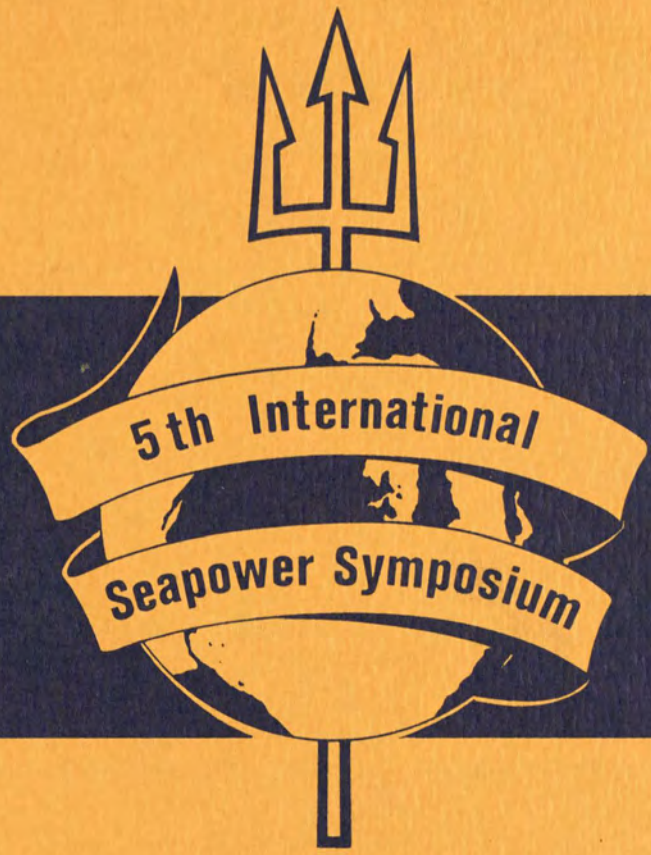
FIFTH
INTERNATIONAL SEAPOWER SYMPOSIUM



U.S. NAVAL WAR COLLEGE
NEWPORT, RHODE ISLAND

2-5 OCTOBER 1979

CHIEF OF NAVAL OPERATIONS

FOREWORD

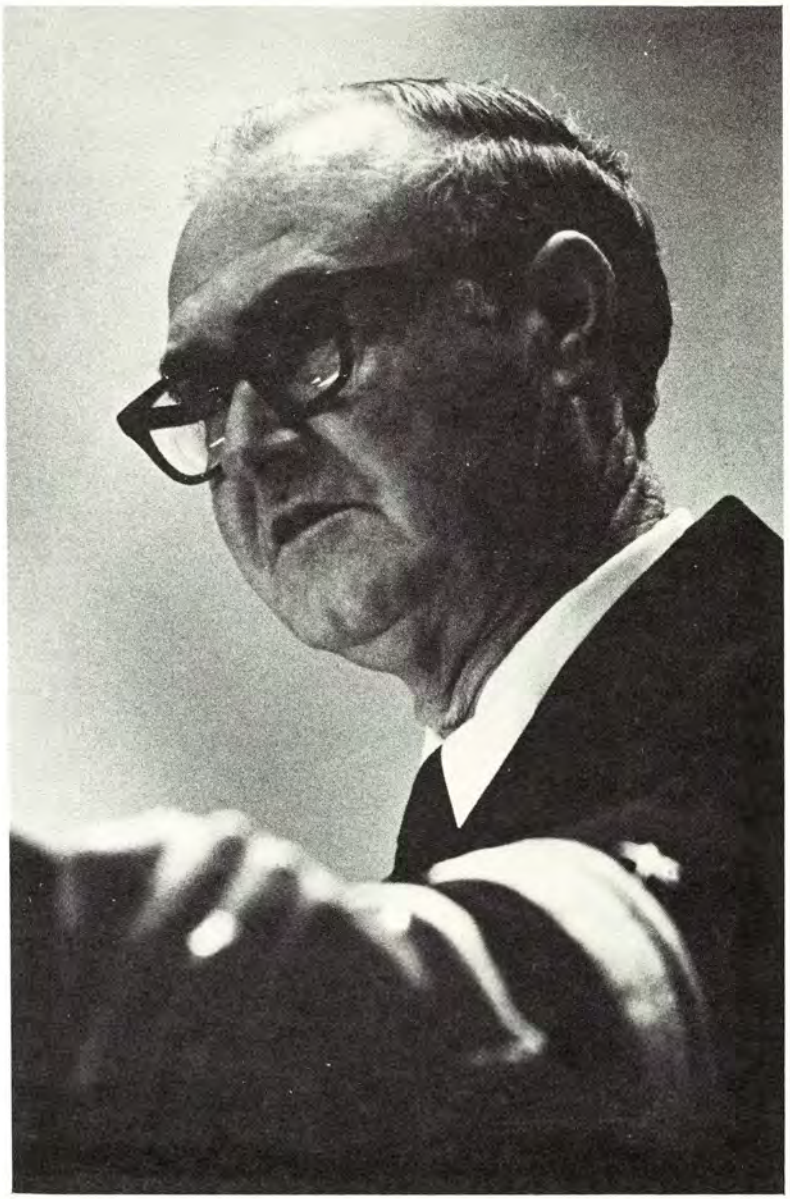
The United States Navy is both pleased and honored to have hosted the Fifth International Seapower Symposium. Once again most of the world's naval leaders have gathered to discuss problems which face all of them. No longer is a problem at sea only of symbolic interest to the world as a whole. In an increasingly real way, each problem at sea impacts upon and is of interest to each and every nation, large and small, industrialized and developing.

Thus, there is constant growth in the importance of these gatherings and the benefits to be gained. As the world at sea becomes more complex and the effects of any single action ripple wider and wider, the avenues of communications and the bonds of fellowship which we establish at these symposia serve as a bulwark against misunderstandings and provocative actions.

The proceedings of the Fifth International Seapower Symposium have been recorded within these pages and are presented to you as a memento of your attendance and your contributions. I hope they will serve as a lasting reminder of the friendships established at Newport and the fact that we can work together in support of the one goal which we all seek -- the safety and security of the oceans of the world.

T. B. HAYWARD
Admiral, U. S. Navy

INTRODUCTORY REMARKS by Rear Admiral Edward F. Welch, Jr., United States Navy, President of the Naval War College.



Distinguished guests, good morning. It is my distinct honor as President of the Naval War College to welcome you to Newport and to the Naval War College on the occasion of the Fifth International Seapower Symposium. I know that some of you have been students at the Naval War College, and some of you have visited here previously. Many of you are here for the first time. My staff and I are eager to make your visit a pleasant and informative one. Please do not hesitate to ask us for assistance.

Later this morning, we will hear from Admiral Jorma Haapkyla who will report on the Maritime Symposium in Helsinki in 1978, from Admiral Julio Guinand reporting on the Inter-American Naval Conference at Lima, also last year, and from Admiral Ferdinando Thaller regarding the Mediterranean-South Atlantic Symposium in Venice in May.

The International Seapower Symposium was originated in 1969 with the objective of promoting mutual understanding among the leaders of the world's maritime nations and was hosted by Admiral Thomas Moorer, U.S. Chief of Naval Operations. Response to that meeting was so favorable that it was decided to invite countries to participate in an International Symposium every two or three years. Admiral Moorer's successor, Admiral Zumwalt, was host for the second and third conferences in 1971 and 1973, and Admiral James Holloway invited delegates to the Fourth International Seapower Symposium in July 1976—during the celebration of this country's 200th anniversary of independence. This year, we will focus on "The Role of Navies in a World of Peace." Let us hope that this topic will be current when the Sixth ISS convenes in the early 1980's.

Your host this year has been our Chief of Naval Operations since July 1978. He is a 1947 graduate of the U.S. Naval Academy, and like Rhode Island some of the finest people I know are also from this class. Happily he is also a graduate of this college and of the National War College in Washington. He has a Postgraduate Degree in International Affairs from George Washington University.

Admiral Hayward is a naval aviator who has been a test pilot and has seen combat in Korea and in Vietnam as a fighter pilot. He has commanded aviation squadrons, a carrier air wing, the U.S.S. *Graffias* and the attack carrier U.S.S. *America.* As an Admiral, he has been Commander of the Hawaiian Sea Frontier, Commander of the U.S. Seventh Fleet in the Western Pacific and Commander in Chief of the U.S. Pacific Fleet before becoming Chief of Naval Operations. He has also served as Director of the Office of Program Appraisal in the Navy Department and as Director of Navy Program Planning.

It is my great pleasure to introduce your host, Admiral Thomas B. Hayward.

WELCOMING REMARKS by Admiral Thomas B. Hayward, United States Navy, Chief of Naval Operations.

Good morning. The Fifth International Seapower Symposium is hereby convened.

It will be difficult for me to express how very pleased I am that we have assembled here this morning, and for the next three days, such a very distinguished group of naval leaders. I am most pleased that you could find time to come here. We have representatives of 49 nations which are joined together today in peace to discuss the continuance of that peace in the decade ahead and our roles therein. Simultaneously, we welcome into our midst eight nations who are represented in this symposium for the first time—Algeria, the Ivory Coast, Jamaica, Panama, Somalia, Sudan, the United Arab Emirates, and Zaire. We know that you will contribute to our deliberations, and we hope that when we all take departure, we will leave with a deeper understanding of our joint responsibilities and our new bonds of friendship which we are certain to cultivate here this week.

In his address to the United Nations General Assembly in 1963, our President, John F. Kennedy said, "Peace is a daily, weekly, monthly process, gradually changing opinions, slowly eroding barriers, quietly building new structures." That is how I view this symposium and these meetings. In the Regional and International Symposia, we exchange information and knowledge. The process contributes to the formation of informed opinions. No barriers of hostility can long withstand the bonds of friendship which we build in these gatherings. Indeed, the entire structure continues to grow as a forum where men who share the responsibility for the safety and security of the world's oceans can talk, listen, and develop new ideas and new understandings about our responsibilities. That is why I believe these meetings, these symposia, are so important. Where there is understanding, there is likewise certain to be vision. For all these reasons, it is a great pleasure for me to once again welcome you, each one of you, to Newport, to the United States, and to this Fifth International Seapower Symposium.

REPORT ON THE SECOND MARITIME SYMPOSIUM, HELSINKI, FINLAND. Presented by Rear Admiral Jorma Haapkyla, Finnish Navy, Commander in Chief, Finnish Naval Forces.

Admiral Hayward, Mr. President, Admirals, distinguished delegates, gentlemen. I'm very pleased today that I have an opportunity to give you a summary report of our Maritime Symposium in Helsinki of May last year.

For those who are not familiar with the Maritime Symposium organization, I think it might be worthwhile to give a brief background history. At the Third International Seapower Symposium here in 1973, the Commander in Chief of the Swedish Navy, Admiral Bengt Lundvall, suggested the regional symposium include also delegations from the Warsaw Pact Navies. It was considered as a good instrument to establish an East-West contact between navies and thus enable an exchange of views and opinions on matters of mutual interest, especially in areas where corresponding navies regularly operate.

The first regional symposium of this kind was accordingly organized and hosted by the Swedish Navy in Stockholm in 1975. Admiral Lundvall defined its purpose and I quote, "The object of the symposium is not to discuss political, logistics or tactical cooperation and planning. It will provide a forum for discussing current and future peaceful use of our navies."

The Maritime Symposium organization consisted basically of the navies of the Fifth Committee of the International Seapower Symposium. Added were the navies of the Soviet Union and the German Democratic Republic. Thus, it included all the navies of the North Atlantic, North Sea, and Baltic areas.

I have here a list of the navies at Helsinki—16 in all—and also the number of delegates from each navy—37 in all.

PARTICIPATING NAVIES AND NUMBER OF DELEGATES

Belgium	1
Canada	3
Denmark	2
Federal Republic of Germany	3
Finland	3
France	3
German Democratic Republic	2
Iceland (Icelandic Coast Guard)	1
Ireland	1
Netherlands	2
Norway	2
Polish People's Republic	3
Sweden	2
Union of Soviet Socialist Republics	3
United Kingdom of Great Britain and Northern Ireland	3
United States of America	3
Total: 16 Navies	37 Delegates

In respect to the Stockholm Symposium, I would just like to state that it was very successful, and served very well its function. It was unanimously agreed to continue, and Finland was chosen as the country for the Second Maritime Symposium, and of course, my neighbor was very happy and proud to be a host for such a prominent congregation of naval leaders.

Now, to the report on the subjects. Considering the theme, it was easy to proceed on the same generally approved and successful course tested already in Stockholm. We decided, accordingly, the general theme would be Navies at the Service of the Society during the Time of Peace.

THEME:

Navies at the service of the society during the time of peace.

SUBJECTS:

1. The peacetime use of the navies to serve society and the possibilities to develop and improve these activities.
2. The participation of the navies in rescue operations and catastrophe

fighting in international waters and the development of these operations especially in the technical field.

Planning the special subjects for our symposium was not so easy. It was clear that only two subjects for the seminar discussions were practical and possible. We decided to have one general subject on the line of the theme, and the other one in a more precisely defined area. Thus, the subjects were called number one "The Peacetime Use of the Navies to Serve Society and the Possibilities to Develop and Improve these Activities." And, the second subject, "The Participation of the Navies in Rescue Operations and Catastrophe Fighting in International Waters" and the development of these operations especially in the technical field.

As you can see, the first subject gave a very wide range for discussion; and we hoped that we would be able to draw some conclusions about matters of special interest inside the first subject. We have, of course, the future symposium also in March. The first subject was divided into five different categories:

CATEGORIES OF DISCUSSION:

1. Surveillance, Inspection and Protection
2. Support and Control of Navigation
3. Research and Development
4. Training
5. International Contacts and Public Relations

I will report the essential part of the views and recommendations expressed by the delegates on each of the above mentioned categories.

First Surveillance, Inspection and Protection. In this field it was noted that there were great difficulties in dealing efficiently with the problems derived from a division of national responsibilities between the navies and other agencies. This results in undesirable delays which inhibits efficiency. Many of the responsible agencies who usually have the means of executing the work, do not have the authority or funds. Although it is recognized that the navies are not primarily responsible, it is possible that without their expertise, the task cannot be satisfactorily executed. How this is solved in each country is a purely national matter. However, as the coordination of the available means may take international applications, it was suggested that an international organization such as IMCO should coordinate efforts to deal with these problems.

For the second category, the importance of accurate navigation and traffic control was stressed and it was noted that there are many advanced navigational systems to the benefit of all navigators. Here is a high standard of training and navigational discipline of great importance. International standards should be set for the professional requirements of personnel and for ship's construction and equipment.

Category three. It was generally agreed that maritime scientific research has very real importance to all concerned. Navies participate in many national and international scientific programs which contribute greatly to the knowledge of the maritime environment in general, and to the resources of the sea in particular. We should thus encourage participation and cooperation of nations in scientific maritime programs of a basic and of a specialized nature. We have a responsibility that results of these programs of the international community should have the attention of participating nations and organizations.

The fourth category, Training. It was considered that the role of the navies in maritime training is valuable for the general needs of societies. Also the training of men in self-discipline, firefighting, first aid, etc. is, of considerable benefit. There was a great general feeling that these services should be developed within the different national systems of training and education in the navies concerned. It was recommended that making naval training facilities available for civilian personnel should be investigated on a national basis.

And lastly, number five. Navy visits were widely accepted as positive means of expanding international contact and understanding. The benefits of increased routine calls to foreign ports were generally recognized. However, the close relationship between all naval visits and foreign policy of respective states is an important factor. It is recommended that possibilities of streamlining routine visits and reducing formalities should be considered.

As a summary of the first subject, it can be noted that the first category seemed by far the most interesting, and was regarded as internationally important. In the second place, the field of research and development was considered very valuable in a peacetime environment. Training however important, was primarily seen as a domestic action. The role of the first subject, Navies at the Service of the Society during the Time of Peace, I take the liberty to quote myself from my keynote address.

"I would like to underline that it is of primary importance for individual countries to find suitable solutions for the use of the navies to serve their maritime communities. If we are able to convince the dealers of public funds that the Navy does support, does contribute to society in the time of peace with valuable and indispensable services, then the civilian world will be more willing to accept investments that pay dividends in normal peaceful times. After there is collective national capacity and established practice, international cooperation at sea will be more feasible. But before this cooperation can bear fruit, the tasks and operations must be outlined and jointly planned, and, if possible, also exercised."

To our second subject. Inter-Navy Rescue Operations and Catastrophe Fighting was clearly a direct hit as a subject. The greater part of the rather short time of the symposium was used discussing this subject. All navies, at present, felt that this field has possibilities and opportunities for the navies to render services to the international maritime community.

In my short summary, it is impossible to deliver a detailed review of more interesting and important articles discussed at our symposium. I limit my summary to some generally agreed statements and recommendations.

Search and Rescue and salvage operations are normally coordinated from rescue centers which often are located together with naval command and control centers, thus, securing the use of advanced military equipment and trained personnel. Also to share with society. One of the overall technical efforts in this field is the common development of a search and rescue satellite by Canada and the United States. On many occasions naval forces can render assistance and rescue operations by providing fast vessels, helicopters and medical services. It was emphasized that the interoperability of procedures and equipment should be improved in these areas. Few countries can, at the moment, afford to maintain specialized vessels and personnel for submarine rescue and salvage operations.

Many delegates stated that the countries with these facilities should continue to make them available for all other countries during a submarine accident. A need for international agreements in this area was also mentioned. It was agreed that fighting oil pollution also requires expertise and equipment not possessed by the Navy. However, the navies must always be prepared to give all available assistance and help.

It was stated that international agreements must be reached in solving problems associated with many activities on the open ocean as well as problems involving pollution and accident prevention. The decision of navy, coast guard, and/or civilian participation in support of these activities will be left to individual governments after international agreement of each subject is achieved through the United Nations or similar international forums. It was emphasized that navies and coast guards have the capabilities to implement the necessary procedures after agreements are reached.

As for practical measures, the symposium delegates regarded the use of following technical means important: Reporting systems such as AMAVRS, that is Automatic Mutual Assistance Vessel Reporting System; emergency locating beacons and data recording devices with the application of satellite systems to aid detection, communication, etc. It was further stressed that there is a necessity of continuous improvement in standardization of equipment. This is true for localization and rescue equipment as well as for survival and medical equipment too. Recommendations for international activities included following statements: Close international cooperation is needed between institutions and agencies during research and development work. Secondly, the international exchange of information about new results of scientific research and new equipment development should be expanded. And thirdly, coordination and cooperation of the problems within IMCO including the development of issuing of international standards for safe construction of ships as well as improved training of crews with the aim of preventing disasters. In general, it is emphasized that we must build on present international organizations rather than more international groups or politics or the like.

Now, I would like to, in addition, underline another very important aspect in our maritime symposium, and that was the opportunity of personal contact and understanding it provided. This East-West Maritime Symposium offered a rare possibility for the Commanders in Chiefs and other naval leaders to get together in an informal, relaxed atmosphere outside the ever curious and nosey publicity of the press and other mass media; and, also free from the rigid formalities and protocol of international diplomacy. We did our best in Helsinki to promote and maintain this state of freedom and a spirit of sincere friendship. I don't think I exaggerate if I say that we succeeded and at least much better than we had expected. Obviously, this aspect was generally enjoyed and highly valued. I regard these personal contacts and the opportunity for private talks as the remarkable feature of this type of symposium.

To conclude this summary report, I think it is appropriate to say a few words about the future of the maritime symposium. It was unanimously agreed among the delegates that this type of symposium must be proclaimed. The seminar groups recommended it in their final reports and gave us a clear opinion that the Second Maritime Symposium had been rewarding and fruitful both as an informal forum for discussions and as a meeting of naval leaders. At the end, it was suggested that I should take care of the continuation of the Maritime Symposium and I hope that there will be an opportunity during this Seapower Symposium to negotiate with the naval representatives concerned about the next Maritime Symposium, and hopefully also to reach some decisions.

Mr. Chairman, my fellow delegates, I hope that you have a general picture of our symposium in Helsinki. I'm convinced, and I think you all will agree, as also Admiral Hayward has stressed, that these international symposia of naval leaders, dealing with the use of our navies to serve the maritime world in peace, are very important now and will be in the future.

Gentlemen, I thank you for your kind attention.

REPORT ON THE NINTH INTER-AMERICAN NAVAL CONFERENCE, LIMA, PERU. Presented by Rear Admiral Julio Guinand, Peruvian Navy, Naval Attache to the United States.

The Peruvian Navy had the honor of being host to the IX Inter-American Naval Conference which was held in the city of Lima during the 23rd to the 27th of August 1978.

The successes achieved at that meeting were numerous, the principal one being, without any doubt, the genuine spirit of brotherhood and sincere purpose of collaboration that is now traditional at these meetings of the highest naval authorities of the Americas.

