SAFETY FAIRWAYS - GULF OF MEXICO
NEW ORLEANS
MISSISSIPPI RIVER TO GALVESTON
CALCASIEU PASS
SABINE PASS
GALVESTON
GULF OF MEXICO

that they tend to concentrate opposing streams of traffic in relatively narrow channels. By their physical structure they are far inferior, being less than half as wide and unmarked by visual aids to navigation.

The present system of Shipping Safety Fairways generates an extremely high potential for head-on meeting situations. The fact that many vessels which operate out of Gulf ports do not use them is the main reason that the collision rate there is not much higher. It is already bad enough, having averaged better than one per month over the five year period ending on 30 June 1970.[45] More than half of the collisions which occurred in the open ocean adjacent to the United States in 1970 were in Gulf waters.

The reasons why so many masters fail to make use of the fairways are several, but the most obvious is the inconvenience which they cause. A brief look at Figure 13 is all that is needed to see the reason. A vessel enroute from New Orleans to Galveston must travel an extra 40 miles if it uses the existing fairways rather than taking a direct coastal route. Time is money, and since the danger presented by offshore oil structures is much less insidious than that of a mine those masters familiar with their locations will tend to thread their way through them in order to shorten the trip. The lack of adequate visual aids to navigation beyond 30 miles from the coast is another factor which discourages their

