FEDERAL HYDROGRAPHY PROGRAMS

OVERSIGHT HEARING

BEFORE THE

SUBCOMMITTEE ON FISHERIES CONSERVATION, WILDLIFE AND OCEANS

OF THE

COMMITTEE ON RESOURCES
HOUSE OF REPRESENTATIVES

ONE HUNDRED FIFTH CONGRESS

FIRST SESSION

ON

THE EFFECTIVENESS AND FUTURE OF THE FEDERAL HYDOGRAPHY PROGRAMS

APRIL 24, 1997—WASHINGTON, DC

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CONTENTS

	Page
Hearing held April 24, 1997	1
Statement of Members:	
Abercrombie, Hon. Neil, a U.S. Representative from Hawaii	2
Miller, Hon. George, a U.S. Representative from California	3
Saxton, Hon. Jim, a U.S. Representative from New Jersey; and Chairman, Subcommittee on Fisheries Conservation, Wildlife and Oceans	1
Young, Hon. Don, a U.S. Representative from Alaska; and Chairman, Committee on Resources	3
Statement of Witnesses:	
Amory, Capt. L.D. Rick, American Pilots Association	17
Prepared statement	58
Borrone, Lillian C., Director, Port Commerce Dept., The Port Authority of New York and New Jersey (prepared statement)	122
Bossler, Rear Adm. John D. (ret.), NOAA (prepared statement)	112
Castellano, Cosmo, Program Manager, SmartBridge, Lockheed Martin	12
Du Moulin, Richard, Chairman, International Association of Independent Tanker Owners	27
Prepared statement	95
Evans, Dr. David, Deputy Assistant Administrator, National Ocean Service	5
Prepared statement	138
Grabowski, Dr. Martha, Member, National Research Council Marine Board	23
Prepared statement	71
Supplement to statement	77
Josephson, Diana, Deputy Undersecretary for Oceans and Atmosphere, Department of Commerce	4
Prepared statement	34
Morton, Dr. Robert W., Vice President, Marine Systems and Surveys Operation, Science Applications International Corporation	19
Prepared statement	63
Provo, James S., Senior Vice President, T. Parker Host, Inc.	21
Prepared statement	67
Spence, Capt. Michael C., Alaska Coastwise Pilots Association (prepared statement)	110
Thomas, Captain Arthur, Chair, Harbor Safety Committee of the San Francisco Bay Region	25
Prepared statement	87
Travis, Will, Executive Director, San Francisco Bay Conservation and Development Commission, State of California (prepared statement)	105
Additional material supplied:	
Commerce Department: Vessel leasing	16
Lockheed Martin Demonstration Chart Technology	51
Communications submitted:	
Bettinelli, Capt. Louis (Interport Pilots Agency): Letter of April 18, 1997, to Hon. Jim Saxton	120
Daly, Thomas F. (NJ Board of Commrs. of Pilotage): Letter of April 18, 1997, to Hon. H. James Saxton	125
Deane, Robert and William Sherwood (United NY & NJ Sandy Hook Pilot's Benevolent Assn.): Letter of April 29, 1997, with attachments to Hon. Jim Saxton	127
Kellogg, Captain Ted: Memorandum of April 15, 1997, to Hon. Don Young	141

Page

Communications submitted—Continued

McGovern, Andrew (Port of NY & NJ): Letter of May 1, 1997, to Hon. Jim Saxton 126

Moore, Capt. R.A. (NY Harbor Pilot): Letter of April 18, 1997, to Hon. Jim Saxton 121

FEDERAL HYDROGRAPHY PROGRAMS

THURSDAY, APRIL 24, 1997

HOUSE OF REPRESENTATIVES, SUBCOMMITTEE ON FISHERIES CONSERVATION, WILDLIFE AND OCEANS, COMMITTEE ON RESOURCES,

Washington, DC.

The Subcommittee met, pursuant to call, at 2:00 p.m., in room 1334, Longworth House Office Building, Hon. Jim Saxton [Chairman of the Subcommittee] presiding.

STATEMENT OF HON. JIM SAXTON, A U.S. REPRESENTATIVE FROM NEW JERSEY; AND CHAIRMAN, SUBCOMMITTEE ON FISHERIES CONSERVATION, WILDLIFE AND OCEANS

Mr. SAXTON. Good afternoon. Today's hearing will examine the Federal hydrography program and discuss its future.

By way of explanation, hydrography is the practice of charting the seafloor. Two hundred years ago the waters of the United States were uncharted and shipwrecks were an expensive cost of doing business. Thomas Jefferson recognized that investing in accurate nautical charts was crucial to the commerce of the young nation, and in 1807 he created the United States Coast Survey, the agency which charted U.S. waters for 190 years.

We will address two issues in this hearing. First, new electronic navigation technology has the potential to greatly increase the safety and efficiency of navigation. We need to determine if our charting program produces products that realize this potential. Second, the Office of Coastal Survey has one-half the funding and one-fourth the number of survey ships that it had 25 years ago. This lack of resources means that ships traveling in many critical areas in United States waters—areas with narrow channels, shallow water and heavy traffic—have to rely on inadequate and out-of-date charts.

Let me give an example of this new technology that will be available. For less than $1000 I, or any other boat owner, can purchase a GPS satellite navigation system that will tell me my position anywhere on the planet with a 20-foot accuracy. That may be a slight exaggeration, but 20 feet sounds good. If I had a perfectly accurate chart to go with the system, I could sail into a foggy harbor at night and tie up at the pier without ever looking out the window. Unfortunately, most nautical charts were made before the invention of GPS and the locations of objects sometimes do not match between old and new survey techniques. It is possible, when navigating near shore, to plot a GPS fix on an old chart and find your boat on land.

This illustrates the benefits of new navigation technology and the problems that must be overcome before we actually see the benefits. No matter how impressive these new high-tech systems are, they do no good if the underlying charts are inaccurate or out of date. Accurate nautical charts and navigation systems are our first line of defense against costly marine accidents and the environmental damage they cause. In recent years millions of dollars have been spent cleaning up oil spills and attempting to repair damage to the environment. By spending a small fraction of this sum on accurate charts of U.S. waters, we can help prevent future oil spills before they happen.

We should not wait for a major maritime accident to call our attention to this problem before we address it. It should be addressed now. We need to ensure that the U.S. nautical charting program, which represents two centuries of experience at ensuring safe navigation, has sufficient resources to prevent accidents before they happen.

I will yield now to the gentleman from Hawaii, the ranking member of the Subcommittee.

STATEMENT OF HON. NEIL ABERCROMBIE, A U.S. REPRESENTATIVE FROM HAWAII

Mr. ABERCROMBIE. Mr. Saxton, thank you very much. I would like to simply reiterate your commentary as my own. I think you have covered it. Hydrography in a word is the science of charting the seafloor.

I am particularly happy to see the panel that we have here, Mr. Chairman, because I am sure they are well aware—and for those who may not be aware and those among those who are attending today, a new island is being born off of the big island of Hawaii, Luihi.

Literally charting the seafloor takes on an entirely different meaning for us in the contemporary world. If I am not mistaken, we have never had the opportunity literally before to chart the birth of an island from its very beginning. All of us will be long since gone and passed from this vale of tears and joy by the time that island thrusts itself above the level of the sea, but nonetheless we will and are now pioneers in the actual charting of its growth.

So this hearing has particular meaning for me, and I am looking forward to the testimony and to the accomplishments that I am sure are going to be forthcoming as a result of the legislation we will be undertaking. Thank you very much.

Mr. SAXTON. At this time I would like to ask unanimous consent that all Members' statements be included in the record. And I have one statement here from Mr. Young, and I believe the minority has a statement from Mr. Miller.

Mr. ABERCROMBIE. Yes, sir.

Mr. SAXTON. OK, I ask unanimous consent that those two statements——

Mr. ABERCROMBIE. This is what passes for a statement from Mr. Miller I have here in my hand.

Mr. SAXTON. OK, I won't tell him you said that.

[Statement of Hon. Don Young follows:]

STATEMENT OF HON. DON YOUNG, A U.S. REPRESENTATIVE FROM ALASKA; AND CHAIRMAN, COMMITTEE ON RESOURCES

Thank you, Mr. Chairman. I am pleased to see that the Subcommittee is holding this hearing on nautical charting and hydrography. Hydrography surveying is indeed one of the often-overlooked, but extremely important tasks that the U.S. Government performs.

I am especially interested in this subject because of the present situation in Alaska. Every year, there is a significant increase in the number of large ships transiting Alaskan waters.

Everyone knows that many of these ships carry oil and other hazardous cargo; but not many people outside Alaska realize just how popular the cruise ship industry in Southeast Alaska has become. The enormous extent of Alaska's waters means that many areas have never been accurately charted at all, and only a few areas have been surveyed well enough to produce the accurate charts that large ships need to operate safely. NOAA's Office of Coast Survey estimates that 22,000 square miles of Alaska waters now see enough traffic that the existing charts may be seriously inadequate.

Right now, one U.S. survey ship operates in Alaskan waters. It will take 34 years for this ship to survey all 22,000 square miles that need new charts. This is a problem that needs to be addressed. Therefore, I think it is very important that Congress pay attention to the progress of NOAA's hydrography program. Nautical charts are something that everyone takes for granted, until an out-of-date chart causes an accident. We must not wait for a major shipping accident to call our attention to a problem that the Federal Government should be solving right now. We need to ensure that our hydrographers are doing their job of improving maritime safety and efficiency, and we need to make sure that they have the proper resources to get the job done.

I look forward to hearing from our distinguished witnesses on this important subject.

[Statement of Hon. George Miller follows:]

STATEMENT OF HON. GEORGE MILLER, A U.S. REPRESENTATIVE FROM CALIFORNIA

State-of-the-art navigation systems are a win-win situation for the San Francisco Bay area and all coastal communities. Getting the maximum possible information to mariners on depth, current, wind, and tides leads to safer and more efficient navigation. Safer navigation in turn saves lives and protects the environment. In addition, more efficient navigation means more goods can be delivered at lower cost, which is good for the economy.

Last October, the Bay area received a clear wake up call when a tiny 200 barrel oil spill caused $10 million in damages. This spill was not the result of a navigation accident, but it showed that a spill of any significant size would be devastating to the economy and the environment of the bay area.

We need to do everything we can to prevent oil spills. Even though we have made great improvements in our ability to respond to and contain oil spills, the technology simply does not exist to repair the damage once the oil is in the water. I have introduced legislation, H.R. 882, to authorize the removal of underwater rocks near Alcatraz Island that pose a threat to deep draft vessels. That is one practical step to reduce the risk of oil spills.

Another practical step is to bring navigation systems up to date. NOAA, working with the San Francisco Bay Harbor Safety Committee and the Coast Guard, is doing just that. I support NOAA's efforts to improve the safety and efficiency of navigation through its San Francisco Bay Project. I hope that the Committee can continue to work in a bipartisan fashion to provide increased funding for these and other efforts of NOAA's navigation services program.

Captain Art Thomas, who the panel will hear from later, speaks from a lifetime of experience navigating the bay, and I would like to thank him for his efforts in this area and for his support of the Bay SAFE legislation.

Mr. SAXTON. At this time I would like to introduce our first panel. Ms. Diana Josephson, Deputy Undersecretary of Oceans and Atmosphere in the Department of Commerce, and she is accompanied by Dr. David Evans, Deputy Assistant Administrator of the National Ocean Service, and Mr. Castellano, a Program Manager, SmartBridge, Lockheed Martin. May I remind the witnesses to

please keep your oral statements to five minutes or less and your written statement will be included in the record.

Ms. Josephson, you may proceed.

STATEMENT OF DIANA JOSEPHSON, DEPUTY UNDERSECRETARY FOR OCEANS AND ATMOSPHERE, DEPARTMENT OF COMMERCE

Ms. JOSEPHSON. Thank you, Mr. Chairman and members of the Subcommittee, for this opportunity to testify on NOAA's efforts to provide critical charting products and data for safe and efficient marine navigation.

Every maritime country has always regarded providing navigation services as a function of the national government. NOAA and its predecessors have a history of almost 200 years of hydrographic charting, water level and geodetic expertise. Today more than 98 percent of U.S. foreign trade by weight is shipped by sea, and more than half of that is hazardous materials or petroleum. Since 1955 maritime trade has doubled and more than 2 billion tons of cargo move through U.S. ports each year. Vessels today are longer, wider and deeper than ever before, and each year there are about 3500 commercial shipping accidents. Safe, timely and efficient movement of goods is vital to keeping U.S. exports competitive.

Working closely with our constituents and product users, we have established criteria for ranking those port and coastal areas most in need of new surveys, charts and related services. We studied the quality of existing data, the tonnage and value of goods, the hazardous nature of the cargo, total vessel traffic and passenger traffic, including operating areas of the cruise lines. As a result, we have identified a critical backlog of 39,000 square nautical miles remaining to be surveyed, more than half of this in Alaskan waters. At current resource levels, it will take about 34 years to do the job.

Advances in navigational technology on modern ships have pushed us toward creating, certifying and providing highly accurate and up-to-date digital navigation data in addition to our traditional paper charts. We need to utilize three major advances in surveying technology to fully realize our goals: first, multibeam echo sounders that can provide highly accurate depth and full-bottom coverage; second, high-speed, high-resolution side-scan sonars that provide vivid images of specific features such as rocks and wrecks; and third, the global positioning system that provides precise locations.

If NOAA can fully implement these technologies, we estimate a 20 percent increase in survey efficiency, as well as obtaining 100 percent coverage of the seafloor. However, since 1996 NOAA has been prohibited from procuring new survey technologies for our ships. Instead we have been instructed to contract for data collection. We are committed to outsourcing much of our data collection, and as long as NOAA maintains the expertise to quality control data from all sources, we can continue the government's traditional policy of self insuring against liability. However, when survey contractors use technologies unavailable to NOAA, we must require them to carry substantial liability insurance to indemnify the government and protect the U.S. Treasury from accident claims.

Since the government will pay for the insurance, the prohibition against modernization may have the result of making private con-

tracting costs prohibitive. The other odd result of this ban is that the nation's expert, NOAA, is prevented from utilizing new technology to reduce the survey backlogs. As I stated earlier, at current resource levels we will need 34 years to complete the current backlog.

I want to commend the Congress and this committee for recognizing the importance of this work by increasing our appropriations by almost $10 million over the past two years. However we have been asked what it would cost to do the job more quickly, say in ten years. Our current estimates for eliminating the survey backlog, producing digital charts, providing up-to-date water level data, including PORTS installations, will cost about $118 million per year for ten years or almost $58 million per year beyond current funding, not including the replacement costs for the three NOAA survey vessels. My written testimony provides more cost details, including a 20-year option.

NOAA will continue to pursue private contracting for data collection and other services. We recently laid up two hydrographic vessels to provide funds for more contracting. We are preparing to contract for about $8.5 million worth of survey work with fiscal year 96 and 97 funds. We have even sponsored courses in conducting chart quality surveys to assist in developing private sector experience and capability, however we must have the in-house capability, operational knowledge and experience to be smart buyers of these private services, and we must have a complete technological understanding and confidence in the data collected by private contractors to protect the U.S. Treasury.

To be most efficient, NOAA also requires permanent Brooks Act contracting authority to facilitate the increased use of private contractors by streamlining and accelerating the procurement process, and long-term lease authority so that we may enter into cost-effective contracts for hydrographic ship support from private industry.

We greatly appreciate the committee's interest and look forward to working with you toward our mutual goals of not only reducing the survey backlogs, but ensuring that we have the safest, most up-to-date charting products and technology to support our nation's commerce and the health of our precious coastal ecosystems. This concludes my testimony. I would be happy to answer questions now or, if you prefer, we could proceed with the demonstration and answer questions later.

[Statement of Diana Josephson may be found at end of hearing.]

Mr. SAXTON. What would you prefer?

Dr. EVANS. We can just go ahead if you would like.

Mr. SAXTON. I am sorry?

Dr. EVANS. We can just proceed with the demonstration if you would like to sort of save the questions.

Mr. SAXTON. Why don't you do that. Go ahead.

STATEMENT OF DR. DAVID EVANS, DEPUTY ASSISTANT ADMINISTRATOR, NATIONAL OCEAN SERVICE

Dr. EVANS. OK, yes, that would be fine. Mr. Chairman, what I would like to do is take a few minutes and demonstrate some of the old and new technologies and kind of bring you up to date to show you what has happened over those 200 years, because there have been some very dramatic changes that have affected both the

quality of the data on our charts and our capability of acquiring new data. I am going to break this up into three sections. I am going to talk about nautical charting, that is the actual preparation of charts. I am going to talk about hydrography, collecting the data that goes on the charts and forms the basis for it, and I am going to talk about measuring water levels and how we provide water level information to mariners as well. I have got some slides that will show how this works. And when I get all finished I am going to end by introducing our colleague from Lockheed Martin and demonstrate, sort of, where the government role ends in this continuum of activities and where the private sector is picking up.

First of all, by way of a little bit of history, what you see up here is the way we used to make nautical charts. This is the traditional way and it has been what we have done for many, many years. Over on the far side you see some funny looking yellow pieces of plastic. That represents the nautical charting data base, the traditional data base, and it represents the way that we actually proceeded to make nautical charts. Corrections were hand ink, etched on those pieces of plastic. When new data were acquired, they were applied to those pieces. They were subsequently compiled to make the color separates required to drive the printing presses to print the charts that you are familiar with using. And folks like this, cartographers like this would sit there and make these corrections by hand.

I think that the cartographic process probably represents the first and most important success story in NOAA's efforts to modernize its programs. I am going to move on.

What we have done is to convert that process to one which is entirely computer based these days. What you see up in front of you with the little cartoons on the bottoms and up in the corners is a computer representation of a portion of a nautical chart. The entire suite of 1000 charts have got representations such as this, digital representations, that allows our cartographers to use those kind of tools like you would use with Mac Paint or a Paint program in Windows to make changes. And what you see on the left and right sides here are the results of those changes. The circled areas on the right frame represent changes that have been put in, changes in soundings, the position of a wreck and so on, that have been put in on the computer in the representation of that chart.

The process then goes to take the resulting computer image from that chart and produce an entire representation of a nautical chart. That nautical chart then has two paths. The first path is to simply go out for distribution through a creative partnership that we have developed. You can buy these charts, many per compact disk that is compatible with your computer, and use it in your laptop computer for navigating a private boat, for example. The other path that those charts follow is to go to another piece of computer software that eliminates the process of having to do a negative engraving before making a paper chart. It automatically generates the color separates for the paper chart process and prepares the material that is necessary to go to the printer.

The consequence of that is that a process that used to take more or less five years from beginning to end to acquire the data and make a revision of the chart, 38 weeks of which was in the simple

production phase of getting the data and doing the engraving, is now reduced to the point where charts can be kept current to within a year of the time the surveys are acquired and will eventually be kept current to within a week of the acquisition of all data. That 38-week part of the process has been reduced to about three weeks in our current production scheme. So there have been significant changes made in the way that we have done the job, leading to two new products, one a digital product that can be used by boaters and the second a revised way of producing it.

Now a rasterized chart like that is basically just a picture of a nautical chart, and whereas it represents a way that you can carry around a lot of charts very conveniently and you can edit them and we can print them, it doesn't actually contain the information that is needed to move into a modern era of navigation. For that you need this really rather strange looking creature up here, which contains all the important information that was on the previous more graphical looking chart. The same channel is outlined, the same navigational aids are outlined. The same shoreline features are outlined there. This is the information that you need if you really want to avoid having a serious collision in that harbor.

Now the importance of this is that having a collision, as you know from the previous testimony, has very dire consequences, both economically and to the environment. What you see on this map of the United States here is a little cartoon where we have superimposed the area that was oiled in the *Exxon Valdez* accident on more familiar pieces of real estate for many of the people who are in the room, part of the geography that is a little easier to relate. So that, for example, that black area there that you see extending from Block Island Sound to about Cape Henry gives you a measure of the scale of the size of that accident when superimposed on the lower 48 States.

It has been suggested that the existence of the kind of electronic data that I showed you in that previous representation operating on an electronic bridge using a modern ECDIS system, that is a computer-based system that can read the semantic information of the nautical chart, could have conceivably prevented the accident that happened on the *Exxon Valdez* by having the mechanisms available to ring an alarm bell, to flash some lights, to get people's attention, because the information content on the chart has been captured in that group of vectors lines that are on there, more than just a picture of the chart. So that an intelligent navigation system would be able to essentially know that a depth contour had been crossed or that an obstruction was coming.

Mr. ABERCROMBIE. Excuse me. Could you not necessarily repeat all of that, but I didn't quite get the transition. From what to what might have given the opportunity to be aware that something was going wrong?

Dr. EVANS. In making a computer representation of the data that is on a nautical chart, there is sort of two paths. The easy path is the graphical one where basically you have a picture of our nautical chart. It is a scanned image, kind of like a fax image, if you will. On the other hand you have to capture the information that is on the chart in a way that a computer could use it. If you want, it is the difference between having—receiving a fax out of your fax

machine and receiving a word processor document via e-mail. If you have a fax, you have a picture of it. You can read it, but you can't correct it and you can't run it through the spell checker. But if you get an e-mail message, you can go through and check the spelling and, you know, change the grammar and move one paragraph around. You can actually work with the content in a meaningful way.

If you have the vector representation of the information, associated with the lines where that channel is, is a piece of information in the data base that says this is the channel and the depth of the channel is X, or that there is an obstruction and the least depth of that obstruction is Y. And a computer program monitoring the position of where the vessel is as it traverses that chart can keep track of it and say, oh, my ship draws 48 feet and there is an obstruction up there that measures 35 feet, I better ring a bell if we are going to run into it within the next five minutes.

Mr. ABERCROMBIE. So it could have been programmed literally to have a bell go off like you would in your automobile if your fuel is too low or——

Dr. EVANS. Exactly.

Mr. ABERCROMBIE. [continuing]—something of that nature?

Dr. EVANS. In fact, at the very end of our discussion here Mr. Castellano is going to talk about a system like that which is currently under development at Lockheed that takes this kind of information—this is the kind of information which we need to produce for a modern era of generation, in contrast to the old more graphic kind of representation.

Mr. ABERCROMBIE. So it now would be possible, from what you are saying then, through technology, then to do what fathoming was all about before, you had someone actually throwing out a measure——

Dr. EVANS. Yes.

Mr. ABERCROMBIE. [continuing]—to figure how many fathoms you were involved in?

Dr. EVANS. In fact, that is exactly right. How to provide the information that shows the immediate context for where the ship is operating is exactly what we are all about. Nautical chart is one representation of that. Instantaneous——

Mr. ABERCROMBIE. OK, thank you.

Dr. EVANS. How much water is under the keel is another representation of that. And how that all gets brought together is really the——

Mr. ABERCROMBIE. So all this is transposable?

Dr. EVANS. I am sorry?

Mr. ABERCROMBIE. All this is transposable to the ship?

Dr. EVANS. Yes, absolutely.

Mr. ABERCROMBIE. Thank you.

Ms. JOSEPHSON. And then it is also tied in with the global positioning system, you know, a GPS receiver on board the ship which can tie into these computer systems and tell you exactly where you are in relation to your position on the face of the earth.

Dr. EVANS. The issue of GPS is important also in terms of the content of the chart. Most of our charts were acquired using old technology. The technology for navigating was essentially celestial

navigation using a sextant. The technology for finding depth was a technology—I can hardly lift it—of using a leadline and measuring how many fathoms of line there were over the side when it touched the bottom. That technology has been replaced, and the GPS technology for positioning is really important in terms of the information content that is on the chart.

If you take a look at this area right here on the chart, the red circle around this wreck indicates the estimated possible error of positioning the wreck given the technology that was used to navigate that wreck. Now this was the best technology available at the time, done by careful people, had the full backing of the government that this was the accurate position of the wreck. But you see it has got somewhere between 50 and 100 meters of possible uncertainty associated with where you are on the face of the earth when you position that wreck. A modern GPS receiver, the sort of thing you buy for less than $1000 at your marine hardware store, will give you an accuracy near shore about the size of a laser dot that is on the chart right now.

Now if you are navigating your vessel with the understanding that you know your position to within the accuracy of that red dot, you may well be inclined to sail across here. I mean, look how far I am from that wreck. However, what is not indicated on the chart is that that wreck might be anywhere within the red circle that is indicated there because of the positioning accuracy used to locate the feature originally. So what we have now is the navigational capability of the mariner sailing has now exceeded the capability or the accuracy that was used to prepare the data for the chart originally. If we are going to modernize one aspect of the business, we have to modernize the other. The charts, to be useful, have got to have a commensurate level of accuracy associated with the location of the features on there. So that although this was the best that could have been done using the technology of the time, the technology has changed.

Ms. JOSEPHSON. And about 50 percent of our charts, as I recollect——

Dr. EVANS. About 60—actually 60 percent of the data that are on our charts are more than 50 years old and were acquired with these kinds of technologies that you see on the table.

So moving on, what is the size of the problem? We mentioned that—just to give you a graphical representation of what this critical area is all about, the shaded area on this chart is our EEZ. NOAA is charged with the responsibility of mapping the EEZ. That is how big it is. It is enormous. This is all to scale. The little red corner over here is what we have defined by the process that Ms. Josephson spoke of as being the critical areas in that EEZ, that is areas that are critical for safety, areas that are determined by the volume of the cargo that is being carried, number of passengers carried and so on. Here is an illustration on the East Coast of the U.S. The blue areas and only the blue areas are what would go into comprising that critical area. So when we talk about the scale of the job for everything that follows, the 34-year number that was cited earlier, we are talking about being able to work off these blue areas around our coastal waters.

Now just to illustrate that point about how old the data are, the orange data on here are leadline data. This is a section of a chart from Alaska. Here is Juneau just to give you a sort of geographical orientation. The survey data from 1940 to 1963 was collected with echo sounders, but done with old style echo sounders where the data were not recorded automatically and where the navigation was still essentially celestial navigation. The green areas in here were data that were collected from between '64 and '96, at least using modern radio navigation, principally LORAN in this case, other kinds of location for shoreline, but still single beam echo sounder data. So essentially all the data on that chart are data that arguably could be replaced.

In addition to finding the depths in a general way, you also have to know where the wrecks are. We had a wreck up there before. People report wrecks and obstructions all the time. Our job is to note them on the charts as potential hazards to navigation until we can actually go out and investigate them and determine whether they in fact are hazards and can be removed, if they are able to be removed, or in any case note their location as hazards that they are. But just to give you a little example, this is Long Island here. We keep changing the scales on these charts. And this is just a plot of the current reported wrecks that need to be investigated in that figure.

Well, you saw a picture of the leadline here. He is a sort of old wood cut of people collecting data with it. I mentioned that we moved from leadline data to single beam echo sounders. Here is a survey launch surveying the bottom with a single beam echo sounder. You get a very precise measurement of where the bottom is relative to the ship. And we can navigate the ship accurately, however, you move back and forth in definite patterns and you can easily find features such as those in between the lines that is covered on the bottom, and even using best survey practices there can still be significant features which are missed.

The side scan sonar that was referred to earlier is a device that you can tow behind the ship, greatly slowing the speed at which you can work, but nevertheless you can tow behind the ship and make a picture of things on the bottom. Now although this is an image of it, you don't have any depth information, but having identified this you can take your ship back and do a more precise survey or conceivably even put a diver in the water to locate it. And this would be an example of a NOAA ship using a single beam echo sounder, making a track across the bottom, unfortunately missing a number of these bumps, but detecting the presence of those bumps by towing the sonar behind it then could allow you to go back and reinvestigate.

The kind of data you would collect from a survey such as this? These are individual soundings. It doesn't matter so much what they are. The spacing here is about 100 meters between the boxes.

Modern technology involves the use of a sonar system mounted again in the ship that gives you full bottom coverage. And everything that is covered in that blue beam there has been recorded. That is, the depth of all of those features has been recorded by the ship. And you get data that look like this. With reasonable practice, one essentially gets 100 percent coverage of the bottom. That also

includes those features that you needed to previously pick up with the sonar, the side scan sonar systems.

Just to graphically illustrate that, here is a section of bottom where what is shown in the orange stripe is what you would get with a conventional single beam echo sounder system and what you see is a spike that has been missed in between that would have been resolved by the full bottom system.

The full bottom data have other uses as well, whether they are for other coastal mapping purposes, coastal zone management activities, scientific studies and so on, but we can move on from that, Rich.

OK, ships are getting a lot bigger. The critical thing—the critical issue that I mentioned earlier is not just where are the obstructions and how deep the water is, but really what is the distance between the bottom of the ship and the bottom of the channel. So in addition to knowing where you are headed, which is what you get from a chart, you need to know how much water you have got underneath the keel. Traditionally mariners have gotten that data from published charts that we prepare and making tidal predictions for all the major port areas in the United States, both water depth and currents. The data for those come from tide gauges. We have got some tide gauges over here. The old system is right here.

I am not going to get up and show it to you. It will take a lot of time to do the song and dance, but afterwards if you would like to come take a look at the old system—basically it is a mechanical system. It has a float and a wire and it measures how deep the water is in a little stilling pool, and from that you get tidal heights. You take many years of those data and you understand what the astronomical forcing is for a particular place and you prepare the tide prediction tables. We maintain a system of those stations all around the coast so that we have the information that is necessary to do those tidal predictions.

Over the last ten years we have replaced this old mechanical system with a modern array of computer based technology that uses a—in this case it is an acoustic sensor for measuring the depth of the water to collect these data. The sensor is not as important as the fact that this is a computer-based system that allows you to address the data rather rapidly, and in fact you could integrate other sensors nearby along with the same data screen. So that if you wanted to collect this data in real time—you are the guy driving that big tanker into a port and you would like to know how much water is there now, not what is in our tide book. The old-fashion way of doing it—there were a few of these in different places around the country. Here is a real time system. It measures and gives you the water depth relative to sum zero.

The way it happens now is with a system we call PORTS, Physical Oceanography Real Time System. You make a water level measurement. You can also measure ocean currents from the bottom. You can make measurements of atmospheric conditions, wind, waves, visibility and so on. You can do this not just at one point, but up and down the whole harbor and the whole bay. And using the computer technology that this system is based on, all of these data can be made available in essentially real time to a mariner.

So that of the four systems we have right now—here is an example of data being made available via the Internet. You see the predicted value of the tides of this harbor in Houston, Galveston, and the actual values of the water levels over the last 16 hours, it looks like. You have a measurement of wind direction. You have measurements of velocity, the water velocity in the channel. And over here superimposed on a little map of the chart is a vector that shows actually what the current is doing right now as you are taking a look at that. These data can be available electronically. They can also be available on a voice response system. We have four such systems in operation around the country right now.

So digital charts with smart information on them, vector information, modern hydrographic survey navigated with GPS standards, and at the very least those critical areas of about 40,000 square nautical miles around our coasts, and real-time information that tells you how much water and where the currents are are the ingredients that are necessary to do modern navigation. Now the way that they all get brought together, frankly, is the job of the mariner. It is not the job of the government and it is not our role. Our job is to make those data available so that a person navigating a ship can safely pilot that ship in and out of our ports.

And I will take the last couple of minutes and turn it over to Mr. Castellano, who will give you some information about how the private sector then takes all of these data in electronic form and packages them into something that actually can help us pilot safely through our waters.

Mr. SAXTON. Thank you very much. I would just like to say at this point that we are going to have a vote shortly, and if we can move through whatever information you have for us by that vote, then we can get onto the second panel immediately after the vote.

Dr. EVANS. Certainly. Thank you.

Mr. SAXTON. You may proceed.

STATEMENT OF COSMO CASTELLANO, PROGRAM MANAGER, SMARTBRIDGE, LOCKHEED MARTIN

Mr. CASTELLANO. Thank you. My name is Cosmo Castellano. And as mentioned, I am the program manager for SmartBridge. This is an integrated bridge program at Lockheed Martin Ocean Radar and Sensor Systems in Syracuse, New York, and I came here to demonstrate our software. However, my computer has not made the trip as nicely as I would have liked to, so we are going to show a few overheads.

The SmartBridge concept integrates a wide array of information that is critical to the mariner, and it provides a variety of displays to best present that information to the mariner on the bridge of the ship. Unlike other integrated bridge systems, our system combines collision avoidance along with situation monitoring in one display, moving radar and ECDIS type functionality on one display. We also are working with communication to vessel traffic management systems that are in place in various ports around the world to allow navigation information from shore to be integrated into the ship's display.

This concept is being developed under a DARPA MARITECH initiative through a Department of Transportation marine adminis-

tration cooperative agreement. It is the goal of this project to enhance the competitiveness of U.S. ships by providing improved operational performance and safety at reduced cost. SmartBridge has been designed to work on vessels of all sizes. It is scaleable. Its hardware and software can easily be upgraded. SmartBridge also allows a number of fully operational displays to be placed anywhere on the ship, not just the ship's bridge. The ship's position is determined from the SmartBridge interface to a wide variety of ship's sensors shown on the bottom of the slide. Those sensors are primarily the differential GPS that has been spoken of here, as well as other positioning technologies: gyrocompass, radars, sonars and environmental sensors.