According to the provisions in the agreement for the Inter-American Naval Conferences, their purpose is to study the common naval problems that are deemed necessary to achieve greater efficiency of the group as a whole and to stimulate permanent professional communication among the high naval commands of the continent.

It was in keeping with said spirit at the IX Inter-American Naval Conference that the naval-related matters were studied and discussed, resulting in the adoption of 27 agreements which are designated as Recommendations. Some of the most important of these are:

—THAT the United States Navy and those of other American countries permit the participation of Bolivian Staff officers, in the capacity of observers, during Joint Operations, while they are embarked in Task Force ships of the United States and/or other participating countries in whatever phase of the operation. This participation will be subject to the prior approval of the navies of the participating countries in said operations.

—THAT an exchange of information take effect concerning the improvement of navigable conditions of international rivers and lakes so as to permit joint actions being carried out to achieve effective navigation of these waterways.

—THAT communication with the Venezuelan Navy be carried on so that at the next meeting of the Directors of Health, consideration may be given to the need for elaborating health programs for the investigation, prevention and elimination of diseases indigenous to the basins of international and frontier rivers.

—THAT the American navies institute in the near future, an Inter-American Naval Conference for Operational Evaluation of Operative Systems. The United States of America was the locale of the first Conference on Operational Evaluation. This conference took place in the month of June at Annapolis with very successful results.

—Annual exchange of information on programs concerning naval civic actions of each of our navies, with an end toward initiating propitious agreements and mutual help, especially between neighboring countries.

—THAT the Specialized Naval Conference on Oceanography, Hydrography, and Research and Development set an early meeting date to consider the aspects presented at this conference by the Venezuelan Navy.

—THAT the navies involved participate in the development of specific research on deep sea diving, evaluation of naval structures and equipment, and ocean dynamics.

—THAT the topic "Joint Action Against the Risks of Contamination Caused by Maritime Disasters" be studied at the next Specialized Inter-American Naval Conference on Hydrography, Oceanography and Research and Development, to take place in Buenos Aires in September 1979, obligating the navies of the member countries to recommend to their government appropriate actions resulting from said study.

—The recommendations of previous conferences were modified and rewritten, as were the rules that govern the Commanders' Conferences.

—Delegate to the Secretary of the IX Inter-American Naval Conference that the Inter-American Committee on Defense be asked to begin study on the elements and methods of logistic support, to be provided by naval bases to Inter-American Naval Forces carrying out operations in defense of maritime traffic, when ships of other nationalities, as well as those from its own country, put into port at those bases. And further, that all the member countries put at the disposal of the Inter-American Naval Forces, their respective naval bases in order to lend logistic support.

—Approve a change in the rules of the Specialized Inter-American Naval Conference on Naval War Colleges for the reconvening of CNIE in accordance with proposal approved by this Committee.

—THAT the American navies adopt a system similar to "HOSTAG" of the United States Navy.

—THAT a meeting be convened on deck to deck Helicopter Operations, in which experts of the American navies in flight safety and helicopter operations will participate.

—THAT the United States Navy prepare an informative presentation on the "HOSTAG" system for the recommended meeting. This meeting took place in August this year in Washington, D.C. with excellent results.

—The Member Navies will judiciously assign a person within their administrative organization the responsibility of updating and managing all the documentation which concerns the Inter-American Naval Conferences and Specialized Inter-American Naval Conferences.

—THAT the American navies prepare a study of the plan presented on the "Exchange of Navy Officials" and send their report on this matter to the Secretary of the IX Inter-American Naval Conference within a period of 3 months.

—THAT the Member Navies of the Conference study the obstacles which impede the efficient functioning of civilian organizations in control of Maritime Traffic—given the fact that their counterpart naval organization has been studied by the Inter-American Committee of Defense and approved by many of the member countries, leaving no doubt that the organization of Naval Control is functioning efficiently.

—Promote among the interested navies, coordination in the control of fishing vessels in wartime, while enforcing the necessary controls in time of peace.

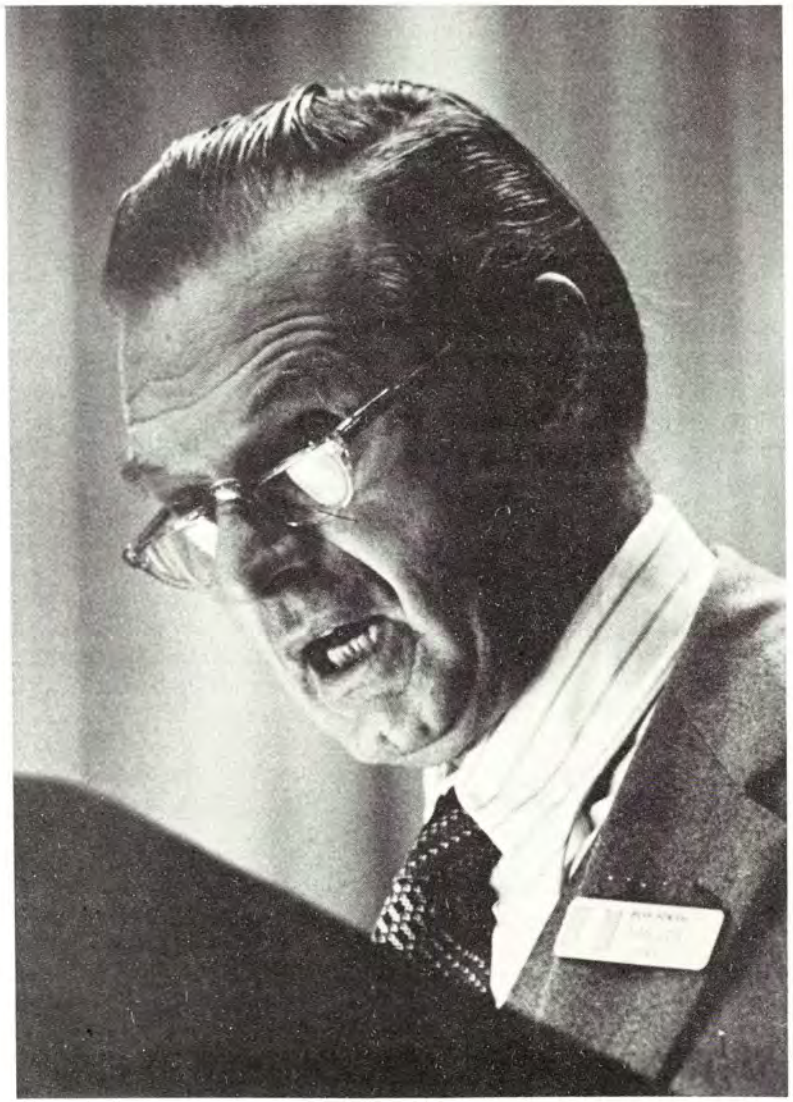
—THAT the host country and locale of the next scheduled CNI be Ecuador, with Venezuela as the first alternate and Colombia as the second alternate locale.

At the present time these Recommendations are being ratified by the navies of the attending countries.

Deserving of special mention at this Conference, as at those previous, is the attendance of a Representative of the Inter-American Committee of Defense and another from the Canadian Navy, invited to attend as observers.

In closing, I wish to point out two statistical facts that will allow us to appreciate the increase in interest and importance of these meetings. The first is that a greater number of topics were presented at the XI Inter-American Naval Conference than at any of the prior meetings; and secondly, it had the largest number of delegates in attendance. Thank you very much.

REPORT ON THE MEDITERRANEAN–SOUTH ATLANTIC REGIONAL SYMPOSIUM, VENICE, ITALY. Presented by Rear Admiral Ferdinando Thaller, Italian Navy, Deputy Chief of Naval Staff for Special Plans.



Admiral Hayward, Admiral Welch, gentlemen. First of all I must express the deepest regrets of the Chief of Staff of the Italian Navy, Admiral Torrisi, who could not be here because of an unforeseen call of the President and the committee. He asked me to convey his greetings to all participants and to bring his best wishes for the success of this Symposium. He wanted me to represent him since I was the organizer and coordinator of the Regional Symposium held in Venice. In passing, I may say, that I'm really glad to take part in this important and stimulating Symposium. I wish to thank Admiral Welch for his most productive and effective support arrangements. Unfortunately, we arrived late, after several hours of delay due to airplane difficulty and we lost our baggage. I apologize that we can't present our slides.

As most of the gentlemen here remember, at the conclusion of the Fourth Seapower Symposium in 1976, the navies belonging to the Fourth Committee (Mediterranean and South Atlantic) moved that the Italian Navy whose representative was chairing the committee, should host a Regional Symposium along the lines of the previous one held in Venice in 1973.

The proposal was readily accepted, government approval was secured and, after a false start in 1977, the 1979 Regional Naval Symposium was born.

For the general information about this event, which turned out, according to the participants, both pleasant and useful, I will briefly touch here on the following items:

—organization and participation
—program and agenda
—comments and results

As far as organization is concerned, work was started in the Fall of '78, establishment of a sort of one-man, part-time, project office. The usual bureaucratic battles were joined and finally, early in 1979, invitations for the meeting were sent to:

—all the navies participating in the Fourth Committee at Newport in 1976;
—all other Mediterranean navies;
—navies not included in these groups, but who were invited to the Regional Symposium of 1973.

The place selected was again, as in 1973, Venice, both for its touristic appeal and the excellent logistic support offered by the "CINI Foundation", a nonprofit organization providing an unsurpassed setting of efficiency and quiet beauty.

The response to the invitation was quite heartwarming.

Practically everybody accepted, particularly the Mediterranean navies. Needless to say we were sorry not to see Libya, who at the last moment could not come because of some problems of government policy.

All the Mediterranean navies participated, all the navies of the Fourth Committee which means Zaire, Netherlands, Great Britain, the Federal Republic of Germany. There were 18 nations in all.

The general theme of the Symposium was "Navies' Contribution to the Solution of Maritime Problems."

For working purposes, the main theme was divided into four topics, one for each day, concerning:

—Maritime environment;

—New national and international legal context for maritime activities;

—The navies' contribution to the solution of maritime problems;

—Technological developments in maritime activities.

Each topic was introduced by a lecture delivered by a guest speaker particularly versed in the field, followed by presentations submitted by the participating navies.

At the end of the working day, a question and answer and discussion period provided the opportunity to exchange ideas and comment on the subject.

Before going into a few details, I will hasten to say that, although it could appear that some of the topics dealt with were beyond the sphere of customary naval activities, we felt that the participants were, first of all, seamen, and as such interested in everything and anything concerning the sea, not only as professional naval officers but also because the sea represents the main avenue of commerce and a source of life and civilization for all mankind.

On the opening day, the maritime environment was discussed with the contribution of a noted Italian marine biologist and presentations by the Tunisian, Venezuelan and French Navies.

A general concern was expressed on the worsening conditions of the seas, particularly in such landlocked areas as the Mediterranean and the Caribbean, both subjected to extremely intensive seaborne traffic, a major part of which is composed of tankers.

Although a note of hope was sounded because, at least in the Mediterranean, things are bad, but not as much as it was foreseen at the time of the last Symposium since there are some signs of a regeneration, there was a consensus on the urgent need of much more stringent measures of control, and on the expanding role of navies in enforcing it.

A number of fields of possible useful cooperation were also explored, from the utilization of interlocked command and control networks for a timely swap of information, to the exchange of technology to devise the best ways to fight pollution.

In brief, there was a general agreement on the extent of the problem and on the ample opportunities existing for navies to cooperate against this extreme danger to all mankind.

The second day was dedicated to the new national and international legal context for maritime activities, introduced by the head of the Italian delegation to the "New Law of the Sea Conference" who spoke on the latest developments on this all important subject, which was also discussed by the Federal Republic of Germany delegates, who presented their viewpoint.

The subject was also treated by the third speaker of the day, a law professor who dealt with the trends of the Italian legislation on maritime environment protection.

The discussion on the new "Law of the Sea," although stressing the existing good perspectives, has shown that a global solution on this critical question is far from close and that some specific questions could be dealt with at a regional level, provided that local agreements comply with principles universally recognized.

The problem of the resources of the seabed is certainly one element of contrast and a delicate point which could generate or aggravate situations of tension.

Hopefully the wisdom of people and governments will always lead to equitable and satisfactory solution, but, undoubtedly, however, such delicate problems could lead to very difficult situations in which the navies could become involved.

On the third day a more closely professional approach was taken, with presentation by the Italian Navy on general naval cooperation in solving Search and Rescue problems; by the Yugoslav Navy on the positive approach taken jointly by Yugoslavia and Italy in maritime matters concerning the Adriatic Sea, particularly in traffic and pollution control; by the British Navy on its offshore activities; by the Spanish Navy on its participation to the international geodynamic project; by the Turkish Navy on its overall outlook on Mediterranean peacetime problems; and finally, by a representative of the International Radio Medical Center on radio medical assistance at sea, its history and perspectives.

The many speakers, that have illustrated the commitments and the contributions of their own navies to peacetime maritime problems, have given us an impression on how widespread and useful are the navies' peacetime activities in support of the maritime community.

The presentation of the representative of the International Radio Medical Center of Rome, whose most important task is the free medical assistance to seamen of any nationality all over the world, was moreover a valid token of human solidarity besides being a useful and effective aid rendered disinterestedly to the international maritime community.

On the closing day, technology was on stage, with a lecture by the Vice Chief of Naval Material Division in the Italian Defence Ministry on the ship system and its evolution, followed by a presentation by a civilian naval engineer on the selection of propulsion system for ships.

A related topic, of deep concern to all of us, was touched by the U.S. Navy representative, who highlighted the main features of a new basic training system—already implemented by that Navy—which could be useful in providing a higher standard of seamanship for naval crews, increasing overall safety at sea.

This last subject—safety at sea—was also treated in another Italian presentation, given by the representative of the agency charged with the harbours and coastline administration.

Finally, the usual farewell addresses followed and, after a sail drill demonstration on board the Italian Training Ship "AMERIGO VESPUCCI," everybody scrambled homebound with, we hope, a fond remembrance of Italy and of the Italian Navy.

So much for the history of the event. Let me now mention a few insights on its significance and draw some conclusions.

First of all, it was established beyond any doubt that, in keeping with age old traditions, navies are still playing a very large role in support of peacetime activities. Moreover, there was a general consensus in the expectation that the scope and extent of this role will be even larger in the future, in connection with the growing importance of the sea and the competition for the exploitation of its resources.

A second point worth mentioning has to do with the recognized capability of naval personnel to communicate and cooperate, owing to a common heritage which automatically establishes bonds above and beyond any racial, political or economical difference; hence, the leading role navies can play in setting up with comparative easy joint endeavours for common purposes.

Last, but not least, most of the problems of peacetime naval activities were seen by all navies with remarkably similar views, geographical, political and economical conditions notwithstanding, and therefore, there are ample grounds to expand the striking examples of cooperation already existing and highlighted during the Symposium.

Did the Symposium bring any tangible results?

Undoubtedly the wealth of information exchanged on various facets of so many problems was important enough. It was also important to recognize the number of connections already existing between navies, and to see the possibilities for quantum jumps in the quality and scope of such connections for the furthering of common interests.

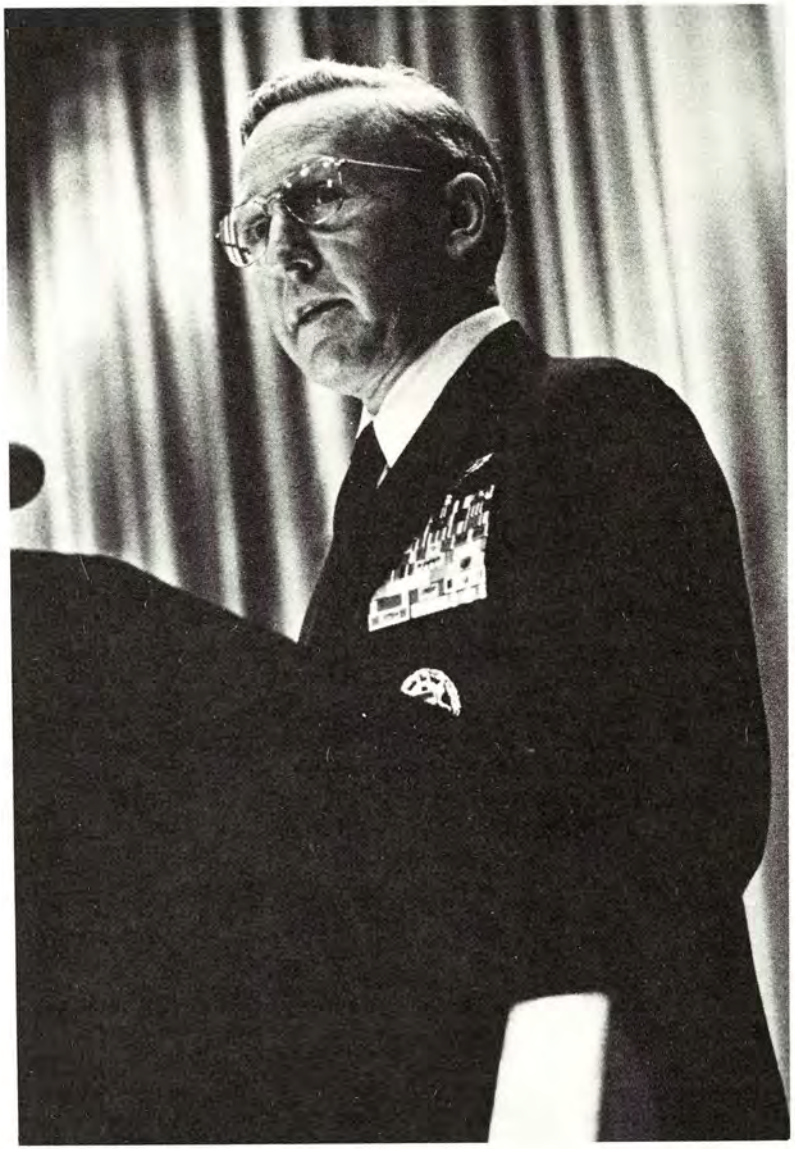
But above all, the immediate, invaluable gain was probably the personal acquaintance—in many cases the renewal of old friendships—amongst so many qualified representatives of the naval profession.

We are firmly convinced that this alone warrants the effort and the expenses for these Symposia, because we all know how much it can mean in the ever tighter web of the relations among nations.

To sum it up, we feel that the Venice 1979 Regional Symposium was a good thing, which prepared the ground for positive developments inevitably to come in a maritime environment calling for an increasing peacetime role of navies.

We feel also that the opportunity to meet personally, made available to so many distinguished sailors, was an invaluable asset, because if it's true that we live in an age driven by technology, it is still men who have to make decisions, and it is what goes on in their minds and hearts which, in the end counts. Thank you very much.

FUTURE ROLE OF MARITIME FORCES. An Address by Admiral Thomas B. Hayward, United States Navy, Chief of Naval Operations.



Thank you, Admiral Welch. Once again, good morning ladies and gentlemen. Listening to the regional reports suggests to me that we will find the opportunity to review many things that we have considered before, and I would hope that we will also explore some new ideas. Perhaps what I can suggest in my remarks will stimulate thoughts about other ideas, as well as highlighting areas of mutual concern. As I considered the future use of our navies and our coast guards, I did not come here to Newport with any delusions about my abilities to forecast the future with much accuracy. Nor did I come here expecting full agreement in any or all of our discussions. In fact, I would be disappointed if we found ourselves in full agreement. Our geographies, our histories, our national characteristics certainly cause us to look at the world through different sets of binoculars, and I would not expect any two of us to have identical views on the broad aspects of economic, foreign, or defense policy which we will be addressing. I would hope that we would be willing to reach out a little bit and discuss our economic and foreign policy interests, as well as our defense interests in peacetime. After all, when two people think exactly alike, that tends to indicate that one person is doing all the thinking. I would guess that we will have quite a number of different views reflected here today and tomorrow.

As mariners we share a common experience and a special responsibility to all mankind. Our understanding and respect of the sea compels us to adhere to a code of mutually understood actions in the way we operate and in the way we provide assistance to those in distress in the harsh and often dangerous environment of the sea. We know that freedom of the seas cannot be taken for granted and that, if lost, it would take years and perhaps even decades to reestablish a stable maritime environment. Some would argue that the very presence of great navies at sea provokes a state of instability and that naval limitations might better serve mankind. I would suggest that such concepts, while theologically intriguing, fail to address the pragmatic conditions of the world in which we find ourselves and ignore the principal lessons of history.

