

HURRICANE RELIEF FROM THE SEA

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ABBREVIATIONS USED IN TEXT

DoD	U.S. Department of Defense
EMD	Emergency Management Division. Each state has an EMD as does the Federal Emergency Management Agency
FEMA	Federal Emergency Management Agency
HSD	U.S. Department of Homeland Security
ICW	Intercoastal Waterway. Inland waterway system along Atlantic and Gulf coasts
LASH	Lighter Aboard Ship. A merchant type ship where cargo is stored on barges that can be landed in a non-port environment
Marad	Maritime Administration. Agency within U.S. Department of Transportation
MSC	Military Sealift Command. A part of DoD Transportation Command
NDRF	National Defense Reserve Fleet
NDSF	National Defense Sealift Fund. A category within DoD Budget
RO/RO	Merchant type vessel where cargo is on wheeled vehicles or on trailers that can be offloaded by tractors
ROS	Reduced Operating Status. Designation for a Ready Reserve Force vessel not fully crewed and one where a specific number of days would be required for the vessel to ready for sea.
RRF	Ready Reserve Force. A part of the NDRF
SIU	Seafarers International Union
TRANSCOM	Command responsible for all DoD transportation requirements

HURRICANE RELIEF FROM THE SEA

The model for Hurricane Relief From the Sea utilizes the military concepts of a *Ready Reserve Force* of merchant ships, a subset of the National Defense Reserve Fleet (NDRF) and *Fast Sealift Ships*, merchant ships already loaded with military equipment and supplies and based at various ports in the United States.

INTRODUCTION

When preparing for, and recovery from, a hurricane seaports in the past have generally focused on securing the port's infrastructure such as protecting container cranes and other equipment from high winds and tidal surges, having emergency power available, replacing/returning channel markers and other navigational aids destroyed or moved out of position, and clearing ship channels as necessary. Current plans anticipate the port becoming operational 72 hours after landfall.

Ships in port either prepare to remain in port and ride out the hurricane or put to sea.

This report takes the position that seaports and other maritime assets can and should play an *active, pre-planned* role in hurricane recovery efforts. In this respect, relief supplies for the disaster area would not only come from the landside, i.e., by highway, rail or airlift, but also *from the sea*, a capability that would become extremely important should land or airlift access be denied in the immediate aftermath of a hurricane.



ASSETS: THE NATIONAL DEFENSE RESERVE FLEET (NDRF)

Prior to World War II the concept of inactive merchant ships playing an active, pre-planned role in emergencies and national security did not exist. While laid up ships could be broken out and returned to service when economic demand warranted, if the ship was approaching the end of its useful life, usually between 25 and 30 years, its final destination was the ship breakers.

*While this report focuses on hurricane relief, it recognizes that ports and other maritime assets can play a relief role in other type of disasters such as earthquakes and terrorist attacks on port and nearby cities.

Also recognized is that hurricanes occasionally make landfall north of Norfolk, VA. This report, however, only considers the Atlantic coast from Norfolk to Miami and the Gulf coast.

At the conclusion of World War II government owned, war built tonnage totaled almost 5,000 ships. Many of the ships were Liberty and Victory types no more than five years old, still young in ship life terms. The *Merchant Ship Sales Act of 1946* (1) authorized the sale of these vessels to American and foreign firms. Ships not sold became part of a National Defense Reserve Fleet as established under Section 11 of the Act. This fleet was located at anchorages along the Atlantic, Gulf and Pacific coasts and maintained as a national defense asset. Responsibility for custody and maintenance of the NDRF was tasked to the Maritime Administration (Marad) then a part of the Department of Commerce, now a part of the Department of Transportation. (DOT) Appendix I is a brief history of the NDRF, 1946-77.

As of September 30, 2005 there were 273 vessels in the NDRF. The most important in terms of hurricane relief are ships in the RRF and ships in the Retention fleet, ships considered to be still valuable in terms of national security and non-military emergencies. Other categories include ships owned by other government agencies but maintained by the Maritime Administration, and ships deemed to no longer have a seagoing capability, i.e., scrap candidates.

READY RESERVE FORCE

The Ready Reserve Force (58 vessels) is composed of relatively modern, militarily useful, logistics support and merchant type ships that would be used, if necessary, to augment the sealift provided by the U.S. privately-owned, active merchant fleet in an emergency. A majority of this tonnage are roll on/roll off (RO/RO) type vessels ranging in cargo capacity from 66,275 square feet to 221,885 square feet. All were built between 1960 and 1984. The RRF is funded by the Department of the Navy.