Through data linkage with Lockheed Martin Vessel Traffic Systems products, the SmartBridge Integrated Bridge can provide a full-port traffic picture to the ship's master. Environmental data from NOAA's Physical Oceanographic Real Time System, or PORTS, along with the oceanographic models can be received by SmartBridge and displayed on the electronic nautical chart.

Next slide, please. In the limited time here and without my computer, I will try to speak to these screen dumps of our system. What you see here is the raster type chart that was displayed earlier. Up top is conning information or status information for the ship. On the right-hand panel are controls to operate the radar and to input your voyage plan. Flip to the next chart, please. You can see we have other panels possible, such as one to control an infrared imaging system so that we could get a view from the ship in inclement weather.

Next chart, please. On the—whoops, go back one chart. One comment I wanted to make. On the bottom of the chart you will notice there are alarms, alerts and warnings that come up, so in the event that there is a situation that the mariner needs to respond to, he has to acknowledge those warnings and alerts. Go ahead, Richard.

This slide depicts the NOAA raster chart, and this is really the piece that I wished to show live. If it is available in the anteroom later—they are busily trying to recover the computer—I would like to show it to you. But this is the raster picture. As was mentioned, to the computer this is nothing more than a picture. It is great for us to look at, but there is absolutely no information in this picture that the computer can operate on.

Next slide, please. What we can do in our system is to load in a vector representation of that same scene and geographically synchronize the vector information with the raster information. Ideally we could use a full vector set and just navigate from that. In this vector set each one of the objects on the screen are stored in a data base. From those objects we know how to paint those things on the screen. We can interrogate the objects either automatically or manually to get information about the objects.

Go back to the raster picture, please, the previous slide. With this system, if we loaded in an incomplete vector set, just the set as was shown on NOAA's presentation, you could use this raster picture as the complete picture for a mariner to look at, and with the limited set of vector themes you could then interrogate the vector data through the raster picture to the data base that is underlying it for that information. In that manner, this provides a tran-

sition path such that an incomplete vector set may be used in conjunction with raster data as an alternative to a full vector chart.

Subsets of the vector information may be used in layers that are selectively enabled or disabled in a vector nautical chart. And the next slide, please. And for instance, PORTS environmental data can be implemented as dynamic chart objects that are transmitted to the ship and overlaid on the nautical chart as arrows indicating direction of wind speed, with the arrow color used to show a range of magnitude.

Next chart, please. The pictorial view, as in this case of currents in the San Francisco Bay, is much more powerful than a table of numbers, especially as presented on the familiar nautical chart. Real-time environmental data can be of tremendous value to the ship in place of astronomical tide tables. Using nowcast and forecast information, the mariner can safely move deep draft vessels through the harbor waters, not only enhancing safety but promoting and facilitating commerce.

Combining the power of the vector chart with the more familiar look of the traditional NOAA charts allows this transition path for our nation's hydrographic office to progressively increase the vector chart data sets while allowing for the benefits of electronic navigation and position fixing. The combination of official chart data with the quality assured real-time environmental data provides the tools for the safe operation of our ports and harbors and can only enhance the competitiveness of United States shipping.

I have just touched on the surface of what SmartBridge can do, but it is important to note that SmartBridge can only be as good as the data that goes into it. If the charting data is not GPS positioned, if the depths are no longer accurate due to the lack of updated surveys, if wrecks and obstructions are not identified and if real-time PORTS type information is not available, there is nothing that any modern technology can do to overcome that problem. Simply reformatting old data in new products is misleading to the user and is inconsistent with the quality of today's position measurement capability.

NOAA has made good progress toward providing data in digital form that enables products like SmartBridge, which can enhance and add value to that data, possible. However, as I have just described, NOAA is far behind where the industry feels it should be in the provision of accurate, up-to-date navigation data. Persons from our traffic management group have been to a number of foreign ports and harbors to demonstrate our marine traffic management products. Most of these ports and harbors have current, accurate charts and even types of real-time PORTS data. That obviously puts United States ports at a competitive disadvantage.

I would like to thank you for this opportunity to participate in the hearing. I apologize for the loss of my computer system. I would be willing to demonstrate the SmartBridge software again if you so wish. Thanks.

Mr. SAXTON. Well, thank you very much for a very thorough presentation. It gives us a good understanding of the great progress that we are capable of making in terms of these items dealing with safety.

Ms. Josephson, you state that the combination of full bottom surveys, digital charts, GPS and PORTS will enhance safety, efficiency and competitiveness. I suspect that all of this will cost a fair amount of money. Do we imply by your statement that we can expect the Administration to request funds to make this combination of tools available in a real basis?

Ms. JOSEPHSON. We are just starting the fiscal year '99 budget process right now, so the answer will be forthcoming. I can't predict at this point. I mean, we have developed, you know, the costs, as you are aware because we submitted them to you, projected cost of doing this, and we will see how the budget process works.

Mr. SAXTON. Thank you very much. I am going to excuse myself just temporarily to take a telephone call, and I yield now to the ranking member.

Mr. ABERCROMBIE. Thank you very much. I am going to take shameless advantage of the chance I had to ask the question for Mr. Saxton by noting that I saw smiles on everybody's faces when I spoke about Luihi, the island that is now growing off of Hawaii. Obviously this is a little bit different in the way of tracking, but would everything which you have enunciated here today be applicable in following the path of growth of the island and the various elements associated with its waxing and waning?

Ms. JOSEPHSON. I guess the technologies could be applied, but in actual fact, you know, we have, I guess, one ship in the Pacific, which is basically currently focusing on charting in Alaska. So we don't have a charting capability, you know, in Hawaii. Would you like to respond?

Dr. EVANS. We don't have the capability to go do it. The technology would certainly apply, however.

Mr. ABERCROMBIE. I am just interested—I think that we have a rare opportunity as a species to understand literally how the planet grows or how land masses were developed in the ocean. And I know that the University of Hawaii is now engaged in charting, if you will, the history of it, but it may take more than what we are capable of right now, but that is something we can go over at a different time.

Dr. EVANS. It is essentially the same technology. In fact, the technology that we wish to apply to the shallow water charting problem that we are dealing with here today was originally developed for deeper water oceanographic exploration and exploration in support of minerals industry and that sort of thing, so that deeper water multibeam capability has been around for some time. I think it is available to the University of Hawaii. And for awhile that will be the appropriate technology for charting the development of the sea mount. As it becomes shallower, though, we will need to move on with the technology that I was demonstrating today.

Mr. ABERCROMBIE. Well, inasmuch as I have been caught, I will go right into the question and pretend that I was just putting a preamble in. Part of the plan you outlined today involves leasing dedicated vessels in areas where short-term contractors are not readily available. And you noted that up-front scoring of lease costs and limitations in the length of the leases make this option as expensive as purchasing a new vessel. You also point out that there are no current plans to commit to capital costs of a new vessel.

Would the Administration support legislation which for a limited number of ships, say two or three, permit 20-year leases and score lease payments in the year the funds are spent?

Ms. JOSEPHSON. I think I would have to take that question under advisement. I don't know the answer for the Administration, I would like to respond for the record, if I might.

[The following was received:]

VESSEL LEASING

Dedicated long term ship leases, and the ability to score lease payments the same year the funds are expended, represents a practical and cost effective approach to providing the government with platforms essential to acquiring hydrographic data and reducing the nation's critical nautical survey backlog.

In the April 9, 1997, Department of Commerce report in response to direction included in House Report 104-676 (accompanying Public Law 104-208, the Omnibus Consolidated Appropriations Act, 1997) on the National Oceanic and Atmospheric Administration's (NOAA) intentions regarding a lease back from the private sector of the hydrographic vessel *Fairweather,* NOAA estimated that a refurbished *Fairweather* could provide service for about 15 years. Current law allows for contracts of no more than 7 years. If a private firm were required to recoup costs of refurbishing and equipping the *Fairweather* in 7 years, annual contract costs to the Government could be prohibitive. The ability to contract for a longer lease would spread the start-up costs over a longer period of time (as was recommended by several of the private sector respondents) thereby making it a more cost-effective option.

Mr. ABERCROMBIE. It is a—can you do that? Because it is a point that we have to be able to——

Ms. JOSEPHSON. Right.

Mr. ABERCROMBIE. [continuing]—address if we are to move forward with our colleagues, who will not be as well versed. And we can't have Mr. Castellano repeat himself to 433 other Members.

Ms. JOSEPHSON. Right.

Mr. SAXTON. If I may, this is a hugely important question, I believe, and one that we are trying to deal with on the military side, as well. In order to provide, for example, military housing, we have a huge outlay each year.

Ms. JOSEPHSON. Right.

Mr. SAXTON. When we get ready to put 100 houses on a base in Mr. Abercrombie's district, we have to expense that all in one year.

Ms. JOSEPHSON. Right.

Mr. SAXTON. There is a movement toward leasing military housing. And the advantage is that you get to have your outlays over a period of, say, 20 years. And this is the same deal, but there is no advantage to leasing if we have to expense it all up front in one year. And so somehow we have got to get across this bridge so that we have the tool known as leasing available to help solve these problems.

Mr. ABERCROMBIE. We don't want to get trapped in a situation where we are thwarted in accomplishing the public purpose because of bookkeeping and accounting, not tricks, but methodologies that don't necessarily relate to the reality of the mission.

Ms. JOSEPHSON. One of the reasons I am hesitating to answer is that I know that in other areas we have been told that if we have a lease the total cost is going to have to score up front, so that is why I want to take it under advisement.

Mr. SAXTON. Thank you.

Ms. JOSEPHSON. I agree with you. We have a number of situations where we would like to do this, to lease in order to avoid the scoring issues, but it is a complex area.

Mr. SAXTON. Well, thank you very much. I have no further questions at this point. We thank you very much for a very thorough explanation of why this issue is important and of the explanation and demonstration of the technology that you have available to you. And I might just add that it is amazing. I found myself caught without a radar in Cape Cod Canal last year and the fog came. And that little GPS that I could hold in my hand literally got us through a very difficult situation, so this technology is really wonderful stuff, and we certainly want to help you proceed to put it to good use for everyone's benefit. Thank you again.

Ms. JOSEPHSON. And I would like to thank the committee for holding this hearing on what we view as a very important area.

Mr. ABERCROMBIE. Mr. Chairman, might I request that if there are additional questions that we submit them and the panel perhaps be requested to answer in writing?

Mr. SAXTON. Without objection. Thank you very much, and we will be back for the second panel in 15 or 20 minutes. Thank you.

[Recess]

Mr. SAXTON. Hopefully we will be joined by some additional members during the course of the next few minutes. In the meantime, I would like to introduce panel two, leading off with Captain L.D. Rick Amory of the American Pilots Association; Dr. Robert W. Morton, Vice President, Marine Systems and Surveys Operation, Science Applications International Corporation; Jim Provo, Senior Vice President, T. Parker Host, Inc.; also Dr. Martha Grabowski, a member of the National Research Council Marine Board; also Captain Arthur Thomas, Chairman of the Harbor Safety Committee of the San Francisco Bay Region; and Mr. Richard du Moulin, Chairman of the International Association of Independent Tanker Owners. We will begin from your right and proceed to your left, Captain. Proceed.

Captain AMORY. Thank you.

Mr. SAXTON. Welcome aboard, incidentally. I believe this is the first time that you have been here.

Captain AMORY. Yes, in this capacity.

Mr. SAXTON. We are pleased to have you.

STATEMENT OF CAPTAIN L.D. RICK AMORY, AMERICAN PILOTS ASSOCIATION

Captain AMORY. Thank you. Mr. Chairman and members of the Subcommittee, I am Captain Rick Amory, President of the Virginia Pilots Association. On behalf of the American Pilots Association, a national trade association representing the United States' 1100 State licensed maritime pilots, thank you for this opportunity to participate in your oversight on the present state of NOAA's hydrographic charting activities and other maritime services. While the VPA and the APA fully support NOAA's efforts to use the latest technologies to minimize its hydrographic charting activities, I would like to take this opportunity to specifically address the work done by NOAA's National Ocean Service regarding real-time tide

and current information that is relied on by my fellow pilots and the maritime industry in our country.

Before I begin to address this issue, let me first thank the committee for its past efforts to increase support for the critical navigation services that NOAA provides to our nation. These increases have allowed NOAA to make dramatic improvements to its chart production capabilities. This is just the first step, however, to restoring NOAA's navigation services to the level they need to be at to ensure the nation's maritime industry has reliable tools such as charts and tide and current data.

At the current annual funding level of $11 million for tide and current information programs—and to my understanding this is what is proposed for fiscal year '98—NOAA will not be able to maintain its national water level observation network, which provides the foundation for NOAA's critical tide and current services. In addition, although the technology and the know-how exists to provide Physical Oceanographic Real Time Information Systems, PORTS, to improve the safety and efficiency of maritime commerce by providing highly accurate observations of actual water level conditions, no moneys have been set aside for NOAA to work with interested ports on a national basis to provide the navigational information systems. Mr. Chairman and members of the Subcommittee, I strongly urge you to increase funding to these programs to enable the National Water Level Observation Network to be modernized and maintained, and for PORTS to be provided to ports that need their services and can support their operation.

The challenge for today's modern pilot is knowing precisely what the ship's location is at all times, allowing him to safely navigate the vessel with regard to precise hydrographic information. Ninety-eight percent of today's U.S. bulk products are exported by ships. Vessels have gotten so large and intermodal transportation so complex that the ability to add a few extra inches of cargo or better schedule a transit by just a few minutes using real-time water level information can result in huge rewards in dollars of revenue.

The safety issue is paramount. U.S. waterborne trade is expected to increase by 50 percent over the next decade. The consequences from even one major accident can be catastrophic. The APA is deeply concerned that the committee recognize the importance of NOAA's charting and real-time tide and current programs that are used by pilots every day around the Nation to navigate safely and efficiently. Pilots and ship owners rely heavily on NOAA's national standards for accurate charts, water levels and current information when making decisions regarding safe navigation of vessels.

Navigation is made difficult by confined maneuvering areas, depth limitations and changing water level and currents due to unpredictable weather conditions. Just as wind forces can adversely affect an aircraft, so can water current affect the movement and maneuverability of a ship. When currents are combined with changing water levels and other dynamic factors, the need for real-time information becomes essential to allowing the right decision to be made at the right moment. This scenario to an airline pilot needing to know wind shear prior to taking off or landing.

The nation's standards for these services must be protected in order for our ports to continue to compete in global economic mar-

ketplace. Mariners must be able to rely on timely, accurate, quality-controlled information. Inaccurate information is far worse than no information.

The dredging and maintenance of channels and harbors provides the pilot with deeper waters to navigate in. Knowing the accurate water levels and currents is equally important. Even with all the dredging efforts, some ships which continue to call on our ports require lightering in order to meet the draft restrictions at certain locations. If quality controlled real-time water level information were available, it would allow the shipper to accurately calculate tons of cargo relating to safe drafts required.

NOAA's navigation products, particularly the tide and current data, help make our transportation infrastructure more efficient and our nation more competitive in the global marketplace. Mr. Chairman, these major undertakings by the U.S. Government to provide accurate information for the safe and efficient navigation of vessels are critical in today's economic climate. The NOAA tide and current data programs have proven their effectiveness and are depended on daily by the pilot members of the APA while performing their duties. We urge your continued active support in having Congress make the necessary investment in NOS marine navigation services which are essential for maintaining economically competitive U.S. shipping.

On behalf of the American Pilot Association, thank you again for this opportunity to present our views for your consideration. I will be happy to answer any questions at this time.

[Statement of L.D. Rick Amory may be found at end of hearing.]

Mr. SAXTON. Thank you very much, Captain. Dr. Morton.

STATEMENT OF DR. ROBERT W. MORTON, VICE PRESIDENT, MARINE SYSTEMS AND SURVEYS OPERATION, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

Dr. MORTON. Thank you, sir. As we have heard today, it is clear that modern technology can provide significant benefits to the safety and efficiency of marine commerce, but only if comprehensive hydrographic data are available that meet the requirements of these new systems. Fortunately, many of the advancements that have improved vessel navigation also have direct application to the methods by which hydrographic data are acquired, and surveys can now be accomplished with 100 percent bottom coverage that is critical for the production of electronic charts and precise navigation of commercial vessels. However it should be pointed out that this technology is still very new. Improvements to the instrumentation and procedures are continually being made. These improvements generate much more data, and unless they are used in an appropriate manner, there is a definite potential for error or omission.

I represent an organization that has spent the last several years developing systems and conducting surveys to meet the strict requirements for hydrographic surveying. NOAA is one of many clients we support, however they are unique in that they play a large role in setting the standards to which our system and procedures must adhere. SAIC was fortunate to be awarded the first contract that NOAA issued for hydrographic surveying using multibeam technology they discussed earlier today, and we are now preparing

for a second contract to conduct a similar survey in the Gulf of Mexico.

I believe that the contracting relationship between NOAA and SAIC was successful during execution of the first project, although it was a very complex and difficult effort. Throughout the duration of that contract, NOAA was extremely rigid relative to quality control issues, thereby insuring valid data. However, they were flexible in allowing SAIC to modify the survey schedules and plans in order to deal with the problems we encountered. I can honestly state that NOAA did their part to make the first contract survey a success.

I can also state that the lessons learned in that survey were incorporated in the Gulf of Mexico contracts that are now under negotiation, including more concise language concerning accuracy and coverage as well as utilization of computer-generated quality control. Furthermore, the use of the Brooks Act changes the emphasis in NOAA's selection process to one of technical capability rather than cost. All of these changes should make future contracts more efficient and profitable both for NOAA and the contractors.

I believe that this is a key point. If NOAA is to be successful in contracting surveys over the long-term, it must find a way to maintain the quality of data while making the venture a profitable one for contractors. This leads directly to the issue of liability insurance, which is now included as a requirement in the Gulf of Mexico surveys. Our investigations has found that this is simply not a cost-effective option. First, it is not clear that the insurance would be available for the extended time required, and second, the costs for a single survey sheet exceed the overall funding available for the entire project.

Furthermore, it is not the survey contractor who actually puts the depth down on the chart. That is now and should continue to be NOAA's responsibility. The fact is that the quality control procedures required by NOAA do provide a traceability back to raw data that will allow NOAA to make appropriate charting decisions. However, these are complicated decisions that must take into account the performance specifications of the modern instrumentation. I believe that NOAA is now capable of accepting that responsibility and should remain in that role by continuing to develop and enforce the appropriate quality control criteria. This means that NOAA must maintain a thorough understanding of the technology and procedures utilized by the survey contractors, a very difficult task during this period of rapid technology growth.

I am also aware of the restrictions that have been placed on NOAA with regard to improvement of data acquisition technology. And although I agree with the emphasis placed on contracting, I am concerned that NOAA will not be able to maintain its expertise over the long-term without an ability to utilize such equipment in house. If NOAA does not have sufficient experience and qualified hydrographers, they will soon be unable to realistically judge the quality and efficiency of contracted surveys or to participate in the decisions made by the International Hydrographic Organization regarding the criteria for accuracy of hydrographic data. I believe an appropriate level of technology improvement should be preserved within the NOAA budget to insure that the agency is able to maintain its role of setting standards and that will allow NOAA to ac-

cept the liability associated with production of nautical charts. I would even go one step further and suggest that NOAA should be given responsibility for initiating and developing new technology and procedures to improve the efficiency and accuracy of hydrographic surveys.

In summary, we at SAIC look forward to participating in the survey of critical areas of U.S. coastline and continuing to work with NOAA to ensure that the data acquired are compatible with the requirements of modern navigation. In order to accomplish this, we feel it is critical that NOAA be given the resources to maintain its expertise, to set the standards, provide the quality assurance and accept the liability that is inherent with the production of nautical charts. Thank you.

[Statement of Dr. Robert Morton may be found at end of hearing.]

Mr. SAXTON. Thank you very much, Dr. Morton. Mr. Provo.

STATEMENT OF JAMES S. PROVO, SENIOR VICE PRESIDENT, T. PARKER HOST, INC.

Mr. PROVO. Mr. Chairman, my name is Jim Provo, and I am Senior Vice President of T. Parker Host, Incorporated. I come before you today on behalf of the National Mining Association and as President of the National Association of Maritime Organizations.

The NMA member companies account for approximately three-fourths of the coal production in the United States, over 1 billion tons annually, and a vast majority of mined minerals, including iron ore, copper, gold, silver, uranium, lead, zinc and phosphate. The mining industry relies on our ports and the services provided by NOAA to export our minerals and coal to the markets throughout the world. The United States is the second largest coal exporter in the world, and in 1996 exported 91.5 million short tons valued at $3.8 billion. NMA members include major coal export companies. U.S. mineral exports were $32 billion in '95, the last year for which the numbers are available.

NAMO represents its members in all matters on a national level that affect foreign and domestic waterborne commerce using U.S. ports. The organization consists of steamship associations and maritime exchanges. We focus on the attention of operational issues that affect the viability of the steamship industry. NAMO's mission is to improve the climate for international shipping in the United States. It was created to focus Federal Government's attention on the needs of steamship agents, owners and operators, and others engaged in ocean shipping. Six successful years after the creation, NAMO is now 38 members strong coast to coast representing various businesses in the maritime industry. NAMO has a strong Congressional membership of 36 Senators and 139 Members of the House.

As your invitation to me describes, the purpose of this oversight hearing is to examine and present the state of NOAA hydrographic charting activities and what should be done about the future of these activities. I am convinced that were it not for the active support of the House Resources Committee, the funding increase for NOAA's mapping, charting programs for the past two fiscal years, which were the first since 1981, would not have been possible. We

greatly appreciate your leadership, Mr. Chairman, on this matter and seek your continued support, for the task of making the nation's nautical charts as accurate and dependable as possible is not finished.

I am sure that you have heard statistics before, but they do bear repeating. Some U.S. coastal waters have never been completely surveyed, including 80 percent of the nation's top ten ports. At current funding levels, even with the recent funding increase made possible by this committee, it would take three decades to complete the survey backlog. There have also been dramatic cutbacks in the number of annual new charts.

Since 1955 the nation's volume of international trade has quadrupled, with the United States achieving the largest waterborne import and export trade in the entire world. More than 100 public ports handled more than 1 billion tons of cargo in '95. This generated 1.6 million jobs, $21 billion in tax revenues and $16.3 billion in custom collections. Moreover, U.S. ocean-borne trade is projected to increase by 50 percent over the next ten years. Yet Federal Government spending for the support of marine navigation related services, except for the recent increase for charting programs, have steadily declined. The declining investment has created a situation that is unacceptable to those who depend upon the safe navigation of our marine waters and their businesses and trade, unacceptable to those who believe that our coastal environments are unnecessarily in danger and unacceptable, hopefully, to the members of the committee.

NOAA has made great strides recently in streamlining its nautical charting program by converting its suite of paper charts to digital raster data base. This has enabled NOAA to dramatically accelerate chart production time, make charts updating easier, and reduce the time required to chart hydrographic survey data. The value of any nautical chart, however, is in the accuracy of the information. And that will only be achieved through the stepped-up program of acquiring new survey data. Only through improved data acquisition will the nation's nautical charts be truly reliable to those who depend upon them.

A modest investment in modernizing the Nation and NOAA's marine navigation services include nautical charts, the National Water Level Observation Network, tide tables, water current data and the availability of proven effective Physical Oceanographic Real-Time Systems, PORTS, which has been a Federal responsibility since 1807 and a promise to those who have been involved in trade and maritime commerce which would have many benefits, benefits that would be over time in great value in the cost of the investment to modernize the Nation and NOAA's maritime navigation.

In the report, Mr. Chairman, I do have some outlines of benefits. I realize the red light is on, and I will conclude my testimony.

[Statement of Mr. James Provo may be found at end of hearing.]

Mr. SAXTON. Thank you very much, Mr. Provo. Dr. Grabowski.

STATEMENT OF DR. MARTHA GRABOWSKI, MEMBER, NATIONAL RESEARCH COUNCIL MARINE BOARD

Dr. GRABOWSKI. Mr. Chairman and members of the Subcommittee, it is my pleasure to be here today and to present testimony to you on the subject of hydrographic charting to assure safe and efficient ports and waterways for the nation. My name is Martha Grabowski. I am a member of the Marine Board at the National Research Council. I have chaired one major Marine Board study on navigation and piloting and assisted on several other studies that investigated hydrographic services and charting activities.

My testimony will draw on the results of several recent Marine Board studies and provide additional personal comments derived from my independent research work. I will first address the underlying needs for improvements in hydrographic surveys and charting services in the U.S. ports and the general safety and economic benefits that can be expected as a result. I will describe conclusions from recent Marine Board work concerning appropriate roles for the Federal Government and private sector in providing these services and finally discuss strategies for producing and providing electronic charting services in the future.

A number of Marine Board studies have concluded that because of the widespread public benefits and broad impacts on the national economy from maritime trade, there is a compelling national interest in supporting Federal programs that maintain safe and efficient ports and waterways. While this Federal support should be maintained, it can also be supplemented with local support where appropriate. It is possible to obtain more cost efficiencies in NOAA by using private industry to accomplish much of the data collection, data management and production of charting projects. Therefore, while support for essential Federal initiatives and investments must be maintained, NOAA must also select the most efficient and effective strategies for future progress to obtain the benefits from new hydrographic charting technologies.

Mr. Chairman and members of the Subcommittee, NOAA is challenged to fulfill its strategic charting mission and make the necessary investments to assure adequate future capability using advanced technologies to meet critical user needs. The three basic tasks that must be supported are data collection and verification, data management and production and distribution of charts and related products. The Marine Board, in its 1994 report, "Charting A Course Into The Digital Future," recommended that the most important public sector responsibility is management and control of the content and quality of the data that support navigation. The private sector can assist in data collection and product distribution using modern qualified technology and techniques, but NOAA must perform the central data management and quality control mission.

For the most part, NOAA has been making significant changes in its operations to contract out those tasks that private industry can best perform and is attempting to maintain its core responsibilities and capabilities to meet public expectations. Private contractors, as we have heard, are engaged in hydrographic surveying task and in chart production activities. This transition of operations and reduction of the Federal presence in these areas will continue and

will need to be monitored to assure that efficiencies are in fact achieved and key capabilities are retained when needed.

The maritime industry, meanwhile, is impatient with the pace of transition to new technologies and improved services, especially in the areas, as we have heard, of accurate update surveying, data collection and dissemination and electronic charting. In a way, it appears that NOAA has fallen behind and not caught up with modern technology. It is true, as we have just heard, that many approaches to major ports have not been surveyed in decades. Areas around eight of the nation's ten top ports need extensive resurveying. While simple electronic charts are being made available, the raster charts that we saw demonstrated in the first panel are not produced with the type of digital data base that makes them acceptable for international standards in the future. And while NOAA has developed a real-time system for disseminating oceanographic, tide and current data, there are no Federal funds available for national implementation and operations.

The United States was one of the leading nations in the development of electronic chart technology. In 1995, the International Maritime Organization, IMO, adopted performance standards for electronic chart display and information systems, ECDIS, that now represent the world's goal for electronic replacement of paper charts. This system requires the use of digitized vector data, as we have heard today. The vector format, for ECDIS, requires significantly more original investment to produce, but produces long-term benefits in terms of accuracy, usability and efficiency. ECDIS is the only electronic chart that will legally substitute for a paper chart under existing international agreement.

A majority of modern mariners would like to have ECDIS charts for use as soon as possible. The production of these charts to the agreed international standards has proven more difficult than originally anticipated, which has led to the development of a proposed interim solution, so-called hybrid charts that use some vector data and some raster data.

The question now is which overall strategy is best for the Nation in the long run as it moves to electronic delivery of hydrographic charts. In independent research on navigation and piloting systems that are being developed and deployed, as we saw in the SmartBridge program, a number of findings have indicated that NOAA's plans to develop and expand vector chart products are worthwhile endeavors that need to be supported. Full vector charts are needed as critical input to most shipboard advanced navigation systems, and the major benefits of new technology on a ship bridge will not be realized without the advent of vector data. In addition, continued support for producing raster charts is also justified, because they provide an interim benefit to all mariners. However, it is believed that support for NOAA's hybrid chart product, which incorporates pieces of vector data and pieces of raster data, is less important or urgent.

In sum, new technologies are rapidly changing the traditional methods for hydrographic data collection and for the delivery of nautical charts to the mariner. These advances are important to the safety and efficiency of maritime trade in U.S. ports and waterways and should receive adequate Federal support. NOAA and the

other Federal agencies are challenged to implement these new technologies while providing effective, accurate and reliable charting services to the maritime community. It will be important for NOAA to justify support for its hydrographic programs and assure that they meet the needs of the mariners and the general public. Thank you.

[Statement of Dr. Martha Grabowski may be found at end of hearing.]

Mr. SAXTON. Dr. Grabowski, thank you very much. Captain Thomas.

STATEMENT OF CAPTAIN ARTHUR THOMAS, CHAIR, HARBOR SAFETY COMMITTEE OF THE SAN FRANCISCO BAY REGION

Captain THOMAS. Thank you, Mr. Chairman. Today I am appearing before you as Chairman of the San Francisco Bay Region Harbor Safety Committee. I want you to know that I am also and have been an active licensed State pilot for over 25 years. I serve as Vice President of the American Pilots Association, and as Vice President of the International Maritime Pilots Organization.

My objective today is to recommend to this committee that a state-of-the-art navigation system be developed for San Francisco Bay waterways. Some of the technologies that should be included in such an integrated system have already been tested in our area. Other technologies are currently under review and modification, but nowhere in the world have all of these technologies been integrated into a modern system that assures maximum commercial benefit with the greatest protection to the environment.

Given the partnership arrangements between the maritime interests within the government and the private sector that already exist in the San Francisco area, we can think of no better location to implement this sort of exciting project. The San Francisco Bay Region is a very unique waterway. As a whole, the bay is the fifth largest U.S. port in oil handling, the fourth largest container port in the country. The bay contains 11 ports within her boundaries, over 200 miles of ship navigation routes and over 200 berths for ocean-going vessels. The bay handled over 9000 large vessel transits last year, and we expect that number to grow. In addition, the bay is a major boating and commercial sportfishing area. You would enjoy sailing your boat there.

The Harbor Safety Committee, which I chair, was created by the State legislature to address two primary objectives, to obtain and provide the highest environmental standards possible for our magnificent waterways, and number two, to ensure that our ports are among the most competitive, efficient and safest in the world. The committee's membership represents the entire spectrum of the maritime industry. It includes environmentalists, port authorities, labor and U.S. Government officials. All of these interest are very deeply committed to enhancing maritime safety on the bay.

The ports of San Francisco Bay have long been recognized as strategic transportation links in the trade infrastructure and economic health of the nation. In 1994 alone over 67 million tons of cargo were imported or exported through the San Francisco Bay ports. Now those cargoes were produced either in inland States for export or were received for inland distribution. So the activities as-

sociated with these ports are really only the tip of the iceberg of the total economic activity involved.

One of the major challenges facing our Harbor Safety Committee is the task of developing and implementing the best navigational system for a bay in which the weather patterns are constantly and instantaneously changing. Similarly, we want to design such a system that meets the rapidly changing shipping practices in one of the most challenging waterways of the world.

Those familiar with San Francisco Bay and its tributaries know that the ship channels in which we operate are extremely shallow indeed. Those channels were designed in the 1920's and 1930's for ships that averaged six to seven thousand gross tons and approximately 25 feet in draft. When I started piloting in 1972, the average size vessel was about 11,000 gross tons and about 26 to 27 feet of draft. Currently the averages are over 30,000 gross tons and in excess of 30 feet of draft. And we routinely handle vessels—for example the sister to the *Exxon Valdez,* the *Sea River Long Beach,* is a regular customer, as was the *Valdez.* But tankers of over 200,000 dead weight tons routinely call with drafts of 50 feet. We now have new container vessels that will be calling in our port. I point out the *Regina Maersk* class of vessel, which is a ship of 81,488 gross tons, 1090 feet in length, 141 feet in beam and draws 46 feet of water for draft, and the ability to load 155 tons of cargo or anywhere from eight to ten containers for every inch of increased draft on the ship.

Both our tankers and our container vessels are being constrained in their loading abilities because of the shallow drafts, the shallowness of our channels. And what is happening is we need very accurate water level and current information in order to maximize the loading on those ships. The current international trend is toward larger, deeper ships. For example that container ship, or for the average container ship, an increase of one inch of draft can increase revenues from eight to $50,000 depending on the nature of the cargo. Each additional foot of draft can accommodate—that the port can accommodate—can mean over $120,000 for every transit, and to a shipper that means that there are increased revenues. A port, like the Port of Oakland within San Francisco, served 1637 ships in 1995. An additional inch of draft would mean annual revenue increases of over $550,000.

In any event, sir, we would appreciate that our written testimony directs us to a project for San Francisco Bay which we are urging the Subcommittee to recommend, and we are urging NOAA to continue. We provide the variety of navigational opportunities needed to evaluate these advanced technologies, and we believe that in place in San Francisco Bay are all of the agencies and the interested individuals and entities ready to accomplish the project.