Yet, times are changing, and as seafaring men we should be the first to recognize the changes and the ways in which nations increasingly are dependent upon the seas. As I ponder the role of maritime forces during the next decade, in what we all hope to be a period of peace, I foresee important evolutions in man's use of the oceans, in the importance of the oceans to each nation, and in our roles within that picture. There is no nation represented here which will not feel the impact of the expanding growth of international trade or the basic changes in the structure of that trade—of a new reliance on the oceans as a prime resource in themselves, coupled with a greater collective reliance on seaborne commerce—and, stemming from all of these, of

increased responsibilities of the sea services which are charged with maintaining a safe and secure regime in the world's oceans. If the importance of the world's oceans is changing, we as mariners must recognize the direction of that change, ensure that our governments and our people understand its implications, and modify our roles accordingly.

Of all the activities of man, the marketplace plays a vital if not predominant role today. In our economic transactions it is clear that we are becoming increasingly reliant on each other, irrespective of our national resources of our state of economic development and, one might even suggest, our political alignments. In world trade, for example, we have seen a rise in the value of exports from 56 billion dollars in 1950 to 1.2 trillion dollars today—a twentyfold increase in that period of time. There is no country represented here that has not been affected by this revolution in the world's economy—in some cases profoundly. Even the United States, which admittedly has been uniquely blessed with extraordinary natural resources, is inextricably linked with the well-being of the world market. For instance, today the United States exports 42 percent of the wheat sold on the world markets, 52 percent of the soybeans, and 62 percent of the corn and other coarse grains which go to feed people around the world. Yet, the United States equally depends on the rest of the world to supply it with many of the crude materials used in our industrial plants, manufactured items such as the more than 50 percent of the ball bearings that go into end products, and certainly a growing percentage of our petroleum needs. Similarly, Western Europe and Northeast Asia, which are rich in industrial know-how and human resources, find themselves dependent upon the rest of the world for a large part of their food stuffs, raw materials, and minerals. To each of us then, international trade is not only important, it is basic to economic survival. All of us are more or less dependent upon world trade to satisfy our essential needs.

There is probably no commodity that better demonstrates our interdependence than petroleum. All nations benefit from the line of tankers originating out of the Persian Gulf and the oil fields of Southeast Asia, Africa, the Caribbean, the North Sea, and Alaska. To a very large extent, agricultural productivity and, therefore, the world food balance depend upon access to petroleum. In the United States, for example, we grow three times as much corn per acre as we did 30 years ago, but in so doing, we use four times as much energy in cultivating, fertilizing, and harvesting those crops. I suspect that this is true wherever machines have replaced men and women in the fields.

Another indication of our dependence upon each other is the dramatic increase in world shipping—up 60 percent in tonnage during the 1970 decade alone. Moreover, we calculate that the number of ships crossing the Mediterranean and the Atlantic, Pacific, and Indian Oceans will increase almost twofold by the mid-to-late 1980s. This is a logical consequence not only of increased trade, but also of the proven efficiency of seaborne commerce. At the same time we are experiencing a marked increase in the importance of seabed resources. I can foresee, for example, a maritime environment that features not only ships carrying rare metals and minerals from distant lands, but also scores of ocean platforms seeking to extract new supplies from deep seabeds. We are already there in the case of petroleum.

The future also holds new challenges and opportunities of a political nature, namely efforts by the international community to establish a Law of the Sea regime. We are all aware that there are numerous complicating factors that have inhibited arriving at a solution mutually acceptable to all interested parties, including those of us here. Among the complications is that of the 12-mile territorial seas, which will affect more than 100 straits around the world narrower than 24 miles. Likewise, a 200-mile conomic zone would cover roughly 40 percent of the total ocean area. For its part, the United States does not seek to control these economic resources, nor would we want any other great power to control them. We do believe that all nations must have the right to free navigation and overflight of such regions, free of foreign control, free of substantial military risk, and free of economic or political cost. I do not believe that any maritime nation or any nation dependent upon international trade could ask for less. In due course, I believe there will be a universal treaty with rules that are adequate and satisfactory to all concerned and that such a treaty will open many doors for cooperative efforts by our navies in peacetime. We are likely to see multilateral efforts to exploit the world's oceans and similar efforts to provide a secure and safe environment for such endeavors. Since no treaty will be self-enforcing, I foresee not only a greater role for our navies and coast guards, but also a greater need to consult and cooperate with each other on questions involving international rights, national responsibilities, and operational effectiveness of our forces.

What, then, will be our mutual roles in this world of ocean commerce that I have painted for you, which will grow in complexity and in volume in the years ahead? Obviously, our first responsibility will be the same as it is today, to protect the sovereignty of our individual nations. Even as we seek more and better ways in which to work with each other in peacetime, each of us must always be prepared to deal with a hostile environment. As Raymond Aron, one of Europe's most distinguished philosophers, has enunciated, "If the future belongs not to warriors but to the producers of cars, wheat, and poetry, then the future is ours. But what if the future belongs, as in the past it so often belonged, to the warriors?" The United States looks upon its responsibilities, therefore, in a global context. Our conviction remains that the most logical way in which to address the issue of hostilities at

sea is to be strong enough and powerful enough, in conjunction with our friends and our allies, that there will be no nation willing to initiate hostilities for selfish gains in contravention of the principle of freedom of the seas. We believe it would be a disaster to all our nations if the seas were to become a site of a broad ocean conflict, driving from them the commerce essential to sustain our highly interdependent economies. The forward deployed naval forces of the United States Navy, in addition to supporting our ties of friendship and alliance, are intended to contribute to a regime of stability under which all countries' ships may use the world's seas for peaceful purposes. Looking back over the last thirty-five years, I believe the record shows these forces have been reasonably successful in that regard—in conjunction with the most important contributions made by many of the naval forces represented here today.

As importance of the seas grow, so does the significance of the stabilizing contribution of our navies. An excellent example is represented by the critical oil Sea Lines of Communication emanating from the mideast which pass through the Indian Ocean and on to Europe, the Far East, and the Western Hemisphere. Reflecting on the importance of these vital Sea Lines of Communication, the President of the United States this week announced his decision to increase the U.S. naval presence in the Indian Ocean. The significance of that decision is underlined by the fact that U.S. naval forces are already stretched very thin worldwide in support of our national commitments. So special efforts will be required on our part to maintain the increased Indian Ocean levels in meeting our President's decision. But we are willing—indeed we feel compelled—to do so, because of the importance of an uninterrupted oil flow to the world economy and because of its importance to the well-being of our nations. We recognize that superpower presence in the Indian Ocean is a complex issue, about which there is a variety of views—all of which we respect and listen to. But in the final analysis, it is inescapable that with power goes responsibility—and those nations which have globally deployable naval power and are committed to a regime of stability, security, and peace have no responsible alternative but to deploy that power where it can best promote that kind of regime. Our presence in regions like the Indian Ocean, in other words, is not for the purpose of increasing tension or the probability of conflict, but for the purpose of adding to stability in a worldwide environment that—whether we like it or not—is prone to instability.

This brings me to a related topic which affects all of our services today—the advent of a new form of danger—a new risk to the free use of the seas—the increasingly discussed terrorist threat to ocean commerce. Though that threat has yet to be manifested in any concrete way, it is very plausible, and our merchant shipping is sufficiently vulnerable to such a threat that we must consider it seriously, assess our capabilities to counter that kind of terrorism, and make the necessary plans to control it promptly should it take on an ominous form. One has only to look at the choke points through which our most important merchant shipping must pass to recognize its potential vulnerability to this type of lawless interference. Protection against terrorism will not be particularly easy, for the terrorist, like the guerilla, has the advantage of the initiative. He can select the time and place of his strike. The countermeasures must stress deterrence, as well as the ability to cope with incidents after they have already occurred. I believe the time has come for us to address our mutual interest in this problem, review our individual capabilities for dealing with terrorism at sea, and identify the forms that cooperative measures against it might profitably take.

Other, more traditional dangers of ocean commerce will preoccupy our attention over the next few days as well, such as our contribution to national and international search and rescue operations, our readiness to respond to disasters at sea, and our capability to support international relief efforts. The timeliness of these topics is underlined by the way in which merchant and naval shipping of several of our countries has been involved prominently in the last few months in providing the traditional mariner's assistance to the refugees in South East Asia whose lives are endangered in those waters. As the scope and importance of seaborne commerce increase, the sea services worldwide will face a host of new challenges—more people exposed to man-made or natural catastrophes at sea and greater demands upon our capabilities for assistance in emergencies. None of this will be new to us, since naval and coast guard forces have a long tradition of such operations. But the problems we see ahead will be of greater magnitude and of wider geographic scope than in the past. We must recognize that the larger the volume of traffic, the greater is the likelihood of disasters, as well as the potential consequences of those disasters. Certainly we must be better prepared to minimize their occurrence and must be much better prepared to deal with their results, whether they represent an immediate danger to lives and material or a longer term danger to man and our environment. We are fortunate that these subjects will be addressed tomorrow by Admiral Sir Henry Leach and by Admiral Jack Hayes.

In my judgment, the solutions to some of these problems have become increasingly complex and require an extraordinary degree of international cooperation. Therefore, I believe this opportunity for us to gather here and to examine how our navies and coast guards can work more closely together is an important step in the right direction.

A number of needs come quickly to mind, some of which we have discussed previously in regional meetings and with which we need to press on and make greater progress—more accurate navigation, more

reliable communications, positive control of traffic in ports and in restricted passages. Our sea services must be capable of handling a variety of situations effectively. Individual units must be able to operate independently in small and restricted bodies of water, but they also must be able to operate as a part of a coordinated, multinational formation in open waters. So we need to expand our mental horizons and not be reluctant to look at these old problems in new ways.

The underlying point that I hope I have conveyed to you is the extent to which our economies and our national well-being have become interdependent, and how I forecast them to become more so in the days ahead. They have become interdependent in ways that none of us predicted 20 years ago, or even as little as 10 years ago. We now understand better that the seas play a central role in this historically significant development. All of us have a vital interest in economic stability and progress for our own nations, in the international trade that makes this development progress possible, and most of all in the freedom that we must have in the continued use of these seas in an unrestricted way. We are exposed to many vulnerabilities to that freedom, produced both by man and nature. The navies cannot deal with them all, but no maritime activity will flourish unless the navies of the world do their utmost to provide a safe and secure environment.

We have already begun the process necessary to provide such an environment by our presence here and by the regional symposia that have been conducted over the past two or three years. I challenge the regional committees to continue that process by carefully considering these questions and others that you will raise on your own:

—What dangers to the continuance of peace on the oceans are most likely to occur—and where?

—Which of these would have the greatest impact on world trade—on your own nation's economies?

—What actions might be undertaken to resolve the situation short of conflict?

—What threat does terrorism pose to maritime commerce, and how can we best counter it?

—What man-made and natural disasters are most likely to occur in our various areas? Which would have the most serious effect? What might we do in advance to lessen the probability of the occurrence and to minimize the impact?

Whatever conclusions we reach will be the result of the first and most important step which we have already taken—meeting here together. I believe that all of us can be optimistic about the role and future of navies in a world at peace. Many factors point to a great maritime renaissance at the end of this century. We are driven in this direction by our economic dependence upon each other, the growing value of seaborne commerce to our national well-being, the sheer efficiency of ocean shipping in an energy-limited world, and the growth of activity on and below the seas. Our countrymen will face many challenges on the seas. In these endeavors there will be an important role for small navies as well as for large ones, since small countries may be the first to suffer from any effort to limit the use of the seas.

The opportunities for navy-to-navy cooperation are bright today and will become increasingly important as we seek better ways to cooperate and to use the resources of a constrained world. The fellowship which we develop in these meetings will greatly assist in increasing our understanding of that world and will benefit ourselves, our services, and certainly our own nations. I look forward in the next two or three days to our exchange of ideas. I hope that you will take advantage of this unique opportunity to talk individually, one-on-one, or in small groups where there is a special and vital concern to you. I make myself personally available in those areas where the United States or its Navy has a direct interface with you. I know that such an interchange will be fruitful and beneficial for both of us. For my part, I consider it to be exciting—the professional exchange which I will have with you—the opportunity to be here with you. I believe the topics that we will review over the next two days are very timely. I think we ought to try to fit them in to the perspective of the issues I have just described—so that we identify the problems and hopefully scope out a few of the potential solutions; so that we can walk away from here and go back to our countries and initiate some actions, not just talk about them—not just share views but, in fact, accomplish something constructive.

Thank you very much.

OCEANOGRAPHIC HORIZONS IN THE 21ST CENTURY. An address by Dr. Robert W. Morse, Senior Scientist, Woods Hole Oceanographic Institution, Woods Hole, Massachusetts.

Editorial Note: During the course of his address, Dr. Morse used a number of 35mm slides which most regrettably cannot be reproduced for inclusion with this report.

Admiral Hayward, Admiral Welch, distinguished delegates to this symposium, it's a delight for me to be here to talk for several reasons. First, there is so much going on today in oceanography that is exciting, it is a pleasure to report about it to an audience of this sort. Secondly, I'm pleased to be able to talk to such an influential, international audience because oceanography is probably the most international of the sciences and depends on the cooperation and support and participation of many nations. And finally, I would like to indicate to you the important role that navies have played in the development of the science of oceanography and particularly to acknowledge, in the presence of our Chief of Naval Operations, the large debt that American science owes to the Navy, which for more than 30 years, through its Office of Naval Research, has provided vital nourishment and support to oceanography in this country. As a consequence, not only has science benefited, but there developed in the process a very intimate relationship between the Navy and the American scientific community. This is, I suppose, illustrated by my own career.

The classical naval science one would probably have to say is astronomy. It is natural that a seafarer would be attracted to the study of the stars. Clearly the knowledge of the skies serves the most practical of purposes, since there is no more important task than knowing where the ship is. But, one suspects that a seafarer on a stormy night also admires the tranquility of the stars and, in a sense, is attracted by the predictability and the eternal nature of the skies. In contrast, the ocean itself does not behave in such predictable ways. There is no telescope by which one can look into the ocean and see what's there. There are no tables that predict the future state of the ocean. Progress in oceanography has really awaited modern technology in identifying, in a sense, the variables of the ocean. And so, in contrast to astronomy, the science of the ocean is of very recent origin.

Historically, it's worth pointing out, for example, that it was not until 1866 that a Hydrographic Office was separated from the Naval Observatory in the U.S. Navy. It's fair to say that, and this is an essential point I want to make in my talk, technical and instrumental advances in the last 20 years (in some important ways, the last 10 years) have made it possible for the first time to get the quantity and quality of data needed for basic understanding of ~~processes~~ within the ocean. This fact makes my task difficult because there is so much going on today in the field that I'm forced to be highly selective in what I will discuss. And, it's hard to live up to the title I was assigned when you realize that what I will talk about could not have been talked about, or in some ways even imagined even 25 years ago, and so, it's not easy in an accelerating field to try to project the future very far.

What I would like to emphasize in my talk is how one's conceptions of the ocean have changed, first, relative to 100 years ago, and then

relative to 25 years ago. Alfred North Whitehead once said that, "The universe is not only strange but it is stranger than we can imagine." I want to indicate to you that the ocean, the more one learns about it, is stranger than first thought, and in fact, stranger than one imagines it might be.

I plan to approach the question of future directions in oceanography by dealing with just two important subjects. I cannot deal with more in a brief time. The two subjects I've chosen are first, *ocean circulation*— that is the current systems of the ocean, and secondly, the *deep sea,* that is, the ocean bottom. My plan is very simple: I would like to start by telling you what the concepts of ocean circulation were a hundred years ago, what they were 25 years ago, and what they are today. Later, I shall do the same for the deep sea. Finally, I shall indicate in both cases where the future might lead.

Let me start with Benjamin Franklin's concept of the North Atlantic Ocean and chart of the Gulf Stream. Now, I apologize to those people whose home ocean is not the Atlantic, but what I say about general phenomena applies equally to other parts of the ocean. Franklin's idea, and this was the idea that persisted through the 100 years that followed, was that the Gulf Stream was a river, so to speak, of warm water. It was his view that the Gulf Stream carried warm water to England and Northern Europe and why they had such a mild climate in spite of their high latitudes. We now know that this is not quite true. The Gulf Stream is not such a simple system. It is true that the Gulf Stream brings warm tropical water to northern latitudes, but England and Northern Europe are not warmed by the Gulf Stream but by the warm air masses that move eastward after absorbing heat that's carried north by the Gulf Stream. Now, why there is such a phenomenon as the Gulf Stream is still a source of some debate. Franklin's view was that it was driven by the trade winds. Other reasons have been proposed for the driving mechanism such as the effects of the sun's heat. We believe today that the Gulf Stream results from a combination of thermal forces created by the solar condition, the winds, and by the rotation of the earth. The rotation of the earth is critical to the phenomenon and, in fact, in all oceans, there are strong western boundary currents to be found.

Now, over the years it was never easy, all of you are aware, to measure currents at sea. It really wasn't until the 20th century that a way to estimate currents in the midocean was developed. It was first used in the METEOR expeditions in the 1920s. If one measures temperature and salinity as a function of depth at a series of stations this can be translated to the density field. From the density field, one infers what the currents must be in order to create that distribution of water. So, large-scale currents can be inferred by the thermal and salinity properties of the water itself. Some of the models for

circulation in the North Atlantic which emerged between 1920 and the 1950s, picture the Gulf Stream branching. Much of the water sinks as it cools, returning in a counterflow underneath the Gulf Stream. Thus water being brought north from the Caribbean eventually returns as deep colder water.

Our present picture of this part of the ocean is much more complex than pictured 25 years ago. It is now known that the Gulf Stream really is quite variable, even spinning off pieces of itself which we call "rings". Two kinds of rings can be formed: cold core rings south of the Stream, which circulate counterclockwise, and warm core rings, which form north of the Stream and circulate clockwise. These rings last for months and even years; they tend to move down the Gulf Stream and eventually get reabsorbed in the more vigorous parts of the Stream. Now, it has also been found that this wide area, which in the North Atlantic has been called the Sargasso Sea, really contains a large number of eddies, which are organized circulations of perhaps 100 kilometers in dimension and have time scales of months. These are like gigantic weather systems in the ocean and, in this part of the world, they tend to move westerly and extend to the deep ocean. The source of these

eddies is not known, but bottom topography may play an important role in their creation.

The remarkable fact is that we now know that from an energy point of view the *variable* features of the ocean are more important than the major current systems. It turns out that the current systems contain only 1% of the kinetic energy of the ocean and that 99% of the energy is contained in the variable part, such as the eddies and other phenomena that move around.

I'd like to say something now about the methods by which we've learned about these variable currents. A key development has been current meters which can be moored. It is now possible to put a string of half a dozen of these on a mooring and leave them down for months, or even more than a year, and continually record the current at different depths. Such current meter strings can now be reliably set and brought back from any depth of water.

Another way of measuring current is to put drifters in the water. Indeed it has been a tradition in the sea for many centuries for sailors to put drifters overboard and hope somebody picks them up later, the current being inferred from where the float ended up. Clearly, such a method is not easy to use scientifically because you never recover many of the floats that are launched. We now have floats, however, that can be monitored continuously from land and can exist in the ocean for several years. One of the most interesting floats depends on the acoustic properties of the ocean. I'm sure most of you are aware that the sound velocity in the ocean first decreases then slowly increases with depth, with pressure. This means that sounds made in the deep part of the ocean propagate along rays which do not intercept the top or the bottom. Such sound can propagate across the whole ocean. This phenomenon can be exploited by a spar buoy which floats at a depth of say 500 meters. Attached to it is an underwater organ pipe with a small sound source activated by batteries. This makes signals several times a day which can be picked up from land stations and the buoy followed by triangulation. Such buoys have now been successfully tried for three or four years in the midoceans. What do their tracks look like? Well, it's very complicated and can be appreciated by this slide which shows the paths of a set of buoys that were turned loose in the much maligned Bermuda triangle. The bottom depth is quite uniform in that part of the Atlantic Ocean. Now, these buoys show (and remember they are 500 meters down so these are not surface motions we're looking at) that there are very complex deep motions. The buoys go most anywhere, some go eastward, though most of them drift westward. They even get trapped sometimes by some local effects. You might ask, what is this place where a lot of buoys are trapped for a long time? It turns out there's a bottom feature here (this is off the Blake Plateau) which is still 3,000 meters down. Yet, eddies formed even over that deep bottom feature will cause the buoys to get trapped in them.

Another way to look at ocean circulation that we can use today is by satellite observation. Here I show an infrared satellite picture of the Gulf Stream. One clearly sees the Gulf Stream since it is the warmest water. One can also see a so-called cold core ring which has formed south of the Gulf Stream. You can see where the Gulf Stream is remarkably sharp on its northern boundary and other areas where it's really hard to tell where the Gulf Stream ends.