Ships in the RRF are owned by the Maritime Administration, Department of Transportation and maintained in a reduced operating status (ROS). They can be activated in a 4, 10 or 20-day time frame. When activated, operational control of RRF ships passes to the Military Sealift Command (MSC) of the Department of Defense Transportation Command. (TRANSCOM)



RRF Class "D" RO/RO

Ships earmarked for the earliest breakout times (4 days) typically have a standby crew of 10 members. Those with lesser activation times have smaller standby crews, e.g., a 10-day activation ship has 3 or 4 crew members. No warning tests are conducted

periodically to measure readiness, i.e. breakout times. The Maritime Administration keeps detailed performance and maintenance records of RRF vessels.

Standby crews, and full crews when a ship is activated, are civilian mariners. The Seaman's International Union (SIU) is a major source for unlicensed RRF crews. Ship maintenance at RRF home ports is performed by civilian contractors under a general agency agreement with the Maritime Administration.



Ready Reserve Force ships were activated in the Somalia peacekeeping operation (1992), in the Haiti Operation Democracy (1994), the Persian Gulf War (1990) and the Iraq War (2003). RRF ships have also been activated in support of non-military emergencies.

RETENTION SHIPS

As described by the Maritime Administration: "Vessels with military utility or logistics value held in retention status and in a preservation program that is designed to keep them in the same condition as when they entered the fleet," (2) As of September 30, 2005 there are 54 ships in the Retention category.

The majority of Retention Ships are break-bulk type vessels of the C-3 and C-4 class built between 1962-68. They are classified by the Maritime Administration as "Military Useful" and "Emergency Sealift." and are located at three Maritime Administration reserve fleet sites—James River, VA, Beaumont, TX, and Suisun Bay (San Francisco, CA) and at seaports along the Atlantic, Gulf, and Pacific coast. (3)

Appendix II lists 25 RRF and 28 Retention Ships by name, type and reserve fleet site/homeport that are located on the Atlantic and Gulf coasts and considered in this study as candidate hurricane relief vessels for the Atlantic and Gulf coasts.



Cape Victory, Beaumont TX

ASSETS: SEAPORTS AND THE INTER-COASTAL WATERWAY

SEAPORTS

The United States is fortunate in having indented Atlantic and Gulf coastlines resulting in numerous natural harbors. From these natural harbors seaports developed to meet the demands of commerce and national security. Table 1 lists deepwater ports along the Atlantic and Gulf coasts from Norfolk, VA to Brownsville, TX and estimated ocean distances between them.

With respect to hurricane recovery, docks and piers at major ports are constructed of reinforced concrete and well able to withstand hurricane force winds and tidal surges. Container cranes are capable of withstanding winds of up to 150 mph.

Figure 1 indicates landfalls of 65 major hurricanes over the last century. As shown by Table 1 and Figure 1, no matter where a hurricane makes landfall, there are deepwater seaports in close proximity to the impacted area that can accept relief supplies/equipment delivered from the sea. In this respect, a 16-17 knot relief ship home-ported 200 nautical miles from a relief port could arrive in approximately 12 hours; from 400 nautical miles in 24 hours; from 600 nautical miles in 36 hours. Faster vessels would significantly reduce the above times.



Gulf Inter-coastal Waterway at Galveston, TX
(Army Corps of Engineers Photo)