Thank you, Mr. Chairman.

[Statement of Captain Arthur Thomas may be found at end of hearing.]

Mr. SAXTON. Thank you very much, Captain Thomas. Mr. du Moulin.

STATEMENT OF RICHARD DU MOULIN, CHAIRMAN, INTERNATIONAL ASSOCIATION OF INDEPENDENT TANKER OWNERS

Mr. DU MOULIN. Thank you. My name is Richard du Moulin. I am Chairman of Marine Transport Lines. We are the oldest shipping company in the United States, founded in 1816. We are based in New Jersey. We have a fleet of U.S. and foreign flag tankers and other types of vessels. Ten of our ships were in Desert Storm.

I am also acting for the next two years as Chairman of INTERTANKO, which is the International Association of Independent Tanker Owners. We have over 500 members amounting to a fleet of over 155 million deadweight from 40 countries. It is a majority of the world's tanker fleet, and we import over 60 percent of the oil that comes into the United States. Our goals are to promote free competition, safe transport and cleaner seas.

All ship owners have a common need for better charts and navigational services, but tankers were singled out by OPA 90 for special treatment. OPA 90 effectively provided for oil spill cleanup. But it went into punishment that goes beyond anything in the rest of the world, particularly the Natural Resource Damage Assessment, and unfortunately OPA 90 failed to provide adequately for prevention. OPA 90 put 100 percent of the liability of an accident on the tanker operator, but tankers are only part of a complex transportation system. We do not operate in a vacuum. The system includes the ship, pilots, tugs, vessel traffic control systems (VTS), terminals, aids to navigation and charts. Unfortunately, U.S. systems are generally deficient when you look at the volume of traffic in the United States, the extreme legal liability and the strong public demands.

VTS, for example, where we have it is behind the great forts of the world, such as Rotterdam. Terminals, many are deficient. They are decrepit and mainly built for ships of the age 50 years ago. Charts are not accurate enough, as you have heard from other people today.

INTERTANKO last year put together an important Port and Terminal Safety Study, a copy of which is being provided here for the record, which analyzes the situation and makes recommendations. With regard to charts, try to imagine an airplane pilot trying to fly safely with conflicting data or no data at all regarding the height of mountains, obstructions such as antennas and even the altitude of the runway he has to land on. Well, shipmasters and ship pilots face the same thing every day. The public is remarkably tolerant of airplane accidents, despite the loss of life. Yet for oil pollution the public has zero tolerance and seeks punishment.

Clearly the public perception of the tanker industry is quite bad. But let me just recite the facts. Over the past 20 years operating pollution has been reduced by 85 percent. These are international statistics, not just in America. This is mainly due to segregated ballast, which has been implemented in the world fleet. Accidental pollution is down 50 percent over 20 years. Oil pollution from tankers is a source of 12 percent of the oil in oceans. Over two-thirds of the oil in the oceans come from ports and industry and the public ashore. Tanker owners invest 20 percent of the cost of a new ship in safety and environmental features, which is twice the ratio

of land-based industry. And we are now spending billions of dollars for fleet replacement, as mandated by OPA 90 and the IMO international regulations.

To give an example of the scale of what pollution really is, Chevron in their annual report described that in 1996 for all the ships they own and operate plus all the ones they charter from independent tanker owners, the amount of oil spilled was comparable to a motorist filling up his tank with gasoline 600 times and dropping five drops.

But any drop is too much. Our goal is zero pollution, but we can't accomplish it without systems improvement. We can't do it alone, and accurate charts are a part of the system. They are the foundation of the information we use. Without better charts, we lose the benefit of better pilotage. We lose the benefit of crew training, the simulator training we are doing quite extensively. We lose the benefit of ISM, which stands for International Safety Management, which is what IMO, the international regulations, require all tanker operators to have implemented by July 1, 1998. We are losing the benefit of the new standards for training certification and watch keeping which have been adopted internationally. We are losing the benefit of GPS, electronic charting and double hull, all because we don't have the right information. In effect, we stand the chance of having electronically aided groundings.

U.S. and international tanker owners have made the commitment to safer transportation. Now Congress must commit the funding needed by NOAA, the Army Corps of Engineers for dredging, the Coast Guard for VTS, for example, by freeing up the harbor maintenance trust funds. We also need Federal Government agencies such as Coast Guard and NOAA to assert Federal authority for marine safety and operations and oppose well-intentioned but dangerous attempts by some States to preempt Federal authority. We appreciate NOAA's assurance of commitment to work with INTERTANKO to preserve a strong Federal role.

I thank you for the opportunity today to discuss these important issues.

[Statement of Mr. Richard du Moulin may be found at end of hearing.]

Mr. SAXTON. Well, thank you very much. I would like to thank all of you for what I think was very useful and articulate testimony about a subject which is certainly of concern to all of us.

We have been joined by the Chairman of the Coast Guard Subcommittee, the gentleman from Maryland, who is also part of this Subcommittee. He does a great job. We have got a history in the Congress of giving the Coast Guard more jobs each year with less money to carry out their tasks. He has got a very difficult task, and we are glad that you are able to be here.

Let me just ask a question which I think is really the key to this entire thing. Many of you or some of you, at least, mentioned the inaccuracy of current day charts. And that is obviously something that I can relate to, because without good data which is transferred to usable forms called charts, it is very difficult to do good coastal navigation. And obviously we are always concerned about coming into ports. And, my district borders the Delaware River ports, and that was a 90-mile stretch from the ocean to Philadelphia and, of

course, on inland to Trenton. And without good charts those kinds of runs can be very dangerous.

Do any of you have other thoughts that you would wish to share with us about accuracy of charts?

Mr. PROVO. I am glad you asked.

Mr. SAXTON. I thought that rolled up chart in front of you had a purpose.

Mr. PROVO. Thank you. As you probably know because you are a great sailor——

Mr. SAXTON. I don't know how great.

Mr. PROVO. Well, I don't either, but that is what——

Mr. SAXTON. I float around mostly.

Mr. PROVO. Some years ago the Coast Guard, in its overzealous way of trying to impose the penalties on vessels, was going at the charts provided by NOAA. Now in order to overcome this, a lot of the owners and operators started buying the British Admiralty chart. And they bought the British Admiralty charts because the British Admiralty charts are up to date. In sailing and mariners are aware that—I will take this for an example. I am not going to open the chart, but this is an interest to the Chesapeake Bay. It was issued in September of 1996. The Notice to Mariners is issued weekly, as you probably know. It is, most of the time, the duty of the second or third mate to make all these changes. So at 50 of these a year, we would have to take this on board for some poor third mate that hadn't been in the country or the ship hadn't been in the country in over a year, but he has his chart, it is just not up to date. The British Admiralty chart, however, has got for the year—this is also in 1995, '96 and '97. They have recorded on the bottom of their chart one, two, three, four, five, six, seven, eight changes that have been made so far on this chart in 1987—97, excuse me.

So, you know, there has to be some place—if the British can do it, we sure as hell got to be able to do it. And I know we are moving through a different era and we are going to data bases and all this, but we are going to still need charts. We have to find a better way than issuing a Notice to Mariners and not in having charts that are on board that are updated which the Coast Guard is more than willing to assess a penalty against a ship for not having proper charts on board. That is the purpose for the chart, what NOAA is so far behind in trying to do. I think with what we have asked ships to do on OPA 90 and we put all—and it has been said that we put a hell of a lot of burden on ship masters, the pilots, the owners and the operators. It is certainly our duty as a country of maritime industry to provide the tools for the people to be able to comply with these regulations.

Mr. SAXTON. Thank you very much. The first panel, of course, was the NOAA panel, and they laid out an ambitious, although I must say almost wholly unfunded plan to bring us into a situation where we solve many of these problems. If the plan that was outlined by NOAA today, which is attended to address the survey backlog and integrate surveys, tide and current data and other pertinent data into a format that can be used by today's mariners through digital schemes of one kind or another, if that plan were

adopted and funded, would it solve most or all of the problems that you have related to us today?

Mr. DU MOULIN. It would be the building block upon which you could start solving the other problems. Vessel traffic control systems is a major problem, but it is based on having accurate data. Pilots need to be better trained and have the lower pilots moved out and everyone else moved up. Ship operators have to have the same applied to them, but underneath it all is the data that you build the system around. And there is a tremendous effort being made by pilots, by ship owners around the world to upgrade themselves, but if they don't have the tools, the rest of the system just can't work.

Mr. SAXTON. Any of you can respond to this if you will. Do you believe there is a role for the private sector here? And if so, what is it, how big is it, what are the problems involved in it?

Captain THOMAS. As possibly one of those lower pilots that ought to be moved out, but I will respond to what you have said, Mr. Chairman, it appears that at least in San Francisco as a demonstration, there is a role for the private sector. And that partnering is being accomplished as we speak now. And I would think that those individuals, as self interested as they may be, such as INTERTANKO members, could, I am sure, partner with the Federal and State and local government agencies so that things are accomplished on a safe level.

As to your original question about NOAA and what the first panel testified to, I think that what you heard from members of this panel, the response would be that yes, what NOAA has asked for would accomplish the task if in fact NOAA is providing the digital base in the correct format that it can be—that it is recognized by the international community and that the data is utilized, but a qualified yes to both questions.

Mr. PROVO. May I say one other thing, and then I will shut up?

Mr. SAXTON. Go ahead.

Mr. PROVO. You know, I think question two, what cost to the private sector, I think that has already been attended to. And when I say it has been attended to, we have this great harbor maintenance fee that we have that you guys are holding hostage. And I guess you have to for whatever reason, but if you would let some of it go, I think some of this could be helped to fund NOAA and the problems we have today. So I think the private sector, shippers, importers, if we want to refer to that, have already made their contribution. Why can't we use some of that money? I think you have got to go vote.

Mr. SAXTON. Yes, we have another one. Do you want to ask your questions at this point and then we will see where we are at the conclusion of your questions?

Mr. GILCHREST. I will just make a quick comment. I don't think we are—actually that is a good comment, and we need to figure out what we are going to do with the harbor maintenance fee. And I think the harbor maintenance fee—depending on who you talk to will depend on how the money should be spent. You get rid of the harbor—you share the harbor maintenance fee and then you have a problem, maybe, with San Francisco Bay, as far a maintenance is concerned. And you give it over to the people who do the charts

and—that is an issue that has to be discussed, and potentially with Federal courts it might be declared unconstitutional. So that is a whole other issue. What I would like to—I don't have much time. I would like to make sort of a philosophical comment first and then discuss some of the specifics.

If we could pull back a little bit and look at the broad overview of planet Earth and we see the development and evolution of civilization, it has happened almost in a very arbitrary sense. The growth of nations, new technology, the international marketplace has striven to achieve a level of standard of living for people all over the world, especially the industrialized nations. But now we are coming to a point where some of you mentioned in the early part of this century ships were—I think it was the gentleman from San Francisco, how big ships were before World War II, how big they were after World War II. Now we are looking at channels that need to be 50 feet in order for ships to come in. How deep does the dredging have to be? Where does the dredging material go? What is the optimum size? Have we achieved it?

We are working with a human population that is getting bigger and more sophisticated, demanding more things with resources that are finite, so we have demands by more people on less and less resources. We all here are discussing the fact that we have to have international coordination on all of our mapping so it is—the ships can be safe. I would like to ask when I am done with this how the British do it and why we can't do it that way. If they can map the Chesapeake Bay, I don't see why we can't map the Chesapeake Bay. And if there is anybody here from the Department of Commerce, I would like to figure out how they can do it. Maybe they are just better at it because they are the ones that colonized us so they know all that stuff.

But because of the constraints of time what I would like to do, Mr. Chairman, I would like to write down a list of the questions that I have and then fax, e-mail, mail, however we do it now, to each of the panel members here in the hopes that we can—these are issues that are sort of mysterious and you can see that there is not a whole lot of members here, so there is not a lot of interest in it, but it is pretty critical. These are pretty critical issues, especially if we are looking at a nation's economy. Shipping is becoming more and more important. Is there a size—maybe somebody—Mr. du Moulin, maybe you could answer this. Is there an optimum size to a ship? Do they ever get too big? What is the optimum size?

Mr. DU MOULIN. In the tanker industry, ships have stopped getting bigger. You have got the 200,000 to 400,000 tonners coming over to Loop. These ships are trading into the deep water ports of the world. But tankers have stabilized in terms of size.

Mr. GILCHREST. And that is because—why have they stabilized?

Mr. DU MOULIN. Because they have proven that in terms of economies of scale, versus flexibility, that the classes of ship we now have: the 300,000 ton VLCCs, the 150,000 tonners for the Suez Canal, the 90,000 ton Aframax class; these have become standards.

Mr. GILCHREST. What do they draw? What is the draft on that?

Mr. DU MOULIN. The deepest—the big ones, the super tankers, will draw generally about 70 feet.

Mr. GILCHREST. 70 feet.

Mr. DU MOULIN. So they don't come into very many U.S. ports.

Mr. GILCHREST. Right.

Mr. DU MOULIN. The handier ships generally draw 40, 45 feet. So it is not such a problem of making the ports that much deeper. It is getting them to the depth that they should be, and dredging just hasn't kept up. Container ships, I think, are the ones that are now growing more rapidly. Tankers have stabilized.

Let me just talk about the issue of the funding. The simplest, the cheapest part of the whole system is just the raw data as to the depth of the water and the configuration of bottom. From that, industry can provide technologies for navigation. Ship owners are very happy to invest in modern navigational gear. We have it already. It is relatively cheap compared to the ship itself. And so the main thing is starting with a foundation of data. After that point funding will come in from industry.

The other fact is that every accident you prevent is saving a lot of money, so it is a good investment. Billions have been put into oil pollution response, cleaning up oil, but you don't need all that money expended if you have fewer accidents. So it is a real payback by getting the data. That is the best payback in the system.

Mr. GILCHREST. I guess we have 30 second for the next——

Mr. SAXTON. Let me just interrupt——

Mr. GILCHREST. I don't think I'm going to—I have to go testify in Appropriations, so I won't be able to come back.

Mr. SAXTON. OK, me too. I have to go to the same place.

Captain THOMAS. Just one quick analogy if I may, Mr. Chairman. We are sitting in the Longworth Building. On container ships, if we take the Longworth Building, duplicate it, make it double in length, now we are talking about the kind of container ship that is currently being constructed and calling in our ports. And they are very constrained by their draft and by the channel widths and so forth. But I think perhaps, just perhaps, the container industry is seeing that economy of scale beginning to stop because the ports, generally speaking, the less developed ports, cannot handle all of those containers that call on a ship of over six or seven thousand container equivalent units.

Mr. GILCHREST. So we have ports that might be 35 feet now, maybe 40, and quite a—year after year people are asking us to dredge the approach channels of the ports deeper and deeper. Do you think that is coming to an end now?

Captain THOMAS. No, I don't think so. You are being asked—ports are being asked to dredge deeper and deeper and deeper because for years they have not been dredged. And I think that is a very valid point to consider. The Port of Oakland is one, for example. We were 25 years in the planning of a dredging to 38 feet. I wasn't even a pilot, and I have been a pilot for over 25 years, when I engaged with the Port of Oakland and the Corps of Engineers in planning that deepening project. 38 feet was envisioned back in 1970 as the deepest possible that that port would ever have to go to. Now they are talking 48 feet and maybe that is not enough.

Mr. SAXTON. Well, let me just explain our situation. Wayne, the gentleman from Maryland, and I both have to go the Commerce Subcommittee, ironically enough, to testify on the NOAA appro-

priation for the next fiscal year. And so I would like to go vote and come back here. Unfortunately we are going to be unable to do that. And so we want to thank you very much for being with us today. And as the gentleman from Maryland suggested, we may be submitting some additional questions to you in writing. Thank you very much. And the hearing is—I have to go vote.

Mr. ABERCROMBIE. We all have to go vote. I just wanted to congratulate Mr. Provo. I have wanted to congratulate you because you said Nation Water Level Observation Network tide tables and water current data and the availability of proven effective Physical Oceanographic Real-Time System, PORTS, all in one breath.

Mr. SAXTON. The hearing is adjourned.

Thank you.

[Whereupon, at 4:00 p.m., the Subcommittee was adjourned; and the following was submitted for the record:]

WRITTEN TESTIMONY OF

DIANA H. JOSEPHSON
DEPUTY UNDER SECRETARY FOR OCEANS AND ATMOSPHERE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

BEFORE THE

SUBCOMMITTEE ON FISHERIES, WILDLIFE AND OCEANS
COMMITTEE ON RESOURCES

U.S. HOUSE OF REPRESENTATIVES

April 24, 1997

INTRODUCTION

Thank you, Mr. Chairman, and members of the Subcommittee, for this opportunity to testify on NOAA's efforts to evaluate and plan to provide modern survey, charting, water levels, and positioning data and technologies to promote safe navigation. The health of coastal economies and the Nation's success in the emerging global market require safe and efficient marine commerce. As a trustee and steward of the Nation's marine environment, NOAA is keenly aware of the need to protect and enhance coastal resources. Modern navigation services support both efficient commerce and marine resource protection. I am accompanied today by David Evans, Deputy Assistant Administrator of the National Ocean Service, Captain Nicholas Prahl, Director of the Office of the Coast Survey, and Captain Lewis Lapine, Director of the Office of the National Geodetic Survey.

THE NEED FOR MODERN NAVIGATION SERVICES

The health of coastal economies and the nation's success in the emerging global market require safe and efficient marine commerce. More than 98 percent of U.S. foreign trade by weight moves by sea. Since 1955, maritime trade has doubled and the nation's volume of international trade has nearly quadrupled. In 1994 international maritime trade exceeded the tonnage of domestic waterborne trade for the first time. Each year more than 2 billion tons of cargo move

through U.S. ports. In 1991, the commercial shipping industry supported 1.5 million jobs, provided $52 billion in personal income, and generated about $20 billion in Federal, state, and local tax revenue.

But with increased marine commerce comes increased risks. During the last half century the length, width, and draft of ships have doubled. Some vessels now draw up to 60 feet of water – the equivalent of a five-story building plunging toward the ocean floor. Every year there are about 3,500 commercial shipping accidents in U.S. waters, and between 1993 and 1995 the Coast Guard reported 4,078 groundings of all vessel types. Half of all cargo transiting U.S. waters is hazardous. Between 1993 and 1996, there were 558 reports of loss of control of tankers, and tankers alone were involved in 174 groundings, 147 collisions, and 12 deaths. One major oil spill can cost billions of dollars, burdening governments and the private sector with litigation, regulation, cleanup, and remediation expenses. In 1996, NOAA's Hazardous Materials Response Division responded to 69 spills, including the release of 1.9 million gallons of caustic soda near Flagler Beach, Florida and the North Cape spill of 825,000 gallons of diesel fuel and heating oil off Narragansett, Rhode Island.

Modernizing NOAA's navigation services provides a cost-effective opportunity to significantly reduce risks to life and property, enhance the efficiency of U.S. ports, and protect the nation's coastal resources without increasing Federal regulation.

FEDERAL RESPONSIBILITIES AND NOAA'S STEWARDSHIP ROLE

Reducing the risk of marine accidents by providing navigational services has been a fundamental Federal responsibility since President Thomas Jefferson created the Survey of the Coast in 1807. The Commerce Clause, the General Welfare Clause, and other constitutional authorities provide the basis for the Federal government's mandate to facilitate safe and efficient maritime trade while protecting lives, property, and marine resources.

The primary Federal responsibilities for NOAA's navigation services are:

Quality Control. Maintain the Federal navigation databases and the operational expertise,

technology, and capability to set national standards and certify the quality and accuracy of the data collected.

Nationwide Coverage. Work to ensure that mariners are provided up-to-date data in uniform, easily accessible formats.

International Standards. Continue to provide leadership in setting and meeting international standards for navigation data and information systems.

Research and Development. Remain in the forefront of researching, developing, and applying new technologies for enhancing the safety and efficiency of maritime commerce.

CRITERIA FOR PRIORITIZING HIGH RISK PORTS AND COASTAL AREAS

As an early participant in efforts to reinvent government and serving as a pilot agency to implement the Government Performance and Results Act (GPRA), NOAA's navigation services undertook a strategic planning process. Upon establishing the primary strategic goal -- Promote Safe Navigation -- NOAA also established criteria for ranking coastal areas and ports most in need of navigation services.

The areas had to have waters shallow enough to pose a threat to navigation, but deep enough to accommodate commercial traffic. Other criteria included the quality of existing hydrographic data, the level of passenger traffic, the volume and type of cargo traffic -- hazardous cargo was more heavily weighted, and the area's proximity to fisheries and marine resources of national significance. The identified critical areas are primarily located in shipping lanes, approaches and within major U.S. ports.

FINDINGS AND STRATEGIES BASED ON THE STRATEGIC REVIEW

In addition to establishing criteria to address the seemingly insurmountable and increasing backlog of existing and new requirements, NOAA also undertook an in-depth evaluation of the navigation services themselves. After a series of internal and external reviews, the agency developed a strategy to focus scarce resources on implementing technologies that would most efficiently promote safe marine navigation.

Nautical Charts

The reduction in force throughout the Federal government poses significant challenges to the slow, labor-intensive processes for producing and revising nautical charts. In response to these challenges, NOAA is modernizing the charting process so increased quantities of new hydrographic data can be accurately and efficiently charted. Whenever possible NOAA is utilizing readily available, off-the-shelf hardware and software to support the creation of a basic suite of digital charts.

Hydrographic Surveys

NOAA's aging hydrographic survey fleet has been reduced, and procurement of new vessels is not favored by the Congress. At the same time, NOAA's surveying responsibility now includes the 3.2 million square nautical miles of the Federal Exclusive Economic Zone. NOAA has established criteria for identifying high-risk areas most in need of surveying. NOAA also retired two of its five remaining hydrographic ships, intends to install advanced hydrographic equipment on the remaining ships, and implement the use of site-specific (spot-and-locality) contracts and long-term leasing of ships for data acquisition.

Tides and Water Levels

There is a growing need and demand for real-time data to improve the accuracy and timeliness of the nation's tide and water level information systems. NOAA will demonstrate the benefits of the prototype Physical Oceanographic Real Time System (PORTS), while maintaining the water level, tide, and current programs, primarily the National Water Level Observation Network (NWLON).

NOAA HAS CONVERTED TO A COMPUTER-BASED CHARTING PROCESS

In 1994, NOAA concluded that despite the advent of digital charts, the demand for paper

charts would continue for the foreseeable future. There was also a growing demand for an inexpensive digital version of the paper chart (the raster chart) and a critical need to provide both paper and raster chart users with up-to-date information. Meeting these demands required dramatically reducing the time and expense of producing charts. In the interim, NOAA could more fully evaluate how best to implement the highly touted, but expensive and more complex, next-generation vector digital charts.

Continual Maintenance: Keeping Charts and Mariners Up-to-Date

In fiscal years 1996 and 1997, the Congress recognized the importance of increasing support for navigation services. NOAA has utilized funding increases to rapidly streamline its nautical charting program by converting its suite of 994 paper charts to a digital raster database.

Using commercially available, desktop technology, NOAA has dramatically accelerated chart production time; has made chart updating much simpler; and, through a private-sector partnership, has made its entire suite of nautical charts available on CD-ROM and floppy disk. NOAA has reduced the time to chart new hydrographic survey data from five years to within one year of acquisition, and can continue to do so even if there is a significant increase in the acquisition of new survey data. By the end of 1997, all Notices to Mariners and other reported changes will be made weekly to the entire chart suite.

The raster process is operational. Present base funding should be sufficient for the continued maintenance of the system. NOAA, in cooperation with a private partner, has made significant advances in creating a Raster Chart Display System that integrates the raster chart with modern positioning and other technologies to provide a product that significantly enhances safe navigation.

Eliminating the Problem of Perishable Data

Historically, a nautical chart would have to serve a mariner for at least 3-5 years before a

new edition was published. During that time many critical changes would accrue and mariners had the responsibility to meticulously edit and update their charts by hand.

By late 1997, mariners using the digital raster chart will be able to directly obtain digital "patches" to update their charts. By the end of the century, NOAA plans to begin point-of-sale printing for paper charts. NOAA is working with the private sector to improve the quality and efficiency, and reduce the costs, of providing "print-on-demand" services. When that is achieved, mariners will be able to contact a chart retailer and order a chart that will be printed on site from NOAA's continually updated chart database.

Providing Advanced Vector Charts

The difference between a raster and a vector chart is similar to the difference between a fax and word processing document. A fax can be viewed and read. A word processing document can also exploit other computer functions such as an automatic spellchecker that issues a warning when errors are made. While a raster chart is a picture of a chart, a vector chart contains information in a computer accessible format. This is an over simplification, but it does convey the essence of the distinction. Vector data are an important element of the Electronic Chart Display and Information System (ECDIS) and related "intelligent bridge" computer systems. These systems can integrate vital ship information such as draft and speed, with radar, water levels, the global positioning system (GPS), and digital chart data to create automated collision-avoidance, anti-grounding, and related safety-warning systems.

Because paper chart features were positioned for use only at the scale of the existing chart, NOAA concluded that new, high-accuracy ECDIS and vector charts required large-scale, more accurately positioned features-- otherwise the vector chart would create the dangerous illusion of improved accuracy. Creating a vector database of every charted feature is expensive; no country has implemented a fully vectorized system. Some are taking short cuts by scanning and then "vectorizing" paper chart features, a practice that could promote a false sense of security and

ultimately diminish, not enhance, navigation safety.

The Raster/Vector Hybrid

Instead, NOAA is collecting and maintaining vector data for a reduced set of the most *navigationally significant* features on approaches to and within the nation's 40 largest ports. Identified in consultation with the marine navigation community, the initial features include fixed aids to navigation, buoys, bridges, obstructions, wrecks, rocks, dredged areas, cables, traffic separation schemes, pipelines, platforms, and cautionary areas. The vector data will comply with the international data exchange standard. The data can be used with ECDIS, and can be displayed in combination with raster charts by overlaying, in side-by-side displays, or in a separate window. The new data will also be used to upgrade the raster/paper chart database.

NOAA would like to accelerate collection of vector data to hasten the private sector's implementation of ECDIS navigation. In the summer of 1997, a prototype of the vector product, as well as data from NOAA's advanced water-level system, PORTS, will be field tested in an integrated, privately developed ECDIS in San Francisco. In response to the Committee's request, NOAA's preliminary estimate of the total additional cost (not included in the President's FY 1997 request) of completing the initial vector database for the nation's 40 major ports and approaches by the year 2000 is about $7.75 million, distributed over three years.

MODERN SURVEYS FOR SAFE NAVIGATION

Before 1930, hydrographers took soundings by throwing a knotted lead line over the side of the ship. Besides being extremely time consuming, this practice missed large and potentially hazardous features rising from the ocean floor. About 50 percent of the soundings on NOAA's current nautical charts are based on data collected with a lead line or primitive echo sounders. Modern multibeam echo sounders can collect wide swaths of precise depth data, and side-scan sonar detects hazards by producing images of strips of the sea floor. It was the NOAA

hydrographic survey ship, RUDE, using state-of-the-art technologies, that discovered the wreckage of TWA Flight 800. The RUDE also has found hazards to navigation in waters previously surveyed with conventional methods.

The Importance of Hydrographic Surveys

There is no magic bullet -- going to sea is expensive and there are no proven alternatives to conducting hydrographic surveys from vessels at sea. Hydrographic surveying is the most costly, but also most important, requirement in promoting safe navigation. Digital charts and ECDIS will be of marginal benefit if their data are derived from decades-old surveys using obsolete techniques that provided incomplete coverage. Advanced multibeam and sidescan sonar surveys positioned with the accuracy of GPS technology can provide full-bottom coverage and precisely locate shoals, rocks, wrecks, and obstructions in critical high-traffic areas and major ports.

The Critical Survey Backlog and Other Requirements

After establishing the critical-needs criteria during the planning and review process, in 1994 NOAA specifically designated 43,000 square nautical miles (snm) in need of new surveys. Today, of the 39,000 snm that remain unsurveyed, about 16,200 are in the continental U.S. and Hawaii and 22,800 in Alaska. This backlog represents only the nation's most important needs and is less than 1.5 percent of the Exclusive Economic Zone that NOAA is responsible for charting.

Through Notices to Mariners, NOAA also receives reports of 200-300 wrecks and obstructions each year. In the course of scheduled surveys, NOAA investigates and documents the depth and position of about 150 a year. This disparity is resulting in a steadily increasing number of unsurveyed, reported hazards to navigation. These areas are noted on charts as "areas to be avoided" often increasing transit time and costs to mariners.

Traffic areas subject to shoaling need to be periodically resurveyed about every 10 years. This creates a recurring requirement to survey about 1,000 snm/year to prevent accumulating a

new critical backlog. In addition, NOAA relies upon the Coast Guard, Army Corps of Engineers, local authorities, and mariners to report new or unforeseen needs which must be prioritized for surveying. Finally, there are new priority requirements outside the critical areas that have never been properly surveyed. For example, up to 21 Panamax-class vessels with drafts of over 40 feet are planned to make port calls each year in areas of inadequate surveys in northwest Alaska.

NOAA's Strategy to Eliminate the Survey Backlog: **Responsibility and Accountability**

1. Modernize the capabilities of NOAA's three remaining ships, launches, and shore parties

Because the capital investment in NOAA's remaining hydrographic ships was incurred long ago, and because NOAA is home to 200 years of expertise in chart-quality hydrography, using NOAA's three remaining hydrographic ships for the remainder of their useful lives is the most cost effective and readily available resource to address the critical survey backlog. *Rude* and *Whiting* operate in the continental U.S., and *Rainier* operates primarily in Alaska. Combined, they survey about 1,300 snm per year. The *Rude*, a small coastal ship, can be operated very cost effectively until at least 2001; at that time NOAA will reassess material condition of this vessel and conduct a cost analysis. Depending upon the results of these analyses, the vessel will operate for an additional 4-7 years or will be replaced by a leased vessel. *Whiting* and *Rainier*, which carry survey launches in addition to ship-board systems, should remain operational until about 2009. Because this is beyond the ten-year ship planning cycle, NOAA has not developed firm plans to replace these two ships. NOAA's present intent is to replace them with the most cost-effective vessels available, possibly dedicated leased vessels.

Modernization will couple the government's surveying expertise with advanced, high accuracy, surveying technology. NOAA estimates at least a 20 percent increase in survey efficiency if it modernizes. It will also preserve the government's leadership role in chart-quality hydrography and maintain Federal expertise so NOAA can quality assure, certify, and adopt

contract data as its own. Only the equipment on NOAA's smallest vessel, the *Rude*, has been modernized. The cost of installing modern equipment on the *Whiting* and *Rainier* and their launches is about $3.5 million.

2. Increase the use of spot-and-locality contracts for survey data

NOAA intends to rely heavily on spot and locality contracting to survey critical areas in the continental U.S. and to conduct wreck and obstruction surveys. To facilitate the increased use of contractors, NOAA is seeking permanent Brooks Act, quality-based, contracting authority to streamline and accelerate the contracting process. The advantages of contracting include no up-front Federal capital expenditures and the immediate availability of support to assist in eliminating the critical backlog. The disadvantages include a lack of private sector experience, contracting delays, uncertainties regarding cost effectiveness, and the inflexibility to respond to unforeseen emergencies or disasters. Contracting also raises issues about liability, indemnification, and insurance coverage that need to be considered as part of this strategy. To assist development of private sector capability, NOAA recently sponsored a well-attended course on chart-quality hydrographic surveying at Old Dominion University. NOAA expects the efficiency and quality of contractors to improve as they gain experience.

3. Lease vessels for Alaska and replace NOAA's ships as they are retired

Because of Alaska's remoteness and harsh climate, NOAA favors long-term access to vessels with proven capabilities to help *Rainier* eliminate the backlog there. In a recent report to the Congress, NOAA concluded that a lease-back from the private sector of the sister ship of *Rainier*, or a vessel of similar capability, is a viable option. The leasing of vessels could also provide platforms for government hydrographers and researchers as NOAA's ships are retired. This will help maintain fundamental Federal expertise and ensure that the government can responsibly certify contract data in the future. Another advantage of leasing ships is it will

eliminate the need for the government administration, infrastructure, and overhead associated with ship maintenance and shore-side facilities. The primary drawbacks of leasing ships are legal limitations on the length of leases, the added costs of allowing for profits, and budget scoring practices that require the capital costs of leases to be assessed in a single fiscal year even if the appropriations are made over the term of the lease. NOAA will, of course, fully evaluate the relative effectiveness of leasing versus other options for obtaining surveying vessel support.

4. Continue to work with other government agencies and the private sector in the research and development of efficient data acquisition, management, and dissemination technologies

The navigation services have a long history of developing and promoting advances in survey technologies. For example, in the 1980s, NOAA worked closely with a private grantee to develop high speed, high resolution sidescan sonars. More recently, NOAA worked in partnership with the private sector and the Army Corps of Engineers to develop SHOALS, an airborne, laser survey technology which NOAA is field testing for chart-quality applications.