maximum use, even for vessels approaching straight into the coast. Unless equipped with LORAN, it is unlikely that such a vessel can be navigated with sufficient accuracy to remain within the fairway until it gets within visual range of shore-based aids, buoys, or identifiable oil rigs.

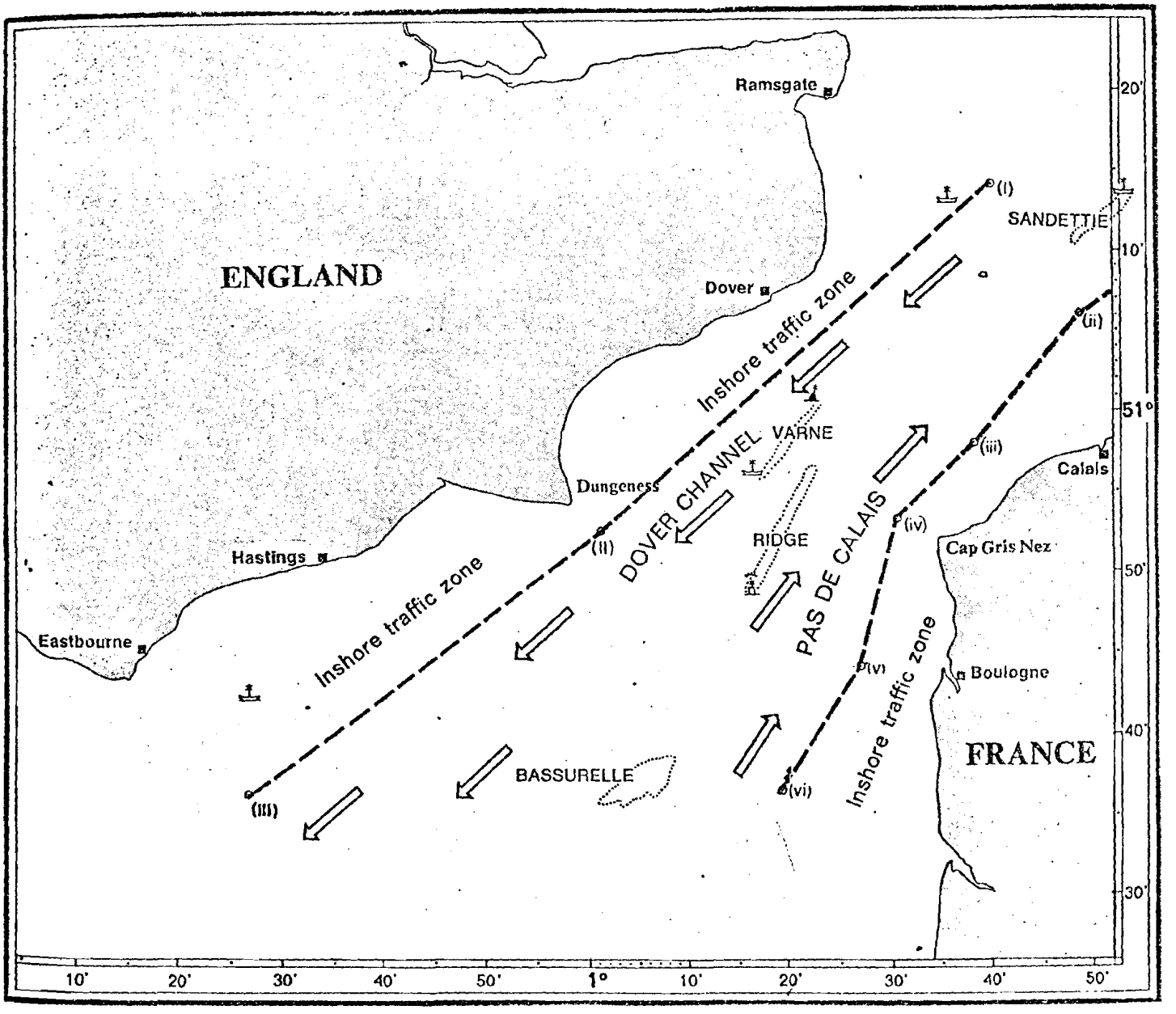
The Coast Guard realized the potential hazard in the Gulf at an early date. In November 1966, at the request of the Commandant, the Commander, Seventh Coast Guard District initiated inquiries concerning the adoption of Sealanes, to separate opposing traffic streams, in lieu of the established fairways. The similarity to the dangers inherent in the NEMEDRI lanes was cited as the reason for change.[46] The proposal, however, was never seriously considered by any of those, other than the Coast Guard, who had been concerned with establishing the existing system. In a letter to the Commandant, the AMMI requested that such action be deferred until the existing scheme could be more firmly accepted by all parties.[47] This appears as recognition on the part of AMMI that the powerful Gulf oil interests would strongly resist such a change. A traffic separation scheme would restrict oil structures from three times the ocean space required for fairways. Apparently AMMI was afraid it would lose what small concessions it had already gained and that the fairways scheme might not be implemented if it supported the Coast Guard proposal.

