TESTIMONY OF REAR ADMIRAL SAMUEL P. DeBOW, Jr.
DIRECTOR OF NOAA COMMISSIONED OFFICER CORPS
AND DIRECTOR OF THE OFFICE OF MARINE AND AVIATION OPERATIONS
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
DEPARTMENT OF COMMERCE
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Good morning, Mr. Chairman and distinguished Members of the Subcommittee. As a representative of the National Oceanic and Atmospheric Administration (NOAA), I thank you for the opportunity to appear before you today to discuss Maritime Domain Awareness (MDA) and NOAA's contributions to homeland security within U.S. maritime boundaries. I have spent most of my career in NOAA's hydrographic survey program as a NOAA Commissioned Officer. Most recently, I was appointed Director of the NOAA Commissioned Officer Corps and Director of the Office of Marine and Aviation Operations, and participated as the NOAA representative to the interagency MDA Implementation Team.

In particular I will update you on the status of NOAA's navigation products and services as they relate to MDA, and on how NOAA's response planning capabilities can minimize damage from natural or man-made incidents on our waterways. I will also discuss more broadly NOAA partnerships with the Department of Homeland Security – specifically with the United States Coast Guard, and the Department of Defense to ensure the safety and security of the Nation's maritime areas.

NOAA's Mission

NOAA's responsibilities for the environment, safety, and commerce of this nation span the oceans, coasts and atmosphere. We provide weather, water, and climate services, manage and protect fisheries and sensitive marine ecosystems, conduct atmospheric, climate, and ecosystems research, promote efficient and environmentally safe commerce and transportation, provide emergency response, and offer vital information in support of homeland security. The work we do touches the life of every person in this country every day. Capabilities that are part of NOAA's standard daily operations often are vital during times of emergency. NOAA has a wide range of resources that can be used to prepare for and respond to accidents, disasters or terrorist incident.

Ports and Maritime Security

A central part of NOAA's contribution to Homeland Security involves port and maritime security. We recognize that U.S. ports are considered vulnerable choke points, and the 95,000 miles of U.S. shoreline are a difficult border to protect. But at the same time, U.S. seaports are gateways to our largest cities and industries. Commercial shipping carries more than 95 percent by volume of the U.S. overseas trade so critical to our economic health on the 3.4 million square nautical miles of ocean and coastal waters under U.S. jurisdiction.

It is in this context that NOAA supports the Coast Guard's Maritime Strategy to uphold maritime security while preserving our fundamental liberties and economic wellbeing. NOAA provides information to decision-makers – including first responders – to use in developing Maritime Domain Awareness. Our primary objectives are to protect lives, property and the environment from hazardous incidents and disasters, whether natural or man-made, and to effectively maintain the Marine Transportation System (MTS) information infrastructure required for safe maritime commerce and U.S. force deployment. We forecast events such as hurricanes and tornadoes; provide the tools necessary to navigate safely in U.S. waters; respond to hazardous material spills and accidents in the marine environment; and offer training and technology to communities to prevent and mitigate the effects of hazards. To accomplish these aims, NOAA relies on its extensive network of platforms and observing systems. It is with this network of data resources and our geospatial expertise that NOAA can provide the basic tools needed by partners such as the Coast Guard and Defense Department in order to conduct MDA activities.

Mapping and Charting

NOAA is responsible for charting the U.S. Exclusive Economic Zone (EEZ) and defining the National Shoreline in support of maritime commerce. The Coast Guard and U.S. Navy have already called upon NOAA's expertise in both areas to help with disaster response and Homeland Security requirements. Immediately after the September 11th attacks, NOAA directly supported search and recovery efforts at the World Trade Center (WTC) and Pentagon disaster sites with its aerial mapping and remote sensing capabilities. Flying a Light Detection and Ranging (LIDAR) system to profile terrain elevations, NOAA produced images at 15 centimeter accuracy to establish an accurate spatial reference frame from which responders could perform effective recovery. The LIDAR data were also used to monitor structural movement of damaged buildings in the area of the WTC disaster and to calculate the volume of rubble. Just last month we helped to respond to Hurricane Ivan by taking aerial images of the post-hurricane shoreline from Gulfport, Mississippi, to Fort Walton Beach, Florida. These images will be compared to pre-hurricane surveys to support damage assessment and emergency response activities for federal, state and local agencies. NOAA's shoreline mapping activities provide an accurate delineation of the national shoreline and up-to-date characterizations of coastal and harbor areas.