Now there is only a limited amount of information you can obtain about the ocean from satellite pictures because all you can see are surface temperature differences. But, it is possible now to put in floats that can be followed by satellite. Let me show you the path of a float that was put in that same Gulf Stream ring seen in the satellite picture. The float was tracked for six months. One can see its circular path in the Gulf Stream ring. The general path is downstream; eventually the ring disappeared down here somewhere; the float got trapped in the Gulf Stream. Here is another slide which summarizes the paths of many floats which were let out in the Gulf Stream area. There are three general patterns: a drift out of the Stream to the south, a southeasterly kind of branch and then a more easterly branch. Although you cannot see it here, there are also concentrations where surface floats get trapped for long periods of time over submerged topographical features. The N.E. Seamount chain is out where these buoys are trapped in a kind of eddy over a seamount.

What about experiments in the future? Time constrains me, so let me mention only one, an experiment being planned at Woods Hole which will be done jointly with Scripps Institution. This will take a large piece of a typical ocean, say 1,000 miles on a side, and place in it a distribution of sources and sound receivers. Signals will be sent between all of them and variations in these signals will reflect changes taking place in the ocean itself as eddies pass through. The problem here is the inverse of the antisubmarine problem where the problem is to measure the ocean and try to predict what this is going to do to sound propagation. Here, we're really trying to turn the problem around by learning about the ocean from fluctuations in the sound.

Now, from a naval point of view, I think it's a critical thing to emphasize this change in conception that I've highlighted here. If the variable features of the ocean determine 90% of the character of the ocean and the steady features 10% or less, then there is an effect on naval warfare all the way from the design of weapons to the whole method of an operation. One must take into account the variable features of the ocean; that's the kind of game the ocean plays.

Let me turn to the other subject of my talk—the sea floor. The classical picture of the sea floor is that of a dark and lifeless place where there's no motion. This view was generally held until the great

CHALLENGER expedition of the mid-1870s which changed the view that there is no life at the bottom of the deep ocean. We now know better; the deep ocean is rich in varieties of life if not in quantities. With few exceptions that I'll mention later, sea life on the bottom of the ocean depends on whatever happens to fall down from the top; because the food which reaches the bottom from the top is scarce, there is clearly not going to be very much biological life at the bottom but there's a great richness in its variety.

The first major interest, besides innocent speculation, in what the sea floor looked like came up in the 1850s with a desire to lay telephone cables between continents and across the Mediterranean Sea. Engineers needed to know what the bottom was like for obvious reasons. What's the best route? Is the cable going to be damaged by the bottom? And so, there were surveys made to find out. But one must imagine how difficult it is to sound the bottom of the deep ocean with a manila line. The great naval officer and oceanographer Matthew Fontaine Maury in 1866 made a chart for the U.S. Navy of the North Atlantic Ocean that was based on 150 soundings—all that existed at that time. Surprisingly he did identify part of the Mid-Atlantic Ridge, which was called "Middle Ground".

Mapping the deep sea in any detail awaited the sonic depth finder. The first depth profile across an ocean basin was not made until 1922 when a destroyer steamed from here in Newport to Gibraltar. This involved 900 separate acoustic soundings. In contrast, H.M.S. *Challenger* on its great oceanographic cruise in the 1870s took three and a half years to make 300 soundings by manila line.

Our understanding in any detail of the topography of the ocean floor, on a global basis, dates from no more than twenty years ago. Heezen's topographical map of the ocean floor shows the general features as we know them today. The most visible features are the 40,000 mile ocean ridge system, a continuous mountain range rising thousands of feet above the floor, and the deep trenches which are found around the perimeter of the Pacific Ocean.

But the most remarkable outcome of understanding the features of the ocean floor has been its revolutionary impact on our understanding of the earth itself. We now know that over geological time the earth has been in constant change: That only a few hundred million years ago all the continents formed a single giant continent and, for reasons which are still obscure, broke apart, the Atlantic Ocean being created by the separation of the Americas and Europe and Africa. The evidence indicates the exposed continents to have ages of several billions of years, but no ocean seems to be more than a couple of hundred million years old.

The radical change which has taken place in our perception of the sea floor in only the past 15 or 20 years was well stated recently by Roger Revelle, the former Director of the Scripps Institution of Oceanography. He said:

> The fundamental doctrine of American geology in the late 1940's was that the continents and ocean basins had been permanent features of the earth's surface, almost since the beginning of geologic time. The crust of the earth beneath the sea was unimaginably old, and the continents had always been about where they are today, though they had probably grown in size over several billion years. The differences in elevation between the sea floor and the continents had perhaps slowly become greater over the geologic ages, as the volume of sea water increased. When Harry Hess first discovered the flat-topped sea mounts of the Central Pacific, he thought they must have been slowly submerged over the last two billion years. It was believed that sediments had gradually but steadily accumulated on the deep-sea floor throughout all this time. The most learned and mathematically able geophysicists published conclusive demonstrations that continental drift was impossible, because of the known physical properties of rocks. Now, 15 years later, we know that none of these doctrines even faintly resembled the truth. Far from being as old as the earth, the oldest rocks on the ocean floor are less than 4% of the earth's age. One of our planet's major oceans, the Atlantic, did not even exist 200 million years ago. The six continents we know today were born and attained their present location by the fragmenting of a giant single continent, PANGEA, and the subsequent gradual but steady motion of the fragments in different directions over and through the ocean floor.

In our present picture we view the crust of the earth as divided into "plates," some of which carry the continents. The action takes place at the boundaries between these plates. The midocean ridges we now know is where new sea floor is created by volcanic action. Thus the newest ocean, the Atlantic, is expanding and moving the bordering continental masses (at rates measured in fractions of meters per year) as lava thrusts up from the interior and slowly cools forming the ridges. The Pacific Ocean, in contrast, is shrinking as older ocean floor moves down into the trenches which are boundaries between two plates, one of which is slipping under the other. This "old" sea floor is presumably remelted in the earth's interior.

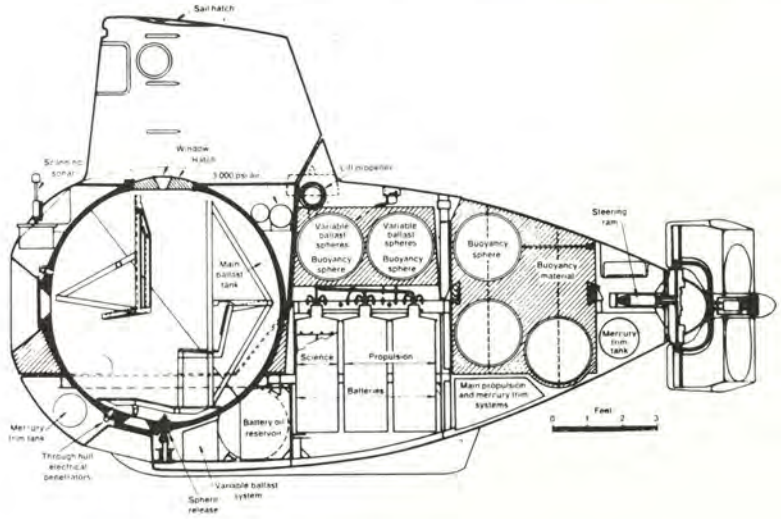
Our detailed knowledge of how the surface of the earth has evolved over the past two hundred million years, what were the times involved, and what were the sequences of events is now fairly well understood and is rapidly being refined by current oceanographic research. The

evidence has come from a variety of sources: by study of the sediments from cores and drilling, by seismic methods of echo-sounding the bottom itself, by our ability to date recovered material, by magnetic studies, by heat flow measurements, and by studies of earthquakes.

We are still far less certain *why* the earth changes as it does; that is to say, we do not understand the driving mechanisms that cause these plates to move with respect to one another. In this respect the ocean ridges are of special interest because here the hot lava of the inner earth reaches the surface. Here creation itself takes place. But only recently have scientists been able to visit these ocean ridges and actually observe in detail what is happening in the volcanic rift valleys which lie along the ridge crests.

Such firsthand exploration has been made possible by the use of deep diving submersibles, of which there are only three or four capable of reaching the ridges. One of these submersibles, *Alvin,* is operated by the Woods Hole Oceanographic Institution; two others have been used by French scientists. Several of the recent expeditions have been cooperative ones between U.S. and French scientists using the submersibles in concert.

Alvin was built by the U.S. Navy's Office of Naval Research for Woods Hole some fifteen years ago. She is carried on a mother ship and can operate for several hours at the bottom. She carries three people and can make two or three knots in horizontal speed. A few years ago her spherical pressure hull was replaced by one of titanium allowing an operating depth of as much as 3,000 meters.



To make a close-up study of a mountain valley some three kilometers deep in the ocean is not a simple task if meaningful information is going to result. Imagine, as an analogy, trying to explore Grand Canyon through a solid cloud cover from a blimp two miles in the sky! Over the past several years a method has evolved for such exploration. Central to it has been the necessity of connecting the local details to the large-scale world; this has been accomplished by developing a navigational net of acoustic transponders which can provide precise positional information in three dimensions. The first step in such a survey is to create a local topographical chart of the region to be explored by means of a precision narrow-beam echo-sounder. This provides the basic road map for the detailed exploration. The next step involves the towing of an instrumented sled just off the sea floor along precisely navigated paths. Thousands of sea floor photographs can be taken from such a sled in order to find the most interesting places for detailed exploration and sampling by the manned submersible.

The first expeditions by submersibles to the ocean ridges took place in the Atlantic in a joint U.S.-French program called Project FAMOUS. The tens of thousands of photographs and hundreds of samples brought back from those dives provided new insights into the geological processes at the spreading center within the rift valley. A characteristic sight was lava pillows.

In the past couple of years, ALVIN has explored some other spreading centers in the Pacific Ocean with results that bear out Whitehead's statement that the universe is stranger even than one might imagine it to be. These expeditions were off the Galapagos Islands (1977 and 1979) and on the East Pacific Rise off the Mexican coast (1979).

The first expeditions by submersibles to the ocean ridges took place in the Atlantic in a joint U.S.-French program called Project Famous. The tens of thousands of photographs and hundreds of samples brought back from those dives provided new insights into the geological processes at the spreading center within the rift valley. A characteristic sight was lava pillows.

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The first unusual discovery was that of new forms of sea life which clustered over hydro-thermal "vents" or hot springs on the sea floor. Later, at the East Pacific Rise location, streams of water as hot as 400°C were found pouring from chimney-like formations on the

bottom. Surrounding these chimneys were rich mineral deposits formed by precipitation from this blackish hot water.

Note to Reader: The talk at this point showed a series of striking slides of both the colorful forms of life found at the lower temperature (20°C) vents, and the dramatic hot water chimneys. These color photographs cannot be reproduced here and so the reader is referred to a recent feature on pp. 680-705 of the November 1979 issue of the *National Geographic* magazine by two scientists from Woods Hole, Drs. Robert D. Ballard and Frederick J. Grassle. This article not only contains the slides shown in this talk but gives an excellent description of the scientific interpretation of the discoveries.

These most recent discoveries indicate dramatically how much our ideas about the ocean floor have changed, not only from one hundred years ago, but during our own lifetimes. The ocean floor is still dark, forbidding and remote. But we know now that it is also a source, not only of life itself, but of the geological forces that move the very continents.

What can we say about future directions of exploration of the sea floor? First of all, we must recognize how little is known. Of the 40,000 miles of ocean ridge, for example, only 40 miles have been seen by man. To explore what remains at a meaningful rate will require new kinds of technological tools which will allow us to use towed instruments with the same information gathering power as the submersible. This undoubtedly can be done since the elements of the technology exist: optical fibres to overcome the present limits of cables, digital color TV (examples of which have already been shown in the slides used in this talk), and computer simulated display so that the outputs of a towed sensor package provide a scientist on the towing ship the same view as if he were at the bottom. Such exploration systems are feasible and should be developed over the next decade.

It is my sincere hope that in this talk I have imparted a sense of how much mystery remains about the ocean. Recent technological advances have changed radically our perception and knowledge; at the same time, however, it is clear that future technology will provide still greater change in our understanding of the ocean.

I hope that it is understood that the science I have discussed comes from contributions of many scientists from many nations. Science is not the domain of any one nation, and, in particular, knowledge about the ocean supports the welfare of all people. I say this particularly since the pursuit of science in the future may be constrained by nationalistic conflicts.

Finally, I would like to emphasize again the important link between

oceanographic science and navies. It has been the experience in this country that vitality in oceanography has been closely linked to sympathetic support and interest by the Navy in basic oceanographic research. This has also paid important dividends to the Navy. Therefore, to those of you who would wish to see oceanographic science strengthened in your own country, I would say that it will be more likely to happen with initiative and support from the Navy.

PROGRESS IN NAVAL CONSTRUCTION. An address by Vice Admiral Kineo Terabe, Japanese Maritime Self Defense Force, President, Maritime Self Defense Force Staff College.

On behalf of the Japanese Maritime Self Defense Force, I would like to express sincere appreciation for inviting the Maritime Self Defense Force to the Fifth Seapower Symposium. It is also my great honor to have been asked to address the subject of "Progress in Naval Construction."

In relation to the theme of "Future Trends in Shipbuilding" which was addressed by Vice Admiral Saito, the Japanese representative to the Fourth Seapower Symposium, I will try to develop further new concepts and techniques regarding Naval Ship Construction, and to probe the possible future problems that may develop.

Vice Admiral Saito discussed historical developments of merchant ships in pursuit of higher economization and naval ships in pursuit of higher performance. He suggested that we may be successful in future developments in progress both of merchant and naval shipbuilding by conquering economic difficulties due to inflation and high wages which currently exist worldwide.

Thereupon, he proposed the following two tentative countermeasures to solve the problems discussed:

First, to make the circumstances of shipbuilding sound and stable by applying techniques learned in the progress of merchant shipbuilding to naval shipbuilding. Also, to apply techniques that were gained in pursuit of higher performance in naval shipbuilding to those of merchant shipbuilding.

Secondly, to clearly define the missions for each free world navy, and to ensure the most desirable mutual cooperation in the development of naval shipbuilding.

In the Second Seminar Committee, several matters were discussed. Among these were adoption of automatic control systems and reasonable reduction of crew sizes. However, in view of damage control, limits to these methods must be recognized for naval shipbuilding.

Problems regarding coastal patrol operations were discussed by participants. It was felt that ship-based helicopters will still perform the patrol mission though speed of the carrier vessel will be slower. Also, merchant ships, after reconfiguration, will be able to carry out limited antimine warfare and/or antisubmarine warfare missions.

Today, I would like to present the doctrine and ideas of naval shipbuilding in the Imperial Japanese Navy and Maritime Self Defense Force. Further, I would like to discuss how we might better construct effective, economic naval vessels for free world nations given current world circumstances.

I should state at the outset that this address offers only my private opinion.

1. Review of the Development of Naval Ships. Prior to World War II, it was always guns that decided the striking capabilities for naval vessels. Through each decisive battle at sea, such as the Battle of Lissa in 1866, Battle of Yellow Sea in 1894, Battle of Tsushima in 1905 and Battle of Jutland in 1916, most navies tried to achieve longer striking power and greater destructive power through the use of larger and larger caliber guns.

This tendency continued until World War II began. In the period

between the First and Second World Wars, the concept of fleet-to-fleet confrontation centering on battleships was the primary naval strategy among major powers. Accordingly, although fleet construction covered a wide range of ships including carriers and submarines, strategy dictated that the highest priority remained with large gun capital ships: battleships and heavy cruisers. During World War II, however, naval air operations displaced gunnery operations and submarines played a remarkably successful role in destroying Sea Lines of Communications (SLOCs).

Naval operations moved into a full-scale three dimensional war. Shipbuilding programs centering on battleships changed to reflect the growing importance of naval air and submarine forces.

At this point, I would like to briefly review the history of Imperial Japanese Navy shipbuilding.

In June 1853, Commodore Matthew C. Perry, Commander, U.S. Fleet, East-India Detachment, initially visited Tokyo Bay in command of four warships.

The Tokugawa Shogunate, who had maintained a peace for about 250 years by the policy of no foreign contact, perceived that the opening of Japan had become inevitable. Accordingly, it permitted large-ship building, which had not been done for over 200 years. The following year, diplomatic relations with European countries were begun.

Japan started to establish a modern navy. In 1860, the Japanese Samurais and sailors accomplished a trans-Pacific voyage to San Francisco in the KANRIM-MARU. Built in Holland, the KANRIN-MARU was a steam-driven 250-ton corvette. In 1866, Japan built its first domestic gunboat. Equipped with a 30-pound gun, it displaced 138 tons. The first naval review in Japan was held in 1868. According to the record, just six ships, totalling 2,452 tons, took part. At the end of World War II, however, 1,400 naval ships totalling over 2.9 million tons had been constructed by the Japanese Navy.

Mahan's strategy influenced not only the United States Navy but also the Japanese Navy, as well as many others in the world. During the Russo-Japanese War, the Japanese Navy's victory over the Russian Pacific Fleet at Tsushima in 1905 resulted in the conclusion of the war with the outcome favorable to Japan. This seemed to be the real proof of Mahan's strategy. Consequently, with great confidence, the Japanese Navy strove for the construction of a fleet with the battleship as the major unit.

Regarding submarines, the Japanese Navy had already started to build some during the Russo-Japanese War. Particularly, since construction of capital ships was restricted by the Washington Naval Limitation Treaty, stress was placed on an expanded submarine building program. The Japanese Navy, however, developed its program with the idea of using submarines only as an element in the fleet-to-fleet confrontation concept. There was little interest in adoption of the role of the German submarines in World War I where they were effectively used in destroying SLOCs. For the Japanese Navy, SLOC destruction by submarines was regarded as a secondary mission.

As regards naval air, in 1912 the first naval aircraft flew in Japan. Ten years later, in 1922, Japan launched HOSHO, the first aircraft carrier in the world designed keel-up as a carrier. In 1937, the Japanese Navy carried out transoceanic bombing missions by navy aircraft which took off from a base on Kyushu, Japan, and flew to China.

This event attracted world attention. It must be specifically mentioned in the naval history that by 1940 the Japanese Navy had already so grown that it was able to organize independent fleet air task forces. But aircraft carriers were not yet considered as the center of naval power. In 1941, the Pacific War started. Significantly, it began by carrier action, a power projection against Pearl Harbor. Admiral Isoroku Yamamoto recognized that the focus of battle had moved from the battleship to the carrier. Yet ironically, the Americans reacted more quickly to the change. During the war, 87% of the Japanese battleships, carriers and cruisers were sunk or damaged by submarines and aircraft. MUSASHI, the largest battleship in the world, was sunk without firing a single round from her jumbo guns against an enemy ship.

In short, the concept of ship construction in the Japanese Navy was concentrated on the idea of fleet-to-fleet confrontation centering on battleships. All types of ships were constructed with efforts to build into them the latest technology that would implement this concept. World War II became not a classic war executed with prepared materials, but rather a total war executed while required war materials were being produced. The concept of Japanese Navy's ship construction pursued only high performance capabilities. This did not allow standardization processes which were essential to mass-production systems. This lack of standardization contributed to the defeat of the Japanese naval forces. The demand for the high performances, focusing only on the striking capabilities, revealed a defense posture that was highly vulnerable. This taught us the lesson that sticking to the concept of ship construction which might be called "one-point concentrationism" or "gun barrel vision" caused a lack of flexibility in preparedness. We could not respond flexibly to the changing aspects of warfare which followed the passage of time and on-going technological developments. A Japanese Navy admiral commented, "It was backward preparedness." We learned that a symptom which shows changes in any aspect of war, even though it may be slight, should not be overlooked and must be correctly judged. We must then dare to change concepts, whether it be strategy, tactics or a ship construction program.

Since World War II, the progress of naval technology has been truly

remarkable. For example;

—developments in nuclear weapons

—increase of ship radius and endurance due to nuclear powered engines

—extension of striking capabilities and improvement of targeting accuracy due to the appearance of missiles

—high capability acoustic and electronic sensors, data processing techniques and fit-out of C3.

—utilization of satellites through developments of space technology.

Nuclear powered ships such as submarines with SLBMs, attack submarines and carriers are or soon will be part of major naval powers inventories. Also, both nuclear and conventionally-powered guided missile cruisers as well as numerous types of conventional guided missile destroyers can be found in the world's navies. Development of high speed missile-capable gun boats has been widespread giving third world countries a new voice in naval affairs.

2. Today's Naval Missions. Before discussing modern shipbuilding concepts, I would like to briefly outline the Japanese view of naval missions as they exist today. Since missions determine ship types, some understanding of these missions is necessary.

In addition to development of science and technology, a new international order in seaborne world trade, exploitation of oceanic resources and a rising oceanic nationalism, has been gradually occurring.

Regarding collective security, the current naval strategic situation is as follows:

First is the fact that traditional utilization of the ocean for sea traffic has risen in importance in spite of development of air traffic. Also, the general concept of oceanic national strategy has become almost indistinguishable from that of continental national strategy.

Secondly, intrusion of seapower by means of SLBMs and cruise missiles has extended deep inland. Thus it has become difficult to draw a distinguishable line between landpower and seapower. It seems apparent that the spectrum of maritime strategy will inevitably be extended and the concept of battle will be changed.