It is doubtful that anything even approaching unanimous adherence to this scheme will occur until the density of offshore structures is such that masters have no other choice. The full import of this classic in poor management will then be made clear by an upturn in offshore vessel collisions. It is difficult to believe that the government and shipping interests have failed to grasp the lesson to be learned in the North Sea, on the Borkum-Terschelling NEMEDRI route.

Modern Sealane Concepts. Major credit for modern efforts to institute standard vessel routing schemes, particularly traffic separation schemes, goes to the Institutes of Navigation of Great Britain, France, and the Federal Republic of Germany. The Institutes, as a result of a general statement of need contained in the 1960 SOLAS Convention, undertook a comprehensive study to determine the viability and acceptability of traffic separation, particularly in the Strait of Dover. This effort has been well documented and needs no further review here.[48] Suffice to say that it resulted in the implementation of the first of a series of IMCO-approved traffic separation schemes on 1 June 1967. This scheme, which is depicted in Figure 14, used natural obstacles in the center of the Strait to separate opposing streams of shipping traffic.

FIGURE 14

TRAFFIC SEPARATION SCHEME FOR DOVER STRAIT



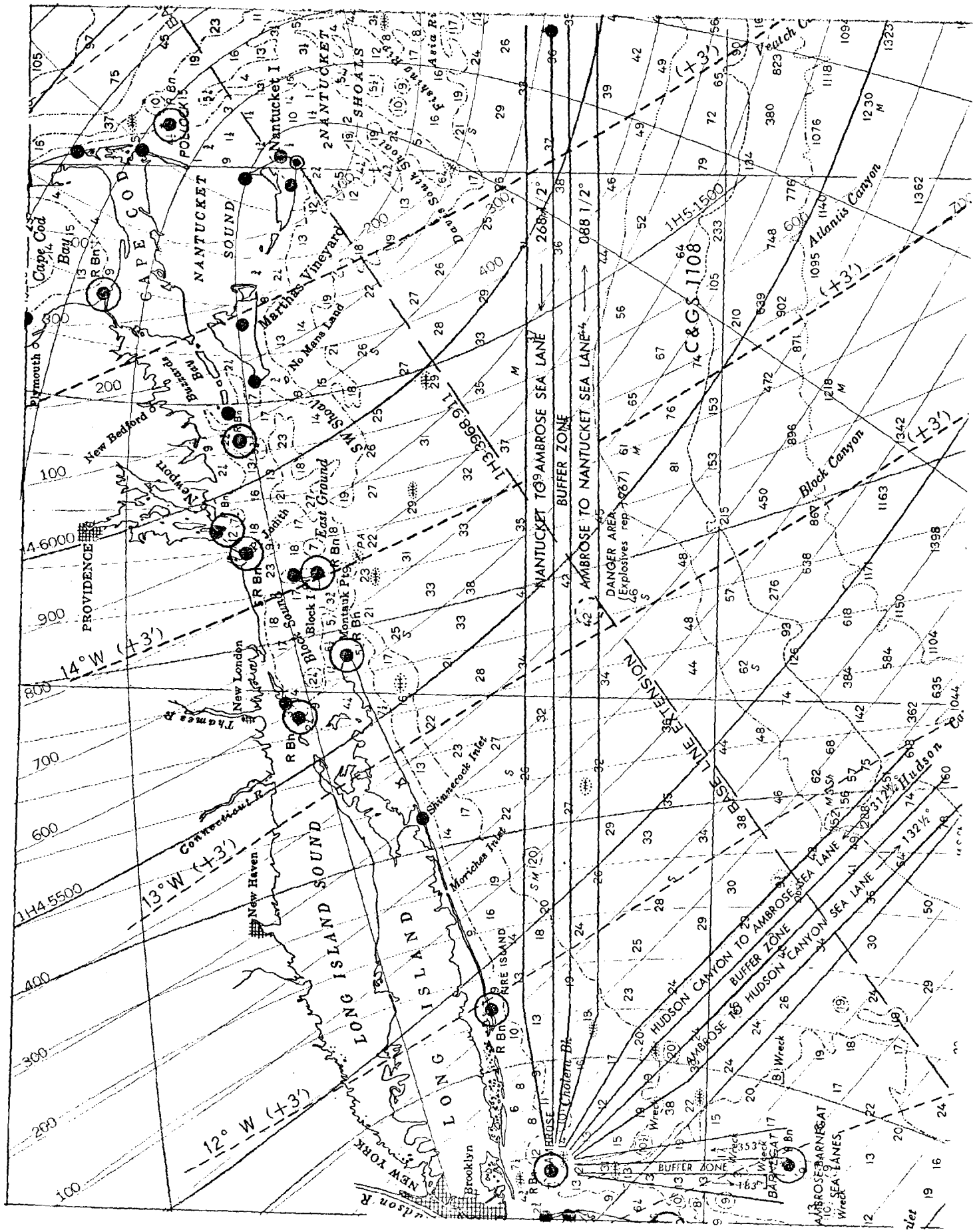
Source: IMCO, Ship's Routeing and Traffic Separation Schemes, (London: IMCO, 1971), p. 31.

Perhaps the most significant aspect of the modern approach to sealanes, which the Dover Strait scheme typifies, was the involvement of the Maritime Safety Committee (MSC) of IMCO. This was the intent of the Institutes of Navigation from the outset; and rightly so. They wisely realized that the problem was not confined simply to the Strait of Dover, nor indeed to the Atlantic Ocean. Shipping accidents were viewed on a world-wide basis. Furthermore, ship traffic in areas like the Strait of Dover and the Port of New York involved ships of practically all maritime nations. To be effective, any effort required international cooperation and IMCO was clearly the instrument by which to achieve it.