On the wet side of the beach, NOAA has a long history in developing the technologies used to collect, measure and chart water depths. NOAA's hydrographic surveying program – my particular area of expertise – engages in categorical surveying of the nation's navigable waters for nautical charts and other navigation tools. These valuable charting and hydrographic services support the Coast Guard, Navy, Army Corps of Engineers and others in their efforts to strengthen MDA and port security. In October 2001, the Naval Oceanographic Office, Corps of Engineers and NOAA signed a memorandum of agreement to conduct cooperative hydrographic surveys for systematic hydrographic surveys of harbors, approaches and vessel traffic lanes critical to military deployment and commercial shipping. The goal was to establish immediate maritime domain awareness, acquire high-resolution data in navigable waterways for effective mine countermeasure operations, and update NOAA Electronic Navigational Charts (ENC). Without hesitation NOAA revised its planned survey schedule to accommodate this request to obtain baseline hydrographic data; we may periodically resurvey these areas to support highly accurate detection of changes that might threaten military or commercial ship transits.

Of the 3.4 million square nautical miles in the EEZ, NOAA has classified over 500,000 as navigationally significant due to the threat of natural and manmade hazards to marine navigation. Beginning in 1994 we identified approximately 43,000 square nautical miles – about 1.3 percent of the EEZ –as being the most "critical" to survey in terms of vessel usage and safety issues. Critical areas constitute waterways with high commercial traffic volumes, oil or hazardous material transport, compelling requests from users, and transiting vessels with low underkeel clearance. This critical subset of navigationally significant areas became known as the survey backlog; much of it is in Alaska and the Gulf of Mexico.

For the past 10 years, we have employed a balanced mix of resources between NOAA survey platforms and contract data acquisition to reduce backlogged requirements. We now contract out over 55 percent of our surveying resources, and our contractor relationships are very strong. The recently reactivated NOAA Survey Vessel FAIRWEATHER, the THOMAS JEFFERSON replacement for the 40-year old WHITING, and planned RUDE replacement will help NOAA to continue to eliminate the backlog of critical requirements still pending. NOAA also looks at technology development for more efficient ways of collecting and analyzing data, such as Autonomous Underwater Vehicles, Light Imaging Detection and Ranging, and multibeam sonar improvements.

With a plan in place to successfully address the backlog of critical requirements, NOAA must concurrently renew its focus on the Nation's other navigationally significant areas. New areas that meet the critical criteria are developing all the time; regions that were lower priority in 1994 have since been identified by the Coast Guard, marine pilots and port authorities as potentially dangerous to safe navigation and in need of survey or re-survey. Some of the causes are naturally occurring changes such as silting, storms and

earthquakes; receding glaciers that offer enticing views to eco-tourists; an increase in number and size of vessels using a waterway; and known wrecks and obstructions following weather events or accidents. NOAA works to find the appropriate balance between addressing these unanticipated requests on a quick response basis and meeting existing navigationally significant requirements. High-accuracy navigation data is essential for safe operations and maritime domain awareness in U.S. waters for commercial mariners, recreational boaters, our federal partners, and other maritime users. These stakeholders depend on NOAA to produce new digital hydrographic data to populate the Electronic Navigational Chart and other innovative products that far exceed the paper nautical chart in capability. Addressing this need requires a continuing investment in NOAA's fleet and contract survey capabilities to maintain expertise and acquire more effective and comprehensive coverage. Maintaining core capability and expertise is a critical component of NOAA's mission to establish standards and ensure the quality of data obtained by a multitude of sources.