Third, it is apparent that development and exploitation of oceanic resources will continue to grow in importance. Naval missions in peace and war have become more manifold through, for example, protection of continental-shelf resources, protection of fishery, surveillance in economic waters, and search and rescue.

Viewing East-West relations after World War II, Soviet strategy has made a great deal of effort to increase naval strength and to develop seapower. The aim seems clearly to move from a purely continental strategy to one that challenges the U.S. and her allies on all fronts. Soviet naval forces have developed into a first-line navy capable of worldwide deployment. Recent deployment of *Kiev*-class carriers, whatever their ultimate purpose, provide the Soviets with an ideal propaganda tool, especially in the presence role.

The Soviet Navy, as a result of its expansion, has not only strategic nuclear weapons but also conventional offensive capabilities against SLOCs. Both at strategic geographic points and against forward suppliers of vital natural resources, the Soviets have exercised naval presence.

The free nations which must respond to the expansion of maritime strategy and buildup of Soviet seapower are required to maintain strategic supremacy at sea through alliance. Free nations expect the U.S. Navy to provide the strategic nuclear deterrence and the offensive operations including power projection. The navies of allied nations then must maintain the capabilities to ensure the safety of critical SLOCs and to control the sea around their own nations in cooperation with the U.S. Navy.

Keeping in mind, then, that the present situation requires nations to work in alliance to maintain strategic supremacy and that the probable roles of allied nations will be defense of SLOCs and coastal waters, what actions can we take to ensure the optimum type ship is constructed?

3. Concept of Naval Ship Construction. Past trends in naval ship construction show consistent pursuit of high performance in naval ships which brought about more sophisticated and complicated armament.

This resulted in extension of construction dates and soaring ship costs. The rise in material cost and wages further accelerated construction costs. For example, Japanese DDG-type ship cost in 1978 rose to about twice that of the same type in 1971. Such rising costs make it apparent that it is financially difficult for a country to obtain the required numbers of ships in accordance with the past concept of "pursuit of high performance." This problem is serious for the Western Allies who have more budgetary constraints to defense expenditure than Eastern Bloc countries. As a result, the Western Allies, to maintain the required minimum quantity, must endure ships with reduced performance at certain levels. Simply, we are obliged to view the pursuit of performance in the light of a balance between performance and economization.

"Balance between performance and economization" does not mean to build cheap price ships of low performance without considering compatibility, but, rather, compatible ships of required numbers with the most suitable platforms and weapons. These ships must be thoroughly examined in view of cost effectiveness, and usefulness to carry out assigned missions against the estimated threats.

Recognizing that the Western Allies face a dilemma between Soviet naval buildup on the one hand and financial constraints on the other,

what kind of ship should actually be built by them?

In our country, maritime strategy is affected by the new constitution executed in 1947 and previous lessons of the Imperial Japanese Navy. The Maritime Self Defense Force is constructing naval ships for two missions: the protection of SLOCs and the control of Japan's local seas. These missions are in support of the Japan-U.S. security system.

The ships engaged in the first mission—protection of SLOCs—must function to counter the three dimensional threat: air, surface, and subsurface. However, every ship is not required to have a total function. When the task force is organized, it will be enough if it can carry out the required function. Therefore, the operational requirement of each ship is determined from the viewpoint of cost effectiveness to maintain the balance between performance and economization. We must analyze the force structure to fulfill the total force function against the threat. For instance, the plan initiated in 1977 shows that one surface task group of eight ships will consist of 2 DDGs equipped with the standard missiles, 1 DDH with 3 ASW helicopters aboard and 5 DDs with SSMs and 1 ASW helicopter aboard respectively. The information processing systems are installed on both DDG and DDH, making them capable of the tactical information command function of air, surface and subsurface warfare. These ships are High Concept, High Capability ships. But their expense ensures that they will be produced in limited amounts. The DD is capable of antisubmarine warfare, surface warfare and some air defense with the short range SAM. This belongs to the Low Concept, High Economization class.

The ships engaged in the second mission—control of Japan's local seas—are compatible with a single function such as local surface warfare, antisubmarine warfare or antimine warfare because they take advantage of the geographical features and the support of land facilities, air units, etc.

Accordingly, the operational performance requirement of these ships might be simplified to maintain the balance between High Performance and High Economization from the viewpoint of cost effectiveness. For example, in my country, we have 1400-ton class DEs and smaller PT boats. They are also Low Concept ships. The high speed missile boat under current study also belongs to this category.

4. **Rationalization of Naval Ship Construction.** In addition to strictly pursuing the cost effectiveness of the naval ships, it is extremely important to reduce naval ship construction and life cycle cost.

For instance, several means such as improvement of operational availability, manpower saving and rationalization at the time of ship construction or weapons production could be considered.

Especially, the problems of rationalization during naval ship construction and weapons production are matters that are directly related to the construction cost. Solutions to these problems are regarded to be the most possible cost-saving measures for the time being.

Here I would like to discuss the rationalization measures possible during naval ship construction.

a. **Shipborne Weapons**: Since the threats have increased both in size and efficiency, relative improvement of efficiency is also required of shipborne weapons systems. The cost for weapons in total ship cost is increasing in ratio every year. Recently in the case of Japanese DD types, it takes fifty percent of total ship cost. This trend is expected to increase with the progress and development of electronics and software for system design, in particular Combat Direction Systems, Missile Systems and the like.

Therefore, it is extremely important to strictly pursue options from a standpoint of cost effectiveness of shipborne weapons. Judging from the cost ratio shared by weapons in ship construction, we must also reduce costs in the areas of technological development and production progress.

(1) **Technological Development.** As shipborne weapons always require high performance to stand against the threat, up-to-date science, technology and techniques as well as high reliability are required. Because of this, weapons production requires great expense for research and development. It is difficult for most countries to make domestic production today. Presently, in some countries, joint development systems are being established in case of weapons that fill common needs.

Proceeding with this trend further, it is necessary for countries which are able to do so to establish flexible joint systems necessary for technological developments. Such developments can be provided to countries with insufficient capability of making joint developments. This could take forms such as standard high-low patterns of weapons, electronics and so on. Joint developments by advanced countries can be modified to help meet the needs of other countries.

(2) **Production Progress.** Shipborne weapons requirements are relatively few in numbers but rich in variety. This makes it extremely difficult for any one nation to pursue economic efficiency by way of constant mass-production. International cooperation is necessary so that the mass-production methods that will give us cheaper but required products will be adequately developed.

b. **Platforms.** It was one proposal of Admiral Saito that we should accomplish naval ship construction cost reductions by fully utilizing the technology of high economic efficiency that has resulted from our experience in merchant ship construction. On this proposal our research has not yet reached the extent of concrete recommendations. I would like to discuss the problems and possibilities on this matter by placing high emphasis on the present domestic situation in Japan.

(1) **Construction System.** Adoption of so-called mass-production methods is the most efficient way for reducing the price of ships. A Japanese shipyard built approximately eighty cargo ships of the same type in series production. According to the results, series production can dramatically reduce costs. For example, if the cost of 3 items—design, on-the-spot construction and steel materials and stores—are set at 100% for the lead ship, the following savings can be predicted for the 20th ship: for design, a 90% reduction, while on-the-spot construction costs drop 50% and materials 5%. Even if mass-production techniques are not possible, as in case of a few naval ships, it appears that the economic effect which is produced by adopting the concentrated order method to single shipyards is extremely great. Therefore, use of naval ships of one country's design and production or multinational cooperation to develop and build standard type naval ships are two possible ways to effectively reduce shipbuilding costs.

(2) **Shipbuilding Technology.** Much effort is being paid to the rationalization of reducing ship costs in each step of construction, as seen, for example, in computerized design and production processes, unification of materials, improvement of efficiency in production management, and use of labor saving machines in steel and materials production. Compared with merchant ships, however, naval ships require several types of structural materials. For example, although the hull weight of the 5,200 displacement ton DDH presently under construction is about 90 percent of that of the 10,000 D.W.T. cargo ships previously mentioned, the pieces of structural material are almost quadruple. Additionally, each material has complicated configuration and cannot be easily adapted to automated production systems. This makes it difficult to reduce cost by large-scale production. With regard to fitting, naval ships have limits in rationalization of production, as they have to be fitted out with more equipments, lines, pipes and so on in much smaller space than in merchant ships. Because of these limitations, construction technology for merchant ships—a technology whose purpose is to build many ships of simple hull structure—could not be extensively applied. However, even if we cannot realize extensive cost-reduction measures, research into its practice may develop some methods for economization.

More complete studies for efficiency must be initiated, and it is necessary to investigate possibilities for cost reduction in several processes such as design, on the spot production, materials to be used and recheck of materials. For example, a few recommended items are:

—to further promote manpower reduction in production of steel materials (marking, cutting and bending processes, assembly, welding, and pipe-manufacturing.)

—to adopt the general standard materials extensively used by merchant ships.

—to make further research into hull structure to find easier ways to assemble needed materials.

—to further improve production control systems.

Conclusion. I have discussed the concept and technique of economical and effective naval construction during a time when costs are increasing remarkably. Just before I completed writing this address, *Jane's Fighting Ships, 1979-80,* was published. According to this edition, Captain John E. Moore pointed out that the United States and non-Communist powers had allowed their naval strength to slump to a point where they soon would be vulnerable to Soviet blackmail. He warned "the results of that blackmail (could be) deprivation of raw materials, markets and the freedom of those friends who are not strong enough to guarantee their own security." Capt. Moore noted that the Soviets have begun building a large nuclear-powered 32,000-ton warship at Leningrad, which is first of 12 reportedly planned by the 1990s. In spite of land power, the Soviets are rapidly building their naval strength. It seems they are challenging free nations in order to gain strategic maritime superiority.

Sun Tzu, the ancient Chinese strategist, said, "It is a doctrine of war not to assume the enemy will not come, but rather to rely on one's readiness to meet him; not to presume that he will not attack, but rather to make one's self invincible."

This relates to current deterrent strategy, and reminds us not to forget readiness as a defense. Therefore, because today's indecision stimulates aggressive ambitions, and might lead to war, we have to emphasize economic and extensive naval construction.

As you know, Japanese defense policy is unique. But our Defense Agency recently issued "the Mid-Term Defense Estimate." This is our plan to improve Japan's defense capability in the five-year period from fiscal 1980 to 1984. In this plan, the Agency calls for building 39 naval vessels including 16 destroyer escorts and 5 attack submarines, minesweepers and surveying ships, and modernization of 6 destroyer escorts. This plan indicates concepts of our defense posture within the Japan-U.S. security system.

Suggestions discussed today may seem ordinary, and might not be totally new concepts of naval construction, but I am convinced that these could be effective measures against Soviet navy improvements, in particular if free nations cooperate. Although some concepts are unable to be implemented immediately, others could be begun without any difficulty. At this point, positive cooperation and close contact among navies in the free world is essential. This accelerates improvement of mutual understanding and cooperation among free nations, and certainly contributes to form the foundation of promoting mutual security.

It is very meaningful that naval leaders representing many countries

are meeting at this forum today. This symposium provides unique opportunities for frank discussions of seapower, and helps us to improve mutual understanding.

Finally, I would like to propose the following in order to promote inter-navy cooperation.

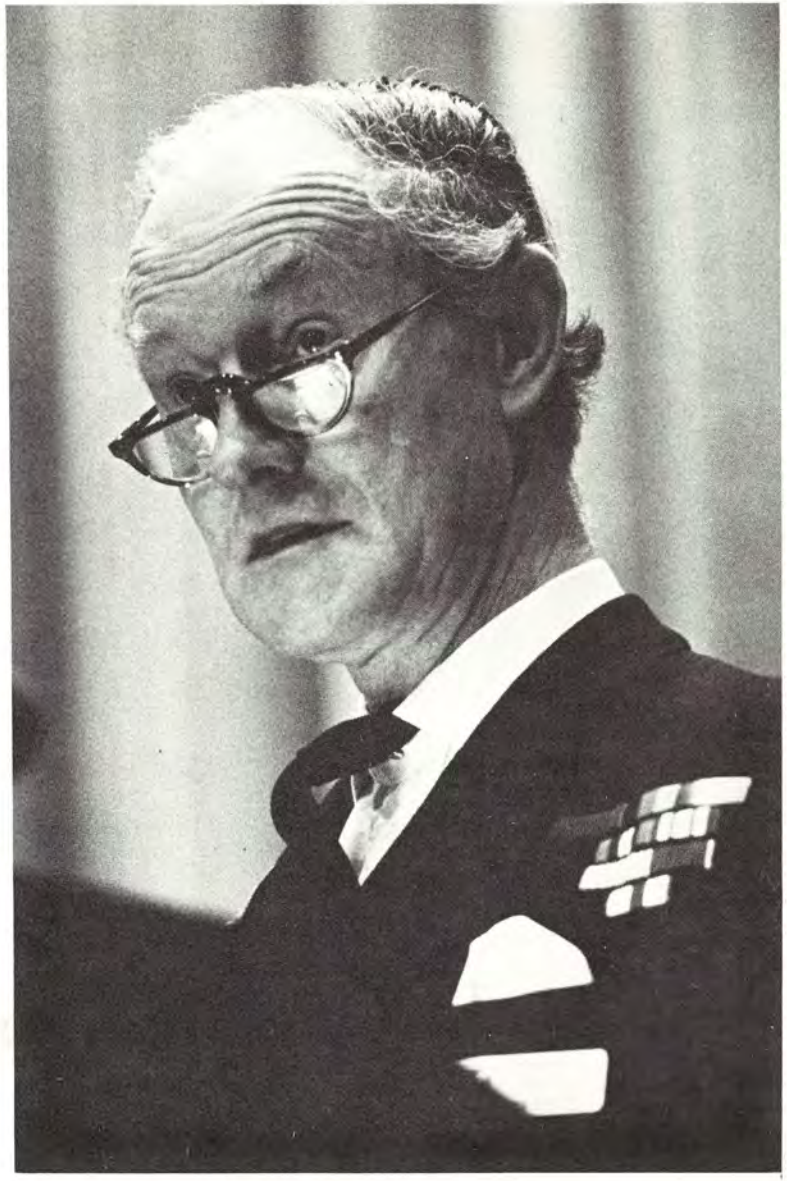
First, student exchange programs and mutual port visits of naval ships.

Secondly, increase of technological data exchange.

Although Japan still has numerous restrictions about international cooperation on defense, we intend to continue making efforts on this point with our goal to be an effective partner in the maintenance of free-world defense.

This concludes my address. Thank you very much for your attention.

PROTECTION OF NATIONAL/INTERNATIONAL RESOURCES AGAINST NATURE AND MAN. An Address by Admiral Sir Henry Leach, GCB, ADC, Royal Navy, Chief of Naval Staff and First Sea Lord.



Chief of Naval Operations, Admiral Welch, Chiefs of Naval Staff, other distinguished colleagues and gentlemen. It is both a great honour and a great pleasure for me to be invited to address you today. I am a little uncertain whether it is an advantage to speak in the morning (when your audience is expected to be awake and the shame if they are not is greater) or in the afternoon (when it is understood that your audience may require a little rest even if they are not actually asleep), and today in addition, I have not been provided with a sitter's stool. However I am fortified by the lecturer who sought the advice of a famous orator on the art of public speaking. The latter replied: "speak as long and as often as you wish and you will quickly develop that natural contempt for your audience which every bore instinctively has."

The title which I have been given is a very broad and general one and the problems which it covers are similarly broad and general. So there is a positive inducement for me to be wide ranging. Let me say therefore, at the outset, that I welcome this opportunity to discuss general issues which, professionally, are of concern to all of us. I shall stick fairly closely to the professional aspects; some of the political issues that arise are of great importance and complexity, but time alone would make it difficult for me to do more than outline areas of controversy. I have also had to resist another temptation: I could cheerfully, and I think interestingly, fill my allotted time by telling you how the Royal Navy and the Royal Air Force have been dealing with the problems that arise in the North Sea and other British offshore areas; it is a practical and demanding example of how to cope, but this is not the occasion.

Let me start by dealing with three general points that seem to me to be intrinsic to the general problems that we all face.

The first point, the nature of the environment, is so obvious and so fundamental that specialists in maritime affairs take it for granted—and usually neglect to mention it. As a consequence, any more general audience fails to be aware of its importance.

It is a simple point to make, that the sea is a very dangerous environment in which to work. It presents a constantly changing pattern of demands on all of us who use it. Conditions can shift and alter with alarming rapidity, and even in good conditions danger is always there—on the sea, under the sea, and over the sea. In all parts of the world, the elemental forces of nature can impose upon us, regularly but unpredictably, struggles to survive which we have to win in order to be able to go on and do our jobs.

We accept such struggles as an undeniable fact; indeed, to meet and overcome them is one of the great challenges that have drawn so many men, and women too, "to go about their business in the great waters." And although we now have many more instruments and tools to help us—from better weather forecasting to all sorts of ship improvements—

the struggles and the challenges remain. The sea is an unstable, infinitely variable and essentially hostile environment, whose power we neglect at our peril.

That brings me to my second point; skills. In order to be able to use the sea successfully we have to develop, and then maintain, skills of a high order. At one level, this means the engineering and scientific knowledge and competence to produce the instruments that enable us to use the sea's resources: the ships, the aircraft, the installations that are now so varied in type and function, the navigational and communication equipment, the life-saving equipment—the list is almost endless, and the growing number of uses to which the sea is being put will make it in the future even longer. The pace of change, indeed, is a major factor in itself, that tests our capacity to innovate successfully.

But over and beyond these material skills there are the personal skills that are necessary. It is the knowledge and the training of the people who use the sea that so often make the difference between mere survival and success; and it is upon the training and development of our personnel that one might reasonably base a judgement about the success of our organisations. Nowhere is this more true than in navies, though it is generally true for all maritime organisations. In spite of all the wonderful inventions and equipments that we now have—and are still promised—the competence and the dedication of our people is a tremendously important concern, that would not only be a vital element in any form of combat, but is a necessary and persistent component in achieving an acceptable level of day-to-day efficiency and safety.

My third general point is that the sea is becomine *more* important to us all rather than *less* important. The passage of resources and materials by sea transport is still of tremendous significance—most of what is important other than passengers, post, racehorses and diamonds still goes by ship—and is a source of trading revenue as well as a source of supply. The resources *in* the sea, and *under* the sea, have assumed a new salience in recent years that is not only of enormous political and economic significance in itself but has very wide, and possibly fundamental, significance for the ways in which the seas are used for all the other purposes which, historically, are more familiar to us.

Let me, for a moment, develop this last point. What in essence has been happening during the last generation is that we have been enabled, through man's inventiveness, to develop the exploitation of the natural resources that biological and geological forces of nature have stored up for us. We can now reach some of them, and we can now win some of them; but we also have to distribute them, use them—and, increasingly, we are becoming aware that we must safeguard them. Fish, oil and gas are the three principal resources that are currently in the forefront of all our minds. Each of them poses a diverse range of commercial, technical and political problems of their own but they will undoubtedly be added to within the foreseeable future. Technology will enable us to extend our reach to the limits of the continental shelf and beyond; and the desires of all our peoples for higher and more assured standards of living will push the need to use these new skills as fast as possible—perhaps even faster than is really necessary.

One of the major problems, therefore, to which we must address ourselves over the next generation is the protection of these resources against waste: against misuse.

I mentioned the distribution of resources. Although the change has arisen from a number of causes not all connected directly with the use of the sea, the pattern of sea trading has altered in a number of important ways in the last two decades. As the pattern of world trade has changed, the instruments by which a great part of the trade is carried out have also altered. New types of ship are one of the most obvious manifestations. The very large crude carriers are not an only example but they are, perhaps, the most dramatic. They have very important consequences, not only for the economics of commercial activity, but also for the extensive, and awful, effects of accident and loss: and for the need, to which I have already referred, to incorporate very high standards of safety and operating efficiency.

Both these sets of changes, the new levels of exploitation and the new means of distribution, have incidentally given rise to demands for investment capital of a size and of a significance in international affairs which, even a few years earlier, would have seemed incredible. Money is, apparently, almost completely soluble in certain types of salt water!

The importance of the materials which are carried by sea; the significance of the resources which are extracted from the sea and from the offshore seabed; and the concentration of investment resources and skills, that has been found necessary to contrive all these activities; combine together to give both an economic and a political prominence to maritime affairs which is of considerable significance to us. For one of the consequences of which we are all very much aware of is that the increase in the number of independent states in the international system, and the technical advances in military equipment and skills, have combined with other factors like the military competition between the great alliances to produce a very large number of navies with effective military capabilities. By no means all of them are "blue water navies" with a long reach; but a great many have at least the potential to be able to engage in effective combat exchanges and to mount credible "sea denial" missions in waters that are important to them.