NOAA continues to work closely with other agencies, academia, and the private sector to develop new technologies. The Navy has expressed an interest in technology transfers and joint projects, and the navigation services are reviewing and pursuing projects for consideration under the recently passed National Ocean Partnership Act. NOAA also is investigating applications of remote sensing and satellite-based mapping. Some satellite applications have provided unprecedented relief maps of ocean floor bathymetry, but they lack the detail needed for charting. Remote sensing technologies may, however, have applications for gathering shoreline data and could provide an efficient alternative to airborne shoreline photogrammetric surveys in the future.

Summary of the Strategy

This four-pronged approach utilizing in house data collection, contracting, leasing, and joint research is a responsible strategy to maintain and enhance Federal expertise while making a

transition to utilizing other cost-effective resources for data acquisition. It also is consistent with the goals and objectives of the Government Performance and Results Act. The short-term use of in-house, contracting, and leasing will allow NOAA to evaluate the quality and cost-effectiveness of the three survey approaches. This competition will also provide an incentive for all parties to perform efficiently. NOAA plans to enlist the services of an independent accounting firm to monitor and report on the cost effectiveness of the different surveying strategies.

Eliminating the Critical Survey Backlog

At Present Funding Levels -- a 30-year strategy

NOAA's hydrographic operations will incur a total annual cost of about $25 million per year. This includes the cost to operate the *Rude* and *Whiting* along the Atlantic and Gulf coasts and *Rainier* in Alaska, and also includes contracting, hydrographers, quality control, data processing, and shore-based support. Without considering the capital costs of vessels to replace NOAA's ships as they are retired, at present funding levels it will take about 16 years to eliminate the backlog in the continental U.S. and 34 years in Alaska. Because of the need to periodically resurvey some areas, to survey wrecks and obstructions, and to meet new requirements, critical needs will continue to accrue and will never be eliminated.

Accelerating the Backlog's Reduction -- a 20-year Strategy

In response to the Committee's inquiry, NOAA could eliminate the backlog in the continental U.S. in the first 10 years of this strategy by modernizing its surveying equipment and increasing spot-and-locality contracting from $6 million to about $14 million a year. (Of course, the Committee should understand that the estimates regarding the increased cost of an accelerated backlog reduction strategy are based on *preliminary estimates* provided by NOAA at the Committee's request based on the best available information and are not in the President's FY 1998 Budget request). Then, if contract funding was sustained after the continental U.S. backlog

was eliminated, NOAA would have resources to prevent new critical needs from accruing. Outfitting NOAA's ships with modern equipment would cost about $3.5 million. An additional $1-3 million per year would support contract surveys of wrecks and obstructions outside the critical areas.

In Alaska, NOAA would probably utilize a combination of in house and leased data collection platforms, but would also pursue some contracting for near-shore data. A second vessel working with *Rainier* would eliminate the Alaska backlog in about 16 years after it began in service at an additional cost of about $11-13 million per year. (Again, these additional costs are based on a preliminary estimate provided by NOAA and not addressed in the President's FY 1998 request). Assuming a leased ship could be in service within two years, the Alaska critical backlog could be eliminated in about 18 years. NOAA would also need to accelerate contracting for shoreline photogrammetry at a cost of about $3 million per year to keep pace with increases in hydrographic surveys. NOAA's estimated cost of accelerating our current rate of production would be about $30.0 million a year over FY 1997 funding levels (also not included in the FY 1998 request).

Eliminating the Backlog Sooner – a 10-year Strategy

Augmenting the 20-year strategy by using two vessels in Alaska (in addition to *Rainier)* would eliminate the entire critical survey backlog by 2010. At that time, NOAA would be preparing to retire *Rainier* and *Whiting* and would have begun planning to replace their capability. The government would also have hydrographers and scientists with expertise in advanced technologies and an experienced private sector capability to conduct future surveys. In response to the Committee's request, NOAA's preliminary estimate, not included in the FY 1998 request, is about $43 million per year over present funding levels.

DELIVERING REAL-TIME TIDE, WATER LEVEL, AND CURRENT DATA

As the draft of vessels has increased and marine commerce has become increasingly competitive, knowing how much water is under a ship's keel has become increasingly critical to maritime safety and efficiency. The Coast Guard needs accurate water-level data for administering minimum under-keel clearance regulations and for providing vessel traffic information services.

For more than a century, the mariner seeking tide and current information has used the tide and tidal current prediction tables. In fact, like nautical charts, these tables are required by law on vessels over 1600 gross tons. Such tables, however, do not provide the mariner information on the actual water level or current conditions. They can only provide predictions based on astronomical effects, such as the gravitational pull of the sun and moon. Such predictions do not, and cannot, include the significant effects of winds, river flow, atmospheric pressure, or water density on water levels and currents. For example, a significant shift in winds alone can result in a difference of several feet between actual and predicted tides.

Maintaining the National Water Level Observation Network

The National Water Level Observation Network (NWLON) is a network of 189 stations that monitors water levels over long periods to establish averages for establishing high and low water. For example, Mean Lower Low Water (MLLW) is the reference used for all nautical chart soundings because it provides a conservative estimate of depth. Long-term, local measurements by NWLON also provide the basis for making tide and tidal current predictions for specific ports and coastal regions.

Declining budgets have hampered replacement of old gauges as well as the maintenance that is required to ensure NWLON provides high quality data. In the early 1990s, NOAA could not afford to conduct surveys and had to withdraw some tidal current predictions, including predictions for New York and San Francisco ports. In 1996, NOAA reprogrammed funds from the mapping and charting program to maintain minimal operation of the NWLON.

Realizing the Promise of PORTS

The Physical Oceanographic Real-Time System (PORTS) builds upon the real-time and communications capabilities of new NWLON stations and is designed to integrate and deliver real-time water levels, currents, winds, and other critical oceanographic and climatological information. PORTS improves the safety and efficiency of maritime commerce by providing mariners with timely, highly accurate observations of actual water level conditions. NOAA is installing a 24-hour-a-day quality assurance system for PORTS, called the Continuous Operating Real Time Monitoring System (CORMS).

PORTS data have been credited with preventing groundings, reducing shipping delays, maximizing vessel capacities, and significantly improving the results of oil spill speed and trajectory models for spill response. Prototype PORTS have been installed in Tampa, San Francisco, Houston/Galveston, and the Port of New York/New Jersey. NOAA continues to research and develop PORTS technology, including the ability to provide short-term forecasts as well as real-time data.

Private sector and local interest in PORTS is high, and because PORTS data can provide specific local benefits by enhancing port efficiency, NOAA anticipates future installations will be based on Federal/local cost sharing. Partnerships with the private sector, local ports, and maritime interests are an integral part of PORTS because each system must be designed to meet specific local needs. Some ports may require an elaborate system, while others may require only minor modifications or additions to the existing NWLON stations.

At current, and proposed funding levels, NOAA will be able to operate NWLON, but not maintain, repair, or replace stations in the network. In response to the Committee's request, NOAA' preliminary estimates that to adequately maintain NWLON, existing PORTS, and the other responsibilities of the water level programs would cost an additional $3.5 million above the $11 million included in the President's request (i.e. a total of $14.5 million per year).

NOAA estimates that about 15–20 of the nation's largest ports could benefit from a complex PORTS installation, each costing $2.0–3.5 million. Another 20–25 ports could benefit from a less complex system at a unit cost of between $500,000 and $2 million. Annual maintenance of PORTS is about one third the installation cost, but includes replacement of all sensors and equipment for the life of the system.

Non-navigational Uses of Real-Time Tide and Water-Level Data.

Tide and water level data have many applications beyond supporting safe marine navigation:

State and local governments use the data to determine property lines and establish setbacks from the high-water mark.

- NOAA's Weather Service uses the data to predict and provide warnings of storm surges and tsunamis.

Climatologists use the data to monitor changes in sea level (including the Great Lakes).

Universities use the data to create circulation models and conduct in-depth investigations of bay and harbor ecosystems.

- The U.S. Army Corps of Engineers uses Great Lakes water levels data to monitor and regulate depths as part of international agreement with Canada.

NOAA's HAZMAT office and port authorities use the data to improve predictions of the speed and trajectory of oil spills, allowing for more precise and efficient deployment of spill response teams and equipment.

CONCLUSION - BUILDING SUSTAINABLE PORT COMMUNITIES

The combination of full-bottom surveys, digital charting, satellite positioning (GPS), and PORTS will enhance the safety, efficiency, and competitiveness of U.S. ports without increased regulation. It will also allow ships to carry more cargo thereby increasing revenues and the competitiveness of U.S. Exports. The increased reliability and accuracy of charted data and water

levels will streamline the scheduling of ship arrivals and departures, will allow for faster, more direct transits reducing fuel consumption and pollution, and will protect the nation's treasured coastal resources.

NOAA is committed to maximizing the use of navigational data for a variety of other purposes as well. In addition to providing navigational services, NOAA's National Ocean Service also houses much of the nation's coastal science and management expertise. Navigation data can provide valuable information to better understand, monitor, protect, enhance, and restore sensitive coastal habitats, and can support efforts to fulfill many of the purposes and objectives of the Coastal Zone Management Act, which Congress enthusiastically reauthorized in 1996.

The National Ocean Service also has utilized partnerships and demonstration projects that integrate its programs to meet the needs of specific port and coastal communities. These site-specific, "sustainable ports" projects in San Francisco Bay, Puget Sound, and Prince William Sound and Cook Inlet involve Federal agencies, state and local governments, harbor safety committees, environmental interests, academia, and the maritime industry. Such partnerships are key to reinventing and improving the delivery of Federal services. They are helping NOAA to identify and maximize use of existing expertise and resources, while limiting duplication of effort and creating innovative solutions to complex challenges.

11.

Lockheed Martin Demonstration of Chart Technology

Hello, my name is Cosmo Castellano, and I am the Program Manager for the SmartBridge™ Integrated Bridge program at Lockheed Martin, Ocean, Radar, and Sensor Systems (OR&SS) in Syracuse, NY. I'm here today to demonstrate SmartBridge™, an advanced technology product being developed by Lockheed Martin to meet the needs of today's and tomorrow's navigation community.

The SmartBridge™ concept integrates a wide array of information critical to the mariner and provides a variety of displays to best present the information. Unlike other integrated bridge systems, our system combines collision avoidance with situation monitoring in one display for enhanced efficiency of operation. Communication with Vessel Traffic Management Systems also allows navigation information from shore to be integrated into the ship's display. The concept is being developed under a DARPA Maritech initiative through a Department of Transportation, Marine Administration (MARAD) cooperative agreement. Its goal is to enhance the competitiveness of US ships by providing improved operational performance and safety at reduced cost.

The SmartBridge™ modular architecture can be scaled to ships large and small, and the open architecture in both hardware and software design allows for a manageable upgrade path. A fully networked system, all navigation data is available on the network to allow multiple display units to perform any of the navigation tasks. The displays can be placed on the ship's bridge, the navigation room, or even shore based sites.

The ship's position is determined from the SmartBridge™ interface to a wide variety of sensors such as Differential GPS, and other positioning technologies, gyrocompass, radars, sonars, and environmental sensors. Through data linkage with the Lockheed Martin Vessel Traffic Systems products, a SmartBridge™ Integrated Bridge can provide a full port traffic picture to the ship's master. Environmental data from NOAA's Physical Oceanographic Real Time System (PORTS) and oceanographic models can be received by SmartBridge™ and displayed on the Electronic Nautical Chart.

Since time is limited I will demonstrate the features of SmartBridge™ most relevant to the purpose of today's hearing, that is, how SmartBridge™ utilizes the navigation products and services provided by NOAA.

On the screen you see a display using a NOAA raster chart as the display data source. As you know, a raster chart is a "picture" whose individual features cannot be manipulated or understood by the computer. Ship's position has been simulated here in place of the navigation position fixing instruments and software. The ship may be centered in the display with the NOAA produced raster chart moving under, or the chart may be fixed and the ship indicator can move.

The raster chart provides a picture that the mariner is familiar with today, since it is identical to the paper charts that are required for use aboard ships. The raster chart, however, contains no intelligence for the computer system to interact with: it is only a picture.

The SmartBridge™ system allows the use of raster and vector data in combination. Both sets of data, raster and vector, are synchronized geographically for use by the system together. Selecting the vector view shows vector data collected by NOAA. You can see that it resembles the raster view, but is much more sparse in nature. This chart only includes the themes of interest to professional shippers. (Note the geographic alignment as the raster and vector views are interchanged on the screen.) Each of the objects in the vector view is stored in a standard International Hydrographic Office format known as S57 version 3, and each

11. (Cont'd)

object may be interrogated (by clicking in the display, or through software system query) for information about that object. For instance, the symbols may represent buoys, lights, wrecks, or aids to navigation or obstacles to avoid.

With this system, the raster chart may be used for mariner presentation, but with the added intelligence of the underlying vector data set. Something that usually cannot be done with a raster chart will now be shown. By selecting an object on the raster chart, we may query the vector data set for information about that object. The software automatically queries the vector data for objects that are in the region of the ship as it travels along its sail plan, and the information about the chart objects is used to develop the warnings and alerts to assist the navigator to avoid collision and optimize his sail plan.

Sub-sets of vector information may be used in layers that are selectively enabled or disable by the operator to remove clutter from the screen, or to include additional information and functions. For instance, the PORTS environmental data is implemented as dynamic chart objects that are transmitted to the ship and overlaid on the nautical chart as arrows indicating direction of wind speed, as one example, with the arrow color used to show range of magnitude. The pictorial view is much more powerful than a table of numbers, especially as presented on the familiar nautical chart. Real time environmental data can be of tremendous value to the ship in place of the astronomical tide tables. Using nowcast and forecast information the mariner can safely move deep draft vessels through harbor waters not only enhancing safety, but promoting and facilitating commerce.

Combine the power of the vector chart with the more familiar "look" of the traditional NOAA charts allows a transition path for our nation's hydrographic office to progressively increase the vector chart data sets while allowing for the benefits of electronic navigation and position fixing. The combination of official chart data with quality assured, real-time environmental data provides tools for the safe operation of our ports and harbors and can only enhance the competitiveness of United States shipping.

Today, I've just touched the surface of what SmartBridge™ can do, but it is important to note that SmartBridge™ can only be as good as the data that goes into it. If the charting data is not GPS positioned, if the depths are no longer accurate due to the lack of updated surveys, if wrecks and obstructions are not identified, and if real time PORTS type information is not available, there is nothing that any modern technology can do to overcome that problem. Simply reformatting "old" data in new products is misleading the user, and is inconsistent with the quality of today's position measurement capabilities.

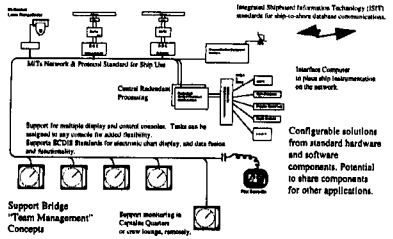
NOAA has been making good progress towards providing data in digital form that enables products like SmartBridge™, which can enhance and add value to that data, possible, however, as I've just described NOAA is far behind where the industry feels it should be in the provision of accurate, up to date navigation data.

I've been to a number of foreign ports and harbors to demonstrate our Marine Traffic Management Products. Most of these ports and harbors have current, accurate charts, and even real time PORTS type data. This obviously puts US ports at a competitive disadvantage.

Thank you for the opportunity to participate in the hearing and demonstrate just of the many capabilities presented by technological advances. If anyone is interested in further demonstrations, I'd be glad to accommodate your request following the hearing.

LOCKHEED MARTIN

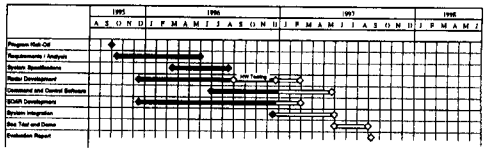
What Is SmartBridge™ ?



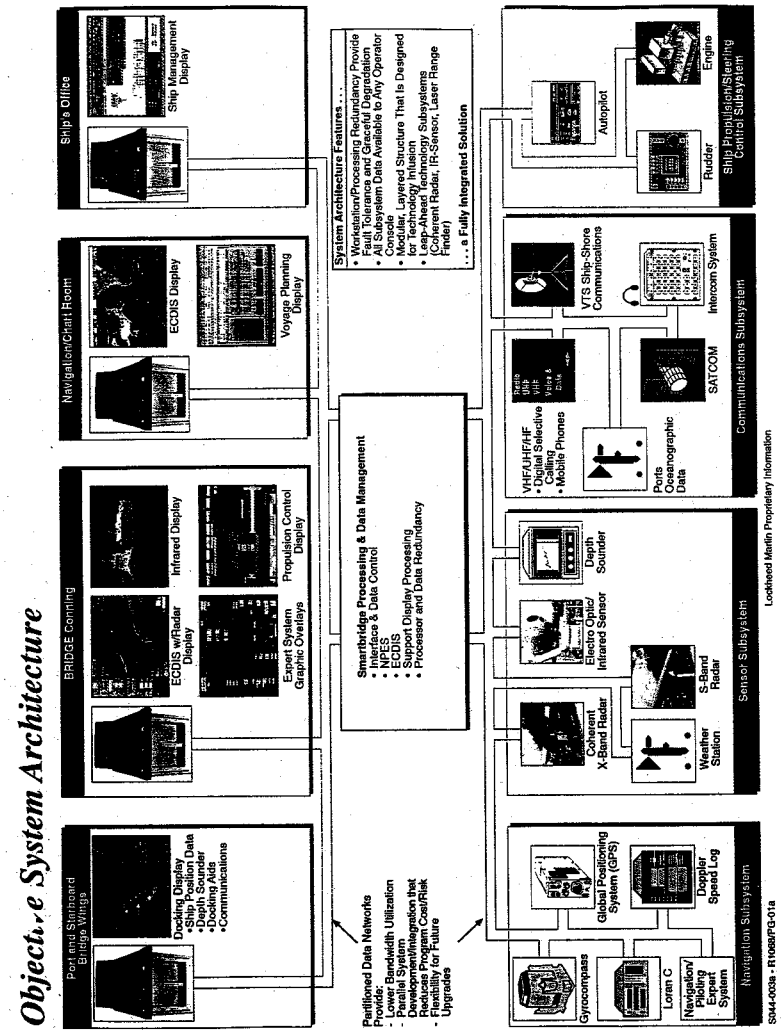
SmartBridge™ Integrated Bridge System is an integrated, networked computer system that manages and fuses data from standard navigation instruments, radar and video systems, off-shore systems (such as NOAA - PORTS), and presents information to the ship's bridge

- Navigation data used for position fixing, and radar tracks and video are overlaid, under operator control, on an Electronic Chart Display Information System (ECDIS). Features of the Automatic Radar Plotting Aid (ARPA) are also included in the system.
- An embedded expert system is available to provide reasoning on the fused data set and either provide recommendations to a pilot or master, or ultimately take control of the ship.
- Maximum use of Vessel Traffic Systems are to be utilized by data link to extend ship's sensor with off-ship data collection stations and radar equipment. Applications include enhanced under-keel clearance measurement and more complete traffic picture capability.

Summary Schedule



11. (Cont'd)


Objective System Architecture
Port and Starboard Bridge Wings
Docking Display
•Ship Position Data
•Depth Sounder
•Docking Aids
•Communications
BRIDGE Combing
ECDIS w/Radar Display
Infrared Display
Expert System Graphic Overlays
Propulsion Control Display
Navigation/Chart Room
ECDIS Display
Voyage Planning Display
Ship's Office
Ship Management Display
Partitioned Data Networks Provide:
- Lower Bandwidth Utilization
- Parallel System Development/Integration that Reduces Program Cost/Risk
- Flexibility for Future Upgrades
Smartbridge Processing & Data Management
• Interface & Data Control
• MMCS
• ECDIS
• Support Display Processing
• Processor and Data Redundancy
System Architecture Features . . .
• Workstation/Processing Redundancy Provide Fault Tolerance and Graceful Degradation
• All Subsystem Data Available to Any Operator Console
• Modular, Layered Structure That Is Designed for Commercial Volume
• Leap-Ahead Technology Subsystems (Coherent Radar, IR-Sensor, Laser Range Finder)
. . . a Fully Integrated Solution
Navigation Subsystem
Gyrocompass
Loran C
Navigation/ Piloting Expert System
Global Positioning System (GPS)
Doppler Speed Log
Sensor Subsystem
Weather Station
Coherent X-Band Radar
Electro Optic/ Infrared Sensor
S-Band Radar
Depth Sounder
Communications Subsystem
VHF/UHF/HF
• Digital Selective Calling
• Mobile Phones
Ports Oceanographic Data
SATCOM
VTS Ship-Shore Communications
Intercom System
Ship Propulsion/Steering Control Subsystem
Autopilot
Rudder
Engine
Lockheed Martin Proprietary Information
S044-003a - R1068/PG-01a

11. (Cont'd)

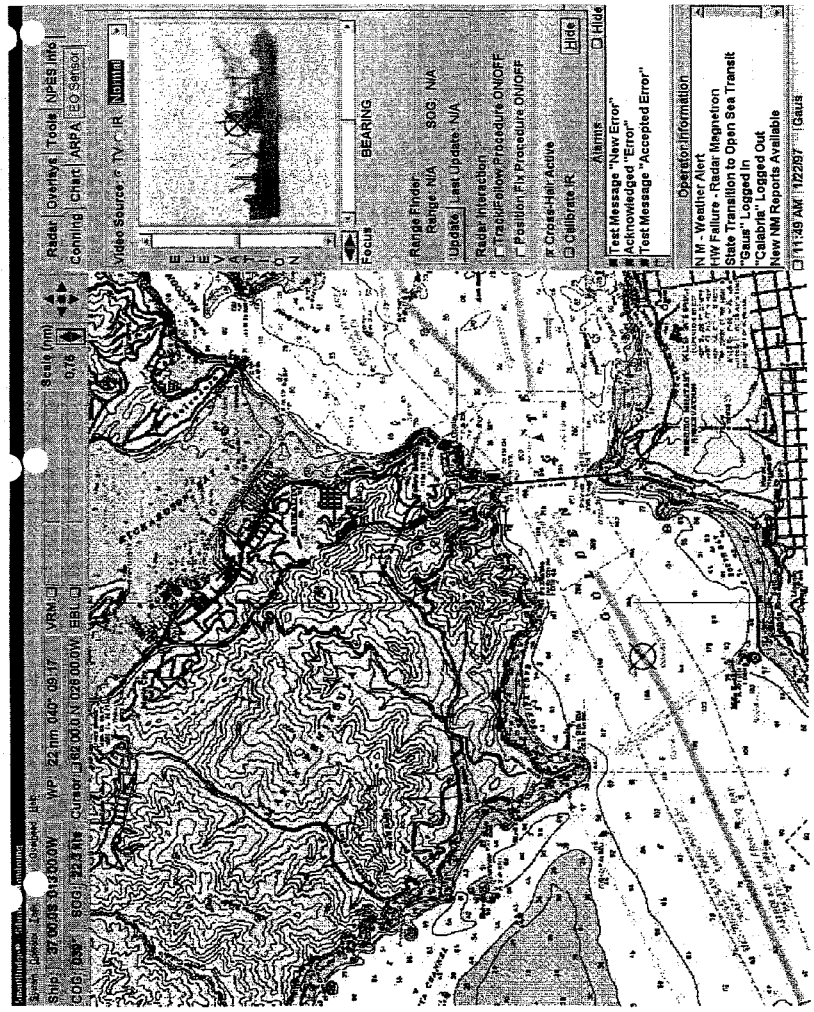
LOCKHEED MARTIN

SmartBridge™ is Different

The SmartBridge™ Integrated Bridge System is different from today's Commercial Off The Shelf Systems.

- *Increased Level of Integration*
  - True integrated system rather than separate stove-piped systems connected together
- *Reconfigurable Network where Interchangeable Common Displays perform all Integrated Bridge Functions*
- *Advanced Sensor Development*
  - Coherent Maritime Radar
  - InfraRed/ Laser rangefinder System
- *Embedded Expert System*
  - Navigation and Piloting Expert System
  - Provides reasoning based on combined sensor data, chart data, and off-ship data
- *Modular, COTS hardware*
  - Scaleable System, adaptable to all classes of ships
  - Low acquisition cost and Support Costs
- *Benefits from work done with NOAA, MARAD, DARPA, RPI*
  - Consortium sponsored in-part by MARAD/DARPA for SmartBridge™ development
  - Steering Group of Industry Experts have guided system requirements

11. (Cont'd)


Monitoring
Radar
Overlays
Tools
NPES Info
Conning
Chart
ARPA
EO Sensor
Scale (nm)
0.76
Video Source: TV / IR
Normal
BEARING
Focus
Range Finder
Range: N/A
SOG: N/A
Update
Last Update: N/A
Radar Intersection
Track Follow Procedure ON/OFF
Position Fix Procedure ON/OFF
Cross-Hair Active
Calibrate IR
Hide
Alarms
Hide
Test Message "New Error"
Acknowledged "Error"
Test Message "Accepted Error"
Operator Information
N.M. - Weather Alert
HW Failure - Radar Magnetron
State Transition to Open Sea Transit
"Gaus" Logged In
"Calabria" Logged Out
New NM Reports Available
11:49 AM 1/22/97
Gaus

Smart Bridge™

LOCKHEED MARTIN

Project Overview

PROJECT OVERVIEW

Title:	ARPA BAA 94-44 MARITECH Initiative, (Ship) Product Improvement Technology
Contracting Agency:	DOT Maritime Administration (MARAD) Cooperative Agreement Signed 9/29/95
Contractor (Lead):	Lockheed Martin Ocean, Radar and Sensor Systems
Period:	3 Years Max
Deliverables:	• Technology Evaluation Reports • Shipboard Demo of Key Capabilities & Equipment
Goal:	Enhance Competitiveness of US Ships by Providing Improved Operational Performance and Safety at Reduced Cost

Testimony of
Lorenzo D. Amory, III
President, Virginia Pilots Association
Before the
Committee on Resources
Subcommittee on Fisheries Conservation, Wildlife and Oceans
United States House of Representatives
April 24, 1997

Mr. Chairman and Members of the Subcommittee, I am Captain Rick Amory, President of the Virginia Pilots Association (VPA). On behalf of the American Pilots Association (APA), a national trade association representing the 1,100 state licensed maritime pilots, thank you for this opportunity to participate in your oversight hearing on the present state of the National Oceanic and Atmospheric Administration's (NOAA) hydrographic charting activities and other maritime services. While the VPA and the APA fully support NOAA's efforts to use the latest technologies to modernize its hydrographic charting activities, I would like to take this opportunity to specifically address the work done by NOAA's National Ocean Service regarding real time tide and current information that is relied on by my fellow pilots and the maritime industry in our country.

However, before I begin in earnest to address this issue, let me first thank the Committee for its efforts over the past two years to help increase support for the critical navigation services that NOAA provides to our Nation. These increases have allowed NOAA to make dramatic improvements to its chart production capabilities, including their conversion to electronic form for use in private sector electronic charting products. This is just the first step, however, to restoring NOAA's navigation services to the level they need to be at to ensure that the Nation's maritime industry has reliable tools, such as charts and tide and current data. To be completely candid, I cannot understand why in the past few decades these vital services have not been recognized and given adequate funding support for the vital role they play in maritime transportation and trade. Just last week I read that bicycle programs have received about $1 billion in federal transportation funds since 1992. When this figure is compared to that invested in our Nation's marine navigation services over the same time period, something is clearly wrong.

At the current annual funding level of $11 million for tide and current information programs - and to my understanding this is what is proposed for FY98 - NOAA will be not be able to maintain its National Water Level Observation Network, which provides the foundation for NOAA's critical tide and current services. In addition, although the technology and the know-how exists to provide Physical Oceanographic Real-Time Information Systems to improve the safety and efficiency of maritime commerce by providing highly accurate observations of actual water level conditions, no monies have been setaside for NOAA to work with interested ports on a national basis to provide these navigational information systems. Mr. Chairman and Members of the Subcommittee I strongly urge you to increase funding for these programs to enable the National Water Level Observation Network to be modernized and maintained, and for PORTS to be provided to ports that need their services and can support their operation.

Since the birth of our Nation, maritime pilots have guided foreign and domestic ships in and out of the country's ports and harbors. In those days we met the ships far at sea in order to deliver them safely to their berths where they could bargain for their cargo. Charts and tide information were known only by the local pilots. The ships were small, 150 feet in length drawing five to eight feet of water, but the business of navigating the bays and rivers was still risky. Proof of the pilots difficulty can be seen all along our coastlines and harbor bottoms with the remains of their vessels.

Yesterdays' accidents of vessel groundings, spilling tea or spices or blocking the channel for a matter of hours, did not make a significant difference by today's standards. The challenge for today's modern pilot is knowing precisely what the ship's location is at all times allowing him to safely navigate the vessel with regard to precise hydrographic information. We deal with billions of dollars of U.S. Commerce and delicate environmental circumstances. Ninety-eight percent of today's U.S. bulk products are exported by ships. Vessels have gotten so large, and intermodal transportation so complex, that the ability to load a few extra inches of cargo or better schedule a transit by just a few minutes by having accurate real time water level information can result in huge differences in dollars of revenue. The safety issue is paramount, due to the potential for the large loss of human life, which was fortunately avoided in the recent Glacier Bay and QE II vessel groundings. No one wants to see another Exxon Valdez occur that could inflict tremendous damage on our beaches and sea life. While these types of incidents are infrequent, U.S. waterborne trade is expected to increase by 50 percent over the next decade, and the consequences from even one major accident can be catastrophic.

The APA is deeply concerned that the Committee recognize the importance of NOAA's charting and real time tide and current programs that are used by pilots every single day around the Nation to navigate safely and efficiently. Pilots and ship owners rely heavily on NOAA's national standards for accurate charts, water levels, and current information when making decisions regarding safe navigation of vessels.

- **Pilots navigating new deeper-draft vessels in restrict channels require more accurate navigation information.**

Navigation is made difficult by confined maneuvering areas, depth limitations, and changing water level and currents due to unpredictable weather conditions. These factors restrict vessel transits, increase the risk of an oil or hazardous materials spill, increase the risk to life and property, and complicate efforts which would be undertaken to mitigate an incident.

Just as wind forces can adversely affect an aircraft, so can water currents affect the movement and maneuverability of a ship. When currents are combined with changing water levels and other dynamic factors, the need for real time information becomes essential to allowing the right decision to be made at the right moment. This scenario is similar to an airline pilot needing to know wind shear prior to landing or take off.

- **Mariners depend on information provided by NOAA which is available from no other source. Professional mariners can have a great deal of confidence in NOS products.**

The Nation's standards for these services must be protected in order for our ports to continue to compete in global economic marketplace. Mariners must be able to rely on timely, accurate, quality controlled information that is consistent no matter what port or harbor in the country is being transited.

- **NOAA funding is an extremely efficient use of tax dollars.**

Economically million of dollars may be lost by having to short load vessels because accurate water level information is not available. I cannot over emphasize the need for accurate chart and real time tide and current information. Inaccurate information is far worse than no information. Groundings, collisions with unmarked obstructions, etc. may have devastating affects on the flow of commerce as well as the environment should an oil spill or hazardous material spill occur.

The U.S. Army Corps of Engineers is tasked with the maintenance of all federal channels providing deep-draft access to the ports. The contract costs of their operation exceeds $300 million per year. The dredging and maintenance of these channels and harbors provides the pilot with deeper water to navigate in, knowing the accurate water levels and currents is equally important. Even with all the dredging efforts, some ships which continue to call on our ports require off-loading or lightering in order to meet the draft restrictions at certain locations. If quality controlled real time water level information were available, it would allow the shipper to accurately calculate tons of cargo relating to safe drafts required.

Here are just a few examples of the numbers we are talking about. One extra inch of draft on a large tanker carrying gasoline is equivalent to almost $100,000 at current retail prices. One extra foot of draft on a container ship would mean about 2000 additional tons of cargo, equal to about 120 twenty foot containers, or just over $100,000 in additional revenue per transit for the shipper. One terminal in Hampton Roads last year loaded 195 ships and 435 barges with coal. If the draft could have been increased by just one inch on each vessel, that one terminal operator would have exported more than $2.2 million in additional coal. I could go on and on with these types of examples, but let me add just a few more that show how important this country's ports and harbors are to its heartland - about one quarter of the U.S. planted acreage of corn, sorghum and barley produces grain that is shipped to foreign buyers. The U.S. also ships about half its annual wheat production overseas. The success of the U.S. in international markets depends on its ability to move grain, as well as a variety of other products, from the farmer or manufacturer to the overseas customer. NOAA's navigation products, particularly the tide and current data, help make our transportation infrastructure more efficient, and our Nation more competitive in the global marketplace.

Mr. Chairman, these major undertakings by the U.S. Government to provide accurate information for the safe and efficient navigation of vessels are critical in today's economic climates. The collection and distribution of information for the maritime community insures continued maritime commerce growth while at the same time protecting our economically important coastal ecosystems. The NOAA Tide and Current Data programs have proven their effectiveness and are depended on daily by the pilot members of the APA while performing their duties.