Electronic Navigational Charts

NOAA ENCs are an important component of NOAA's suite of navigation tools for capturing and displaying accurate hydrographic data. Built to international standards, ENCs are essentially a database of chart features and attributes that can be intelligently processed and displayed by electronic charting systems. As "smart charts," NOAA ENCs give the user much more information than can the paper- chart . They can be incorporated with GPS and other oceanographic sensor data (water levels, winds and weather) to significantly improve navigation safety and efficiency by warning the mariner of hazards to navigation and situations where the vessel's current track will take it into danger. NOAA ENCs also serve as fully integrated vector base maps for use in geographic information systems. This functionality can benefit MDA efforts; modern electronic information systems are key to maritime security, port safety and uninterrupted maritime commerce. ENCs can be used for port vulnerability and risk management assessments, the Coast Guard's Automatic Identification System (AIS) for Homeland Security MDA and vessel traffic management, emergency response planning, coastal zone management and many other purposes. The Coast Guard also relies on NOAA ENCs to navigate its vessels in areas with ENC coverage.

NOAA currently has 420 ENCs built of the nation's major ports and approaches, with a goal of matching the coverage of our 1000-chart paper suite by the end of 2008 based on the President's FY2005 request. They are available for download, free and open, on the Internet. In fact, in July 2004 the number of ENC downloads reached the three million mark. As we work to complete ENC coverage, our comprehensive suite of digital raster nautical charts with weekly electronic updates serves mariners well as an interim solution and entry point into electronic navigation. We work hard to see that this updated information is widely distributed. Fully one-third of our ***paper/digital raster*** charts were refreshed and published as new editions this year. In addition, NOAA Print-on-Demand technology allows us to update charts weekly, or even hourly if necessary, to put up-to-date nautical charts in the hands of mariners. NOAA ENCs are currently updated on a monthly basis for critical chart corrections derived from Coast Guard

reports, Corps of Engineers blueprint analysis, NOAA survey data and other sources. Although it currently takes 18 months for a full NOAA hydrographic survey to move from the vessel to the chart, NOAA is working on streamlining this pipeline with processing and technology improvements. The goal is to reduce the "ping-to-chart" timeframe to three months, with critical correction updates provided weekly.

Spatial Reference

NOAA is responsible for maintaining the National Spatial Reference System (NSRS), which establishes a highly accurate, precise, and consistent nationwide geographic framework. NSRS is the unseen backbone of all surveying, mapping, and navigation activities throughout the U.S. It is the coordinate reference system that allows a ship to leave a port and confidently navigate to another port or an airplane to take off and land precisely at another airport. NOAA works with other federal, state and local agencies and private industry to establish standards that form a common base between all entities. This common base grows more and more critical with the growing use of geographical information systems and the Global Positioning System (GPS). For example, WTC recovery efforts relied on the NSRS to establish a reference system to locate all utilities and building structures in the impacted area.

Part of the NSRS is the Continuously Operating Reference Station (CORS) network -- a nationwide network of permanently operating GPS receivers to support 3-dimensional positioning. NOAA and the Coast Guard partner on maintaining CORS around the country. The NSRS and CORS network is already located at the 40 major port areas and is ready to support the operational and geospatial needs to protect U.S. ports and coastal areas. In Louisiana, NOAA used CORS for elevation surveys of major evacuation routes to demonstrate the critical need for early evacuation decisions as some of the region's major evacuation routes have been sinking steadily and are subject to rapid flooding. To improve the NSRS, NOAA is developing height measurement standards to provide a consistent method in height measurements.