Almost concurrently with the work of the Institutes of Navigation, the U.S. Coast Guard stated its intention to seek adoption of "Sealanes" in American waters. The first statement of this intent was made in January of 1965, by the Commandant, in a speech to the Marine Society of New York.[49] This was followed by a series of government-industry studies in major U.S. ports.[50] The first standard sealane schemes to be implemented by the United States were at the entrance to the Port of New York and Delaware Bay. These conformed to the standards that had been developed by the Institutes of Navigation and accepted by IMCO.[51] The New York scheme, which is shown in Figure 15, was implemented without IMCO

FIGURE 15

SEALANE SYSTEM - PORT OF NEW YORK



approval on 1 May 1967, one month prior to the scheme in the Strait of Dover. It was approved by IMCO in March 1968.

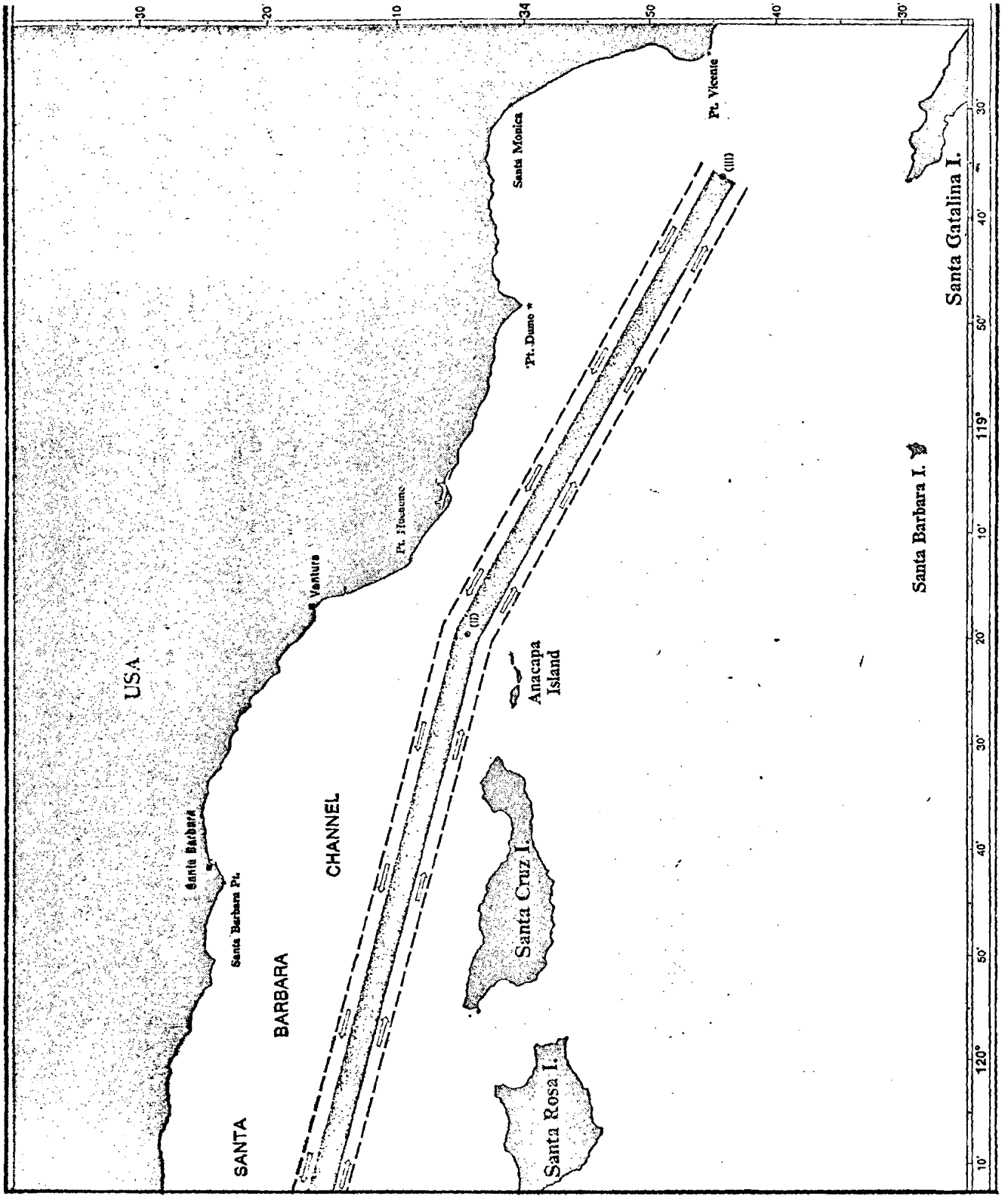
These initial schemes have been followed by many others, all approved by IMCO. The total number as of April 1971 was 57.[52] It is worthwhile to note that all IMCO-approved schemes have two essential common features which are: separation of opposing streams of vessel traffic; and safe routing around natural hazards.