In closing, I would like to state that the APA supports NOAA's effort to continue their services and improve upon them. Their programs are designed to be implemented nationally for our industry as well as many others. NOS has worked closely with many of the Nation's ports and users in order to perfect a practical product that meets the needs of local mariners. This consultative

effort is essential to improving the design and continued delivery of NOAA products which are high quality and relevant to user needs. For NOAA to be fully successful, however, they must be provided the resources to continue their work and keep pace with present and future challenges of shipping and the advancements of the maritime industry to provide for the safe and efficient marine navigation. We urge your continued active support in having Congress make the necessary investment in NOS marine navigation services, which are essential for maintaining economically competitive U.S. shipping.

Mr. Chairman, that concludes my prepared testimony. On behalf of the Virginia Pilots Association and the American Pilots Association, thank you again for this opportunity to present our views for your consideration. I would be glad to answer any questions Members of the Subcommittee may have.

NOAA'S HYDROGRAPHIC CHARTING PROGRAM

VIEW FROM A CONTRACTOR'S PERSPECTIVE

ROBERT W. MORTON, Ph.D.

VICE PRESIDENT
MARINE SYSTEMS AND SURVEYS OPERATION

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

As stated in the invitation I received to testify before this committee, it is clear that modern navigation technology can provide significant benefits to the safety and efficiency of maritime commerce; but only if comprehensive hydrographic data are available that meet the requirements of these new systems. Fortunately, many of the same technological advancements that have improved vessel navigation also have direct application to the methods by which hydrographic data are acquired. Through the development of shallow water multibeam sonars, improved side scan sonars and GPS positioning, hydrographic surveying can now be accomplished with the 100% bottom coverage that is critical for the production of electronic charts and precise navigation of commercial vessels. However, it should be pointed out that this technology is still very new, and improvements to the instrumentation and procedures are continually being made. These improvements have, and will continue, to increase the efficiency and accuracy of survey operations, however, they generate much more data than was ever available in the past and unless they are used in an appropriate manner there is a definite potential for error or omission.

I represent the Newport, RI office of Science Applications International Corporation (SAIC), an organization that has spent the last several years developing systems and conducting surveys that meet the strict requirements for hydrographic surveying. NOAA is one of many clients we support, however, they are unique, in that they play a large role in setting the standards to which our systems and procedures must adhere. SAIC was fortunate to be awarded the first contract that NOAA issued to the private sector for Hydrographic Surveying using multibeam and side scan sonars. This survey took place in Long Island and Vineyard Sounds during 1995 and we are now preparing for a second contract to conduct a similar survey in the Gulf of Mexico.

I believe that the contracting relationship between NOAA and SAIC was successful during execution of the first project, although it has been a very complex and difficult effort. As I stated above, the new instrumentation used for hydrographic surveying, generates large amounts of data, and it is my opinion that neither SAIC nor NOAA were prepared for the complexities that this caused on such a large survey effort. Throughout the duration of the first contract, NOAA was extremely rigid relative to quality control issues, thereby insuring valid data; however; they were flexible in allowing SAIC to modify our survey schedules and plans in order to deal with the problems encountered. I can honestly state that NOAA, working within the boundaries of federal contracting regulations, certainly did their part to make the first contract survey a success.

I can also state that lessons learned in the first survey were incorporated in the RFP for the Gulf of Mexico contracts which are now under negotiation. These contracts include more concise language concerning accuracy and coverage requirements as well as utilization of computer generated quality control, rather than traditional paper products. Furthermore, the use of the Brooks Act contracting approach, rather than the original competitive, fixed price contract, changes the emphasis in NOAA's selection process to

one of technical capability rather than cost. All of these changes should make the follow on contracts more efficient and profitable, both for NOAA and the contractors.

I believe that this is a key point. If NOAA is to be successful in contracting hydrographic surveys over the long term, it must find a way to maintain the quality of the data while making the venture a profitable one for contractors. This leads directly to the issue of liability insurance to protect the government from the legal consequences of possible survey errors. This insurance is currently included as a requirement in the RFP for the Gulf of Mexico survey contracts, however, our investigations have found that this is simply not a cost effective option. First, it is not clear that the insurance would be available for the extended time required, and second, the costs for a single survey sheet, exceed the overall funding available for the entire project.

Furthermore, it is not the survey contractor who actually puts the depth sounding on the chart: that is now, and should continue to be, NOAA's responsibility. In order to meet that responsibility NOAA must have the capacity to review and edit the data generated by survey contractors. The fact is, that if done correctly, the quality control procedures required by NOAA and the International Hydrographic Organization (IHO) do provide the traceability back to raw data that would allow NOAA to make appropriate charting decisions. However, these are complicated requirements that must take into account the performance specifications of modern instrumentation. I believe that NOAA is now capable of accepting that responsibility and should remain in that role by continuing to develop and enforce the appropriate quality control criteria to determine the validity of survey data. This means that NOAA must maintain a thorough understanding of the technology and procedures utilized by the survey contractors; a very difficult task during this period of rapid technology growth.

I am aware of the restrictions that have been placed on NOAA with regard to improvement of data acquisition technology within the organization, and although I agree with the emphasis placed on contracting with the private sector, I am concerned that NOAA will not be able to maintain its expertise over the long term without an ability to utilize such equipment in house. If NOAA does not have sufficient qualified hydrographers, experienced in multibeam sonar operations, they will soon be unable to realistically judge the quality and efficiency of contracted surveys or to participate in decisions made by the International Hydrographic Organization regarding the criteria for accuracy and reliability of hydrographic data. I believe that an appropriate level of technology improvement should be preserved within the NOAA appropriations to insure that the agency is able to maintain its role of setting standards for hydrographic survey operations in a manner that will allow NOAA to accept the liability associated with production of nautical charts. I would even go one step further, and suggest that NOAA should be given responsibility for initiating and developing new technology and procedures to improve the efficiency and accuracy of hydrographic surveys.

This is important to SAIC, not only because of our work with NOAA to meet the survey needs of the coastal United States, but also because we, and other contractors, compete

on an international level for hydrographic systems and surveys. Many of our international competitors are supported by government subsidies that are not available to U.S. companies. The major discriminator we do have, is that our systems and procedures have been verified by NOAA to meet IHO standards. NOAA's credibility in terms of quality control of hydrographic data and continued participation in the International Hydrographic Organization are key to maintaining the competitive stature of American companies in the international marketplace.

In summary, we at SAIC look forward to participating in the very important task of surveying the critical areas of the U.S. coastline and continuing to work with NOAA to insure that the data acquired are compatible with the requirements of modern navigation systems. In order to accomplish this objective, we feel it is critical that NOAA maintain the expertise that will allow the agency to continue to set the standards, provide the quality assurance and accept the liability that is inherent with the production of nautical charts.

TESTIMONY OF JAMES S. PROVO

SENIOR VICE PRESIDENT, T. PARKER HOST, INC.

ON BEHALF OF

THE NATIONAL MINING ASSOCIATION

AND

THE NATIONAL ASSOCIATION OF MARITIME ORGANIZATIONS

BEFORE THE

SUBCOMMITTEE ON FISHERIES CONSERVATION,

WILDLIFE AND OCEANS

HOUSE COMMITTEE ON RESOURCES

APRIL 24, 1997

Mr. Chairman and Members of the Subcommittee, my name is Jim Provo and I am Senior Vice President with T. Parker Host, Inc. I come before you today on behalf of the National Mining Association (NMA), and as President of the National Association of Maritime Organizations (NAMO).

The NMA's member companies account for approximately three-fourths of the coal production in the United States, over one billion tons annually, and the vast majority of mined minerals including iron ore, copper, gold, silver, uranium, lead, zinc and phosphate. The mining industry relies on our ports and the services provided by the National Oceanic and Atmospheric Administration (NOAA) to export our minerals and coal to markets throughout the world. The United States is the second largest coal exporter in the world and in 1996 we exported approximately 91.5 million short tons of coal valued at nearly $3.8 billion. NMA members include major coal exporting companies. U.S. mineral exports were $32 billion in 1995, the last year for which numbers are available.

NAMO represents its members in all matters on a national level that affect foreign or domestic waterborne commerce using U.S. ports. NAMO is an organization consisting of steamship associations and maritime exchanges. NAMO focuses its attention on operational issues that affect the viability of the steamship industry. NAMO's mission is to improve the climate for international shipping in the United States. NAMO was created to focus federal government attention on the needs of steamship agents, owners and operators, and others engaged in ocean shipping. Six successful years after its creation, NAMO is now 38 members strong, coast to coast, representing various businesses in the maritime industry. NAMO has a strong congressional membership of 36 Senators and 139 Representatives.

As your invitation to me describes, the purpose of this oversight hearing is to examine the present state of the National Oceanic and Atmospheric Administration's (NOAA) hydrographic charting activities, and what should be done about the future of these activities. I am convinced that were it not for the active support of the House Resources Committee, the funding increases for NOAA's Mapping, Charting and Geodesy programs for the past two fiscal years, which were the first since 1981, would not have been possible. We greatly appreciate your leadership on this matter, and seek your continued support, for the task of making the nation's nautical charts as accurate and dependable as possible, is not finished.

I am sure you have heard the statistics before, but they do bear repeating. Some U.S. coastal waters have never been completely surveyed, including 80 percent of the nation's top 10 ports. At current funding levels - even with the recent funding increases made possible by this Committee - it will take three decades to complete this survey backlog. There has also been a dramatic cutback in the number of annual new chart editions.

Since 1955, the nation's volume of international trade has nearly quadrupled, with the United States achieving the largest waterborne import and export trade in the entire world. More than 100 public ports handled more than 1 billion tons of cargo in 1995. This generated 1.6 million jobs, $21 billion in tax revenues and $16.3 billion in custom collections. Moreover, U.S. ocean-borne trade is projected to increase by 50 percent over the next 10 years. Yet the federal government's funding support for marine navigation and related services, except for the recent increases for the charting program, have steadily declined. This declining investment has created a situation that is unacceptable. Unacceptable to those who depend upon the safe navigation of our marine waters for their business and trade, unacceptable to those who believe that our coastal environs are unnecessarily in danger, and unacceptable, hopefully, to the Members of the Committee.

NOAA has made great strides recently to streamline its nautical charting program by converting its suite of paper charts to digital raster database. This has enabled NOAA to dramatically accelerate chart production time, make chart updating easier, and reduce the time required to chart new hydrographic survey data. The value of any nautical chart, however, is in its accuracy of information, and that will only be achieved through a stepped-up program of acquiring new survey data. Only through improved data acquisition will the nation's nautical charts be truly reliable to those who depend upon them.

A modest investment in modernizing the nation's and NOAA's marine navigation services, including nautical charts, the Nation Water Level Observation Network, tide tables and water current data, and the availability of proven effective Physical Oceanographic Real-Time Systems (PORTS), which has been a Federal responsibility since 1807 and a promise to those who have been involved in trade and maritime commerce, would have many benefits. Benefits that would be over time greater in value than the cost of an investment to modernize the nation's and NOAA's marine navigation services.

These benefits include:

- An increase in marine safety which will be even more important as the industry trend is toward larger and faster ships to compete globally. With industry making the necessary investment in double-hull tankers and other preventive and spill response requirements of the Oil Pollution Act of 1990 and other related environmental laws and regulations, it is appropriate for the government to make a similar investment in providing the tools necessary to make U.S. waters as safe as possible.

- Fully utilizing PORTS and other state-of-the-art measuring devices that provide critical under keel clearance information, including sea bed depth and water level status, can provide new-told shipping efficiencies

resulting in trade advantages for U.S. shipping and ports. For example, for a capesize vessel, 120,000 DWT, every inch of draft gained as a result of having this information, lets us carry an additional 270 tons of coal. Knowing the depth of the channel in advance of transit, would enable a ship to be loaded to the maximum safe draft possible, thus fully utilizing the vessel's carrying capacity, and reducing the risk of groundings.

I urge the Resources Committee to provide NOAA sufficient authorizations to:

- Eliminate the critical survey backlog and produce the most accurate and reliable nautical charts possible. This includes resurveying utilizing advanced multibeam and sidescan sonar technologies can locate obstructions and features not previously charted by providing full-bottom coverage.

- Maintain and modernize the National Water Level Observation Network to provide the most accurate tide datum determination, prediction, and monitoring possible.

- Provide Physical Oceanographic Real-Time Information Systems to the ports that want them installed and can support their operation.

Mr. Chairman, this concludes my testimony, but I would be pleased to answer any questions from you and other members of this Subcommittee.

Hydrographic Charting for U.S. Ports and Waterways

Statement of

Dr. Martha Grabowski
Member, Marine Board
National Research Council / National Academy of Sciences
and
LeMoyne College, Syracuse, New York
Rensselaer Polytechnic Institute, Troy, New York

before the
Subcommittee on Fisheries Conservation, Wildlife and Oceans
Committee on Resources
U. S. House of Representatives

April 24, 1997

Mr. Chairman and members of the subcommittee, it is a pleasure for me to be here today and present testimony to you on the subject of the future of hydrographic charting to assure safe and efficient ports and waterways for the nation. My name is Martha Grabowski. I am a member of the Marine Board at the National Research Council, and I have chaired one major Marine Board study on navigation and piloting and assisted on several other studies that investigated hydrographic services and charting activities.

New navigational technologies combined with the growth of waterborne commerce and the diversity of waterway users are affecting how hydrographic information is collected and delivered to the mariner. Technological innovations can bring cost savings, efficiency, and safety improvements when implemented with good understanding of costs, user needs, and benefits. It is important for the nation to maintain its world leadership role in advanced hydrographic and navigation information systems.

My testimony will draw on the results of several recent Marine Board studies and provide additional personal comments derived from my independent research work. I will first address the underlying needs for improvements in hydrographic surveys and charting services in U.S. ports and waterways and the general safety and economic benefits that may be expected. I will also describe conclusions from recent Marine Board work concerning appropriate roles for the federal government and private sector in providing these services. Finally, I will discuss strategies for producing and providing electronic charting services to mariners in the future.

Hydrographic Charting for the Twenty-first Century

The United States is a world trade leader. Its economy is increasingly dependent upon ocean transportation and the vitality of our ports, harbors, and coastline. The safe transportation of goods and people on the nation's waterways has always been and remains an important goal. As we enter the twenty-first century, enormous change and growth is affecting our marine enterprises, and we are challenged to maintain safety while improving efficiency and the effective multiple uses of waterways. Ports must be able to provide efficient capabilities to accommodate not only expanding trade but also the increasing size and speed of ocean-going ships.

Many U.S. ports also serve a growing volume of coastal and inland vessel traffic with a variety of barges, towing vessels, passenger ferries, and recreational boats. The navigation and port management systems in the United States generally lag those of the most sophisticated ports in Europe and Asia, where ensuring the safety of maritime operations under all weather conditions brings high efficiency. It is vital to bring modern charting and navigation technology and efficiency to our port operations in order to maintain and improve our world trade position in the future.

For more than 200 years mariners have relied on nautical charts to be one of the most important aids to navigation. The quality of those charts depends upon accurate and timely survey data. Both the data and the methods of delivering those data have been affected by new technology. We can now collect data with more precision (with multibeam bathymetry and global positioning systems) and provide more accurate navigation information to the mariner more quickly and in electronic format. These improvements, however, also come with a cost. We must now invest in the institutional and technological changes that will bring the safety and efficiency benefits for the future.

A number of Marine Board studies[1] have concluded that, because of the widespread public benefits and broad impacts on the national economy from maritime trade, there is a compelling national interest in supporting federal programs that maintain safe and efficient ports and waterways. While this federal support should be maintained, it can also be supplemented with local support when appropriate. It is also possible to obtain more cost efficiencies by using private industry to accomplish much of the data collection, data management, and production of charting products. Therefore, while support for essential federal initiatives and investments must be maintained, we must also select the most efficient and effective strategies for future progress to obtain the benefits from new hydrographic charting technologies.

The National Oceanographic and Atmospheric Administration (NOAA) is challenged to fulfill its nautical charting mission and make the necessary investments to assure an adequate future capability using advanced technologies and to meet critical user needs. The three basic tasks that must be supported are data collection and verification, data management and production, and distribution of charts and other products. The Marine Board, in its 1994 report *Charting a Course into the Digital Future,* recommended that the most important public sector function is management and control of the content and quality of the data that support safe navigation. The private sector can assist in data collection and product distribution using modern qualified technology and techniques, but NOAA must perform the central data management and quality control mission.

For the most part, NOAA has been making significant changes in its operations to contract out those tasks that private industry can best perform and is attempting to maintain its core responsibilities and capabilities to meet public expectations. Private contractors are engaged in hydrographic surveying tasks and in chart production activities. This transition of operations and reduction of the federal presence in these

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[1] National Research Council. 1994. *Minding the Helm: Marine Navigation and Piloting.* Marine Board, Washington, DC: National Academy Press. National Research Council. 1994. *Charting a Course into the Digital Era: Guidance for NOAA's Nautical Charting Mission.* Marine Board, Washington, DC: National Academy Press. National Research Council. 1996. *Technical Issues in NOAA's Nautical Chart Program.* Marine Board, Washington, DC: National Academy Press. National Research Council. 1996. *Vessel Navigation and Traffic Services for Safe and Efficient Ports and Waterways.* Marine Board, Washington, DC: National Academy Press.

areas will need to continue and be monitored to assure that efficiencies are in fact achieved and key capabilities are retained when needed.

The maritime industry, meanwhile, is impatient with the pace of the transition to new technologies and improved services, especially in accurate, updated surveys, data collection and dissemination, and electronic charting. In a way, it appears that NOAA has not caught up with modern technology and is continually falling behind in hydrographic surveys of important waterways. It is true that many approaches to major ports have not been surveyed in decades. Areas around eight of the nation's ten top ports need extensive resurveying. While simple electronic charts are being made available, they are not produced with the type of digital database that will make them acceptable to international standards in the future. And while NOAA has developed a real-time system for disseminating oceanographic, tides, and current data, there are no federal funds available for national implementation and operations.

Advanced hydrographic charting technology is available for making major improvements in the services we can deliver to the mariner in U.S. ports and waterways. NOAA is attempting to adopt this new technology and, at the same time, to reduce operating costs and effect savings through private contracting. Together these are significant institutional changes, and some goals may not be met. It is important to consider certain costs as investments that will bring future benefits—especially in areas of new technologies. Delivery of electronic charts and other data accurately and reliably in the future is top priority to the mariner and will bring significant efficiencies. However, it must be matched with the accurate and reliable collection and management of hydrographic data, or all of the efficiencies will disappear. NOAA needs a well-defined strategy and the resources to accomplish this difficult and costly task.

Strategies for Future Electronic Charting

The United States was one of the leading nations in the development of electronic chart technology. In 1995 the International Maritime Organization (IMO) adopted performance standards for Electronic Chart Display and Information Systems (ECDIS) that now represent the world's goal for replacement of paper charts. This system requires the use of digitized "vector" data for producing and displaying the electronic chart. These vector data must be collected and created from original survey data or must be converted from an existing format to one containing geographical coordinates and attributes. A more readily produced chart is know as a "raster" chart. The raster chart is produced using an image from an existing paper chart and storing that image electronically. A new raster chart is produced from a new paper chart, but vector charts can be modified by introducing new geographical coordinates and attributes. The vector format or ECDIS requires significantly more original investment to produce but will bring benefits in accuracy, usability, and efficiency in the long run. ECDIS is the only electronic chart that will legally substitute for a paper chart under existing international agreement.

The majority of modern mariners would like to have ECDIS charts for use as soon as possible. The production of these charts to the agreed international standards has proven more difficult than was originally anticipated. In the United States, NOAA has estimated that producing all of its 1,000 charts in ECDIS format would cost $20-25 million. Other countries (Norway and the United Kingdom) have produced only a few ECDIS charts even though their original plan was to produce hundreds by now. This has led to a proposed interim solution of a hybrid chart that uses some vector data and some raster data. Also, raster charts are readily available from commercial firms. The question now is what overall strategy is best for the nation in the long run as it moves to electronic delivery of hydrographic charts.

I have also done independent research work on navigation and piloting systems using electronic charting technologies. I have evaluated the process by which NOAA is developing electronic chart products and evaluated the usefulness of these products to mariners who are developing advanced navigation systems for ships to enhance the safety of vessel transits. Technology in the maritime industry is changing rapidly—incorporating more advanced navigation systems using distributed information inputs, managing ship's bridge data for smaller vessel crews, and accommodating complex sensor inputs. The newer marine navigation and piloting technologies are critically dependent on the availability and accuracy of hydrographic products. However, not all NOAA hydrographic products are of equal value to the mariner who uses automatic navigation and piloting systems.

My investigations of NOAA's hydrographic charting program and the products that are produced now and planned for the future have led me to some personal conclusions and opinions about their future direction. First, it is my view that NOAA's plans to develop and expand vector chart products is a very worthwhile effort and should be supported. Full vector charts are needed as critical input to most shipboard advanced navigation systems, and the major benefits of new technology on a ship's bridge will not be realized until accurate vector charts are available. In addition, continued support for producing raster charts is also justified because they provide an interim benefit to all mariners. However, I believe that support for NOAA's hybrid chart product is less important or urgent.

Finally, I believe that NOAA should develop a demonstration project to evaluate vector chart products in a few key ports. This project should also incorporate a systematic process to solicit views from the maritime user community about the value of specific chart products and to incorporate those views in the development process. It is important in these times of rapid technological change to maintain close coordination between government agencies that provide public services and the community of users of those services.

In sum, new technologies are rapidly changing the traditional methods used for hydrographic data collection and for delivery of nautical chart products to the mariner. These advances are important to the safety and efficiency of maritime trade in U.S. ports and waterways and should receive adequate federal support. The technological advances are coming at the same time that major growth is occurring in ocean trade, in ship traffic in major U.S. ports, and in the variety of other users of major waterways. The United States has been a world leader in new navigation technologies, especially electronic charting and delivery of advanced navigation information. NOAA and other federal agencies are now challenged to implement these new technologies while providing and maintaining cost-effective, accurate, and reliable charting services to the maritime community. It will be important for NOAA to justify support for its hydrographic programs and assure that they meet the needs of mariners and the general public.

Hydrographic Charting for U.S. Ports and Waterways

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Committee on Resources
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1.0 Introduction

Technology in the marine transportation system, which includes technology and decision aids aboard the bridges of individual ships [11] as well as organization-wide distributed systems [14], is changing rapidly. There are challenges associated with the increased presence and use of technology in the marine transportation system, however. Ships are now being fitted with an increasing array of high-technology equipment to aid in navigation [3] [11] [17] at the same time that competitive pressures and the dynamics of the marine employment market have resulted in a trend of decreasing vessel crew sizes, and vessels equipped with complex sensors and equipment, a combination which can lead to information overload [30] [31]. In addition, a lack of uniform equipment standards has led to a proliferation of equipment and user interfaces. When these occurrences are coupled with inadequate training of personnel to use this equipment, use of technology can lead to accidents[7] [8][18] [27] [28].

Increasingly, marine navigation and piloting technologies are critically dependent on the availability and accuracy of NOAA hydrographic products. However, not all NOAA hydrographic products are of the same utility to marine navigation and piloting systems. In this paper, I provide a brief overview of marine navigation and piloting technology, discussing the information requirements of the technologies discussed, and map those requirements alongside NOAA's hydrographic products. Based on that examination and mapping, my investigations suggest that NOAA's plans to expand and develop vector chart products is worthwhile, and the continued production of raster chart

products should also be supported. However, I believe that support for the NOAA hybrid product is much less important. In addition, I would encourage NOAA to implement a demonstration project in a few key ports to evaluate vector products and to systematically solicit and incorporate user needs in its product development process.

2. Marine Navigation and Piloting Technology

Recent advances in navigation technology have focused on making better information available to ship's masters and pilots, relieving them of more routine activities (for example, logistics, scheduling, record keeping; etc.), and thus freeing them to concentrate on the vessel's conduct through the waterway. These technological advances have been grouped into the following categories:

- Position fixing technology,
- Steering and trackkeeping technology,
- Passage/route planning technology,
- Collision avoidance and surveillance technology, and
- Communications technology. [25].

Electronic chart technology, including electronic chart display and information systems (ECDIS), offer notable advantages in passage and route planning. Widespread availability of Global Positioning System (GPS) and Differential Global Positioning System (DGPS) receivers has greatly enhanced vessel position fixing accuracy while freeing the bridge personnel of the requirement to manually fix the vessel's position. Improvements in communications have also made bridge-to-bridge communication easier. Automatic Radar Plotting Aids (Areas) greatly assist in the task of collision avoidance, and aids like steering systems integrated with electronic chart display and information systems, rate of turn indicators, and autopilots, etc., have attained maturity in assisting steering and trackkeeping [25].

Currently, the trend in navigation technology is towards the development of Integrated Bridge Systems (IBS), which project the ship's wheelhouse as the center of operational decision making aboard ship, by integrating information from diverse onboard equipment and sensors, and presenting them to the bridge watch team [17]. Knowledge based systems [10], which incorporate expert piloting and voyage planning knowledge, are being embedded within IBS, to provide decision support for navigational operations [9,11]. However, there are many problems that need to be solved and many issues that need to be addressed before these technological advances contribute more fully to enhance the safety in the marine transportation system [25]. The issue of the degree to which technological aids can supplant or supplement human decision making is open to debate. The accuracy of the information provided, especially in the case of electronic charts, is still not known and the lack of internationally accepted standards for uniform data transfer and data representation have hampered the proliferation of many of these technologies.

Systems developed for ship's navigation decision support have evolved from stand alone intelligent training systems to support specific functions [4] [13], to embedded intelligent systems within a single ship's integrated bridge system [10], to distributed systems available to all vessels and vessel traffic service centers along a waterway [14]. Further, efforts are being made to provide increasing intelligent support to the various subsystems [14] [24] of the marine transportation system. The increasing availability of advanced communication technologies such as local area networks, wide area networks, Automatic Dependent Surveillance Systems (ADSS), now termed Automated Identification Systems (AIS), satellite navigation systems and the Global Positioning Systems (GPS), have also made the concept of distributed systems with embedded intelligence feasible.

2.1 Electronic Chart Display and Information Systems (ECDIS)

Electronic chart display and information systems (ECDIS) provide fully attributed data sets for hydrographic data. ECDIS with proper electronic nautical chart (ENC) data sets permit maritime administrations such as the Coast Guard to consider ECDIS as the legal equivalent of paper charts required under SOLAS 1974 (regulation V/20). Full content ENC data, or vector data, is specified in the International Maritime Organization (IMO) performance standard for ECDIS, IMO Resolution A19/817 of December 1995. IMO has requested that member governments, including the United States, have their national hydrographic offices (for the U.S., NOAA) produce electronic nautical charts and associated updating services as soon as possible.

International standards for vector nautical chart data (IHO S-57) were formally adopted by the International Hydrographic Organization (IHO) in 1992. Both the data format (S-57) and the content, display, and updating standard (S-52) are specifically referenced in the IMO Performance Standard for ECDIS.

2.2 Integrated Bridge Systems

With the large number of navigational aids provided on the bridges of even small ships, the requirement to make the information available easier to assimilate and use effectively is pushing the trend to consolidate displays and the number of "black boxes" aboard ship [17] [23] [32]. Such consolidation is thought to free the watch officer's time and attention so that more attention can be focused on safe and efficient navigation [15].

As a result, integrated ship's bridge systems (IBS) are being developed by a number of nations -- the United States, Norway, West Germany, Japan, and the United Kingdom [5] [11] [15] [18] [19], as well as a variety of manufacturers. These integrated bridges incorporate controls and monitors for all essential vessel functions -- navigation, engine control, and communications [18] [23] [25]. Typically, IBS combine text, graphic and electronic chart display and information capabilities to provide a real time plan view of the vessel's position in the waterway, superimposed on an electronic chart display,

along with the vessel's voyage plan. Additional information displayed include information on shiphandling, navigation, maneuvering. Often, this information is overlaid in layers so as to provide different types of information to different system users.

2.3 Automatic Identification Systems (AIS)

Automated identification systems (AIS) are ship- and shore-based transponder and receiver systems which provide other vessels and VTS systems with automated broadcast of ship identification, course, speed, and position information; vessel intent information based on its next waypoint could also be transmitted. DGPS sensor information can be used for positioning information, with the data transmitted via VHF radio channels, or other broadcast media. Currently, such systems are required by the Coast Guard on tank vessels of 20,000 deadweight tons or more using the vessel traffic services system in Prince William Sound, Alaska [25].

2.4 Pilot Carry Aboard Systems

Pilot carry aboard systems, sometimes referred to as portable communication, navigation and surveillance systems (PCNS) [25] or portable piloting units [21], are small units carried aboard vessels by pilots. These units typically contain a DGPS receiver with an electronic chart display, VHF radio, and transponder system. Such systems could provide the functionality of AIS systems before widespread implementation of AIS [25]. A number of vendors have developed such systems, and several pilot organizations are using and evaluating the systems. These units are carried aboard by pilots, set up on the bridge of the ship by pilots, and then used as a navigation information resource during the piloting transit [21].

2.5 Real Time Environmental Sensors

Real time environmental systems provide information derived from sensors placed at strategic locations in a port or waterway in order to measure real time water level, current velocity, wind velocity, and water temperature. Such systems are useful to mariners, pilots, shipping company managers, and regulators interested in safe arrival and departure times, times of high and low water, the impact of wind on currents and tidal data, and in the daily fluctuations in environmental sensor information in a port or waterway. Data can be provided by voice, text, graphical display, or on-line [25].

2.6 Intelligent Decision Aids for Ship's Piloting

A number of decision aids for ship's navigation and piloting have been developed over the past decade. Coenen, Smeaton, and Bole [2] describe a design for a prototype standalone real time knowledge-based ship's collision avoidance decision aid for open water, multi-ship encounters. Hayashi, Kuwajima, Sotooka, Yamakazi, and Murase [16] describe a stranding avoidance system that combines an electronic chart system with overlaid radar images to aid in position fixing and situation assessment; Raytheon [29]

provides an overview of a stranding avoidance system that combines electronic charts with an on board sonar system. The advanced ships' bridge concepts described by Grove [15], Iijima and Hayashi [19], Kristiansen, Rensvik, and Mathiesen [23], Hederstrom and Glyden [17], and Grabowski and Sanborn [9, 12] all include navigation and collision avoidance decision aids.

A highly publicized application of expert system technology to ocean shipping has been the Japanese Intelligent Ship program [6] [19] , which completed its second six-year research phase in late 1994. The project is being carried out by the Japanese Shipbuilding Research Association with grants from the Japan Shipbuilding Industry Foundation and with assistance from seven major shipyards and six shipping lines in Japan [4].

In the Japanese Intelligent Ship, maneuvering and other ship operations are performed automatically by an integrated system employing expert systems, digital communications via satellite to enable information exchange between ships and shore stations, and high performance sensors [19]. The intelligent ship's subsystems (e.g., optimum navigation and course planning, oceanographic and meteorological systems, automatic docking and undocking systems, and automatic anchoring/mooring systems) are linked by a local area network (LAN) and communicate with a "Captain Expert:" an expert system which incorporates the knowledge and experience of senior ship's masters. These subsystems are intended for use within a harbor, and allow the vessel to navigate and be docked at the pier in a totally automated manner, without a vessel crew on board.

In the U.S., a ten year effort sponsored by the Maritime Administration, U.S. Coast Guard, and a variety of shipping and piloting organizations, has focused on the development and deployment of real time knowledge based systems for ship's piloting [9, 10, 11, 12, 13, 14]. These systems, developed for and with the pilot and shipping organizations in New York harbor, Prince William Sound, Alaska, and San Francisco Bay, access the information available from ship's sensors, navigational and electronic equipment, positioning equipment, and human navigators to generate real time decision support to masters, mates and pilots operating in close waters.

2.7 Vessel Traffic Service (VTS) Systems

Vessel traffic service systems are designed to coordinate, assist and occasionally control marine traffic. Parallels have been drawn between the Air Traffic Control (ATC) system and VTS's, but significant differences in the operating environments, operating traditions and technologies involved prevent direct mapping of one to the other [20] [25]. VTS's can be described as "interactive shore-based communications systems, usually augmented with surveillance equipment (principally radar) for acquisition of position and traffic flow data that provide information and navigation support services to improve navigation safety and traffic efficiency" [20] [22] [26].

In practice, VTS functions vary widely. Generally, the U.S. Coast Guard operated-VTS's in the U.S. focus on information gathering, advice and space management, whereas, some VTS's in Europe regularly engage in shore-based pilotage in adverse conditions [25]. The U.S. Army Corps of Engineers also engages in vessel traffic control - especially queuing up vessels at the locks that they operate; VTS operators in the Panama Canal take over responsibility for traffic direction, control and navigation of vessels.