Tides and Currents

Regional stakeholder listening sessions conducted by the Coast Guard, NOAA, and other federal agencies in the late 1990's revealed that Marine Transportation System stakeholders' highest priority is accurate, reliable, timely information. In combination with nautical charts, tide and current data are critical pieces of environmental information necessary for a complete picture of the frequently hazardous environment in which mariners operate. Accurate tidal information can make the difference between a vessel grounding or making a safe transit. Knowledge of the currents helps today's ever larger vessels safely maneuver through channels and turns in our constricted harbors.

NOAA operates several ocean observing systems to provide this critical data to mariners: the National Water Level Observation Network (NWLON) of 175 long term tide and water level stations, the National Current Observation Program, and the Physical Oceanographic Real Time System (PORTS®). NOAA's traditional tide and tidal current prediction tables, along with nautical charts, must be carried on all vessels over 1600 gross tons. While the ability to predict tides and currents has been around for centuries, these astronomic-based calculations cannot factor in meteorological effects, and are often significantly different than actual conditions if weather comes into play. As a result, this information is used extensively for both MDA and port safety, particularly with the size of vessels today challenging dredged channel depths in almost every major U.S. harbor.

NOAA's cost-shared partnership program – PORTS® – addresses this need. Technological advances allow tide and current data reports in real time, as well as other types of environmental data important to mariners such as wind, air and water temperature, barometric pressure, and salinity. The PORTS® program works with local users to assess requirements within an area and determine what type of real time environmental data is needed and where to place sensors. NOAA quality controls the data on a 24/7 basis so that mariners can rely on PORTS® to avoid accidents rather than cause them. If for some reason vessels must leave port immediately, PORTS data integrated with GPS would help to calculate underkeel clearances for a vessel's transit, thereby reducing the possibility of ships running aground, blocking other vessels and channels or spilling contaminants.

There are now twelve PORTS® in existence in the United States, serving 34 seaports through which 37 percent of U.S. cargo by tonnage passes on an annual basis. The thirteenth, Columbia River, will likely come online in FY2005. A primary user, the Coast Guard works closely with NOAA on PORTS®; some PORTS® such as New York/New Jersey are operated in conjunction with the Coast Guard Vessel Traffic System center. NOAA is also working with the Coast Guard to integrate PORTS® data into its Automatic Identification System; to date this has been accomplished in the Great Lakes.

A recent addition to the PORTS® suite of sensors is the air gap sensor, which provides mariners with the distance between the underside of a bridge, and the water. In the last few decades, ship size has grown both above and below the waterline, and the number of bridge strikes by ship antennas and superstructures is on the rise. The air gap sensor is a specialized tool developed by NOAA to help address a major user priority.

Another powerful enhancement to PORTS® are NOAA's Oceanographic Forecast System models. These models rely on the real-time data provided by PORTS® and other systems to generate accurate forecasts of tide and current conditions 36 hours into the future. They can also "nowcast," or provide present conditions, at locations where observations are not available. NOAA presently operates three models (NY/NJ, Chesapeake Bay, Houston-Galveston) with several more under development. The models help mariners plan vessel transits to take advantage of favorable tides and currents, or perhaps more importantly, avoid unfavorable conditions. In the event of a

crisis, NOAA's forecast models would provide crucial advance data for re-routing of vessel traffic and safe evacuation planning. Marine modeling also supports trajectory predictions of the oceanic and atmospheric dispersion of hazardous materials to protect people and the environment. Besides enhancing safety, both models and PORTS® data can also significantly improve efficiency through optimal loading of cargo and scheduling.

The FY2005 President's Request contains a $2.7M increase to fully maintain and upgrade NWLON to real-time status as well. NWLON has long provided the nation with tidal datums (vertical reference), tide and storm surge predictions, long-term sea level rise and other products. This modernization effort will establish a baseline level of real-time tide and water level data at the top 150 U.S. seaports, as well as a solid foundation upon which PORTS® can build. The Great Lakes NWLON stations already have this capability, and the additional funding will make real-time service available from all coastal NWLON stations. It should be noted that a single NWLON station may accommodate over 20 other types of sensors in addition to water level, so this data would be provided in real-time also. NWLON, along with NOAA's survey platforms and spatial reference networks, is a fundamental data contributor to the Integrated Ocean Observing System and larger Global Earth Observing System of Systems.