Where required, IMCO has approved safe routing through or around man-made hazards, but only where the above mentioned essential criteria have been met. Thus, the NEMEDRI routes and Shipping Safety Fairways in the Gulf of Mexico do not have IMCO approval and are unlikely to obtain it unless they are modified.

The Santa Barbara Channel. It is worth making particular mention of the coastwise Sealanes which were implemented in the Santa Barbara Channel in January 1969 by the Coast Guard. The primary purpose of this scheme is the same as that of the Shipping Safety Fairways, however, wiser heads have prevailed and the gross mis-management which occurred in the Gulf of Mexico has not been repeated.[53] As shown in Figure 16, traffic separation has been incorporated along with the preservation of a structure-free route. The scheme has, accordingly, received IMCO approval.

FIGURE 16

SEALANE AND SHIPPING SAFETY FAIRWAY SYSTEM
SANTA BARBARA CHANNEL



Source: IMCO, Ship's Routeing and Traffic Separation Schemes. (London: IMCO, 1971), p. 79.

These Sealanes did not come about without the same conflicts between competing interests as occurred in the Gulf of Mexico. The Coast Guard and shipping interests were strongly in favor of implementation prior to the leasing of offshore areas for oil exploitation. The bureaucratic real estate salesmen of the Department of the Interior (Bureau of Land Management) and the oil interests scoffed at concern for the safety of navigation, and leases were consummated for offshore lands beneath the proposed sealane areas.[54] This placed the Corps of Engineers in the awkward position of having to refuse structure permits to companies which had already paid high prices for the right to do so. The Corps took a much weaker position than it had in the Gulf of Mexico and disclaimed its authority to deny erection permits until such time as Sealanes had been officially designated. A compromise solution was finally arrived at in which two major concessions were made by navigation interests. These were to reduce one way lane width to one mile from two, and to allow drilling within one half mile of a lane rather than one mile.[55]

It is premature to say that these Sealanes will not be encroached upon, but the position the navigation interests were in was significantly strengthened when they were implemented and approved by IMCO. There can be no doubt that the approach taken squarely addresses the oil-shipping conflict

at an early stage and will, therefore, admit of sensible management.

Problem Areas With IMCO Schemes. The present international approach to sealanes shows much more thought with regard to structure and application than those which have gone before. There are several significant factors, however, which detracted from their overall effectiveness.

At the present time, all vessel routing schemes in international waters, and most of those within the territorial seas, are voluntary. Failure of some masters, even though they are few, to adhere to lane discipline while within a sealane can give rise to very serious collisions.

Aids to navigation are a major concern in establishing sealanes, particularly in international waters. It makes little sense to establish a scheme which is not serviced by aids which are adequate for the navigation accuracy required to remain within it. The lack of adequate aids on the French side of the Strait of Dover held up traffic separation for years after agreement had been reached to go forward.[56] Prior to implementing the sealanes leading to the Port of New York, it was necessary for the U.S. Coast Guard to obtain statutory authority to establish aids beyond the limit of the territorial sea.[57] This problem can be expected to arise with each new system for which IMCO approval is requested.