VTS's have been predominantly used as a means to improve safety, efficiency and economic benefits in ports and waterways, especially those engaged in fierce competition, but environmental objectives have recently begun to play a part [25]. In keeping with the general trends in the marine transportation system, increasingly sophisticated equipment is being developed for VTS systems. These include VHF-FM radio networks, radar, Closed Circuit and Low Light-Level TV, infrared imaging devices, radar beacons, portable and fixed transponders, electronic charts and computer displays, position rebroadcasting systems, and automatic recording systems [20]. However, the deployment of much of this equipment is highly uneven from waterway to waterway. Consequently, radar, radio and occasionally remote televisions remain the principal means of information gathering, information dissemination and traffic monitoring in most VTS systems.

3. Adequacy of NOAA Products for Marine Navigation and Piloting Systems

Currently, NOAA offers three types of hydrographic products: raster charts, vector charts, and hybrid vector charts. NOAA has made a strategic decision to concentrate resources on the development of raster charts and a hybrid vector product, and to concentrate very few resources on the development of vector charts in accordance with international standards (IHO S-57). This decision is in direct contrast to the paths taken by leading hydrographic nations such as Norway, the United Kingdom, Japan, Germany, the Russian Federation, and Canada. These countries are fully committed to producing vector data.

Raster charts are digitized by "scanning" paper charts, using technology common to desktop publishing. Each tiny segment of each line on a chart is converted to a "raster" picture element or pixel. These pixels are similar to a television picture or magnified newsprint in that they appear as dots on a grid. Raster charts provide an image on a computer screen, but there is no meaning or context associated with the image. Raster charts thus provide a flat file representation of a graphical image which is useful for display, but not for providing information about what the image means [1].

In contrast, vector charts provide information about what the individual elements on the chart mean: for example, a wharf can appear as an image on a raster chart, but the vector system can identify it as a wharf and attach characteristics or attributes to the wharf, such as height, length, age, and ownership, with its number of berths and facilities -data that might otherwise be available only by consulting the relevant printed Sailing

Directions [1]. Such attribute information is critical for marine navigation and piloting systems, who rely critically on the information attached to chart displays in order to perform critical situation assessment, system monitoring, system control, and decision support generation functions--not just chart display. Thus, raster charts can meet the display requirements of marine navigation and piloting systems, but not the information processing and assessment requirements of marine navigation and piloting systems.

NOAA' s hybrid vector product is an attempt to provide both raster and vector chart information in the same product, in a cost-effective design. In order to do this, NOAA chose to implement a limited set of chart objects in the hybrid product, and to provide limited vector attributes with the chart objects subset. The chart objects chosen for inclusion in the hybrid data set represent some, but not all, of the critical waterways objects important for marine navigation and piloting systems. However, the hybrid product does not contain sufficient information for marine navigation and piloting systems faced with situation assessment, system monitoring, control or recommendation generation tasks.

Use of the hybrid product can be a frustrating experience, as the information most critical to a safe waterways transit can be missing from the database. For example, in San Francisco, Alcatraz Island is missing from the database, as are data on features shoreward of the 18-foot depth contour, or seaward of the 80-foot depth contour. For San Francisco, this means that data on features along the shore--which mariners use for relative and running bearings, and marine navigation and piloting systems used for reference bearings are unavailable, as are critical data such as the arrival or sea buoy in San Francisco, which marks the outer approach to San Francisco Bay. Although it is understandable that a limited subset of chart database features would allow cost criteria to be met, the subset of chart data objects implemented in the NOAA hybrid product is inadequate for current--and certainly future--marine navigation and piloting systems.

Resources being devoted to the current hybrid product effort might better be employed in a testbed program in demonstration ports focused on the development of fully vectorized chart databases for one or two selected ports. Such a testbed program might be modeled after the Canadian Hydrographic Service experience, or the current NOAA PORTS program, which is also developing demonstration capabilities in selected ports. Such experience would allow NOAA to develop experience in the production of fully vectorized products, taking advantage of lessons learned and best practices from the Canadian, United Kingdom, Japanese and Norwegian Hydrographic Service experiences, and allow NOAA to develop an experiential basis from which a more complete vector product implementation plan could be developed. Moreover, the testbed program would provide an opportunity for systematized stakeholder, user, and customer input to the product development process, an element that was missing from the hybrid product development process.

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STATEMENT OF CAPTAIN ARTHUR J. THOMAS
CHAIRMAN, SAN FRANCISCO HARBOR SAFETY COMMITTEE

TO THE HOUSE COMMITTEE ON RESOURCES
SUBCOMMITTEE ON FISHERIES, CONSERVATION, WILDLIFE & OCEANS

U.S. HOUSE OF REPRESENTATIVES
APRIL 24, 1997

Chairman Saxton and members of the Committee, thank you for the opportunity to appear before you today and present my views and the views of my colleagues regarding various maritime safety considerations in San Francisco Bay and its surrounding waterways.

Today, I am appearing before you in my capacity as the Chairman of the Harbor Safety Committee of the San Francisco Bay Region. However, I also want you to know that I have been an active, state licensed Bar Pilot in San Francisco for over 25 years. I have served as the President of the San Francisco Bar Pilots Association and currently serve as Vice President of the American Pilots Association and Vice President of the International Maritime Organization.

My objective today is to recommend to this committee that a state-of-the-art navigational system be developed for the San Francisco Bay waterways. Some of the technologies that should be included in such an integrated system have already been tested in our area. Other technologies are currently under review and modification. But nowhere in the world have all of these technologies been integrated into a modern system that assures maximum commercial benefit with the greatest protections to the environment. Given the partnering arrangements among maritime interests within government and the private sector that currently exist in the San Francisco area, we can think of no better location to implement such an exciting project.

As Chairman of the Harbor Safety Committee, I have the pleasure of working with a group of individuals dedicated to ensuring that the beauty, economic vitality and diversity of our waterways is preserved for generations to come. The State Harbor Safety Committee came into existence with the enactment of the State Oil Spill and Prevention legislation in 1990. The membership of the Committee is delineated in the Act and

includes representatives from all facets of the maritime community. Dry cargo and tanker operators, barge operators, maritime labor, port authorities, pilots, commercial and sport fishermen, pleasure boat operators, environmental organizations, and U.S. Government representatives are included as members. The Committee is responsible to the State for recommending procedures to enhance maritime safety on the bay.

The Harbor Safety Committee is the forum in which numerous steps have been taken to improve the navigational safety practices and procedures in our bay. Among these advancements are, in cooperation with the National Oceanic and Atmospheric Administration (NOAA), the introduction of a modeling and installation of a Physical Oceanographic Real Time System (PORTS) in the bay; the development of recommendations for new state tug/ tanker escort regulations now in effect; drafting of recommendations for minimum tanker underkeel clearance regulations; production of the Harbor Safety Plan for the Bay Area, with annual amendments; and promulgation of the recent recommendation that several rocks which are deemed navigational hazards to deep draft vessels in the bay deep water channels be removed.

Wearing my hat as a pilot for a moment, I want to point out that part of the charge given to me and all pilots licensed by the State is to provide safe pilotage for all vessels entering and using the bays of San Francisco, San Pablo and Suisun. Additionally, the State requires my services aboard ships to help ensure the safety of life and property, and the continued economic well-being of the citizens of my state. Protection of the San Francisco Bay waters and surrounding ecosystems is another direct charge to the pilot -- and it has been since our state pilotage system was created by the first State legislature in 1850. We take our work as seriously today as did our predecessors over 147 years ago.

For our ports to remain strong players in interstate and international commerce, we must make an investment in both dredging operations and the implementation of a navigational charting system that is long overdue. The environmental sensitivity of the bay and the potential impact of an oil spill or accident involving hazardous cargo are profound concerns for our community. We must look to the federal government for leadership and assistance to make our waterways competitive and safe. We believe that the federal government needs to recognize the importance of these issues for the larger commercial and environmental implications they raise.

We believe that the San Francisco Bay region is the logical location to develop and implement a test program that encompasses and integrates all of the navigational technologies that various federal government entities are utilizing around the country. We realize that some of these technologies have been developed in isolated environments where integration with other technology is not possible. New technologies have yet to be fully refined, yet they offer the promise of exciting possibilities. Other technologies need to be integrated with products being designed in the private sector.

We would like to suggest that, in addition to the commercial and environmental benefits that the creation of a state-of-the-art integrated navigational system would offer, the members of the Harbor Safety Committee and the San Francisco Bay Area maritime community have already demonstrated the ability to partner for a common goal. The development of the PORTS project in the San Francisco Bay Area allowed for federal, state and local governments to team with public interest groups and private commercial interests to form a close partnership. In fact, the funding for the development, operations and maintenance of the PORTS program was shared by federal and state governments. We believe that a similar partnering arrangement could be invaluable if a high-technology, fully integrated navigational system could be created for our area.

The San Francisco Bay Region is a most unique estuary. As a whole, the bay is the fifth largest U.S. port in crude oil handling and the fourth largest container port in the country. The bay contains eleven ports within her boundaries, over two hundred miles of ship navigation routes and over two hundred berths for ocean going vessels. The bay handled over nine thousand large-vessel transits last year and we expect that number to grow in the future. In addition, the bay is a major boating and commercial sport fishing area. Any visitor to our area knows that the bay is much more than an active, healthy commercial port. The physical beauty of our waterways, the richness of our wildlife and the products of our local fishing fleets all make our area one of the most popular vacation spots in the world.

Our bay is a vital habitat to wildlife. Together with the Delta area, these waterways comprise a complex and sensitive ecosystem. These waterways drain over 40% of California and comprise the largest estuary on the West Coast. Over 90% of California's wetlands are located in the San Francisco Bay Area. Yet anyone who has sailed on these waterways knows that difficult navigational problems exist. Depth limitations, fog, strong currents, treacherous tidal fluctuations, rapidly changing weather patterns and confined maneuvering areas also make our waterways some of the most challenging and potentially hazardous in the world. The concern to balance the preservation of our ecosytem with the needs of vibrant commercial ports has compelled the San Francisco maritime community to continually develop the safest navigational system possible.

The ports of the San Francisco Bay Area have been long recognized as strategic transportation links in the trade infrastructure of the nation. Those of us associated with maritime commerce have long understood how vital our industry is to the economic health of the country. In 1994 alone, over 67 million tons of cargo were imported or exported through the San Francisco Bay area ports. These cargoes were produced either in inland states for export or were received for inland distribution. The activities associated with these ports are really only the tip of the iceberg of the total economic activity involved.

In fact, tens of thousands of individuals are employed in activities directly related to maritime industry. One of the great success stories within this jurisdiction is the Port of Oakland which has enjoyed strong and steady growth. Oakland is poised to realize a

significant increase in traffic when expansion of the facility and deeper dredging of its channels are completed. But for the Port of Oakland and much of our waterways, the problems of dredging and confined deep water channel are serious concerns.

The dredging issue in particular highlights the fact that San Francisco Bay and its tributaries are considered shallow when compared to other ports in the world. The ship channels that exist were designed in the 1920's and 30's for ships that averaged 6 to 7 thousand gross tons and drew about 25 feet of draft. In the early 1970's, the ships calling on Bay Area ports averaged about 11,000 gross tons and 27 feet of draft. Now the average size ship we handle is over 30,000 gross tons and has an average draft of over 30 feet. Tankers of up to 200,000 deadweight tons and above, with arrival drafts of 50 feet, now routinely call at Bay Area ports. New container vessels, such as the REGINA MAERSK, will begin calling at the Port of Oakland this year. The REGINA MAERSK class is 81,488 gross tons; 1,090 feet in length, 141 feet in beam, and will draw 46 feet of draft, with an ability to load 155 tons of cargo (or 8 to 10 containers) for each inch of increased draft. Both tankers and container vessels are being constrained in loading to their maximum capabilities because of channel depths. Accurate water level and current information is essential to safely maximize loading and movement of modern ships.

This international trend in commercial shipping toward larger and deeper-draft vessels can best be understood by the economics of a ship's cargo. For container vessels, each additional inch of draft can increase revenues by $8,000 to $50,000 per transit, depending on the nature of the cargo. By contrast, each additional foot of draft a port can accommodate can generate revenues of $120,000 or more per transit. To a shipper this can mean that the company can realize additional revenue with each shipment. To a port like Oakland, which serviced 1,637 ships in 1995, an additional inch of draft could mean annual revenue increases of over $550,000. To American ports, this additional inch can make them among the most competitive and safest ports in the world.

To exacerbate the problem for San Francisco pilots, in October, 1991, NOAA and the National Ocean Service (NOS) were concerned with the unreliability of the "Tidal Current Tables - San Francisco Bay" and withdrew the charts from further distribution. NOAA subsequently issued a cautionary Notice to Mariners so that use of these charts would be halted. These actions were taken because federal agencies realized that the charts were hopelessly outdated and had been developed by methods that could be termed crude, at best.

One of the tools that has been developed in conjunction with NOAA to assist us as a navigational tool is PORTS. As you may know, PORTS refers to a series of instruments placed in strategic locations around the San Francisco Bay that register a number of critical water measurements. Included among the data monitored are water levels, water temperature, current flow, winds, air temperature, atmospheric pressure, water temperature, and salinity. This information is then transmitted to a central location for data distribution to users.

PORTS provides several benefits to the community. It allows us to more accurately determine high tide water levels. Use of this information can increase the economic viability of a vessel seeking to dock or sail with the deepest draft possible. I can attest to at least one instance of a ship captain deciding to load additional cargo on his ship because the PORTS system indicated that he had an hour more than the published charts stated before high tide. In this manner, the overall value of his shipment increased by the additional cargo he loaded.

PORTS also provided valuable assistance during a recent oil spill on our waterways and the data it produced was used to predict the trajectory of the spill. In this instance, PORTS was able to accurately determine where the oil spill would be located at specific future intervals based on the modeling that the system allowed us to do. Such forecasting presents a remarkable tool if the unthinkable happens and a major oil spill occurs in the San Francisco Bay.

The Harbor Safety Committee recognizes the assistance that the PORTS project provides to both the commercial and environmental standards of the San Francisco Bay area. However, we realize that there is much more that the federal government can and should do in order to promote safe and competitive interstate and international commerce. The steps that we advocate also can provide the greatest margins of safety possible for maritime traffic and the most responsive accident procedures attainable in the case of an accident.

PORTS offers an important component of what could be the most advanced and sophisticated maritime traffic management system in the world. If PORTS could be integrated with several other technologies that NOAA, the Harbor Safety Committee, and other federal agencies are exploring, the San Francisco Bay could become the showplace for maritime safety. The integration of these services would require the leadership and foresight of the U.S. Congress to demonstrate the benefits to interstate commerce and environmental protection of a state-of-the-art navigational system.

Among the other components of such an integrated system are:

Electronic Charting System

For the continued safety and security of all American ports, the state pilot remains the definitive element of the navigational system. Any electronic support system can only be designed to assist in the pilot's decision making processes.

However, as America continues her voyage into the electronic age, the state pilots in all our major ports, particularly in San Francisco, must explore all tools that will further enhance safe and efficient traffic movement within confined waterways. The system, in its present developmental form, is in essence an Electronic Chart System (ECS) that is portable. The Harbor Safety Committee believes that electronic charting is vital to the

development of integrated shipboard navigational systems. This electronic charting capability is both the backdrop and the foundation upon which every other technological development will be displayed in order to facilitate the presentation of navigational information and assist the mariner in the process of making control decisions aboard ship.

As the system is developed, it will provide enhanced value to all mariners. The electronic charting capability now under development and testing is called the Portable Piloting Units or PPU. The PPU allow for each pilot to carry a complete set of navigational charts with a communications package for all ship movements. We expect that the ultimate PPU will include capabilities to serve as a receiver for PORTS data; accurate ship positioning using differential global positioning; a silent Vessel Traffic Service using a vessel transponder technology for the use of the pilot and master and, electronic chart overlays of the U.S. Army Corps of Engineers' most recent ship channel surveys.

The indispensable software component is the electronic chart program that uses, in most forms, the survey data that NOAA NOS compiles and is the source data for the nautical chart. NOAA, its licensees,, and others issue nautical paper charts and charts in CD-ROM and computer disk format for use with electronic chart systems.

Transponder Vessel I.D. System and Vessel Traffic Service

We know that a transponder-based vessel identification system is going to be mandated by the International Maritime Organization. Similar to the advances that have been realized using a similar system in Prince William Sound, such a transponder identification system establishes a unique identifier for each vessel operating in specific waterways. The key to such a system is a digital based voiceless system that embodies shore-side monitoring. It is possible to build onto this transponder system by implementation of a vessel traffic system. Such a complete system would achieve an unprecedented level of vessel identification and tracking.

Global Positioning Systems (GPS)

The system hardware components include a notebook computer fitted with Global Position System (GPS) antenna or Differential Global Position System antenna (DGPS) and an efficient communications link. Recent advances include technology to provide vessel heading information. A GPS technology will allow for a master or pilot to know with great precision his exact location anywhere on our waterways in any kind of weather.

Private industry is playing a significant role in the development of integrated bridge systems. For example, Lockheed Martin, with the assistance of Rensselaer Polytechnic Institute, is developing the "SmartBridge" program that will assist the pilot and master in assimilating and applying navigational data.

The San Francisco Bay Area provides the variety of navigational opportunities needed to evaluate advanced technology alternatives. The area also offers the industrial base interested in technological development that is needed to push system level experimentation into the future. The Bay Area provides a proven cost effectiveness for federal involvement with the agencies already here and part of our port operations. A number of agencies are already represented and are part of Bay Area port operations. All the needed building blocks are here to support, build and evaluate the navigational systems of the future.

It is critical that the federal government take strong and decisive steps to promote such an integrated system for our country. We are deeply concerned about the timing of such a project because we believe the American maritime industry is falling behind in the development of an electronic charting process.

The International Maritime Organization is in the process of developing international regulations which will require all ships to make use of electronic charts. The NOAA charts are currently based on surveys that are, in some cases, thirty-four years old. Additionally, because the underwater environment is constantly changing, especially in coastal and port areas, such out of date information will not be useable. Further, accurate and current geographic and topographic information is required in order to fully utilize satellite based positioning systems. We need to ensure that we are making meaningful progress toward meeting international standards in the Electronic Display and Information System (ECDIS).

In addition to the recommendations we have highlighted above, we believe that Congress should provide sufficient funds to NOAA so that timely surveys can be accomplished. Without good surveys, the lack of accurate and reliable information will surely lead to maritime disasters within our waters.

On behalf of the Harbor Safety Committee of the San Francisco Bay Region, I want to publicly acknowledge how fortunate our area is that NOAA decided to utilize our waterways for the modeling and installation of the primary phase of the PORTS project. Captain Thomas Richards of NOAA has been of invaluable assistance to the Harbor Safety Committee and other groups in the San Francisco Bay Area, providing cooperative and in-depth advice relating to PORTS project.

Obviously, the safe and efficient movement of commercial ships is critical to our economic well-being. Just as important, the long term health of the coastal environment is also critical. We believe that the two requirements can be met and attained with a fully integrated system that will showcase emerging and complimentary technologies. A collaborative effort of industry, state and local government and federal agencies, as amply demonstrated in the San Francisco Bay Area, is the most cost effective way to achieve these important improvements in safety and efficiency.

Mr. Chairman, thank you and the members of the Committee for the opportunity to make this presentation to you today. I would be happy to answer any questions you may have.

TESTIMONY OF
RICHARD DU MOULIN
CHAIRMAN OF THE INTERNATIONAL ASSOCIATION OF
INDEPENDENT TANKER OWNERS (INTERTANKO) AND
CHAIRMAN AND CHIEF EXECUTIVE OFFICER OF MARINE TRANSPORT LINES
BEFORE HOUSE SUBCOMMITTEE ON
FISHERIES CONSERVATION, WILDLIFE AND OCEANS
APRIL 24, 1997

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
HYDROGRAPHIC CHARTING ACTIVITIES

Good Morning. I am Richard Du Moulin, Chairman and Chief Executive Officer of Marine Transport Lines, Inc. ("MTL"), Weehawken, New Jersey. Founded in 1816, MTL is the oldest shipping company in the United States. Currently, MTL owns or operates ten tankers in the U.S. domestic and international trades, as well as dry cargo ships and car carriers.

I am also the current Chairman of the International Association of Independent Tanker Owner ("INTERTANKO"), Oslo, Norway. INTERTANKO is the only international trade association in the world which represents independent tanker owner and operators. Its over 500 members and associate members are based in 40 countries, including the United States. The member companies own or operate 150 million deadweight tons of tanker tonnage consisting of approximately 1,700 tankers. This is a majority of the independent tanker owners and operators in the United States and in the world.

Nearly 60 percent of the United States' oil imports are transported by INTERTANKO member companies. A considerable number of chemical tankers are also owned or operated by INTERTANKO members, including my own. INTERTANKO obviously has a very keen interest in the hydrographic charting and navigation safety programs of the National Oceanic and Atmospheric Administration ("NOAA").

I. OUR SAFETY CONCERNS

INTERTANKO views charting and the identification of navigation hazards to be the cornerstone to a safe and efficient marine transportation system. The reason is obvious. Finding, charting, and identifying safe channels, and consequently avoiding navigation

hazards before a vessel enters port and into harm's way, is the most cost-effective form of accident prevention that can exist.

Consequently, INTERTANKO strongly supports NOAA's hydrographic charting activities and efforts to improve navigation safety systems generally. Such activities will help ensure that the marine transportation of oil and chemicals remains safe, efficient, environmentally benign, and economically rewarding.

However, our enthusiasm has not altogether been matched by all segments of the United States Government, or even the very department in which NOAA resides. By either benign neglect, lack of alluring new technologies, or an obsession with devoting time and resources to radical programs such as speculative natural resource damage assessments, the United States has been left with a hydrographic charting program that simply has fallen behind and is not catching up. This is not because of the lack of effort by the hard-working and dedicated personnel of NOAA involved in this program, but because of the lack of recognition in Congress, the Administration, and even the Department of Commerce of the importance of this program.

Unfortunately, NOAA's charting program does not get headlines for the accidents it prevents, for the oil that is not spilled. The United States, for all its legitimate concern about prevention of vessel accidents and potential pollution, has not come to grips with what INTERTANKO regards is essential-accurate charting and hydrographic data. Federal marine safety and environmental protection requirements are meaningless if pilots and masters have to rely on charts that are incomplete, inaccurate, or out of date.

In times of budgetary stress, there is no easy answer to resolving this situation. INTERTANKO members are major users of U.S. ports and face enormous costs and liabilities if they experience casualties in these waters. As this subcommittee is already aware, tankers operating in U.S. waters face increasingly congested waterways and ever silting channels without the benefit of uniformly trained pilots, adequate vessel traffic systems, and up-to-date charts. The U.S. port infrastructure is deteriorating and in need of extensive repair.

In an effort to help focus the issues and debate on navigation safety, INTERTANKO commissioned a study to: (1) evaluate port and terminal safety in the United States; (2) identify safety hazards and problems; and (3) offer recommendations and solutions. The "Port and Terminal Safety Study" ("PTS") was completed and released on October, 1996 and has become the focal point for INTERTANKO's efforts in the United States. I have provided a copy of the PTS report for the hearing record.

II. THE PORT AND TERMINAL SAFETY STUDY

The PTS report found that in the United States the Federal Government has the fundamental responsibility for dredging in federally maintained channels, and for hydrography in all waters as displayed on charts, coast pilots, and tide and current tables. Similarly, the Coast Guard has the federal responsibility for the quality and reliability of navigation aids. Adequate and reliable performance by the Federal government in these roles is a vital part of the risk sharing principle which INTERTANKO feels is needed to provide the maximum level of safety in all waterways.

In an October 1992 statement by the Coast Guard Commandant to a Senate Sub-Committee entitled "Maintaining Approaches to Commercial Berths", some examples include:

- Water depth information is contained in three different Federal government publications, NOAA Maritime Charts and Coast Pilots, and the Army Engineers Port Series books. The testimony showed water depth difference for about a dozen ports of commonly 15% to 20% in the same location (i.e., for Port Elizabeth Channel, the chart reported 29-32 feet, the Coast Pilot 35-40 feet, and the Army Engineers 32-35 feet).
- The Commandant stated that "in discussions with facility operators, owners, Masters and Pilots, on the availability of up-to-date information, each said the owner/operator of the facility is normally consulted, not the nautical charts and publications....as the depth information is not current, and is inconsistent among publications."
- An earlier Coast Guard Report (Henn Board of Inquiry) stated that "the increased size of vessels using these waterways, specifically tank ships and tank barges, has reduced the margin for operating error in these confined waters, and requires consistent high level of seamanship," and, :it is becoming more difficult for many of the existing oil terminal facilities to safely accommodate increasingly larger tank vessels," and, "there is no uniform requirement for performing condition surveys and reporting the characteristics of berthing areas. Significant ambiguity exists with respect to who has

responsibility over the approaches to berthing areas outside the Federal project channel."

- INTERTANKO recommends that responsibility for the water depth information at each berthing area must be the responsibility of the terminal operator, but that water depths in the approaches between Federally maintained channels and terminal berths must remain the responsibility of the Federal government, to be carried out by Army Engineers, and made public in NOAA publications.
- The Commandant's testimony also states that "it is becoming more difficult for many of the existing oil terminal facilities to safely accommodate increasingly larger tank vessels, there is a need for up-to-date information. This is especially true in light of the practice of vessels being navigated in the areas where charted depths are less than the draft of the vessel."

NRC's 1994 "Charting a Course into the Digital Era," notes that "NOAA produces and maintains nearly 1000 nautical chart editions, over 400 bathymetric charts, 9 Coast pilots and numerous miscellaneous supporting documents." They state, further, that "there is a growing backlog of requests for surveys, both for new areas that have never been charted, and to up-date charts." There is also anecdotal evidence to the effect that some valuable information which should be on charts, such as reported wrecks, revetments, and other hazards to navigation are not properly identified, positioned or surveyed. The number of such cases is growing, rather than diminishing.

III. DREDGING, HYDROGRAPHY, AND NAVIGATION AIDS RECOMMENDATIONS

Largely because of funding deficiencies, NOAA is badly behind in carrying out needed hydrographic surveys. Because of the resulting lack of accurate up-to-date hydrographic information, and the pressing need for maintenance and improvement dredging in many areas, INTERTANKO recommends that:

- NOAA should promptly identify funding needed to carry out within a specified period, say five years, necessary surveys and up-date the backlog of charting and other hydrographic information needs, to get these on a current and reliable basis. INTERTANKO and other user groups and environmental organizations must commit to providing aggressive political support to such funding requests. The five year plan should also address the modernization of the NWLON so that real-time water level data is available as a navigation aid at all locations for use by the maritime community, as well as the development of new local PORTS partnerships where there is clear evidence that it will provide economic benefits.
- The U.S. Army Engineers should develop, together with local authorities, the budgetary requirements to put the nation's harbor maintenance dredging and improvement requirements on to an achievable schedule in a specified period, say five-ten years.

The key bodies involved in making needed improvements to dredging, hydrography, and navigation aids will be the Corps of Army Engineers, NOAA and the Coast Guard. None of these can take adequate action, however, without Congress taking decisive steps with regard to funding needed. Particularly, the Administration must free up the funds in the Harbor Maintenance Trust Fund intended to accomplish the work for which the funds were collected. Every dollar spent comes back many times over as a safety and environmental dividend to the American public.

IV. CONCLUSION

INTERTANKO appreciates the opportunity to comment on the hydrographic charting programs of NOAA. INTERTANKO's motto is "For Safe Transport, Cleaner Seas, and Free Competition." This reflects our core beliefs in regard to transporting the world's energy needs. I believe that you will find our comments today mirror these beliefs. We pledge to the committee our best efforts to assist you and NOAA in improving current charting and navigation safety.

I would be remiss if I did not extend publicly my appreciation for NOAA's assistance in attempting to address another major threat to safety: state attempts to disturb and curtail existing federal and international marine safety rules.

While the U.S. Government has long undertaken extensive regulation of operations, manning, safety, training, equipment, design, and personnel qualifications for tankers and other vessels operating in interstate and foreign commerce, today we are facing more and more state attempts to regulate tank vessels. This is a serious mistake for the safety of our

vessels, our crews, our cargoes and for the marine environment. Tanker owners and operators seek uniformity in safety and environmental protection measures. We believe that uniformly high standards build the foundation for safe operation today and even safer operations in the future. The United States Government, through the Congress and the Coast Guard, have adhered to this principle by mandating national uniform standards regarding safety and environmental protection, and seeking international standardization as well.

These types of state provisions are no doubt unlawful under federal constitutional provisions. Indeed, INTERTANKO has challenged Washington State requirements in federal courts. The real problem, however, is that we should not have to contend with these assaults on the federal structure of safety and environmental rules. Industry does not have the resources to mount challenges in every state. Our testimony here today on this important topic reflects our support for vigorous national programs at the highest common denominator of safety and environmental protection. It also reflects our appreciation for NOAA's reports to us that they have worked within the councils of the federal government to oppose the dismantling of a uniform federal system by well-intended, but ultimately destructive local initiatives. We appreciate NOAA's efforts to remind certain states of the damage they do to our commerce and, potentially, to our environment, by their efforts to reinvent the wheel. The states no doubt have legitimate concerns about the protection of the quality of local environments. INTERTANKO and NOAA share those concerns. The only realistic effective response is to protect those concerns through diligent involvement with federal authorities such as NOAA and the Coast Guard as they formulate national and international policies.

We look forward to working with the subcommittee. I am prepared to answer any questions you may have.

Testimony of
Will Travis
Executive Director
San Francisco Bay Conservation and Development Commission
State of California

Before the

Committee on Resources
Subcommittee on Fisheries Conservation, Wildlife and Oceans
United States House of Representatives
Washington, DC 20515

April 24, 1997

Mr. Chairman and Members of the Subcommittee:

I am Will Travis, Executive Director of the San Francisco Bay Conservation and Development Commission (BCDC). I would like to thank you for the opportunity to submit testimony before your committee with regard to the present state of the National Oceanic and Atmospheric Administration's (NOAA) hydrographic charting activities and other efforts.

I would like to illustrate the interrelationship between a healthy maritime economy and healthy coastal ecosystems with three specific examples of how National Ocean Service programs are making significant improvements in our ability to protect the Bay — while commercial vessels transiting to the Port of Oakland or the oil refineries in Carquinez Strait are doing so more safely and with fewer delays:

- the NOS Physical Oceanographic Real Time System (PORTS);
- a recent NOS photogrammetry project in San Francisco Bay; and
- new hydrographic surveys.

I'll conclude with remarks about how NOS has engaged the Bay area coastal management and shipping communities in a collaborative partnership to improve navigation services while providing coastal managers with new and effective information tools.

San Francisco Bay
San Francisco Bay and the Delta comprise a rich and diverse coastal ecosystem. Draining over 40 percent of California, together they comprise the largest estuary on the West Coast. The Bay ecosystem supports diverse flora and fauna, resting and feeding areas for most of the birds that migrate along the Pacific flyway and an active commercial salmon and herring industry. The Bay is central to the identity and quality of life to the region's residents and the millions of visitors who travel to the Bay Area each year. Unfortunately, over time, the Bay's open surface has been diminished by one-third, and 90 percent of its wetlands have been lost. The Bay is threatened by nonpoint source pollution, continued urban development, and the diversion of fresh water to other parts of California.

San Francisco is also home to six major ocean shipping ports, to oil refineries, and petroleum-blending facilities. The Bay is the fifth largest U.S. port in crude oil handling and the fourth largest container port. Maritime activities are vital to the Bay area's economy, and it is critical to the region's economic health that maritime commerce continue to grow. At the same time, new deeper-draft vessels require more accurate navigation information and, eventually, deeper and wider channels. Navigation in the Bay is made difficult by confined maneuvering areas, depth and width limitations, fog, and strong currents. These factors restrict vessel transits, increase the risk of an oil or hazardous materials spill, and complicate efforts that might be undertaken to mitigate a spill's effects.

BCDC, a California state agency, was formed in 1966 in recognition that the then-common practice of filling in the Bay to create land and haphazardly replacing critical wetlands and other habitat with shopping centers and other development could not continue without destroying the Bay itself. In 1977, we became part of California's federally approved coastal zone management program under the Coastal Zone Management Act of 1972. We have jurisdiction over the open water, marshes and mudflats of the San Francisco Bay estuary to the Delta, the first 100 feet inland from the shoreline around San Francisco Bay, and other sensitive areas.

In the exercise of its mission, BCDC works with local governments, the general public, and the private sector to plan for the long-term sustainability of the Bay's natural resources as well as it's water-dependent economic base. We understand the importance of a vital marine-based economy in the Bay. Working closely the Bay area ports, shipping lines, trade experts, and others BCDC recently revised its Seaport Plan, a blueprint for port facilities and other infrastructure needs into the 21st century. Through the Long Term Management Strategy for dredge spoil disposal, BCDC collaborated with industry and other agencies to help ensure needed dredging can occur and dredged materials can be disposed of safely, and where appropriate, used for wetlands restoration and other beneficial purposes.