NOAA is also exploring High Frequency Radar (HFR) technology as a means to modernize currents measurement. HFR sensors mounted along the coast can monitor large geographic areas and provide comprehensive information on surface currents. NOAA presently uses Acoustic Doppler Current Profilers that are very accurate but point-based, and they measure currents through the water column with the exception of the top meter. HFR is therefore an attractive complement to Doppler Profilers. There are a number of other potential applications for HFR technology, such as vessel detection, and oil spill response. NOAA is working with academia and other federal agencies to further refine this technology; approximately 60 HFRs are already operated primarily by academia for research purposes.

Response

NOAA has a wide range of capabilities in its day-to-day operations that can be used to prepare for catastrophic events. For example, surveying and charting are daily NOAA activities mandated by Congress. But after Hurricanes Frances, Ivan and Jeanne, NOAA deployed its Navigation Response Teams (NRT) for emergency surveying to quickly reopen Atlantic and Gulf Coast ports, demonstrating the economic, safety and MDA benefits of rapidly resurveying ports and harbors. The NRTs typically conduct hazardous obstruction surveys throughout the Atlantic Seaboard, Pacific Coast, Great Lakes and the Gulf of Mexico to update NOAA nautical charts. NOAA and the Defense Counter Terrorism Technology Support Office are presently crafting an agreement to partner in developing Underwater Domain Awareness capability for ports, harbors and inland waterways. The task is to investigate enhanced sonar technologies and

capabilities to better detect, classify and/or interdict underwater threats. The NRTs will serve as research platforms to test equipment and develop new ways to effectively and efficiently survey navigable waterways.

NOAA's hydrographic vessels are occasionally called upon by Coast Guard to acquire detailed side scan and multi-beam survey images for search and recovery, as was the case with TWA 800 and the EgyptAir crash. Earlier this year, NOAA assisted a Coast Guard investigation by locating and obtaining high-resolution imagery of the Bow Mariner, an ethanol tanker that exploded and sank off the Virginia Capes. This capability is another weapon in the defense against maritime threats, as it allows ports to be re-opened quickly if nothing is discovered and helps the Coast Guard to design temporary lanes and detours based on depth data. As mentioned earlier, we can also rapidly disseminate chart updates and critical chart corrections to the mariner, and we can create and distribute temporary charts, overlays and data sets as needed by primary responders like the Coast Guard.

NOAA's Scientific Support Coordinators (SSC) sit in Coast Guard offices, working daily with their Coast Guard counterparts to plan for emergencies and develop port-specific incident response plans. These plans anticipate specific challenges to incident response and recovery, such as those faced by chemical facilities in port areas. NOAA also develops computer programs that are used for both incident-specific planning and routine training. This preparedness training is vital, because when an event occurs, first responders do not have time to fumble with cumbersome and unfamiliar tools. NOAA SSCs then go on-site during emergencies to bring all of NOAA's support resources to the table.

One of NOAA's major contributions in preparation for and in response to an emergency is the software program CAMEO (Computer-Aided Management of Emergency Operations). Jointly designed with EPA, CAMEO is widely distributed among firefighters and serves as a primary tool in preparing for and responding to chemical incidents. An updated version of CAMEO was released in March of 2004. It contains a chemical database of over 6,000 hazardous chemicals, and chemical-specific information on fire and explosive hazards, health hazards, firefighting techniques, cleanup procedures, and protective clothing. Other programs built into the software estimate the downwind dispersion of a chemical cloud based on the toxicological/physical characteristics of the released chemical, atmospheric conditions, and "footprints" from the air dispersion model. CAMEO can also display the location of facilities storing hazardous materials as well as buildings of high concern, such as hospitals and schools.