Since the coastal state is the logical provider of such service, the problem of who pays becomes important. Perhaps it depends upon whether sealanes are regarded as self protective for the coastal states or a service to the ship operators.

At the present time such aids as have been provided have been established and paid for by the coastal state. This has emphasized another problem area--that of non-standard buoyage for sealanes. For example, buoyage on the French side of the Strait of Dover differs from that on the English side. Buoyage in U.S. waters differs from both of these, and so on from country to country. In order to prevent confusion in sealanes, a world-wide standard buoyage system is needed, particularly for marking dangerous sunken wrecks and other unseen hazards which may exist in the lanes.

Summary. The history of the development of sealanes has been traced through the present system of IMCO-approved schemes. The reasons for their need can be seen to fall in three major categories which are: (1) separation of opposing traffic streams to prevent collisions; (2) safe routing of vessels through or around hazards; and (3) preservation of routes which are maintained free of man-made hazards.

Many of the older schemes successfully addressed the particular problem for which they were developed. Some, either due to a change in vessel traffic patterns or oversight,

have created other situations as hazardous, or more so, than the danger they were meant to eliminate.

The present world-wide system of IMCO-approved sealanes are structures to address all three of the previously cited hazards simultaneously. Some problems remain; mainly those of enforceability, protection from encroachment, and standard buoyage. By and large, this new approach can be expected to reduce shipping accidents, particularly collisions. Collision trends over the four years since the first schemes were implemented show hopeful signs of improvement; however, it is premature to claim success at this time.

APPENDIX III

APPENDIX III

GLOSSARY

In general, the United States accepts all terminology which IMCO has adopted relating to vessel routing schemes. There are certain variations, however, which were approved for American usage prior to IMCO's adoption of standard terminology. These are used to identify various elements of vessel routing schemes which are overprinted on navigation charts produced by the Coast and Geodetic Survey and the U.S. Navy Oceanographic Office. Both sets of terms are given below.

United States Terminology:

Sealane(s) - A vessel routing scheme which incorporates traffic separation and safe routing through congested or hazardous waters in order to reduce the risk of collision.

Sea lane - A corridor within which all vessel traffic is advised to proceed in the same general direction.

Buffer zone - A zone between opposing sea lanes which is intended to provide a safe degree of separation between streams of vessel traffic proceeding in opposite directions.

Shipping Safety Fairway - A corridor in which vessel traffic moves generally in parallel and opposing directions.

Normally implemented as a recommended route for vessels through offshore oil exploitation areas, or to identify areas which can be expected to be kept free of oil recovery platforms.

United Kingdom Terminology:

Clearway - A corridor in which vessel traffic moves generally in parallel and opposing directions. Normally implemented as a recommended route for vessels through offshore oil exploitation areas, or to identify areas which can be expected to be kept free of oil recovery platforms. Not expected to be overprinted on navigation charts.

IMCO Terminology:

Routing - A complex of measures concerning routes followed by ships and aiming at reducing the risk of casualties; it includes traffic separation schemes, fairways, tracks and deep-draught routes.

Traffic separation scheme - A scheme which aims at reducing the risk of collision in congested and/or converging areas by separating traffic.

Traffic lane - An area within definite limits inside which all ships are advised to proceed in approximately the same direction.

Track - A recommended direction of general traffic flow without definite boundaries or with only one such boundary.

Fairway - An area within defined limits inside which two-way traffic normally may be expected.

Separation zone or line - The zone or line separating traffic proceeding in opposite, or nearly opposite, directions.

Roundabout - A traffic separation scheme in which traffic moves in a counter-clockwise direction around a specified point or zone.

Inshore traffic zone - An area between the landward boundary of a traffic separation scheme and the adjacent coast intended for coastal traffic.

Deep-draught route - A route which is primarily selected for use by ships which, because of their draught, cannot navigate safely outside such route.