I find it somewhat unusual that a coastal resource manager has been asked to testify regarding NOAA's efforts in charting and mapping. In years past, coastal managers — including myself — might have taken an opportunity such as this to ask only for additional direct funding for our own programs. I have come to understand, however, that adequate hydrographic surveys, accessible photogrammetric surveys, accurate water level networks, all the basis for charts and other navigation and positioning services, are also critical to my agency's coastal resource protection and management mission. My view of the importance of NOS charting and geodesy programs is simple:

- Safe marine transportation — in other words, accident prevention — is an inexpensive form of coastal protection. Given the diminished state of coastal ecosystems nationwide, we have no option but to take all possible steps to ensure that the spill in Prince William Sound was the last such disaster.

- Efficient marine transportation is critical to the continued economic health of the San Francisco Bay. The Bay is "draft challenged," and it is essential that vessel operators be able to make full use of the limited depth of the Bay's channels and to minimize delays due to tides or currents.

- Expanded capacity for ports is required if the U.S. is to keep pace in the global trade. In addition to demands for new port infrastructure and dredging, we must seek ways to make crowded waterways safer and more efficient through advanced navigation systems and other information tools.

- Sustainable coastal ecosystem goals demand that port development, dredging, waterways management, and coastal resource planning be integrated to ensure needed expansion can take place without jeopardizing the health of coastal ecosystems. Data collected for charting and navigation services purposes provides a detailed description of the physical environment essential to sound coastal resource management and provides a common framework to assist port planners, waterways managers, industry, and coastal managers address these difficult challenges.

Physical Oceanographic Real Time System
Turing now to the first of the three examples of how safe and efficient marine transportation supports my agency's coastal management goals:

The approach over the bar outside the Golden Gate, which is dredged to 55 feet, can be difficult to navigate. Water depths are 380 feet at the Gate, but the Bay shallows rapidly once inside the headlands. Maintaining the major channels in the Bay requires the removal and disposal of two to five million cubic yards of material annually. New larger classes of vessels, however, require even deeper and wider channels. A project about to be completed is deepening the Oakland inner and outer harbors to 42 feet at a cost of $40 million; there are proposals to deepen them further to 50 feet in the near future. Accommodating these deeper-draft vessels is essential if Bay ports hope to remain competitive on the West Coast.

Effective channel depth can also be increased by improving bathymetric and water-level information to allow vessels to operate in larger tide windows without increasing risk. (Such information, of course, is but one factor and local communities may determine that other steps, such as tug escorts, are necessary.)

The NOS Physical Oceanographic Real-Time System (PORTS), which measures water levels,

currents, and other parameters in real time, meets both navigation needs for accurate under keel information and currents, and coastal management needs for effective oil spill response. In response to local interest, NOS launched a limited PORTS demonstration in the Bay as part of the San Francisco Bay Project. The demonstration phase allows local mariners and others to use PORTS data and assess its usefulness for navigation, and oil spill response agencies to develop experience using PORTS for prevention and response planning. In addition, NOS is working closely with the state Office of Oil Spill Prevention and Response, U.S. Geological Survey and the U.S. Coast Guard to integrate PORTS data, oil spill prevention and response tools, and the Vessel Traffic System for the Bay. An even broader application of PORTS data will be its use by the Coast Guard Research and Development Center and a research and development project involving the San Francisco Bar Pilots in integrating PORTS into electronic chart systems.

Accurate bathymetry, particularly when presented in digital form on moving map displays, combined with real-time water level and current information from PORTS, reduces the margin of channel depth now required to account for the uncertainty that accompanies incomplete information. The economic benefits of this information are direct and immediate to ports. In one recent case at the Port of Oakland, a ship using improved tide information was able to remain at the dock longer than it could have using predicted tides, and off-load additional containers. As a result, the shipping line saved the cost of shipping the containers to Oakland from it next port of call. More recently, J.D. Nielsen, Senior Vice President of Maersk Lines, was quoted in the *Journal of Commerce* on March 24, 1997 as saying three feet of extra draft in the Port of Oakland were worth $3.5 million per year to his shipping company alone.

PORTS information also advances BCDC and national coastal management and protection mandates in several ways:

- Risk of accidents and spills and subsequent injury to coastal resources is reduced, since pilots and masters can rely on real-time information instead of inferred bottom contours or predicted tides and currents;

- Were a spill to occur, however, first responders may also use PORTS data to validate trajectory models and other spill response tools, with the result that spill response is more effective and efficient.

- The need for dredging is reduced or may be delayed into the future, given that the capacity of existing channels is expanded;

- This same information is critical for the management and protection of coastal resources. Where dredging is required, for example, current and water level data can assist in project design, help identify dredge spoil disposal options, help execute projects to minimize harm to coastal resources, and to plan beneficial use of spoil, should that be a viable alternative.

It is interesting to note that NOS proposed a partnership of local interests and state agencies to operate and maintain PORTS as a way to capitalize on NOS technical expertise while recognizing that the agency has neither the financial resources nor the staff to bear the primary responsibility for the system. In response, the California Office of Oil Spill Prevention and Response will provide the majority of the funding for operations, while the Marine Exchange, a private, not-for-profit consortium of Bay waterfront companies, will operate PORTS with NOS technical guidance. I believe this partnership is a good example of the innovative relationships that can and must form if we are to meet the requirements of global trade without jeopardizing our invaluable coastal resources.

Photogrammetry

My second illustration of how NOS navigation and positioning programs have benefited the Bay's coastal management community is a photogrammetry project conducted by the National Ocean Service's National Geodetic Survey. The BCDC regulatory boundary by law is based on the position of the shoreline at Mean High Water. A series of challenges to our administrative interpretation of the shoreline led to a frustrating—and expensive--situation for regulator and permit applicant alike: the shoreline, and our jurisdiction, had to be determined on a case-by-case basis. BCDC and the regulated community united in a request of NOS that the agency's charting expertise be applied to establishing a new, authoritative boundary. Under the San Francisco Bay

Project, about which I'll comment in a moment, NOS agreed to do so as part of its next update of the Bay area suite of nautical charts.

The shoreline was of greatest importance to us, but BCDC and other Bay area coastal resource managers had a need for both aerial photography and compiled information from the project. Additionally, NOS' photogrammetric project established a baseline to measure change during the past ten years and for the next ten years to come. As with PORTS, the NOS approach to the project has been innovative: instead of only producing the data needed for nautical charts or a new shoreline, NOS will make available to the private sector and other interested parties the photography, control information, and other data needed to develop value-added products from the photography.

Hydrographic Surveys
Using its own assets, as well as private-sector contract survey support, NOS was able to conduct spot hydrographic surveys within the Bay to evaluate two problem areas for mariners. I understand from NOS staff that this contract was part of the agency's overall efforts to work more closely with the private sector in acquiring data for charts and other navigation and positioning products.

Of particular note is that as survey work was concluding, NOS mobilized quickly to work out a cooperative agreement with the U.S. Geological Survey, whereby USGS provided additional private-sector contract survey support with the result that a much larger area of the Bay was surveyed—albeit not to NOS standards for navigation purposes--to meet a variety of non-charting needs. This collaborative effort is an excellent example of agencies working together on related missions. NOS and USGS have been able to jointly use the data generated by the survey efforts. Benefits include new information critical to removing three large rocks northwest of Alcatraz Island which pose a navigational hazard to large vessels transiting the Bay. Finally, the data produced by this survey will provide much needed information for refining circulation models for oil spill response and other coastal protection purposes.

These three examples illustration just a few of the linkages between the NOS coastal protection and navigation and positioning programs. Coastal managers need these data collected for navigation and positioning purposes to address a broader set of coastal resource issues for the future such as change analysis, land-use assessment, wetland restoration, monitoring nonpoint-source pollution, identifying hazardous waste sites, modeling sediment and containment fates, and other uses. In today's economic and political climates, these natural efficiencies are critical: the need to collect data and distribute information for the maritime community results in comprehensive information essential to sustain coastal ecosystems that would otherwise be deemed too costly to produce.

San Francisco Bay Project and Pacific Coast Program
I have focused on the importance of the NOS charting and geodesy programs to BCDC. But *how* NOS is delivering navigation products and services in the Bay Area is important as well. I would like to comment briefly on how NOS' efforts to integrate its coastal management and maritime commerce responsibilities through a regional approach – initially the San Francisco Bay Project, and now the Pacific Coast Program -- is paying dividends in the Bay.

These efforts have three core principles. First, NOS will provide the primary clients, the marine transportation industry and coastal managers, with the best available scientific and technological support. Second, NOS will manage coastal and ocean ecosystems holistically, rather than resource-by-resource or problem-by-problem. And, third, NOS will build bridges among local, state, and federal agencies, the private sector, and non-governmental organizations to promote innovative approaches to protecting and managing coastal resources for the future while improving the safety and efficiency of maritime commerce.

The San Francisco Bay Project was the first NOS effort to focus on a particular geographic area, and to invite the local community to join the strength of NOS national programs with the expertise and knowledge of local maritime commerce and coastal management communities. The strategic partnerships formed there are enabling NOS to tailor and expand its navigation and positioning products and services to support a larger and more diverse client base. The cross fertilization of resources, ideas, and experience evolving from this collaborative process has

served as a solid foundation for the other Pacific Coast Program projects, currently in Puget Sound, Washington, and Prince William Sound/Cook Inlet, Alaska, and for future local and regional projects.

For the first time in my 25-year involvement with coastal management, a federal agency has taken the time and effort to seek out local input into a problem. By placing a site manager in the region, NOS made a serious commitment to the Bay and our local community. Their representative began attending our meetings, listening to our issues, and dealing with our problems, rather than the old way of doing business. I, as well as many other public and private sector organizations in the Bay area, am impressed with the way NOAA and NOS have begun to address our issues.

NOS realized that regional problems are too complex to address with broad programs implemented at the national level. To meet a particular area's needs, these programs must be tailored, with local community input, for that particular geographic area. The kinds of relationships needed to address regional navigation issues effectively are not possible at the national level. Consultation and collaboration with the local maritime community and coastal resource protection and management communities are essential for improving the design and delivery of NOS products and services. The data NOS collects for its charting and geodesy programs accurately describe the physical environment to ensure mariners can operate safely and efficiently. That same information is invaluable for coastal management, oil spill prevention and response, and research. NOS information must be accessible to a broad array of users, and new products and services for specific regional needs must be developed in collaboration with local communities. The San Francisco Bay Project and Pacific Coast Program are doing just that.

I would like to thank you for the opportunity to submit this testimony. I urge you to support NOS navigation and positioning programs at a level that will allow the agency to address the backlog of surveys, move into the next generation of navigation technology, and continue its work in San Francisco and elsewhere on the West Coast.

from: Alaska Coastwise Pilots Association 50 Front St., Suite 20 PO Box 23367 Ketchikan, Alaska 99901 marine pilotage dispatch serve tel: 907-225-7245 fax: 907-247-4568 email: acpa@alaska.ktn.net

To: U.S. House of Representatives Committee on Resources,
Subcommittee on Fisheries Conservation, Wildlife, and Oceans
Washington D.C. 20515

Re: 4/24/97 Hearing on the Future of Federal Hydrography
April 21, 1997 (BY TELEFAX and email)

Dear Congressman Young and Members of the Committee,

As marine pilots operating in the Southeastern region of Alaska, we are intimately aware of the necessity for accurate and up to date hydrography in the waterways of our state.

Waterborne commerce, including freighter, tanker, and cruise ship, has increased steadily in recent years, both in number of ships and in their physical dimensions. The potential for public harm in the event of a grounding of just one vessel is enormous. As publicly-regulated professionals, we have been compelled to increase and update our training and pilotage standards to safeguard against this peril. Application of our skills, however, relies largely on accurate hydrographic information.

The waterways of Southeastern Alaska, more popularly known to Americans as the "Inside Passage", contain some of the richest scenic and natural resource treasures of our state. Our waterways pose some unique challenges to safe navigation, however, because of recent glaciation and other natural causes of seafloor movement. In areas near Glacier Bay, for instance, the sea bottom has risen and changed quite dramatically in the twenty years or so that I have piloted these waters. Much of our state is geologically active, resulting in underwater rockslides and other events which quickly alter the topography. To safely transit these waters we must have recent, accurate cartographic placement of depths, landmarks, and hazards.

The advent of modern satellite-based navigation systems like GPS does not displace the need for accurate charts. The satellite based systems can assist a vessel in plotting its location with great accuracy on the globe, but unless the same accuracy is applied to hazards on the globe, it simply does not mean anything in terms of assisting the vessel in avoiding those hazards. It must be noted that ECDIS, used in conjunction with GPS/DGPS systems, is on the rise worldwide, and most modern ships now carry this equipment. Many mariners are not aware that GPS/DGPS systems have an

accuracy that exceeds that of many of our charts. This is a dangerous development because navigators who observe great precision of such systems on the open ocean expect the same precision with respect to charted hazards when making landfalls and while transiting pilotage waters. There is a pressing need for modernization of survey and charting methods to alleviate this disparity.

Lastly, in addressing the development of NOAA electronic charts, several important matters must be considered. A cost savings to taxpayers and/or user groups may be achieved because charts may be obtained and updated by digital electronic methods. Modern ships have communications equipment capable of receiving the data stream necessary to update charts. If private developers are relied upon to provide electronic charting systems there will still be a need for a public policy in setting standards for all aspects of those charts, from the methodologies used in collection of raw survey data to the scale and resolution of the finished product.

Thank you for the opportunity to comment on this issue.

Sincerely,

Captain Michael C. Spence

Statement of

John D. Bossler, Rear Admiral (Ret.), NOAA

for the

Subcommittee on Fisheries Conservation,

Wildlife and Oceans

House Committee on Resources

April 24, 1997

Mr. Chairman and members of the subcommittee:

My name is John D. Bossler, Rear Admiral NOAA (Ret,) and I am a former Director of the Coast & Geodetic Survey, which produces the nautical and aeronautical charts vital to our nation's safe, efficient marine and air transportation. Currently I am the Director of The Center for Mapping at The Ohio State University, Director of the NASA Commercial Space Center in Real-Time Satellite Mapping, and a full professor in the Department of Civil and Environmental Engineering and Geodetic Science of The Ohio State University. I have been president and chairman of numerous professional societies including the American Congress of Surveying and Mapping, National Academy of Science Advisory Committee on Mapping Science, and the University Consortium for Geographic Information Science. It is my pleasure to provide my views on the future of the Commissioned Officer Corps of the National Oceanic and Atmospheric Administration (NOAA).

NOAA CORPS

The Administration has included in its Fiscal Year 1998 budget a "place-maker" of $14 million to civilianize the NOAA Commissioned Corps. If this proposal is adopted, a uniformed service that plays a key role in our Nation's charting program will be dissolved. This would mark the first elimination of a uniformed service in our nation's history.

A full inquiry into the facts and circumstances surrounding the proposal will reflect that the Administration's intended proposal is simply not supportable. In this respect, three major areas must be carefully considered and fully examined - service history, national interests, to include potential environmental and national security issues, and cost savings.

SERVICE HISTORY

First, background on the history of the Commissioned Corps. The Commissioned Corps has been integral to our nation's development for the past 190 years. The Corps traces its lineage to 1807 when President Thomas Jefferson signed a bill for the "Survey of the Coast." Today's Commissioned Corps is the direct descendant of the commissioned service of the United States Coast and Geodetic Survey (C&GS). It has served the American people on many occasions over the decades, providing valuable scientific and engineering skills to the armed services and the nation.

The Commissioned Corps is unique in that it provides an organization of uniformed professionals to conduct NOAA's operational activities such as managing ships, aircraft, and field assignments with great flexibility and rapid response. The NOAA Corps is the only uniformed service that requires every officer to have a college degree in science or engineering prior to being commissioned. The Commissioned Corps selects its personnel from the strength of the country's premier colleges and universities. NOAA line managers are very supportive of the Commissioned Corps because these officers bring not only key technical skills, but heightened skills in operations, program needs, and management.

The Commissioned Corps is distinctively designed to meet the operational needs of NOAA (ships, aircraft and mobile duty) and to respond quickly to the emergent needs of the nation. Officers enter the Corps with the expectation that they will be separated from their families for long periods of time and will have to move their families often as a part of the Commissioned Corps' rotational assignment system. This continual rotation of officers provides for transfer of ideas throughout NOAA components. It has served NOAA and the nation very well, and should continue to do so into the 21st century. This rotational system, which has many of the positive attributes of the Senior Executive Service, is not limited to the executive level, but spans the entire breadth of NOAA - from an officer in charge of a field hydrographic survey launch, to a commander of a hurricane research aircraft, to the director of the National Geodetic Survey.

The Director of the NOAA Corps, a flag officer, has the capability to immediately direct transfers as required to meet national emergencies. A civilian, or privatized system would be more expensive and not as responsive to emergent requirements. Therefore, with the disestablishment of the Commissioned Corps, the nation would lose an important capability.

The Commissioned Corps' composition of scientists and engineers also provides a cadre of talented and technically competent officers who are intimately familiar with the operational needs of the organization. Many officers pursue advanced degrees, some attaining the doctorate level. Academic advancement is a factor in the Corps' "up or out" promotion system, i.e., as the percentage of officers becomes fewer at each senior grade, only the most talented advance, ensuring the highest quality support.

The Commissioned Corps also provides NOAA with officers who are multifaceted. In this respect, officers typically serve within multiple line components, similar to the Department of Defense's joint service commands. The multiplicity of assignments, therefore, engenders officers that who are multifaceted, as well as extremely dedicated and loyal to NOAA and the nation. This talent pool has contributed significantly, not only to NOAA but to other agencies, as well as the international community. Examples are numerous, but include the current president of the International Hydrographic Office in Monaco, fellows in the American Geophysical Union, past presidents of various sections of prestigious scientific and professional societies, and acknowledged world experts in the areas of geodesy, photogrammetry, and hydrography.

NATIONAL INTERESTS

There are significant national interests, to include environmental safety and potential national security implications that must also be carefully examined and considered in evaluating any proposal to disband NOAA.

First, Commissioned Corps officers are subject to a legislative transfer provision similar to that of the United States Coast Guard and Public Health Service, whereby the Corps' officers, ships, and equipment can be transferred immediately to the armed services in time of war and or national emergency. This legislative transfer provision was enacted to ensure that the nation could rapidly and efficiently tap the technical expertise of C&GS officers for the purpose of national defense. During World War II, officers served under assignment to the Army, Navy, and Marine Corps in all theaters of the war, often in the front lines or in enemy-held territory as artillery surveyors, amphibious engineers, hydrographers, geophysicists, reconnaissance specialists, and cartographers.

This contingent of officers received four Silver Star medals for gallantry under fire, seven Legion of Merit medals for exceptional technical contributions to the war effort, and numerous Bronze Star medals with Combat "V" for conducting surveys in enemy-held territory or while under fire. C&GS ships also received commendations for their role in charting the unknown waters of the western Pacific, often in advance of, and therefore unprotected by, fleet units.

Within the Navy, C&GS officers served as hydrographers throughout the western Pacific and were present at all major landings subsequent to Tarawa. As a direct result of difficulties encountered during the Tarawa landings, in which these officers had not been employed, Admiral Richmond Kelly Turner, chief of Naval amphibious forces in the Pacific, placed a C&GS officer in charge of all hydrographic operations associated with naval amphibious forces. A C&GS officer served as Force Hydrographer for the remainder of the war and directed the hydrographic efforts at Kwajalein, Peleliu, Saipan, Guam, Tinian, Iwo Jima, and Okinawa.

C&GS officers attached to the Marine Corps served primarily in two capacities, as either artillery surveyors or as intelligence officers, and they served in all major actions of the Pacific war. As artillery surveyors they often landed with the first wave to orient Marine artillery amidst the initial assault firestorm, and then carried their surveys forward -- often beyond the front lines. After providing survey control for Marine artillery, they aided in locating enemy artillery. On Iwo Jima, for example, a C&GS officer determined the position of 16 Japanese guns that were subsequently destroyed. Because of the nature of the work, these officers were readily exposed to hostile fire and often referred to as "sniper bait."

The nation has since been fortunate to not have seen another conflict on the scale of World War II and the need to directly transfer NOAA Corps officers to one of their sister services has, therefore, not arisen. Nevertheless, the NOAA Corps has continued to make vital contributions during national emergencies.

Today's threat includes not only military, but environmental threats as recently announced by the State Department. When the EXXON VALDEZ oil spill occurred, NOAA Corps officers, working with the Coast Guard, were heavily involved both ashore and at sea by operating NOAA ships that conducted environmental surveys of the area around the spill.

During Operation Desert Storm, Iraq created some of the worst oil-field fires and oil spills in history. The Commissioned Corps served with the armed forces during both Operation Desert Shield and Operation Desert Storm. NOAA provided ship and technical expertise for environmental appraisal, and the first comprehensive study of the Persian Gulf. NOAA Corps officers ashore provided scientific expertise in hazardous-materials management, leading shore parties and conducting surveys of oil-related damage to beaches and tidal areas.

The NOAA Ship MT MITCHELL carried a contingent of world-class scientists to the Persian Gulf to evaluate and determine the extent of the environmental damage. Prior to sailing, the uniformed service status of the officers allowed for immediate access to critical and classified information such as mine threat, and other military risk assessments. As a U.S. Government vessel commissioned in the public service, commanded by uniformed service members, and with sovereign status, MT MITCHELL easily bypassed the routine restrictions placed upon commercial and civilian research vessels. This status provided instant credibility in dealing with the on-site commanders of several Persian Gulf nations, where port security and logistics are controlled by military services. Research operations around several critical islands, controlled by these countries' military services, required negotiations between NOAA Corps officers and the local commanders.

While operating in the Persian Gulf, MT MITCHELL maintained close communications with other U.S. forces, both as a safety measure and to ensure smooth logistics through the military. The MT MITCHELL was the first U.S. Government ship to operate in Iranian waters in over 13 years. Although subject to occasional challenges by Iranian warships, the warship status and uniformed service command ensured recognition of MT MITCHELL's sovereign status and prompt acknowledgment of support for the mission. Both the Iranian scientists and Iranian naval observers on board MT MITCHELL commented that such operations would have never been possible on a civilian research ship, and provided anecdotal information on the earlier failure of such efforts involving civilians and non-government ships. The NOAA Corps uniform was also accorded instant credibility by Saudi Arabian, Kuwaiti, and Iranian authorities and observers. Most importantly, the skills and knowledge of the NOAA Corps officers maximized the productivity of this scientific expedition by providing a safe, effective research platform, and a means to collect critical data. The captain and crew of this expedition received a Commerce Gold and Silver Medals, respectively, for their service.

A more recent example of the continued vital importance of the NOAA commissioned corps is the NOAA Ship RUDE, which located the wreckage of TWA Flight 800 within 24 hours of the crash. The RUDE and a shore component,

composed of NOAA Corps officers, created highly detailed map products that greatly facilitated the retrieval of wreckage by Navy divers. The efforts of these Commissioned Corps officers was recently recognized by Secretary Pena of the Department of Transportation at a United States Coast Guard Awards Ceremony with a Public Service Commendation and by NOAA's parent bureau, the Department of Commerce, with the Department's highest award - the Commerce GOLD Medal.

In summary, the Commissioned Corps continues to be recognized for technical competence, leadership, and devotion to duty -- even under the most difficult conditions. The Corps provides "instant government recognition" and excellent interface to their fellow uniformed services. In addition, the Corps has a code of dress/appearance, readily gaining trust and respect, and providing NOAA and the nation with a needed "service to service" interface. The Corps is subject to transfer to the military services on immediate notice and has served, or is serving, in interface assignments with the Coast Guard, Defense Mapping Agency, Oceanographer of the Navy, Naval Meteorology and Oceanography Command, and occasionally with foreign offices. In my opinion, the nation would lose an extremely valuable asset if the Commissioned Corps were eliminated. As Vice President Gore stated in a letter to the Commissioned Corps on its 1994 anniversary:

"The NOAA Corps has provided valuable support to the other uniformed services in times of war and will continue to play an important role in supporting safe navigation, sustaining the health and harvests of our oceans, and providing advance warnings of hazardous weather conditions. As the Corps looks to the future, there will be many opportunities to utilize advanced technologies and alternative platforms and to develop new and innovative ways of operating. I am sure that the flexibility and adaptability that the Corps has demonstrated in the past will serve it well in the years to come."

COST SAVINGS

The last point is the projected cost savings from eliminating the NOAA Corps - the cost savings are minimal or non-existent. The asserted basis for dissolution is the mistaken belief that savings can be garnered through the privatization and civilianization of the Commissioned Corps. Simply stated, the original proposal to eliminate the Commissioned Corps was, unfortunately, not based on a thorough economic analysis.

When the NOAA administrator announced his intentions to eliminate the NOAA Corps, a general accounting office study requested by Representative Kasich was underway and nearing completion. The only cost study available at that time, in fact, showed that the NOAA Corps was actually less costly than an equivalent civil service work force. This study, prepared by Arthur Andersen & Co. under a contract initiated by the administrator's office, showed that the NOAA Corps was about $500,000 less expensive than its civilian counterparts. Clearly, NOAA'S decision to eliminate the NOAA CORPS was not based on economics, but simply politics,

i.e., to comply with the vice president's national performance review recommendation to eliminate the NOAA Corps with a projected cost savings of $35 million.

The subsequent GAO report (GAO-GGD-97-10, "Federal Personnel Issues: Issues on the Need for NOAA's Commissioned Corps") found only a 2% or about $600,000 cost differential between the Corps and an equivalent cadre of civil servants. The GAO's cost comparison did not, however, include either the overtime costs of using civilian aircraft pilots versus NOAA Corps pilots who do not earn overtime or the increased cost of moving a civilian as noted in the study conducted by Arthur Andersen. In particular, moving a member of the uniformed services entails less than one-third the cost of moving a civilian. Therefore, when moving costs are considered, the cost benefit tilts in favor of the NOAA commissioned officer.

There are also environmental issues. NOAA Corps officers are the only group of uniformed federal hygrographers in the nation. NOAA's nautical charts are highly regarded by the maritime community. The loss of the hydrographic expertise at NOAA could, therefore, jeopardize the nation's ability to conduct overseas military operations from the sea, as previously discussed. In addition, the loss of this hydrographic expertise could jeopardize the environment and safety of our coastal waterways through which most of our international trade is conducted.

Any purported savings realized through eliminating the Commissioned Corps would potentially be more than offset by the loss of the Commissioned Corps capacity for rapid response to prevent catastrophic environmental accidents, such as the grounding of an oil tanker on an uncharted rock. Mobility and rapid response -- attributes displayed during Operation Desert Shield/Desert Storm, the EXXON VALDEZ disaster and the crash of TWA flight 800 -- reflect the value of uniformed-service status to the nation.

As NOAA looks to increase reliance on private contractors and outsource hydrographic surveys, there is the issue of tort liability for any private civilian organization providing hydrographic surveys for use in creating U.S. government nautical charts. In particular, it is extremely doubtful that a private entity could obtain catastrophic insurance from another commercial entity for liability against a suit arising from the grounding of a cruise ship on an uncharted rock or an environmental catastrophe such as EXXON VALDEZ that resulted from deficiencies in nautical charts. As a result, the federal government would in all probability have to assume such liability. Given the foregoing, privatization of the national charting program must be carefully considered and explored in-depth to ensure that increased costs are not incurred as a result of privatization.

As currently presented in the proposed FY98 budget, the apparent "cost" of eliminating the NOAA Corps is only $6 million more than the FY97 retired pay line item of $8 million, or a total cost of $14 million. However, in reality, the total cost is much higher. In addition to the $14 million currently budgeted for elimination, are the retirement pay for

current retirees and the retirement pay for those officers who would be forced to retire if the Corps is eliminated. These additional retirement pay costs are estimated to be in excess of $10 million annually; this is an unfunded liability that does not appear in the proposed FY98 NOAA budget.

Simply stated, for no increase in costs, the Commissioned Corps provides the nation with a cadre of highly professional and dedicated women and men who serve in a multitude of ways. Without the Corps, the nation will suffer over the long run. Furthermore, when we again find we need the Corps, it will take years to get it back, at an even higher cost, perhaps at the cost of lives.

If all the costs of elimination are fairly considered, there is a significant savings in keeping the NOAA Corps that has served the nation faithfully for decades. Clearly, the potential cost savings from eliminating the NOAA Corps is nonexistent. The short-sighted reasoning of the Administration in eliminating the NOAA Corps could have an adverse impact on the environment and potentially impair our national security in time of crisis.

SUMMARY

In closing, any proposal to eliminate the Commissioned Corps must carefully examine the potential risks to the nation from the loss of the Corps and its technical expertise. Dissolution should not be permitted to proceed without a verifiable plan for how NOAA plans to continue providing services to the nation, such as nautical charting, without added cost to the taxpayer. This plan should be especially specific in the area of hydrographic surveys, where private contractors may not accept tort liability for their surveys or agree to conduct surveys in remote areas such as Alaska or in times of national emergency with the other uniformed services. In short, the outstanding service the NOAA Corps provides to the nation and the fact that there will be virtually no savings in its dissolution must lead to the retention of the Commissioned Corps.

John Bossler, Director OSU Center for Mapping
1216 Kinnear Road Columbus Ohio 43212 (614) 292-1600

CAPTAIN LOUIS BETTINELLI
INTERPORT PILOTS AGENCY, INC.
PORT MONMOUTH, NEW JERSEY

April 18, 1997

Honorable Jim Saxton, Chairman
Subcommittee on Fisheries Conservation,
Wildlife and Oceans
H 1 - 805 O'Neill House Office Building
Washington, D.C. 20515

Dear Chairman Saxton:

I am a federally licensed pilot in the Port of New York and New Jersey and provide services to many of the deep-draft tankships and container ships that frequent the port.

It is my understanding that on April 24, the Subcommittee on Fisheries Conservation, Wildlife and Oceans will be conducting an oversight hearing on the National Oceanographic and Atmospheric Administration's marine navigational services. An essential part of the services provided by NOAA is the Physical Oceanographic Real Time System (PORTS) currently operating in the Port of New York & New Jersey. Professional mariners rely on PORTS to ascertain the stage of the tide and the velocity of currents and wind. As I am certain you can appreciate, the ability to secure accurate information is key to safely navigating the Port District and safely transporting better that 30 billion gallons of petroleum annually.

It is imperative that adequate federal funding of this vital service continue. The benefits that flow from the PORT program inure to residents in the tri-state area in terms of the transportation of goods, the enhancement of vessel operations and the protection of natural resources. The exceptionally modest operation and maintenance costs for PORTS is the best investment the federal government can make in the area of waterway safety.

Safe vessel operations is contingent on the quality, timeliness and accuracy of the information available to the commercial mariner. Only PORTS can ensure that information on tide, wind and weather is available to pilots navigating ships, tugs and towboats in the Port District. I urge your committee to provide adequate funding for the PORTS program in New York Harbor for fiscal year 1998.

Sincerely,

Capt. Bettinelli

CAPT. R.A. MOORE
N.Y. HARBOR PILOT / MARINE CONSULTANT
5 TUDOR CITY PL., SUITE #1420
NEW YORK, N.Y. 10017

TEL: (212) 661-3736 FAX: (212) 682-4927

April 18, 1997

Honorable Jim Saxton, Chairman
Subcommittee on Fisheries Conservation,
Wildlife and Oceans
H 1 - 805 O'Neill House Office Building
Washington, D.C. 20515

Dear Chairman Saxton:

I am a federally licensed pilot in the Port of New York and New Jersey and provide services to many of the deep-draft tankships and container ships that frequent the port.

It is my understanding that on April 24, the Subcommittee on Fisheries Conservation, Wildlife and Oceans will be conducting an oversight hearing on the National Oceanographic and Atmospheric Administration's marine navigational services. An essential part of the services provided by NOAA is the Physical Oceanographic Real Time System (PORTS) currently operating in the Port of New York & New Jersey. Professional mariners rely on PORTS to ascertain the stage of the tide and the velocity of currents and wind. As I am certain you can appreciate, the ability to secure accurate information is key to safely navigating the Port District and safely transporting better that 30 billion gallons of petroleum annually.

It is imperative that adequate federal funding of this vital service continue. The benefits that flow from the PORT program inure to residents in the tri-state area in terms of the transportation of goods, the enhancement of vessel operations and the protection of natural resources. The exceptionally modest operation and maintenance costs for PORTS is the best investment the federal government can make in the area of waterway safety.

Every single day, millions of dollars worth of goods are safely imported and exported in the Port District. Millions of residents in the greater metropolitan area and the New England states depend on the petroleum products distributed throughout the region to heat their homes. Marine transportation is also essential to the smooth operation of local and state governments that provide municipal services. Finally, the ability to safely navigate the Port District and thereby avoid oil spills and the attending damage to natural resources cannot be underestimated.

Safe vessel operations is contingent on the quality, timeliness and accuracy of the information available to the commercial mariner. Only PORTS can ensure that information on tide, wind and weather is available to masters and captains navigating ships, tugs and towboats in the Port District. I urge your committee to provide adequate funding for the PORTS program in New York Harbor for fiscal year 1998.