NOAA's response capabilities are forming stronger internal relationships to better prepare for emergencies and support Coast Guard on MDA issues. For example, the National Ocean Service and the National Weather Service are partnering to provide site-specific weather forecasts during oil and chemical spills. More precise weather data will improve NOAA's oil spill trajectory forecasts, increase worker safety and inform decisions on weather-dependent spill response methods. NOAA is also presently

creating an Emergency Response Program to improve its overall response coordination.

It would be remiss of me not to mention the NOAA Corps, the smallest of the Nation's seven Uniformed Services, when discussing NOAA's response capabilities. Although these officers primarily have science and engineering backgrounds, they too stand ready to support the Coast Guard, Department of Defense and any other Federal agency that requires assistance in protecting the Nation's security. At the request of the DOD, NOAA has provided a summary of its capabilities, ships and aircraft that could be used in a national emergency. NOAA's Marine and Aviation Operations (NMAO) operates our diverse fleet of research and hydrographic coastal and ocean-going vessels ranging in length from 90 to 274 feet, as well as our helicopters and airplanes. NMAO abilities to assist port security efforts include assisting the Coast Guard boarding or inspection parties, supporting port/harbor security, providing sophisticated airborne chemical detection support, conducting hydrographic surveying/sea floor mapping and Geographic Information System development, conducting state-of-the-art sonar operations, and providing additional hurricane reconnaissance if U.S. Air Force assets are reassigned.

NOAA and USCG Partnership

One of NOAA's closest Federal partners in many of our activities is the U.S. Coast Guard. We work with the Coast Guard on fisheries and sanctuary enforcement, the Marine Transportation System (MTS), satellite-aided search and rescue, and hazardous material spill response in marine and coastal environments. This partnership has been a long-standing and productive one for both agencies. I thank the Coast Guard personnel for their tremendous efforts to ensure the safety of our valuable port and marine areas. Our ports and MTS are important to national security not only from the perspective of military mobility, but also as the backbone of our Nation's commerce. The Coast Guard plays a vital role in protecting this critical commercial activity, and NOAA is working hard to support the Coast Guard's security measures.

We continue to explore ways in which we can assist on MDA and port security. A newly signed agreement between the NOAA National Data Buoy Center and the Coast Guard covers the installation of maritime two-way communication and surveillance systems on NOAA data buoys to intercept and relay AIS signals to Coast Guard for vessel tracking. This helps to expand MDA beyond nearshore waters to relay AIS information while a vessel of threat potential is far enough away from our coasts to take action. Along the same lines, NOAA's Satellite Search and Rescue now supports the International Maritime Organization's newly mandated Ship Security Alerting System (SSAS). The purpose of the SSAS is to transmit a security alert from the ship to shore to indicate to a competent authority that the security of the ship is under threat or has been compromised without raising an alarm on board ship nor alert other ships. A third area under study involves the use of the NOAA Fisheries Vessel Monitoring System (VMS)

for MDA purposes. VMS is a satellite-based surveillance system with two-way communications used by NOAA Fisheries Law Enforcement to identify and track vessels throughout the US EEZ, Pacific Ocean, and Atlantic Ocean. Although VMS is currently restricted to fisheries enforcement through the Magnuson-Stevens Act, it offers the potential for fishermen to act as America's eyes and ears on the water and notify Coast Guard of suspicious activity under the "Coastal Watch" program.

Conclusion

In conclusion, NOAA provides the supporting geographic information to assist Coast Guard and other agencies responsible for preparedness and response in the maritime domain. NOAA data increases awareness of the marine environment. NOAA is committed to MDA, particularly with respect to port security and safety of life, property and the environment. In NOAA's unique role as an information provider, we will continue to work closely with our partners to ensure that the U.S. Marine Transportation System and our maritime domain are secure so that maritime commerce, the lifeblood of our economy, continues to flow through U.S. ports and harbors. This concludes my testimony, and I would be pleased to respond to any questions the Committee may have.