In short, the sea is now important enough to a large number of states—either for what it brings or for what it promises—for them to want to be able to protect what they see as their interests or to contest

regional and international negotiation about the best ways of relating and reconciling competing national–interests; but the prior existence of a treaty might just reduce the possibility that negotiation would spill over into demonstrations of force.

We run something of a risk, of course, that in seeking such wide agreements, we shall in the end be faced with an environment in which the open and flexible character of the sea as a highway will be restricted. A recent study on "The Future of United States Naval Power" describes the possibility: "The heretofore predictable and benign ocean legal environment seems headed for a future of 'unfamiliar texture'." I think it is still too early to be sure just how thick or unacceptably heavy this texture will turn out in practice to be; but it does seem likely that the shift towards new standards and practices will have some general consequences that are already predictable. The first, which I have already mentioned, is a flurry of diplomatic activity, to specify particular needs and circumstances that are not detailed in any general settlement. If there is no general settlement, the flurry will become an avalanche. The second consequence is, I think, fairly obvious, too. There will be an urgent need for each individual state to reassess what the new situation–either general agreement or the prospect of anarchy will mean for its own policies and objectives, with inevitable consequences for the naval forces of all the countries concerned.

To the extent that all this implies that the importance of the sea in the affairs of the international community has been realised rather late in the day, I think that these possibilities only serve to illustrate my contention that the UNCLOS negotiations are very important; indeed certainly important enough for us to try to procure an outcome with which we can all reasonably live, and work. For I think we share a common interest in accepting that the seas, and the seabed beyond the limits of a reasonable national jurisdiction, are "the common heritage of mankind"; and I hope that we all share a common resolve to play our parts in ensuring that this worthy conception is safely and reasonably maintained, and not abused.

Let me turn now to a particular part of my topic that raises some interesting professional points. The protection of maritime resources against man. I have touched, at a general level, on the need to conserve and properly manage the sea's resources against man's demands, and I should like to emphasise the point that in my view this remains, over the long term, *perhaps* the most fundamental problem of all. I have also mentioned the need for high standards of operating efficiency, and I do not think I need say very much more on this topic than to emphasise that whatever restrictions there may be in the future to navigational freedom because of legal enactments, there are already a significant number of areas in the world where in practice, offshore installations and fixed constructions make safe ship handling a very sensitive and important issue. The characteristics of the natural environment make some of these installations very large and impressive indeed. In the North Sea, for example, one concrete platform displaces over 600,000 tons: other structures have a total height of some 900 feet, and have to withstand 100-foot waves and 150-MPH winds. They function in areas where 270 days of the year are officially classified as bad weather, and they require to be serviced by a constant stream of support ships and aircraft. They take a lot of looking after, and there are a lot of them around; and North Sea is only one example.

There must always be a possibility therefore that they could be damaged, by storm or accident, or even by deliberate action; and the need to be able to take quick remedial action, to save life and contain the consequences of any pollutant damage is an obvious one. This is one of the areas in which not only adequate resources but adequate and well-coordinated planning is necessary.

We also have to take into account the possibility that one of these installations might be seized by force. Here let me make one or two distinctions about the sort of problems that might arise in the establishment, you would not, I think, expect me to go into detail about possible tactical modes of response. From the control point of view, the destruction of any offshore installation is, perhaps paradoxically, the simplest extreme situation with which to deal; search, rescue and repair are immediate local tasks, and determination of cause the obvious command task. Determination of response is a bit less simple! The next most simple category to identify is the multiple occupation (or, indeed, destruction) by the armed forces of another state. It is not an easy situation to deal with; but it is simple to categorise because presumably it is an action which has a discoverable purpose. It would come, I think, fairly high up any ladder of escalating military action between states. The least simple category of action would be a demonstrative occupation by a nongovernmental group of activists–who might be violent or nonviolent in their philosophy. To deal with them effectively creates risks of loss of life and damage and, of course, as we have seen in other, somewhat analogous examples, usually provides a range of opportunities for the dissemination of propaganda for their cause. It is a difficult situation to deal with expeditiously and effectively, because the concepts of rationality and purpose that the two sides in the activity have are highly likely not to be compatible. Hijacking, like terrorism, has a logic of its own; and calls for the type of response which emphasises flexibility of planning and a sensitivity to the particular circumstances of each separate incident. The best way to deal with it remains, in my view, the careful, methodical precautions, of surveillance, patrol, intelligence, good communications and swift reaction, that will ensure, so far as we can,

that it does not take place. But, as I am sure I need not stress before this audience, this calls for the allocation of fairly substantial resources, which have to be conveniently located and constantly exercised. It is a legitimate, and even significant, mission for the Armed Forces of a state; but it diverges, slightly, from the principal functions which we traditionally attribute to defence forces, and in that sense could be a competitor for resources, against more traditional tasks.

I think I have said enough to support the contention, by way of summary, that the new opportunities for exploiting and developing the potentiality of the sea, both as a transport medium and as a resource base, are creating new areas for concern:

—new requirements for international standards of cooperation and

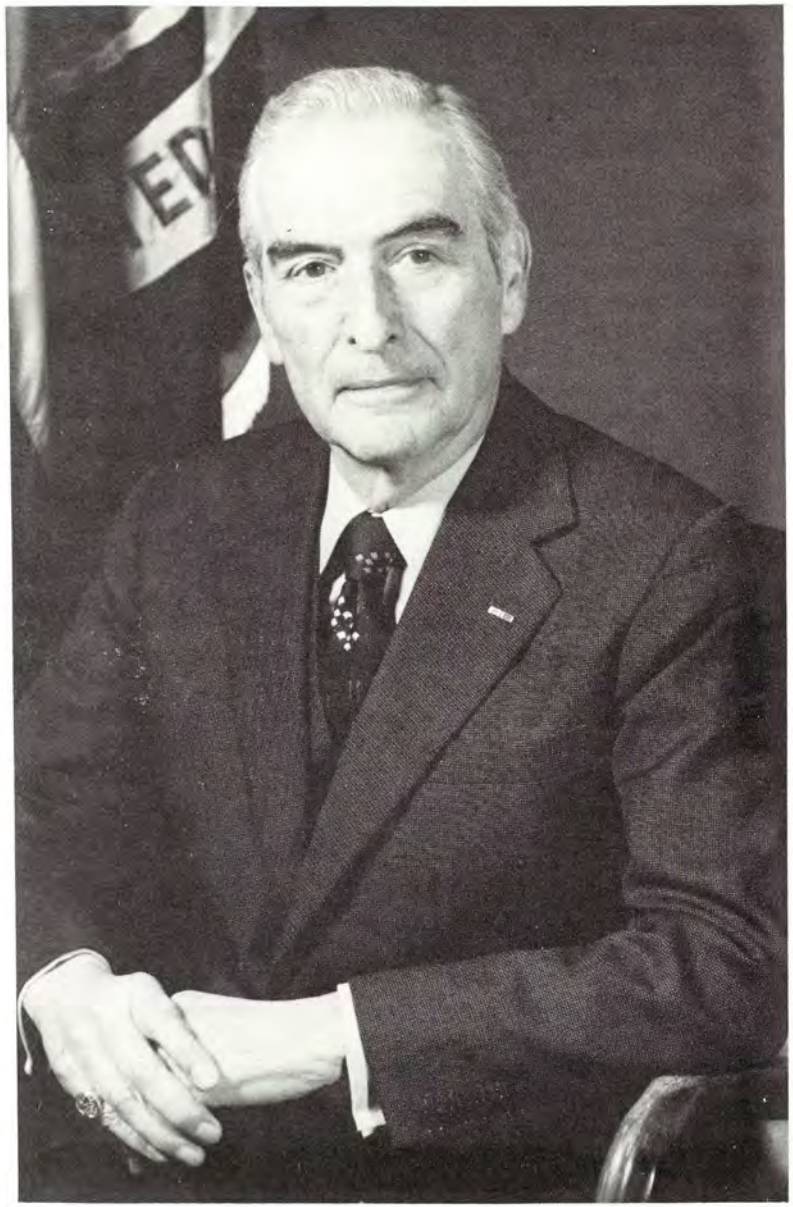
—new risks of conflict.

The hazards of nature are, in one sense, familiar; they present challenges which are quantitatively different but, in essence, they are only enhanced versions of the challenges and dangers which the sea has always presented. The man-made hazards are, however, qualitatively new and many of them come back, in the end, to problems that, being of the tribe of man, we create for ourselves.

And as a final thought.

Quis Custodietipsos Custodes?—Who will watch the watchers? Thank you.

THE ROLE OF NAVIES IN A WORLD OF PEACE. Remarks by The Honorable Edward Hidalgo, Secretary of the Navy, United States of America.



The theme of this Fifth International Seapower Symposium is "The Role of Navies in a World of Peace." At first glance, that theme evokes images of three roles. First, there is the need to protect one's territorial waters and shores and to govern commerce and fishing. Admiral Sir Henry Leach addressed this subject in thoughtful terms just a few hours ago. Second, navies provide relief services when natural disasters, such as hurricanes, strike. The Commandant of our Coast Guard, Admiral John Hayes, will speak to this role this afternoon. I would only note here that Admiral Harry Train—Supreme Allied Commander, Atlantic—has for the past two months devoted many units of his 2nd Fleet to Caribbean duty in order to repair some of the terrible, tragic damage wrought by hurricanes David and Frederick. Third, navies, as well as other military services, provide a nucleus of trained and organized manpower which can further the development of many nations.

It is tempting to speculate that the ultimate role of navies in a world of peace would be: not to need navies at all. That, however, is the folly of unachievable utopia. The principal role of navies in a world of peace is clear: to deter war. Among the 49 nations here today, there are differences.

There are also remarkable similarities. You are all naval officers, sharing a tradition of the sea. You have heard that time and again, you have lived that tradition. You are also all very senior officers, leaders of men and commanders of ships. You know, as guardians of your nations, that you bear heavy responsibilities. Because you speak the common language of naval command, you can talk freely to one another. Such relationships can be of great benefit to our respective nations, emphatically so in times of wars, either for resolving conflict or for working in concert.

On a philosophical plane of the human spirit, there is another characteristic which the maritime nations gathered here also share. That is a belief in the dignity of man and a dedication to the principle of democratic pluralism. Put simply, we differ in our economic system, in our forms of political government, in the color of our skins and the cut of our uniforms. Where we are the same is in our general view about the destiny of man. Think about it for a moment. None among us accepts that the state should unilaterally determine what rights a man does or does not have. None among us seeks hegemony over other nations. None among us professes allegiance to a totalitarian state. Our differences are small when compared to the gulf which divides those who believe in totalitarianism from those who do not.

Since vigilance is indeed the price of eternal liberty, hopefully our navies will remain strong and our alliances and friendships equally so. I look forward to a new and heightened dimension in my close partnership with Admiral Hayward to insure that such strength remains a characteristic of the U.S. Navy. Toward our allies and friends, the

United States, because of its size and the gifts which God bestowed on the nation, will continue, as in the past, to discharge its rightful obligations. The United States also finds itself in a situation of competition (as well as cooperation) with the Soviet Union and with other totalitarian nations. In the maritime arena, because the United States is a maritime nation, with close ties to other nations (which you represent) around the globe, we must maintain naval superiority over the Soviet Union—a *substantial* edge, I might add, of naval superiority when the naval capabilities of our allies are included.

On the one hand, we have no desire to draw others into the U.S.-Soviet competition, such as it is, or to enlarge the arenas of that competition. On the other hand, in the naval arena we intend to have sufficient superiority to deter war and so to keep the peace. Because navies are military instruments, and because there is much written about the American Navy budget, I would like to share with you a few observations about our capabilities.

—At any given time, there are at least two carrier battle groups deployed in the Atlantic and two in the Pacific. These battle groups work in cooperation with other navies. The same applies to our Marine Corps. Last year our marines held joint exercises in 22 different nations. These far-flung joint exercises and training operations are important and will continue.

—The Soviet Union is deploying aircraft carriers and heavy, missile-armed cruisers. Impressive though they are, the Soviet combatants are no match for our battle groups. This is worth bearing in mind if, for whatever reason, Soviet and American naval forces are dispatched to the same area of the ocean during a crisis.

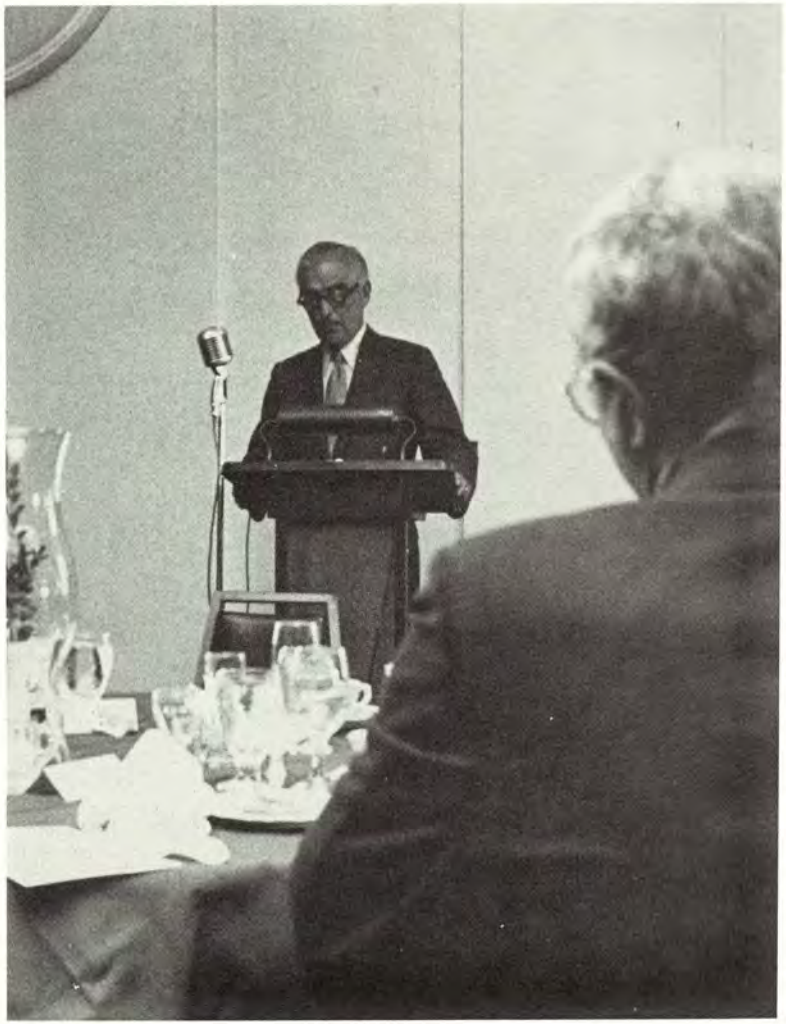
—As many of you are aware, antisubmarine warfare is improving. More than 170 allied frigates are available for convoy protection in a major war. The United States will increase its number of convoy escorts and frigates by 25% in the next five years.

—Less well known are the studies in antimissile defense which are being made. And I don't mean on paper. One system is the DDG-47 class of destroyers. This ship features a phased-array radar which can simultaneously illuminate, even in an electronic warfare environment, many incoming missiles. In partnership with many of you, we are working on a whole series of much less expensive systems to decoy or shoot down smaller numbers of incoming missiles.

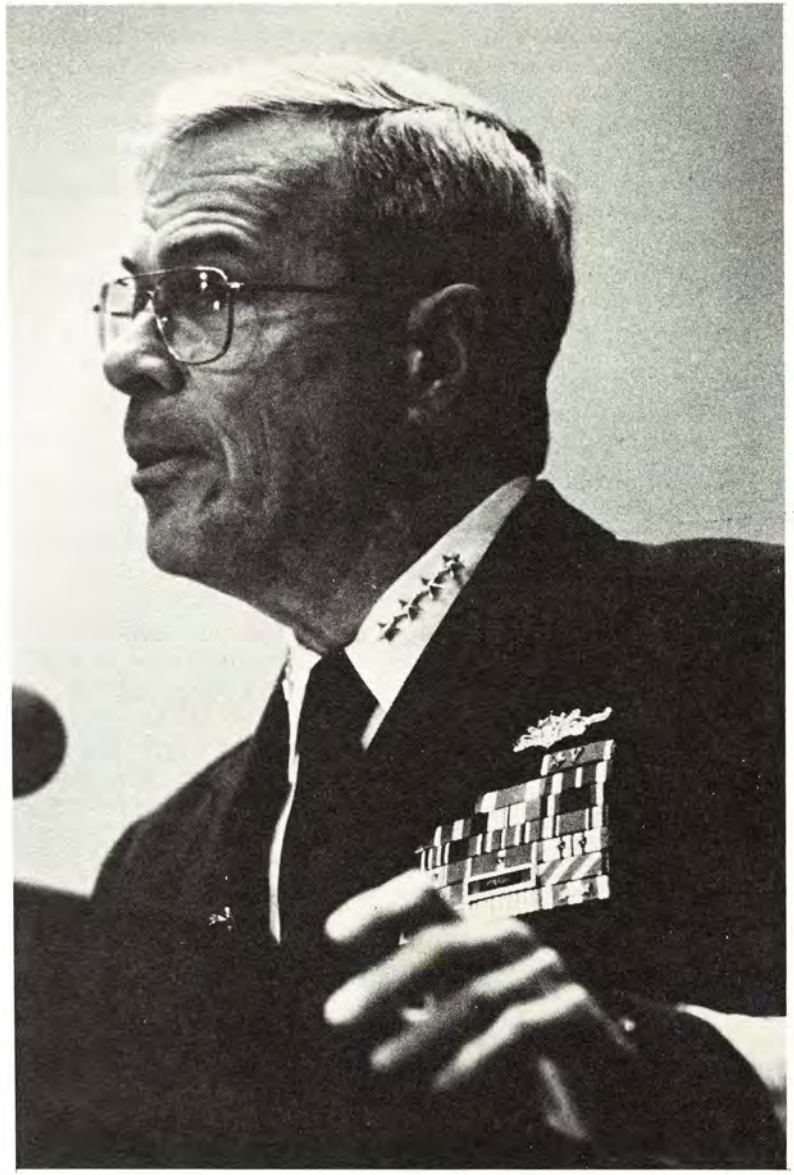
—The Harpoon antiship missile has proven quite accurate and reliable. Even while it is now being deployed in the fleet, we are moving beyond it to a longer-range missile called Tomahawk. In this way, we intend to increase the offensive striking power of the fleet.

In sum, what brings us together is not just an affiliation with the sea or with the gray ships that inhabit the sealanes. We are also united by a profound view about the citizen and his relationship to the state on the one hand, and about the state and the international community on the other.

Since the first role of government is the security of its people, the first role of navies in peace is to deter war. Toward that end the strength of the navy is critical. As Secretary designate of the United States Navy—a navy which acts in concert with your navies—I say to you with the utmost sincerity and conviction that Admiral Hayward and I shall do everything in our power faithfully to discharge our responsibilities in the preservation of our maritime strength.



MUTUAL SUPPORT IN DISASTER CONTROL. An address by Admiral John B. Hayes, United States Coast Guard, Commandant of the Coast Guard.



Admiral Welch, my distinguished colleagues, and fellow sailors. Somehow with an audience such as this, I can't resist telling a story that I think is particularly appropriate.

As coincidence would have it, a good bishop and an admiral both departed this world and presented themselves to heaven at the same time. At the pearly gates, St. Peter sized them up, pulled the admiral aside, and slammed the gate in the bishop's face. As the bishop waited patiently for hours, he could hear all the signs of a large celebration from within heaven's walls—trumpets, angels singing. Several hours later the gate opened and the bishop could see the remnants of the admiral's reception—velvet carpets over gold paving, flowers scattered everywhere, and a light rain of rose petals was still falling. The admiral, wearing garlands of flowers, sat amidst a bevy of angels. As the bishop watched, the admiral ascended up through the layers of clouds. Then, as the attendants cleared the last remnants of the ceremony, St. Peter beckoned the bishop and said: "We are ready for you, your grace." As they proceeded through an opening in the clouds, the bishop saw a very modest receiving line of angels and clerical contemporaries. At this point he got a little annoyed and wanted to know why the admiral had received such preferred treatment. St. Peter's reply was: "We see bishops come through here every day, but this is the first time within anyone's recollection, that we've had an admiral."

Well now with that hopefully *good beginning,* my objective will be to give you a *good ending, and keep them as close together as possible.*

Today I thought I would divide my remarks into three areas—first, describe the dimensions of maritime disaster as a family of occurrences; second, and in that context, portray for you today's Coast Guard and its roles; and finally, try and relate these to world, regional, and national needs.