Capt. R. Moore

Statement
of
Lillian C. Borrone
Director - Port Commerce Department
The Port Authority of New York and New Jersey

Regarding the National Oceanic and Atmospheric Administration's National Ocean Service Hydrographic Surveys and Related Marine Navigation Services in Fiscal Year 1998

Subcommittee on Fisheries, Oceans and Wildlife
Resources Committee
U.S. House of Representatives

May 8, 1997

I appreciate the opportunity to offer this statement, which represents the view of the Port Authority of New York and New Jersey (Port Authority) regarding hydrographic surveys and related marine navigation services of the National Oceanic and Atmospheric Administration (NOAA). The New York/New Jersey Port is the nation's second largest generator of international maritime trade in value, and the largest petroleum port in the United States handling 30,000,000,000 gallons per year of crude and refined petroleum annually. As such the public's interest in international commerce, public safety and environmental protection will be ill-served by inadequate navigation infrastructure and safety aids. I trust that the following information will be helpful to the Subcommittee on Fisheries, Conservation, Wildlife and Oceans during its deliberations on these important and essential marine services.

The bi-state Port Authority is responsible for the largest marine terminal container complex on the East Coast of the United States. The port handles a full range of commodities from the most basic, food and organic products to the most sophisticated, telecommunications products. There are some 350 cargo handling facilities spread out over the port district's 750 mile shoreline. The water-related businesses of commercial fishing, and the maritime industries in the Port of New York and New Jersey provide direct and indirect employment for over 200,000 people. Revenue generated from the New York and New Jersey port industry alone amounts to $19,000,000,000 annually or 3.3 % of the Gross Regional Product. Not-including recreational boat activity, some 300,000 vessels transit the harbor annually. While water-related recreational activity does not come under the purview of the Port Authority, it too is not an insignificant element in the regional economy. We rely on various federal and non-federal agencies to provide the full complement of safety and utility services that this complex harbor community requires. In addition to working with NOAA, the Port Authority works in concert with the U.S. Army Corps of Engineers, the U.S. Coast Guard, fire departments, police departments, NOAA, a variety of state and local agencies, and others to safeguard the port community.

In light of the Port of New York and New Jersey's current difficulty in having channels dredged and lacking adequate navigational services from NOAA, vessel operators will have insufficient information to determine cargo load configurations, in our shoaled waters. As NOAA has stated in its documents:

- NOAA cannot ensure quality control of the Tide and Current Data prior to distribution to the user. NOAA General Counsel has determined that this lack of quality control places NOAA at "substantial legal risk".[1]

- Publications containing tidal currents for New York and San Francisco have been withdrawn because the data upon which they are based are no longer accurate due to hydrologic and geologic changes in those areas.[2]

Without accurate information there is an inherent risk in the Port. The federal government is left with a conundrum: it could hold mariners responsible in the event of an accident, but how can mariners be held responsible when there is inadequate depth, tide and current information?

Listed below are the items that we endorse from NOAA's 1998 Marine Navigation Services Plan presented to the Committee. Specific to the Port of New York and New Jersey we seek funding of NOAA/NOS projects:

Nautical Charting - NOAA would accelerate the completion of significant vector features with the cost spread over three years. The nautical charts for the Port of New York and New Jersey are so old and outdated that they are rendered useless and now officially withdrawn by NOAA. Vector data are an important element of the Electronic Chart Display & Information System (ECDIS) and related "intelligent bridge" computer systems. These systems can integrate vital ship features such as draft and speed with radar, water levels, the Global Positioning System (GPS), and digital chart data to create automated collision-avoidance, anti-grounding, and related safety-warning systems. There has been a shift in the global marketplace to deeper draft vessels, with these new vessels we cannot afford groundings due to inadequate data. We support additional funding over the FY 97 base of $2,250,000.

Hydrography & Data Acquisition - We recommend the 20-year option to eliminate the critical backlog in 18 years by modernizing NOAA equipment. Hydrographic surveying is the most costly, but also the most important requirement in promoting safe navigation. Digital charts and ECDIS will be of marginal benefit if their data are derived from decades-old surveys using obsolete techniques that provided incomplete coverage. We support additional funding over the FY 1997 base of $30,400,000.

---

[1] "Promote Safe Navigation - 5-year Implementation Plan FY 1999-2003" - Draft March 25, 1997, NOAA/NOS. p. 15

[2] Ibid. p.11

Tides, Water Levels and Currents - We recommend the installation nationwide of the Physical Oceanographic Real Time System (PORTS) which means the installation of 15-20 complex PORTS and add 20-25 less complex systems over 10 years; including maintenance of base programs. We support additional funding over the FY 1997 base of $11,500,000. PORTS gives vessel operators the data they need to determine load capacity -- a critical component for the Port of New York and New Jersey, a harbor hampered by inadequate depth due to constraints on dredging. With this request we would like to ensure that bridge air draft clearance information is provided for the Port of New York and New Jersey. This measure monitors tide levels and will assist in the timing of vessel routing in order to prevent bridge/vessel collisions. If no funding is provided the loss of the Physical Oceanographic Real-Time System on January 1, 1998, means the Port of New York and New Jersey will have curtailed safety and environmental protection. At a minimum it is critical to provide an additional $3,500,000 to above the FY 1997 base in order to maintain existing services, including the existing four PORTS installations.

Funding NOAA/NOS - The Port of New York and New Jersey has been working with NOAA/NOS for over two years in the development of the Port's PORT System by providing in-kind services. To minimize potential future groundings and maximize use of the tide for container vessels carrying greater and greater loads, PORTS must be continued. Maintaining the current New York and New Jersey PORT System will cost $300,000. Commerce in the Port of New York and New Jersey contributes at least $70,000,000 annually to the Harbor Maintenance Trust Fund from which we estimate that our Port gets back only thirty-six cents on the dollar. If anything, Congress should support NOAA's requests for access to a limited amount of the Trust Fund monies to ensure adequate funding. The Federal Government must continue its over 200-year tradition of providing navigational aids for commerce plying the waters of the United States. We are eager to work with you in the in the development of an appropriate federal funding source for the National Oceanic and Atmospheric Administration's National Ocean Service.

As a bi-state public authority charged with the promotion and protection of the Port, the Port Authority of New York and New Jersey takes very seriously its responsibility to the public interest in the region. We work with other agencies to ensure that the Port infrastructure fosters growth in commerce in such a way that is respectful of the coastal environment and mindful of the safety of those who transport valued cargo and passengers to and from our region. The federal government has clear responsibility in that as well.

BOARD OF COMMISSIONERS OF PILOTAGE
OF THE STATE OF NEW JERSEY
P.O. BOX 652, NEWARK, NJ 07101-0652
TEL: 201-639-7950

RICHARD L. AMSTER
PRESIDENT

COMMISSIONERS:
EDWARD B. PULVER
THOMAS F. DALY
STANLEY E. WIKLINSKI
ROBERT S. STARR
FRANCESCO A. MUSORRAFITI

April 18, 1997

Re: N.J. State Pilotage Commission

The Honorable H. James Saxton
Chairman
Subcommittee on Fisheries
Conservation, Wildlife & Oceans
Washington, D.C. 20515

Dear Mr. Saxton:

This Commission is responsible for the regulation of State pilots who pilot ships entering and leaving the Port of New York/New Jersey. The Commission has reviewed the NOAA, PORT system which is presently operating in the harbor.

The Commissioners have concluded that the perpetuation of the PORT system would greatly enhance the safe pilotage of vessels within the port. From an environmental perspective the system is particularly vital because this port is the largest petroleum port in the nation. The PORT system substantially reduces the chances of an oil spill arising from a tanker grounding.

Because the Port of New York/New Jersey serves the Mid-Atlantic region, it would seem appropriate that funding for the PORT system be at the federal level.

Sincerely,

Thomas F. Daly
Corresponding Secretary

TFD/dp

ME5B:726900.1

HARBOR SAFETY, NAVIGATION AND OPERATIONS COMMITTEE
OF THE PORT OF NEW YORK AND NEW JERSEY

May 1, 1997

Honorable Jim Saxton
Chairman
Subcommittee on Fisheries Conservation,
Wildlife and Oceans
H1-805 O'Neil House Office Building
Washington, D.C. 20515

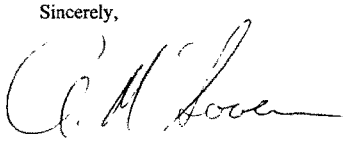
Dear Mr. Saxton,

It is our understanding that the Subcommittee on Fisheries Conservation, Wildlife and Oceans have conducted an oversight hearing on the National Oceanic and Atmospheric Administration's hydrographic charting and related marine navigational services on April 24, 1997. On behalf of the Harbor Safety, Navigation and Operations Committee, we respectfully request your accepting the enclosed written statement as part of the hearing record.

We appreciate your consideration of our views regarding these essential government services, and would welcome the opportunity to respond to any questions you, Members of the Subcommittee, or staff should have.

Thank you in advance for your attention to this request.

Sincerely,



Andrew McGovern
Chairman

The Harbor Safety, Navigation and Operations Committee of the Port of NY and NJ an independent organization, under the auspices of the Maritime Association of the Port of NY & NJ, comprised of a broad segment of the maritime community and includes both government and private interests. Meetings are held about every two months to discuss and act upon various subjects which effect the safe operation of the Port.

[The statement submitted was essentially identical to the one submitted by Mr. Deane and Mr. Sherwood which follows.]

UNITED NEW YORK SANDY HOOK PILOT'S BENEVOLENT ASSOCIATION
AND
UNITED NEW JERSEY SANDY HOOK PILOT'S BENEVOLENT ASSOCIATION

201 EDGEWATER STREET
STATEN ISLAND, N. Y. 10305

CABLE ADDRESS:
"HOOKPILOTS" - NEW YORK
TEL. (718) 448-3900
FAX. (718) 447-1582

April 29, 1997

Honorable Jim Saxton
Chairman
Subcommittee on Fisheries Conservation,
Wildlife and Oceans
H1-805 O'Neil House Office Building
Washington, D.C. 20515

Dear Mr. Saxton,

It is our understanding that the Subcommittee on Fisheries Conservation, Wildlife and Oceans have conducted an oversight hearing on the National Oceanic and Atmospheric Administration's hydrographic charting and related marine navigational services on April 24, 1997. On behalf of the United NY and NJ Sandy Hook Pilots(responsible for the safe movement of vessels in, out and about the Port of NY & NJ), we respectfully request your accepting the enclosed written statement as part of the hearing record.

We appreciate your consideration of our views regarding these essential government services, and would welcome the opportunity to respond to any questions you, Members of the Subcommittee, or staff should have.

Thank you in advance for your attention to this request.

Sincerely,

Robert Deane
President
New Jersey Sandy Hook Pilots
Association

William Sherwood
President
New York Sandy Hook Pilots
Association

We appreciate the opportunity to submit testimony, which represents the views of the United NY and NJ Sandy Hook Pilots Association regarding the marine navigation services of the National Oceanic and Atmospheric Administration (NOAA). We trust the following information will be helpful to the Subcommittee on Fisheries, Conservation, Wildlife and Oceans, during its deliberations on these important and essential government services in support of marine navigation efficiencies and safety.

The members of the United NY and NJ Sandy Hook Pilots Association in addition to our support of Nautical Charting, Hydrography and Data Acquisition feel it is vital to the continued physical, environmental and economic well being of the northeast that the Physical Oceanographic Real Time System (PORTS) demonstration project for the Port of NY & NJ be expanded and evolve into a permanently provided service to the users of the Port as well as the surrounding region. We say the region for a number of reasons some of which are;

•without the information provided by the PORT system the probability of an oil spill will increase and that spill would most likely affect a large portion of the northeast not just the Port of NY & NJ (as indicated in the enclosed illustration).

•if there were a spill while the PORT system were operating, the real time information provided by the system will greatly reduce both the environmental and economic impact of the cleanup (as was quite recently illustrated in Houston and San Francisco (articles enclosed)).

• the information provided by PORTS facilitates ship operators in the determination or cargo load capacities which is critical, now due to the current dredging constraints of the Port of NY & NJ and in the future to maximize the full depth of the channels. At the present time this is possible only in real time, but soon using information provided by the PORT system in conjunction with computer modeling we will have the ability to forecast higher and lower than astronomically predicted tide heights. This will result in a safer and more efficient Port with increased employment and reduced costs which will benefit both the immediate area and the whole region if not the country.

The PORT system will help mitigate the lack of dredging in the Port by allowing the users to maximize the use of the available depths.

Federal Regulations contained in OPA 90 require the master, pilot and possibly the owner of a vessel to know the under keel clearance (UKC) of the vessel during the entire passage through confined waters. The only way this can realistically be accomplished is with real time water level information. This is due to the large variation between the astronomically predicted height of the tide and the actual height in a Port such as the Port of NY & NJ which is greatly affected by environmental conditions, it is not unusual to have a two foot (and at times a much larger) difference between predicted and actual water levels. This fact has led to numerous groundings in the Port (Potomac Trader, Concho, numerous barges, etc.), fortunately they have not yet resulted in a major oil spill.

The PORT system with its ability to measure the speed and direction of the current throughout the water column will greatly improve the understanding of the

extremely complex current scenarios in the Port of NY & NJ. Currents converge at certain points within the Port as well as running in opposite directions, be it side by side or over and under simultaneously. The times and the strengths at which these events occur vary greatly from the predicted due to environmental influences. Many areas at which this phenomenon occurs are narrow channels cut into granite. That rock having the ability to open the side or bottom of a vessel with even the slightest glancing blow.

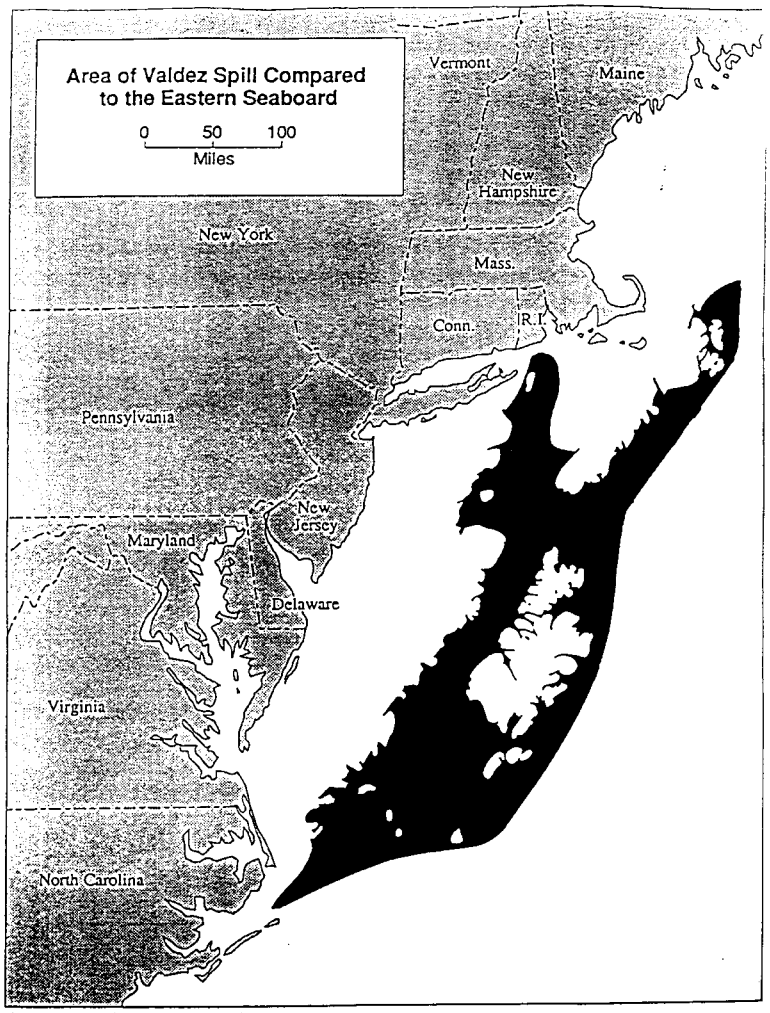
The history behind this request goes back to 1991, when the National Ocean Service (NOS) published a notice to all mariners (enclosed) to discard and no longer use the Tidal Current Charts for the Port of NY & NJ following a QA study showing errors as large as 128%. The NOS neither has the budget nor the willingness to replace these charts because the real time data supplied by the PORT system is so much more valuable and accurate as well as being cheaper to obtain.

The United NY and NJ Sandy Hook Pilots Association feel the NOS has a duty and legal obligation to provide the above mentioned informational service however, they cannot do this without the proper additional funding. The Sandy Hook Pilots feel the Federal Government should provide funding for the PORT System for many reasons, some of which are;

- the safety benefits of the system affect citizens and businesses over a wide area, not just in the commercial maritime community or locally
- the economic benefits affect an even wider and more diverse population than the safety benefits
- the potential user base is to broad and diverse (deep draft commercial ships, barges, tugs, commercial fishing vessels, recreational boaters(sail and power), sport fishermen(afloat and shore side), passenger vessels, military vessels, etc.) to be able to collect user fees on an equitable basis.
- the Port of NY & NJ already pays much more into the Harbor Maintenance Trust Fund than is returned to the Port in the way of project funding (about 3 to 1). In today's atmosphere of competition between ports the Port of NY & NJ is subsidizing our competition.

One method of providing the additional funding is to take the Harbor Maintenance Trust Fund off budget and releasing some of the surplus to fund the operation and maintenance of the PORT system.

We are requesting 100% funding of the PORT system and PORTS operation and maintenance by the Federal Government.



Source: *Alaska Fish & Game*, Vol. 21, No. 4

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
Rockville, Maryland 20852

October 17, 1991

TO: N/CG2212 - A. E. Lundberg

FROM: N/OES33 - Henry R. Frey

SUBJECT: COAST PILOT and NOTICE TO MARINERS Notices - Withdrawal of the Tidal Current Chart for New York Harbor

Please post the following announcement in appropriate editions of the Notice to Mariners and Coast Pilot:

Effective October 28, 1991, the National Ocean Service (NOS) Tidal Current Charts - New York Harbor will be officially withdrawn from distribution. A recent evaluation shows that tidal currents determined from the New York Harbor charts, last revised in 1976, are not as accurate as those determined from more recent information published in the NOS Tidal Current Tables - Atlantic Coast of North America including Greenland. NOS plans no further revisions of the tidal current chart series.

cc: N/OES - Stanford
N/OCRA - Ehler
N/CG - Yeager
N/ORM - Coxe
N/OES4 - Baer
N/OES334 - Kendrick
N/OES333 - Williams
N/OES33 - Welch

SENATE RESOLUTION No. 93

STATE OF NEW JERSEY

INTRODUCED MAY 13, 1993

By Senator COWAN

A SENATE RESOLUTION urging the Congress of the United States to appropriate to the National Ocean Service of the National Oceanic and Atmospheric Administration (NOAA) those funds necessary for a project to develop a Current Atlas and Physical Oceanographic Real Time System (PORTS) for the Port of New York and New Jersey.

WHEREAS, A compilation of accurate and updated tidal and current information is a valuable tool which is absolutely essential to the safe and productive navigation of any port; and

WHEREAS, The Port of New York and New Jersey is the second busiest port in the United States, supporting over 200,000 jobs in the greater metropolitan area, in addition to receiving approximately 60,000 vessel trips per year, including approximately 10,000 tanker trips and 7,000 cargo vessel trips; and

WHEREAS, A major dredging project is presently being undertaken at the Port of New York and New Jersey which will affect the velocity and direction of tidal currents; and

WHEREAS, Information contained in the current charts for mariners navigating the Port of New York and New Jersey was originally compiled from a 1932 survey; and

WHEREAS, The inaccuracy of the current charts used for the Port of New York and New Jersey has caused the National Ocean Service of the National Oceanic and Atmospheric Administration to withdraw these charts, with no immediate plans for replacing them; and

WHEREAS, A Physical Oceanographic Real Time System (PORTS) would provide Real Time information, identify the speed and direction of currents and winds, and indicate height, temperature and density of water, as well as providing useful information regarding bridge clearances; now, therefore,

BE IT RESOLVED *by the Senate of the State of New Jersey:*

1. This House urges the Congress of the United States to appropriate to the National Ocean Service of the National Oceanic and Atmospheric Administration (NOAA) those funds necessary for a project to develop a Current Atlas and Physical Oceanographic Real Time System (PORTS) for the Port of New York and New Jersey.

2. Duly authenticated copies of this resolution, signed by the President of the Senate and attested by the Secretary thereof, shall be transmitted to the Vice President of the United States, the Speaker of the House of Representatives, and every member of Congress elected from this State; the National Ocean Service of the National Oceanic and Atmospheric Administration;

State of New York
Legislative Resolution

Senate No. 1072

Assembly No. 988

BY: Senators Marchi and Mega

BY: Committee on Rules at the request of Connelly, Vitaliano, Becker, Bianchi, Brennan, Diaz, Dugan, Greene, Griffith, Harenberg, Healey, Lasher, Murtaugh, Muscarella, O'Shea, Parola and Sidikman

MEMORIALIZING the United States Congress to authorize the Department of Commerce to enact a Physical Oceanographic Real-Time Systems (PORTS) program for the Port of New York and New Jersey

WHEREAS, The Port of New York and New Jersey is vital to the economy of both the States of New York and New Jersey, and the nation, as the Port serves the needs of the Northeast, Midwest, West and Canada; and

WHEREAS, The Port of New York and New Jersey is the second busiest port in the U.S., supporting over 200,000 jobs; and

WHEREAS, The Port's Vessel Traffic Service reports that for calendar year 1991, there were more than 59,000 vessel transits; and

WHEREAS, The United States Department of Commerce, National Oceanic and Atmospheric Administration (NOAA) has withdrawn the current tidal charts, used by pilots to navigate the harbor, due to an evaluation which resulted in tide table-chart differences of as much as 128% of the flood and 66% of the Ebb of the tide in certain ports; and

WHEREAS, Inaccurate tidal charts have contributed to accidents and groundings within the New York and New Jersey Ports, such as the heavy lift ship *Silver Express* that struck the Bayonne Bridge on October 11, 1991, and the oil tanker *Potamac Trader* which ran aground in the East River on March 14, 1993; and

WHEREAS, A major dredging project is now underway in the Port which will effect the current, velocity, depth and direction of the water within the harbor; and

WHEREAS, The dredging project will permit greater access to the harbor and docking facilities by vessels which are of greater length, carry greater tonnage and have a deeper draft, necessitating accurate measurements of the depth of the harbor at the Ebb and Flood of the tide; and

WHEREAS, NOAA has the capability to undertake a project that will result in new tide measurements, revised tide and current predictions, a model-generated atlas and a Physical Oceanographic Real-Time Systems (PORTS) program for the Port of New York and New Jersey; and

WHEREAS, The NOAA Tampa Bay Oceanography Project has proven to help prevent catastrophic spills, as well as aid in the clean up if one should occur and is extremely valuable in search and rescue efforts; now, therefore, be it

RESOLVED, That this Legislative Body pause in its deliberations and memorialize the United Stated Congress to authorize the Department of Commerce to enact a Physical Oceanographic Real-Time Systems (PORTS) program for the Port of New York and New Jersey; and be it further

RESOLVED, That a copies of this Resolution, suitably engrossed, be transmitted to the United Stated Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service, United New York Sandy Hook Pilots Association, United New Jersey Sandy Hook Pilots Association and the Port Authority of New York and New Jersey.

ADOPTED IN SENATE ON
April 27, 1993

By order of the Senate,

Stephen F. Sloan

Stephen F. Sloan, *Secretary*

ADOPTED IN ASSEMBLY ON
June 3, 1993

By order of the Assembly,

Francine M. Misasi

Francine M. Misasi, *Clerk*

AROUND THE NATION

Barge Bursts in Texas, Gushing Long Ribbon of Oil

GALVESTON, Tex.—A barge carrying more than 714,000 gallons of oil broke open just outside the Houston Ship Channel yesterday, gushing a ribbon of oil at least five miles long into Galveston Bay.

The oil began streaming from the Buffalo Marine Service Inc. barge into an area between Pelican Island and Bolivar Peninsula about 1 p.m., the Coast Guard said. By late evening, the current pulled the oil south along the coast.

About 4,200 barrels, or 176,400 gallons, of No. 2 crude oil had spilled by evening, Coast Guard Lt. Greg Delong said.

Coast Guard Cmdr. Dean Kutz said the rest of the tanks were intact and it appeared the spill would be restricted to 4,200 barrels.

Texas Land Commissioner Garry Mauro said the thick oil won't evaporate easily. He said winds up to 45 mph, rough seas and the heavy oil would complicate the cleanup.

Crews deployed a protective boom and planned to use skimmers and other oil recovery equipment.

A ship was standing by to remove the remaining oil from the barge.

Buffalo Marine accepted responsibility for the spill, said Daniel Buchsbaum, the company's cleanup coordinator.

Decisions based on Ports Information

From: David_Kennedy_AES@hazmat.noaa.gov on Thu, Mar 28, 1996 7:54 AM
Subject: Fwd(2): PORTS

Stan, We have been working on a spill that happened off Galveston in the Bolivar Roads area. It is a barge that ran aground and had a catastropic failure and actually split in two, spilling about 200,000 gallons of #6 fuel. Within 1000 yards of the grounding site was a PORTS ADCP instalation. At the time of the spill there were strong and sustained winds from the north and Galveston Bay was in a significant flushing mode. We immediately got access to the PORTS data and were able to determine that the predicted tides etc. were not what was really going on at the grounding location. As a result of this data we were able to create a trajectory that accurately predicted the initial movement of the oil. If we had relied on predicted it would have increased our margin of error significantly. During the first two days of the spill it was essential to keep data and interpretation from this insrument coming to us 24 hours a day. We are used to this mode of operation but have found that other parts of the government aren't quite so keen and don't really have a good "spill mentality." We were impressed and gratefull to the PORTS tech support team in Silver Spring when we found that they indeed demonstrated the right stuff. They were right there with us and met every demand we gave them. They worked well into their night to keep the data coming and gave us home numbers so we could call them any time we needed. Their enthusiasm and support were outstanding. dmk

****

NOAA Hazmat 7600 Sand Point Way NE, Seattle, WA (206)526-6317

****

THURSDAY, OCTOBER 31, 1996

San Francisco Chronicle
THE VOICE OF THE WEST

EDITORIALS

Bay Oil Spill a Dry Run

AS CLEANUP crews continue to skim and scrape after Monday's oil spill in San Francisco Bay, a troubling reality hovers: This spill was a baby.

About 8,000 gallons of thick fuel oil poured into the water when tank valves on a ship in dry dock somehow were opened. It spread from Pier 70, near China Basin, under the Bay Bridge, out to Treasure Island and over to Aquatic Park. Another 72,000 gallons spilled but were contained.

Yet even if all the oil had ended up in the water, it still would not meet the U.S. Coast Guard definition of a "large" spill. The Exxon Valdez, which frequently anchored in San Francisco Bay, dumped 11 million gallons into Alaska's Prince William Sound in 1989, and San Francisco's last big spill in 1988 involved 432,000 gallons.

The potential for disaster here is great. Nearly 1,000 full tankers sail under the Golden Gate Bridge each year, headed for Bay Area refineries. Strong currents and shallow waters make the bay one of the most treacherous ports in the world. Some ships carry more than 50 million gallons — 6,250 times what spilled Monday.

The Coast Guard reports that response to the spill was swift. Still, there is no substitute for real experience. This week's cleanup needs to be painstakingly analyzed to ensure an effective response to a much larger, and more disastrous, spill.

San Francisco Chronicle
A DIVISION OF CHRONICLE PUBLISHING COMPANY

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National Ocean Service
San Francisco Bay Project

San Francisco PORTS and the Cape Mohican Spill

The National Ocean Service (NOS) designed the San Francisco Bay Project to promote safe and efficient maritime commerce and the protection and sound management of the Bay's coastal resources. The NOS Physical Oceanographic Real-Time System (PORTS), which measures water levels, currents, and other parameters in real time, meets both navigation needs for accurate under keel information and currents, and coastal management needs for effective oil spill response. In response to local interest, NOS launched a limited PORTS demonstration in the Bay as part of the San Francisco Bay Project. The demonstration phase allows local mariners and others to use PORTS data and assess its usefulness for navigation, and oil spill response agencies to develop experience using PORTS for prevention and response planning. Under the San Francisco Bay Project, for example, PORTS data is being used to identify pollution collection points to inform contingency planning in the Bay. In this demonstration phase, PORTS is not intended to be a fully operational navigation or oil spill response system. Nevertheless, San Francisco PORTS proved invaluable in the recent Cape Mohican spill.

On 30 October 1996 the M/V Cape Mohican, a 725 foot Maritime Administration vessel, discharged an estimated 1950 barrels (about 81,000 gallons) of fuel oil. The discharge occurred while the vessel was located in dry-dock at pier 70. Most of the oil was retained with in the dry-dock, with an estimated 200 barrels (about 8,000 gallons) being released into the waters of San Francisco Bay. Over the next few days, oil migrated throughout the central Bay, eventually reaching the ocean shore outside of the Golden Gate.

In oil and chemical spills in the marine environment, NOAA's HAZMAT provides scientific and technical support to the U.S. Coast Guard and other responders. One of the organization's primary functions during a spill response is to model trajectories and make predictions for material movement over various time intervals. These models and predictions are used to support a variety of strategic spill response decisions. The accuracy and efficiency of the model is directly tied to the availability of reliable input parameters, including meteorological, tide, and current information. In spills where PORTS data is not available a variety of historical and predictive analytical tools provide these parameters. During the Cape Mohican spill however, both real-time read outs from PORTS sensors and archived PORTS data greatly improved the quality of the model inputs, with the result that the model results were much more accurate.

The archived PORTS information allowed the HAZMAT team to initialize the models more accurately. The frequency of real-time PORTS data allowed the scientists to update the model rapidly, and to respond promptly to changing meteorological and oceanographic conditions. The bullets below provide additional information on how specific PORTS sensors were used to inform HAZMAT's trajectory models.

o Meteorological Sensors: Wind, of course, is an important factor in the movement of oil. In the Cape Mohican spill, HAZMAT worked closely with the National Weather Service to monitor wind conditions and predictions. Wind fields inside the Bay, however, are complex and difficult to predict. PORTS meteorological sensors allowed modelers to detect discrepancies between forecasted and actual winds and adjust the trajectory predictions accordingly. The differences were not trivial: in one instance model outputs using predicted winds indicated oil would move in a substantially different direction from model outputs using actual winds#the more accurate trajectory predictions allowed responders to redirect protection and cleanup efforts accordingly.

o Current Sensors: The most important Acoustic Doppler Current Profiler (ADCP) in the San Francisco PORTS is the sensor at the Golden Gate. Because current speed and direction through the Golden Gate drive tidal cycles and current patterns throughout the Bay. A good understanding of conditions there in real time is essential for accurate trajectory modeling inside the Bay. Hazmat modelers used Golden Gate ADCP data to validate and confirm current predictions throughout the spill response. Without these date. Responders could not know the actual confidence level of current predictions. Given the location of the spill, data from the Oakland, Richmond, and Benicia ADCPs were not necessary for model inputs.

o Tide Gauges: Accurate tidal data is critical in a spill both because of tidal effects on currents and to predict the beaching of oil. HAZMAT used output from the PORTS tide gauges in the same way it used the Golden Gate current data to validate model results. Trajectory models use built-in astronomical tidal prediction routines; the PORTS data validated the accuracy of these predictions and no other adjustments were needed for this particular spill response. However, wind, freshwater inflows, and other factors affect tidal range. In more extreme conditions than existed at the time of the Cape Mohican spill real time data from PORTS would have been used directly in trajectory models.

The Cape Mohican spill was relatively small, but the potential for harm to coastal resources and man-made structures was significant. PORTS greatly improved the quality and accuracy of the HAZMAT trajectory models and

strategic spill response decisions. As a result, the spill response was more effective and efficient and damage to coastal and estuarine resources was mitigated. PORTS was critical in the Cape Mohican spill. But the value of PORTS in a larger spill, or one where sustained adverse conditions hampered effective spill response would be far greater.

From: Ted Kellogg[SMTP:tkelog@ptialaska.net]
Sent: Tuesday, April 15, 1997 11:43 PM
To: Young, Don (Public Opinion)
Subject: Oversight hearing on:The future of hydrography

Representative Young,

As a Marine Pilot (Lic.#158), and the Vice President of the Southeast Alaska Pilots' Association allow me to express our concerns related to the upcoming; oversight hearing on: the future of hydrography, under the Committee on Resources, April 24, 1997 at 1400 in the Jones Room.

As end users of the endless survey work NOAA performs here in Alaska, particularly in Southeast, we can't stress the importance we Alaskans and Pilots place on the numerous charts and publications that cover our region. We move hundreds of thousands of people through our waters, not to mention great quantities of cargo and other waterborne commerece. Without NOAA's continuous comittment to nautical charting moving us into into the 21st century the mariner, fisherman, pilot and State of Alaska are all subject to additional risk while foreign and domestic vessels transit our waterways.

Please continue to support the work and presence NOAA maintains in Alaska, especially Southeast. I urge you and your colleagues to consider additional funding for resources devoted to Alaska on this issue. Let's work together to keep our waters free of uncharted dangers.

Respectfully,

Captain Ted Kellogg