Whether you look at tanker incidents such as those that have occurred in recent years off the coasts of the U.S., France, Spain, and England, Chile, or Barbados; the havoc in the wake of hurricanes David or Frederick; or the refugee problems precipitated by war or social-economic unrest, disaster in the maritime environment is, by definition, all somewhat relative. I also suggest that disaster needn't include just those things that I've identified. For is it not a disaster when a nation's third largest import business is the illegal inportation of drugs? These are all most certainly areas where mutual cooperation and coordination can be extremely valuable. Whatever the case, I think all of these rather traumatic events, and others that we could identify, have common traits. They either involve the impact of *man upon man, the environment upon man, man upon the environment,* or, in the case of flooding, *the environment upon itself.*

Certainly today's trends in the maritime arena underscore the likelihood of similar and even more complicated events occurring. I

think this is true for many reasons. There will be more people living near and earning their livelihood on the water. The outer continental shelf is under increasing development and, I might emphasize, conflicting use. We have identified some dozen or so activities that are either going on in that outer continental shelf arena, or projected to occur in the coming decade. This morning Sir Henry mentioned a number of those uses. I might add to his list such things as aquaculture, triggered by the need for food throughout the world, scientific research, recreation, and the establishment of certain areas offshore and near shore as sanctuaries strictly for enjoyment by posterity. Intermingled with those diverse uses we will find increasing shipments of hazardous cargoes as part of a growing reliance on maritime commerce. I simply ask you the question. "As that occurs, are we going to continue to be able to have innocent passage of such hazardous cargoes without control, even outside the territorial seas of coastal nations?"

Frankly, as one looks at the strategic and economic importance of certain of these activities offshore, such as the deep-water port that's now under construction in the Gulf of Mexico off Louisiana or the activities of the law-of-the-sea conference, it's clear that such activities, and how we handle the international aspects of them, are going to have a major impact on our future as maritime and coastal nations.

Now, with that as background, let's look at how we go about coping with maritime disaster as far as the U.S. Coast Guard itself is concerned. We go about this in two ways. The first is *prevention.* If we look at the problem of prevention we have such things as the requirement to have Coast Guard engineers approve the design and inspect the construction of hazardous material carriers such as the large liquified natural gas ships which contain such a tremendous cargo of potential energy. Clearly, it must be regulated both from the standpoint of both safety and protection of the environment. We also conduct compliance inspections after the vessel is operational to assure that operating regulations are being complied with. Another aspect of prevention is prediction, such as the activities of our international ice patrol. Here we try to assure that vessels plying the North Atlantic do not suffer the same fate as the *Titanic.* We also maintain certain supporting systems, such as this port access route off Southern California and its complementing aids to navigation, to prevent or at least minimize the risk of casualties. Similar supporting systems include Loran Electronic Navigation and our vessel traffic services.

Obviously, when these preventative measures fail, someone has to respond to the problem that results. Our first reaction of course is rescue. Here too we also have supporting systems. One that has been one of the most cost-effective examples of international cooperation is what we call AMVER, the *Automated Mutual-Assistance Vessel Rescue System.* From the standpoint of response, whether it be a collision incident or a search and rescue case, the crucial factor is managing that effort. Here we make extensive use of what we call an on-scene commander. Today when we are faced with a pollution incident we have increasingly sophisticated and capable equipment at our disposal to contain the pollution and control the effects of the disaster. And sometimes the cure is a rather simple kind of operation such as men and shovels cleaning up miles of beach. However, on balance, when you look at the whole prevention/response posture, and how the Coast Guard goes about it, it clearly involves *the elements of seapower* in the broader sense. It combines assets—ships, aircraft, boats—with a highly sophisticated command and control structure, and a policy umbrella which operates within the Executive Branch of our Government and at the same time encourages disaster prevention and control through international agreements and other coordinating mechanisms. It is indeed a very complex and interesting relationship.

Some of you, of course, will recall my visit to Latin America a year ago this coming December. That visit was partly for the purpose of discussing maritime problems of mutual interest with many of those nations bordering the Caribbean Sea. In particular, how we might better work together in handling the sort of thing that's of concern to us in this Symposium today.

If you look at the Coast Guard, it becomes very apparent that it is a substantial element of seapower. Not only with respect to assets, which interestingly enough make us, in terms of armed vessels, the sixth largest Navy of the world; but also with respect to the impact that we have on our nation's seapower through our regulatory authorities and the activities that we engage in on the outer continental shelf. The other side of that coin is that I think we are, by our very nature, along with our sister services, a major disaster control asset.

If we place the Coast Guard in the bureaucracy of our country, in peace time we're in the Department of Transportation, having moved from the Department of the Treasury about twelve years ago. As one of the five U.S. Armed Forces, during wartime the Coast Guard comes under the operational command of Admiral Tom Hayward, the Chief of Naval Operations; and, interestingly enough, directly under the Secretary of the Navy for those peacetime regulatory functions that remain operative during time of war.

In looking at our missions, I like to divide them into those missions that *provide seagoing expertise,* such as search and rescue, and those that *require seagoing expertise,* such as planning the aids to navigation configuration for a channel or being a watchstander in one of our operations control centers. Although the rescue mission you see here is a rather dramatic view, it's typical of the operating conditions our people on the west coast of the United States have in operating over the

bar with our motor surfboats. This particular boat will turn completely over and keep right on operating. Although it's a very able vessel, I don't envy the coxswains of those boats. And of course it is duties like this, I might add, which provide the Coast Guard with its seagoing maritime expertise. On the other hand, we have such things as operating our vessel traffic service centers and enforcing maritime safety regulations which are part of a broad mix of Coast Guard functions which *require seagoing expertise.* I think it is useful to view our service as having those two broad areas of responsibility.

Very quickly let me tell you about our resources. We are of course, the smallest of our country's five armed forces—about 45,000 people, of which, 38,000 are military. Our current annual budget approaches 2.0 billion dollars, and we operate over 700 shore facilities, spread not only around the United States, but in a number of countries of the world as well. These include 34 major support facilities. Attached to these shore facilities we have about 2500 small boats of various sizes, capabilities and descriptions; 41 medium range fixed-wing aircraft, and twenty-five C-130 long range surveillance aircraft, which is the workhorse of our extended search and surveillance capability. We also have 116 short and long range helicopters and 250 cutters of various descriptions. These multimission cutters have special capabilities that include domestic icebreaking in our rivers and on the Great Lakes, our nation's six polar icebreakers which deploy annually to the Arctic and Antarctic, some seventy-three vessels which service aids to navigation, and certain ships which are outfitted to conduct marine science activities. Finally, and particularly looking to the future, we rely heavily on the ship/helicopter team which we have developed to enforce maritime law and to carry out our search and rescue responsibilities. The Coast Guard combines a multimission capital plant—ships, aircraft and boats—with multimission people who are cross-trained, like the boatswains mate for example. He is not only the coxswain of a boat, but may also be the officer-in-charge of a boarding party enforcing the law, or working on a buoy tender servicing an aid to navigation. When you look at us a combination of prevention and response programs being carried out by multimission facilities and people, it is indeed an interesting blend.

When our safety education programs miss the mark, then a Coast Guard team is ready for the rescue; when our safety systems, like vessel traffic services fail, then people and property are endangered and we are ready to respond. If port safety regulations are ignored, then frequently disaster results and we pick up the pieces. And kind of tying all this together is the military character of our service, which together with our traditional humanitarian concern for others, is what makes us the effective organization I think we are. Finally, and of increasing importance to us, is the existence of a strong Coast Guard Auxiliary (47,000 volunteers) and Coast Guard Reserve (11,700) who supplement our regular operations. We couldn't get along without them. To those nations that do not have that kind of advantage, all I can say is that you have a tremendous opportunity and I encourage you to explore it.

But, what does this all mean in terms of maritime disaster control and seapower? As I see it, all maritime nations have the same basic needs and concerns, and if anything, this is perhaps becoming more true today. Whether we have large assets or modest assets, the aggregate forces that neighboring nations possess are formidable, and can easily be brought to bear in disaster situations in a coordinated and cooperative way. I think therefore, today more than any other time in our history perhaps, the door is open for more effective international cooperation in areas that are truly of mutual humanitarian and environmental concern.

Given the need and capabilities, then, I suppose the question is how do we marry them effectively in today's world? There certainly is no simple answer to that. We have talked about it a good bit in our seminar this morning, and surely the other speakers have touched upon it as well. Both bilateral and multinational agreements immediately come to mind. And although that may sound simplistic, that approach has worked well in such a variety of ways, whether one talks about fisheries, or law enforcement or commercial vessel safety. But we have just scratched the surface; there is so much to be done.

Regional contingency plans for pollution response, for example, would be extremely useful. Sir Henry this morning very correctly pointed out the tremendous diffusion of environmental responsibility in the agencies of government. From our experience, no matter how you are organized, there is a genuine need for a great many interests to be involved. Therefore, one should take advantage of it and treat it as an opportunity, and not as a problem. In our nation we have a national contingency plan which, at both the national and regional level, is now designed to bring together all levels of government in a coordinated response effort. The national response team has a member from each of the major agencies concerned with a major polluting incident. They participate on that team and the regional response team does likewise. We've utilized this organization enough now so that we're convinced of its validity and see no reason why it should not be equally applicable on the international scene. Indeed we already have such an arrangement with Canada and have begun to work on a similar one with Mexico.

I also find that international forums have been quite effective and we should use them more than sporadically. The International Maritime Consultative Organization, which is formally structured and to which I will head the United States delegation this fall, is another medium which brings nations to work more closely together to solve those safety and environmental problems which are international in scope. I

would be remiss, here, if I did not also mention the International Conference on Search and Rescue, out of which has come an International Maritime Search and Rescue Agreement which pends ratification. Certainly that is the kind of thing we're also talking about.

Obviously, with such a variety of nations having separate and different political systems, there are complications in getting together to solve these problems, but I don't see anything in my judgment that can't be overcome. If I were to draw any general conclusions from examining this problem and thinking about it, it would be that the interdependency of the national objectives of the various maritime and coastal nations is, in my view, the most commanding mandate for accepting the challenge and the opportunity that the management of that coastal zone offshore presents; and, I might add, disaster control is only one facet. It seems unlikely to me in today's world that responsible nations, would permit the coastal waters of the world to become the focus of conflict if they can possibly avoid it; although the inherently conflicting uses now present in that arena most certainly sow the seeds for that possibility. It is vital that our major efforts concentrate on those international initiatives which constructively avoid that very kind of conflict, and perhaps, as we build a response mechanism to handle maritime disasters, we can also build the faith, goodwill and lines of communication which may avoid these other kinds of problems. Certainly we can foster participation in symposiums such as this on a regular basis and promote bilateral and multilateral agreements on a regional basis to handle those regional problems.

As a final note, I thought I might comment on the question of what type of organization, Coast Guard or Navy, should be considered as we talk about how to carry out national responsibilities in the maritime arena. I do not intend to recommend a specific solution to that, because I don't think it's really that simple. We were talking about this problem between luncheon and my address. The question was asked, "At what point should a nation consider relieving its Navy from enforcing laws and other coast-guard-like activities, by forming a coast-guard-like organization, and let the Navy devote all of its attention to those activities which Secretary Hidalgo described so well as being the primary concern of a Navy? When is it proper to establish a coast-guard-like organization to handle these separate activities? I suspect the answer is when a variety of things occur. One certainly would be at the point where coast-guard-like activities cease to receive a sufficient portion of the budget. For after all, in the real world, it is resources that make things happen and apportioning available resources has to be a competitive situation in your countries just as it is in our own. The decision most certainly must also respect traditions and political realities. So, I suspect it deals with a number of other very important national objectives that will, of course, vary from country to country. So it is not a simple question and one that we do not necessarily have to deal with here as long as we recognize that responding to disaster is a very logical responsibility, whether we're talking about navies or coast guards. *We* obviously have found that a coast-guard-type organization is an extremely effective way to meet our particular national needs.

As I look into our future, it seems to me that this Symposium series can't help but be a harbinger of closer cooperation and coordination with our United States Navy and with the navies and coast guards of other nations. I truly look forward to that because, through such action, a great deal can be done to keep our efforts reasonably aligned with the national interests of all concerned.

I appreciate very much being asked to be a part of this international Symposium, and I would welcome, to the extent the President wishes to offer me the time, the opportunity to answer any questions that you might have.

Thank you very much.

SUMMARY. An address by Admiral Harry D. Train II, United States Navy, Commander-in-Chief, United States Atlantic Fleet and Supreme Allied Commander, Atlantic.

Admiral Hayward, Admiral Welch, distinguished delegates to the Fifth International Seapower Symposium.

I was honored to be the one selected to sum up the results of this distinguished symposium. In fulfilling my role as rapporteur, I will not lose sight of the fact that the operative word on the part of this symposium is "seapower." It is not "maritime," it is not "naval"; it is "seapower."

In the last two days we have agreed that we find ourselves in a peacetime environment in a world of constant change. We, who have dedicated our lives to the sea, with the attendant planning for defeating an opposing naval force, are faced now with additional missions and problems such as:

—influencing political, economic and military events
—protecting ocean resources
—deterring terrorism at sea
—protecting ecology
—discovering and developing new oil reserves
—losing ships to inflation

I might add, that the United States has lost more ships to inflation than we lost in combat in World War II, and more ships than we lost to naval arms limitations negotiations following World War I.

Because of the rapid growth and technology and trade in the free world, all maritime nations have become economically interdependent. As Admiral Hayward said, international trade is a basic ingredient of economic stability. The role of the marketplace has become dominant.

The 200-mile economic zone claimed by many coastal states does not alter this fact, it reenforces it. More than one-third of the world's oceans fall within currently claimed coastal zones. The exclusive economic zone swallows at one or several points almost all of the major trading routes; encompasses most of the world's fishing grounds, and includes the vast majority of the estimated two thousand billion barrels of oil reserves in the submerged continental margins.

No matter what variant of the Law of the Sea Treaty is eventually agreed upon, one thing is certain—it will not be self-enforcing. Thus, while technological breakthroughs may be shrinking the world, they are also enlarging maritime responsibilities. The protection of ocean bed resources will require an adequate maritime capability.

We have shipped millions of tons of goods for 35 years without undue concern for the safety of their arrival. We have been able to do this because we, as trading partners, share maritime superiority. Therefore, many of our respective countrymen believe there is not a problem. While the duly elected and accountable political leadership of the nations here represented understand very well the political utility of naval superiority, they perceive no clear and present danger demanding the employment of naval superiority. As a result we are in danger of

neglecting to build for the future, because our maritime forces seem adequate today.

The reasons for inadequate investment are twofold. First, all of our various defense budgets are severely constrained by the fight against inflation, by a worsening energy situation and by heavy domestic claims on public funds. Second, within our respective defense ministries, the fiscal priorities discount naval forces.

How did we get ourselves into this position? We, like our naval predecessors for the past 2500 years, have spent the majority of our time responding to the needs of our leaders. We have not had the time to explain to our citizens that maritime superiority guarantees their everyday existence.

We have not developed a maritime constituency to carry the torch for us while we are planning, training, and building navies capable of deterring war and maintaining a strong peacetime naval presence.

One could think we should not have to develop a maritime constituency; that the deeds of the past three decades speak for themselves. As Admiral Hayward said "looking back over the last thirty-five years, I believe the record shows that forward-deployed naval forces of the United States have been reasonably successful in contributing to a regime of stability under which the ships of all nations may use the world's seas for peaceful purposes—in conjunction with the important contributions made by many of the naval forces represented here today." And I should add, like the forward-deployed forces of the Royal Navy under the 19th century Pax Brittanica.

We have done it with such success and so without fanfare that we have been taken for granted. People who call for limitations in naval forces ignore the "essence of history." Historically what we have done cannot be quantified, qualified, placed into a computer or proven by analysis. Therefore, funding becomes a problem.

If we do not have adequate funds, we cannot carry out the additional missions we have discussed this week, let alone our primary mission of deterring war. As Sir Henry said, "there have been significant amounts of investment capital available for certain maritime needs and money is, apparently, almost completely soluble in certain types of salt water." We must insure that some of that soluble capital is invested in the proper mix of navy and coast guard ships. To do this, we must convince the "dealers in public funds" of the absolute necessity of peacetime naval presence.

Of all of our common problems, the most pressing is lack of funding or what inflation does to those funds we do receive. Each of us needs new ships, equipment and better training facilities. We need adequate pay to retain people.

What are the missions which we have to carry out with the limited funds available? As Admiral Hayward pointed out, the first requirement is to protect our nations' sovereign rights. We must insure that Mr. Aron's question is not a rhetorical one. We warriors must insure that our political leaders have a maritime tool at their disposal which will allow them to respond to the full range of threats, from outright military attack to subtle political pressure. Sir Henry painted us a cogent picture of one of these threats in his discussion of maritime terrorism. His requirements for counteraction, you will recall were, "surveillance, patrol, intelligence, good communication and swift reaction." It will take a well-honed maritime force to provide such a capability.

Peacekeeping missions are not, of course, the only source of justification for peacetime naval forces. Disasters, both man-made and natural, will require maritime capability. Every speaker has described the interdependence being forced on all nations by the interlocking nature of our economies, and the resultant increase in our dependence on the sea, not only as a path over which resources flow, but also as a source of the very resources we are dependent upon.

This interdependence has made all of us very sensitive to the results of maritime disasters. Admiral Hayes focused our attention on this important element of seapower.

Maritime forces must provide, and indeed are the only source of, the skills needed to do the disaster control job. Skills, which, as the First Sea Lord pointed out, can only be obtained at sea and which often make the difference between success and failure.

Beyond skills, ships and aircraft are the *sine qua non.* These resources must be of a specialized, yet varied nature. They must include things as simple as a small boat and as complex as command centers capable of coordinating large scale multinational disaster prevention and control efforts.

Dr. Morse described the significant role naval forces play in the unravelling of the mysteries of our little-understood marine environment. The importance of such technological assistance cannot be overstated. For, if we are dependent upon the sea for our economic survival, it follows that a thorough understanding of its characteristics is critical. As the world population grows, the potential for new sources of food from the ocean may be even more critical.

Thus, as maritime leaders, we are presented in peacetime with an even more complex "tapestry" than the simple "war winning" scenarios upon which most of us have heretofore been concentrating our efforts.

One of the difficulties of addressing these problems, not only among ourselves, but also to our various political authorities, is the fact that problems such as these defy quantification.

How can you put a value on the deterrence of a terrorist act? How can you predict the extent of the next natural disaster? How can you explain all the ramifications of not being able to protect maritime

sovereign rights?

If quantification fails us, we need not throw up our hands in despair and allow needed resources to pass us by. We must bring our experience to bear, and although experience cannot be put into a computer, I have found that, more often than not, "gut" reaction, based on experience has been a valid decision-making guide. The analytical community tends to discount this point because the very nature of their business does not allow them the privilege of the experience we have enjoyed as a seafaring men. Thus, the analysts cannot handle history, for they fail to grasp the fact that a weaker force with superior leadership can defeat a superior force with weak leadership.

Let us look then at various means of utilizing maritime forces in a peacetime environment.

In a peacekeeping scenario, maritime forces can provide our political leaders with a unique, subtle instrument of policy only if, sufficient assets are available to allow a choice of action. Let me give you an example from my experience.

When I commanded the United States Sixth Fleet in the Mediterranean, I had two carrier battle groups and an amphibious task force available for use. If a situation developed which required a reaction, both battle groups and the Marines could be ordered by competent political authority to the threatened area, thereby dominating the situation and signaling that a vital national interest was at stake. At the other end of the spectrum, forces could be kept well clear of the area of confrontation signaling that it was up to the parties involved to settle their own dispute. No U.S. Government involvement would be expected.

Between these extremes lay a whole host of maritime options which political decision makers could use. For example, a small "hostage" force could be dispatched to the area to insure that all parties would be aware that U.S. interests must be taken into account.

On the other hand, the mere presence of major portions of the fleet near, but not in the area of interest, signalled our intention to watch the situation while not necessarily committing the government to any specific action.

Therefore, having forces adequate for the task on hand, a government may signal various shades of interest in a situation giving substance to diplomatic peacekeeping efforts. This same approach might be available to smaller navies, which if necessary, could band together to protect a common interest when presented with any of the threats outlined by Admiral Hayward; such as blockade, closing or restricting passages, threats to oil rigs, or threats of terrorism.

As seafarers, the thing we must remember is that we offer the most flexible options to our political leadership. We as naval leaders provide a mobile peacekeeping force that is not available from our army and air force colleagues. When you put one man ashore with a rifle—you are dedicated to your purpose. When you request rights to use a foreign airfield—you are dedicated to your purpose. On the other hand ships may be moved to present a strong presence without the political ramifications of a definite commitment, if that is what the political climate dictates, ships need no clearance from others to sail in international waters of the world. In this regard, we, as naval leaders, must insure that this situation, that is the freedom to operate in the international waters of the world, continues.

Since it was first devised by the Dutch Jurist Hugo Grotius in the 16th century, the concept of freedom of the seas has served maritime nations well. Should this concept be weakened, we will all suffer and unfortunately it will be the small nations which will suffer first. The principle of free transit and innocent passage must be preserved.

As Admiral Hayward told us, "our objective must be a regime of stability in an international situation prone to instability."

Beyond the peacekeeping efforts however, maritime forces can and do play an important role in the disaster prevention and control areas. Admiral Hayes referred us to the unique role of regulator and protector which maritime forces can play. But as Admiral Terabe pointed out such efforts will require specialized forces coupled with the nicest sense of judgment to insure that all the necessary elements can be brought to bear in any given situation.

Too often nations have focused on only one aspect of the problem, such as coastal defense or fishery protection, without realizing that somehow we must make the whole fit into a rational plan.

As a result politicians have allocated assets for exclusive economic zone surveillance, without also providing assets for coastal defense or defense to the nations' vital sea lines of communications.

The high/low concept, which Admiral Terabe pointed out, may offer a cost-effective approach to the problem especially if used in conjunction with other maritime nations.

But whatever solution fits individual national needs best, it is up to us to present our political leaders with positive programs designed to meet the entire spectrum of maritime needs.

The spectrum must include Secretary Hidalgo's three aspects of seapower:

—protection of territorial waters

—provision of relief services, and

—providing a nucleus of trained personnel to help further development of many nations

Our programs must be based on your experience and your skills. There is just no other source. There is no way the analyst can quantify or qualify the 2500 years of our heritage at sea.

Thus, it is obvious that peacetime maritime operations cover vital

and wide-ranging commitments. Meeting them will require an open mind on our part and the development of forces flexible enough to meet our immediate peacetime needs, while at the same time, strong enough to carry out wartime tasks. We must not allow ourselves to be mesmerized by one or two tasks to the detriment of our overall mission, insuring free use of the seas. Admiral Terabe pointed out the pitfalls of "gun barrel" vision. We must remain flexible.

In essence what we have determined here is that with or without a clear and perceived naval threat to our respective nations, there is a need to maintain naval forces strong enough to ensure a level of maritime superiority sufficient to support our manufacturing and trading societies and to protect our resources.

With the rapidly changing events in the world today, peacetime naval presence must be able to cope with adjacent problem areas such as those described by Sir Henry in his phrase "offshore tapestry."

The acquisition of a force capable of carrying out these complex and sometimes contradictory roles will be expensive. A number of possible measures to control costs has been discussed.

Admiral Terabe recommended a high/low mix of force capability and pointed to a number of ways of reducing construction costs such as:

—series building of warships where possible
—modularization of weapons systems, and
—rationalization of construction methods.

In addition, other cost-cutting proposals have been put forward. These include:

—expanding student exchange programs to insure we are aware of each other's national viewpoints
—multinational design of ships and weapons systems
—technology exchange and last, but certainly not least,
—the continuation of symposia such as this.

A number of the committees have also addressed operational considerations with special emphasis on working out basic communications and maneuvering agreements which will allow various national forces to operate safely in response to search and rescue situations.

Such an operational primer must be within this group's capability. For, if nations with ideological differences of the magnitude of the United States and the Soviet Union can agree upon measures to prevent incidents at sea, then we who share a common bond must be able to do no less.

Allow me now if you will, to bring to your attention a possible solution to a problem which has been discussed in almost all of the committees—ship surveillance.

The reasons for surveillance are many including:

—the need to obtain search and rescue data;
—the need to protect the environment against hazardous cargoes and overfishing;
—the need to control the 200-mile economic zone and the need to impede drug runners and smugglers.

Especially vexing to our navies will be surveillance over the 200-mile economic zone. A nation with only 300 miles of seacoast—which is modest compared to the geography of many nations here—faces the task of patrolling 60,000 square miles of ocean. This raises the question: is there not some way we can all live together, and get technology to work for us for a change?

There is a system—as we heard from Admiral Hayes—the automated merchant vessel reporting (AMVR) system, working today on a real-time basis. So the concept of an expanded international ship surveillance system is not farfetched.

The issue here is the real value of real-time ship surveillance on information measured against its dollar cost. This is particularly true since the simpler and less costly the surveillance system, the higher the probability that we can sell the idea to the distributor of public funds.

Real-time surveillance by standard military means would be very expensive. For instance, a radar satellite would cost $5-15 billion.

A much cheaper means might make use of something like positional transponders on all ships, with required check-in to a ground station every 24 hours.

Or, perhaps AMVR should be required of ships as airliners are required to file flight plans. AMVR is now voluntary, but it works and its costs are modest.

The data from any such system must be kept confidential. Otherwise competition among merchant vessels will cause the ship captains not to report their course and destination. While a required AMVR would not prohibit rerouting it would require daily reporting of position, speed, course and possible destination.

A practical reporting and surveillance system may best be done worldwide on a regional basis. A ship which systematically cheated could then eventually become subject to sanctions from a group of nations.

Two of our seminars have recommended that a thorough analysis be undertaken of the monetary cost, feasibility, benefits and drawbacks associated with a required, regional ship surveillance system.

Thus, as your rapporteur, I bring it to the attention of all of us because I believe the idea has merit.

Now the question is: who will undertake the study? If there are no volunteers, we shall perhaps ask IMCO.

In closing, one thing should be borne in mind. It will do us little good, if, while concentrating on our economic zones or disaster relief responsibilities, we do not provide for respective basic military needs.

Weakness remains provocative.

Let us now review the major points of our discussions this week:

—the role of navies is expanding;

—however inflation is making ship construction costs prohibitive

—because we have not fostered a maritime constituency, we are having difficulty obtaining necessary funds

—since we cannot rely on analysis to provide us with arguments to develop this maritime constituency, we must rely on our own experience

—our experience shows the maritime forces provide our political leaders with a unique policy instrument for influencing events

—we cannot provide the forces necessary to influence events unless we can reduce costs

—and finally, without reduced costs we cannot keep our navies strong enough to protect our interdependent trade economies.

Above all, let us not forget the precept given us by our keynote speaker, Admiral Hayward. If we are to continue to provide a stable maritime environment, we must develop a consensus on how to deal with danger from the sea, either external threats or maritime calamities.

Even more important however, we must turn the consensus into action if we are to be successful in our basic mission of supporting our political leaders.

We know a strong peacetime naval presence is hard to quantify: *Now,* we need to insure that our analysts have the benefit of our experience.

We know a strong peacetime naval presence provides political leaders with a range of options which will fit the political requirement: *Now,* we need to remind our political leaders that they will lose this important chess piece if they do not provide adequate funding.

We know a strong peacetime naval presence composed of the proper mix of multimission forces is mobile and self-sustaining: *Now,* we need to insure we get the best mix available within the funding constraints of our respective countries.

We know our continued, combined, peacetime naval presence provides maritime superiority which is necessary to ensure the economic welfare of the free world. *Now,* we need to build the international maritime constituency to articulate the case for seapower. Thank you.

CLOSING REMARKS. Presented by Admiral Thomas B. Hayward, United States Navy, Chief of Naval Operations.

For all of us, I would like to extend to Admiral Train our appreciation for the astuteness with which he coalesced the essence of the speeches that we have heard and the work of the seminar committees. I think that we will all gain much in the days ahead when the work of this symposium is published if we read carefully what Admiral Train has put together for us. I believe that he has summarized the substance of all previous addresses and seminars in a very logical way, which will permit each of us to reassess what we have been doing for these past two days and, hopefully, will lead to action on our part.

If my personal observations and the reports I have received are accurate, the seminars themselves have added to the value of these past two or three days in the sense that there has been a lively exchange on those issues which we had identified as our specific areas of concern. I think we need to assess for our next symposium whether the methodology of this one was right. Did we get the most out of two and a half days of concentrated effort, or is there another technique that might be more useful the next time we assemble? I am encouraged that we did use our time well and that each of you participated actively and aggressively in helping to assess the global aspects of our responsibilities. I appreciate that particular emphasis on your part. The topics that we have discussed will remain with us throughout our periods of responsibility as chiefs of our own navies, holding important positions within our nations as well as our navies.

Our social scientists tell us that the most pervasive characteristic of our age is change, and we have certainly highlighted that phenomenon. The rate of change has been impressive in the last decade. In all probability, it will continue to accelerate in the next decade as nations interact for economic and political purposes—either as individual states or as coalitions of nations. I believe that the challenges each of us faces in our positions of responsibility will become more demanding in the days ahead and will require from us the utmost excellence in the use of our talents and the talents of those who work with and for us.

I have tried to draw several conclusions as I have listened to the discussions of the past two and a half days. From my own assessment I concluded, first, that as professional mariners we have a unique responsibility to educate our public through the media and through our own positions of leadership, and to impress effectively upon the military and civilian leaders in our own governments the importance of our maritime environment for the major issues, vital concerns, and policies of our own nations.

While some of our individual efforts may have been significant, our collective track record has not been particularly impressive. Each one of us, generally, has seen our navies gradually decline in size; I hope not inexorably. We must be effective in using our own wisdom and that of those who assist us. In developing this maritime constituency from our

own people and from our government leaders, we cannot be the silent service.

The second conclusion is that cooperation among our navies will be required to an unprecedented degree in the future, if we are going to produce the kind of secure regime that we have discussed. I would like to make certain that you go away from here convinced that the United States Navy, for one, will do its utmost to cooperate with you, to work with you, to work within our alliances, as well as bilaterally from one navy to another. I hope that you have made the same commitment to yourselves as you have interfaced over this past two and a half days, as you have had an opportunity to establish the personal relationships and rapport that is probably the essence of the symposium. Bureaucratic obstacles should never deter, dissuade, or discourage us.

The third conclusion is that all countries are increasingly compelled to acknowledge that unilateral rights to the use of the seas must be balanced by a clear recognition that we have a *common* interest as well. Hence, we must work together to resolve those common interests, hopefully setting aside selfish considerations where we possibly can. Of course, each of us has a different perspective of our own nations' problems as they relate to the use of the seas—the waterways that constitute either our territorial waters or our international arteries. Somehow we must try to visualize our needs from a common perspective, to the maximum degree possible. We have discussed the Law of the Sea negotiations and their importance. We must solve that issue. We have to go back to our governments and indicate our commitment to work together, to put aside those few things that yet prevent us from agreeing on a common set of understandings that will work for the good of all of us. I think that we as naval leaders have a unique responsibility in that regard.

Perhaps the final conclusion is that the Fifth International Seapower Symposium, like its predecessors, has brought us together in a way that is unique and is important. The progress made here compels us to make certain that we move on and establish a date, not too far away, when we will get together again, recognizing how much value there is to be gained by our personal interchange. This is the right kind of forum for men of our position to get to know each other, to identify issues, and at least to discuss if not to resolve them.

Clearly we owe to you, Admiral Welch, a particular vote of thanks for these magnificent surroundings which you have made available to us and a vote of thanks to your staff members some of whom I hope are here now so they can note our accolades to you. You have done a superb job in making this a comfortable and enjoyable symposium, as well as helping to stimulate our thinking.

We can go away from here satisfied that we have used our time well listening to one another. I believe we also should depart committed to doing something about what we have heard. Our people will commence immediately to prepare publication of the speeches, conclusions, and recommendations of the seminars. We will get them to you as soon as possible so that you, hopefully, will use them to generate action within your own organizations. As the host for this symposium, I commit the United States Navy to address every issue and to generate an appropriate response. We must task ourselves collectively to deal with these dozen or so special interest items that we think are important to us—not set them aside for another three years and then sit back and talk about them again, but return able to report to ourselves what we have accomplished in the interim. Let us see if we cannot do that and make this an even more important symposium than those that have gone before.

I would like to conclude by accentuating seapower and freedom of the seas in our mind's eye as we go away from Newport, because to me that is the essence of our responsibility; that is, the interplay between seapower and freedom of the seas. I believe that it matters not how large our navies are. Each country has special requirements and special interests, whether it's within a few dozen miles of its coastline, a few hundred miles, or thousands of miles. We must have adequate power to control and to influence the use of those waters in ways that are a benefit to mankind. The principle of freedom of the seas is one that must be inviolate. In this audience—considering the responsibilities represented by you as individuals—we have the obligation to insure that no nation or coalition of nations can ever be successful in preventing the free and independent use of the seas by any individual nation. If we are successful in that endeavor, we will achieve our principal responsibility, the stability of the world's oceans. There are times when we are all going to be tested again and again, but the prevention of war is our principal obligation. The winning of war is obviously a necessity if deterrence fails, but let's prevent the wars by assuring that our actions collectively result in the oceans of the world being available to all, at all times. Let's commit ourselves to that principle. If we do that, we will surely insure that peace will, in fact, reign around the world and across the world's oceans. In a period in which there is going to be unprecedented growth and unprecedented responsibility for the oceans of the world to be used for the development of our own countries, we should make sure that his audience pulls together and works together as a body of individuals who influence the world in that direction.

Finally, I would like to extend a special thanks to those of you who had to travel long distances in order to be present. I know that your colleagues have all gained individually from your views, your wisdom. I want to express my personal appreciation for the time and effort it took for you to be here. I wish you Godspeed as you return to your homelands. May we all be together again soon and have an opportunity to keep this dialogue going. Thank you very much.

REGIONAL COMMITTEE COMPOSITION

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Vice Admiral Barroso
Bolivia
Rear Admiral Torrez
Bolivia
Rear Admiral Nunez
Bolivia
Vice Admiral Saboia
Brazil
Admiral Merino
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Chairman:
Major Motta
Panama

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Professor West
United States

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Indonesia
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New Zealand
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Japan

Monitor:
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Brigadier General Mohamed
Somalia
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United Arab Emirates
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Kenya

Monitor:
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Italy
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Italy
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Canada
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Denmark
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France
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United States
Vice Admiral Bryan
United States
Dr. Morse
United States

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Commodore Lutken
Norway

Monitor:
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United States

Recorder:
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United States

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Brazil
Captain Cairns
Canada
Captain Ghisolfo
Chile
Captain Hassan
Egypt
Captain Radicke
Germany
Rear Admiral Safaat
Indonesia
Captain Yehezkely
Israel
Vice Admiral Terabe
Japan
Commander Jo
Japan
Colonel Kok
Netherlands
Captain Grimstvedt
Norway
Rear Admiral Fonseca
Portugal
Commodore Enquist
Sweden
Rear Admiral Suratin
Thailand
Rear Admiral Cooke
U.K.
Rear Admiral Burgoyne
U.K.
Rear Admiral H. Rodriguez
Venezuela
Rear Admiral J. Rodriguez
Venezuela
Lieutenant Commander Diamonika
Zaire
Lieutenant Kinga
Zaire
Rear Admiral Welch
United States

Chairman:
Commodore Enquist
Sweden

Monitor:
Captain Platte
United States

Recorder:
Commander Tschudy
United States

COMMITTEE REPORTS

Committee One: Eastern Pacific, Western Atlantic and Caribbean

Chairman: Major Jose Santos Motta, Panama National Guard.

The Committee listed common problems of the region. Increasing costs of navies was considered a primary problem. The question put to the Committee was, "how to reduce costs between the countries?" Another related question was posed, "Do we need such sophisticated ships?"

Training and retention of key personnel was discussed at length. A general theme was the concern over the number of people trained who then leave the Navy for civilian life. The point was made, that even though expensive, this training was good for countries as a whole. Retention problems as well as the pros and cons of a draft and an all-volunteer force were debated.

Four other topics were considered important: Oceanography, Sea Activities, Patrolling of Territorial Waters, and Use of Navies in Civic Action.

Oceanography. The Committee agreed that this science was in its infancy, with great potential for all nations. The major problem is the extensive cost of equipment. Various nations had shown ingenious solutions to training and recruitment of skilled scientists. The delegates underlined the need for cooperation.

Sea Activities. The focus on this subject was on fishing not on trade or commerce. The Chilean program for training fishermen caught the interest of the Committee and details of the program were promised. The point was made that fish do not abide by geographical boundaries and more information is needed on fish cycles, leading to international agreements not to exterminate vulnerable species.

Patrolling of Territorial Waters. The theme was the prevention of trespass by foreign fishing boats. The main problem is that the 200-mile exclusive economic zones exceed national surveillance and apprehension means. National fishermen could assist in surveillance, but are reluctant to radio in their locations for fear of competition. Satellites are too expensive, long-range aircraft seemed the best surveillance means, but frequently violators escape before a ship can reach the scene. To all countries but the U.S.—which has a Coast Guard—the patrolling of the 200-mile zone is a major *Navy* mission.

Civic Action. The majority view was that, in developing nations, civic action must be part of the military's peacetime role because the Navy has the skilled manpower and equipment to assist society.

Nations cannot afford *not* to utilize these talents while at peace. The point was made that during long periods of peace the military is well-advised to show the government it is earning its keep.

A minority view was that expensive naval platforms require continuous and arduous training. It is a misuse of this valuable equipment which will lead to its inefficiency if dedicated to civic action. In an emergency, such as an earthquake, all military assets would be mobilized. But on a daily peacetime basis, a Navy procured for the deterrence of war and the protection of a country should not be assigned to the quite different mission of civic action. If civic action is the major goal then less expensive equipment and training are needed.

Freedom of the Seas. Key points included:

—International law is necessary because, "before the law" all nations, large and small, are equal and must abide equally. The problem with endorsing the slogan of "freedom of the seas" is that it becomes just a slogan. There must be equality and freedom by even-handed laws. For instance, a South American nation is not free to extract oil from the North Sea.

—How to apply "the right of innocent passage" to dangerous cargoes, such as oil tankers in hazardous waters, was acknowledged as a growing problem.

—Concerning exploitation of sea resources, one suggestion was that a variable territorial limit be established for fish corresponding to the migration patterns of fish. But a fixed territorial limit be set for sea resources, such as oil, which cannot be replenished or which are stationary.

—A 200-mile economic zone has become a fact of life. So when we

refer to a "common heritage of the sea," that quote should apply to common sharing *beyond* 200 miles.

—One nation distinguishes between a claim to the sea bed platform out to the 100 fathom curve and a claim for resources in the sea out to 200 miles.

—Search and Rescue (SAR) is a classic task involving international cooperation. The U.S. Coast Guard devotes 18% of its resources to SAR. The interdiction of drugs and other law enforcement issues flows from SAR. Computers linked to the Automated Merchant Vessel Reporting System (AMVR) has simplified the task of SAR for individual nations and has improved the safety of merchantmen at sea.

—To help SAR, all ships going to sea should be *required* to have proper communications.

—Accidents to small boats are going to happen and navies will continue to help them. It is at times a frustration to navies—but it is appreciated by those who sail in small boats! Insurance policies to cover the charges of rescue for small boats would be too expensive.

—In the future all nations may require, as is the case with airliners, an "IFF" electronic signature for all ships. Tracked by satellites, this system would give real-time positions of all ships at sea, limiting incursions by drug runners, smugglers and illegal fishermen. International participation would greatly reduce the cost to individual nations.

—Protection of offshore assets against terrorists centered about oil rigs and stopping large ships. It was noted that the U.K. has a special unit of Marines for the task. Efforts to board a large ship underway without permission often require shooting, which one would prefer not to do. For the U.S. Coast Guard, the rule is to report the violation to the country of origin if a vessel will not stop. It was noted that this same note of protest may not work for smaller nations.

Summary and Major Recommendation. The major issue discussed was ship surveillance. Real time surveillance by standard military means would be very expensive. For instance, a radar satellite would cost $5-15B. Software for computers now costs ten times that of hardware.

A much cheaper means would be LORAN-C transponders upon all ships, with required check-in to a ground station every 24 hours.

The issue is the value of real time ship surveillance information measured against its dollar costs. This is particularly true since the simpler and less costly the surveillance system, the higher the probability that those breaking the law can evade it.

The reasons for the surveillance system are:

(1) search and rescue data,

(2) protection of the environment against hazardous cargoes and overfishing,

(3) control of the 200-mile economic zones,

(4) impediment to drug runners and smugglers.

The Automated Merchant Vessel Reporting (AMVR) system is working today on a near real-time basis. So the concept of an expanded international ship surveillance system is not farfetched. AMVR should to be required, not voluntary. The software has been smoothed out and is available. Its data *must* be kept confidential. Otherwise competition among merchant marine vessels will cause ship captains not to report their course and destination. In fact, many merchant vessels do not know where they are going because, even during voyage, the cargo may be sold and resold. Nevertheless, at any time, a ship's master has a course he is following and a destination. A *required* AMVR would not prohibit rerouting, it would require daily reporting of position, speed, course and probable destination.

A practical reporting surveillance system may best be done worldwide on a *regional* basis. A ship which *systematically* cheated would then eventually become subject to sanctions from a nation or group of nations.

Consequently, Seminar One recommends that a thorough analysis be undertaken of the monetary costs, feasibility, benefits and drawbacks associated with a required, regional ship surveillance system.