Figure 1: U.S. Hurricane Landfall Sites and Major Port Cities

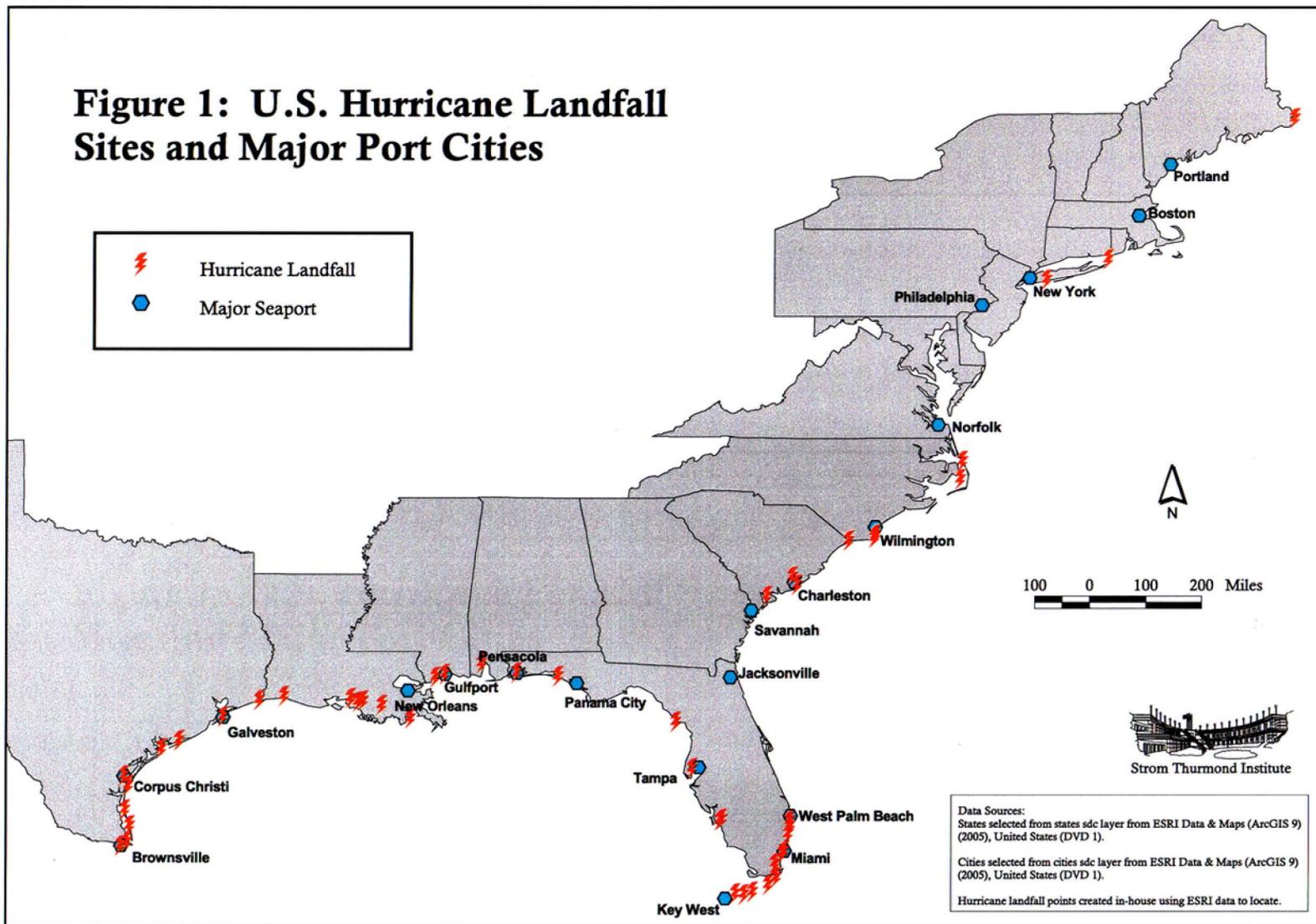


TABLE 1

DISTANCES BETWEEN SELECTED SEAPORTS ON THE
ATLANTIC AND GULF COASTS

<u>Port Pairs</u>	<u>Ocean Distances Between Pairs</u> (Estimate)	
	<u>Statute Miles</u>	<u>Nautical Miles</u>
<u>Atlantic Coast</u>		
Norfolk, VA Wilmington, NC	270	234.8
Wilmington, NC Georgetown, SC	120	104.3
Georgetown, SC Charleston, SC	67	58.3
Charleston, SC Port Royal, SC	85	73.9
Port Royal, SC Savannah, GA	90	78.2
Savannah, GA Brunswick, GA	75	65.2
Brunswick, GA Jacksonville, FL	52	45.2
Jacksonville, FL Ft Pierce, FL	225	195.6
Ft Pierce, FL Miami, FL	130	113.0
Miami, FL Key West, FL	172	149.0

Gulf Coast

Key West, FL Tampa, FL	310	269.5
Tampa, FL Pensacola, FL	360	313.0
Pensacola, FL Mobile, AL	60	52.2
Mobile, AL New Orleans, LA	135	117.3
New Orleans, LA Galveston/Houston Ship Channel	580	504.3
Galveston, TX Corpus Christi, TX	230	200.0
Corpus Christi, TX Brownsville, TX	120	104.3

Key West, FL is shown because of its strategic location.

Deepwater ports not shown include: Morehead City, NC, St Marys, GA, West Palm Beach, FL, Ft Lauderdale, FL, Lake Charles, LA, Texas City, TX

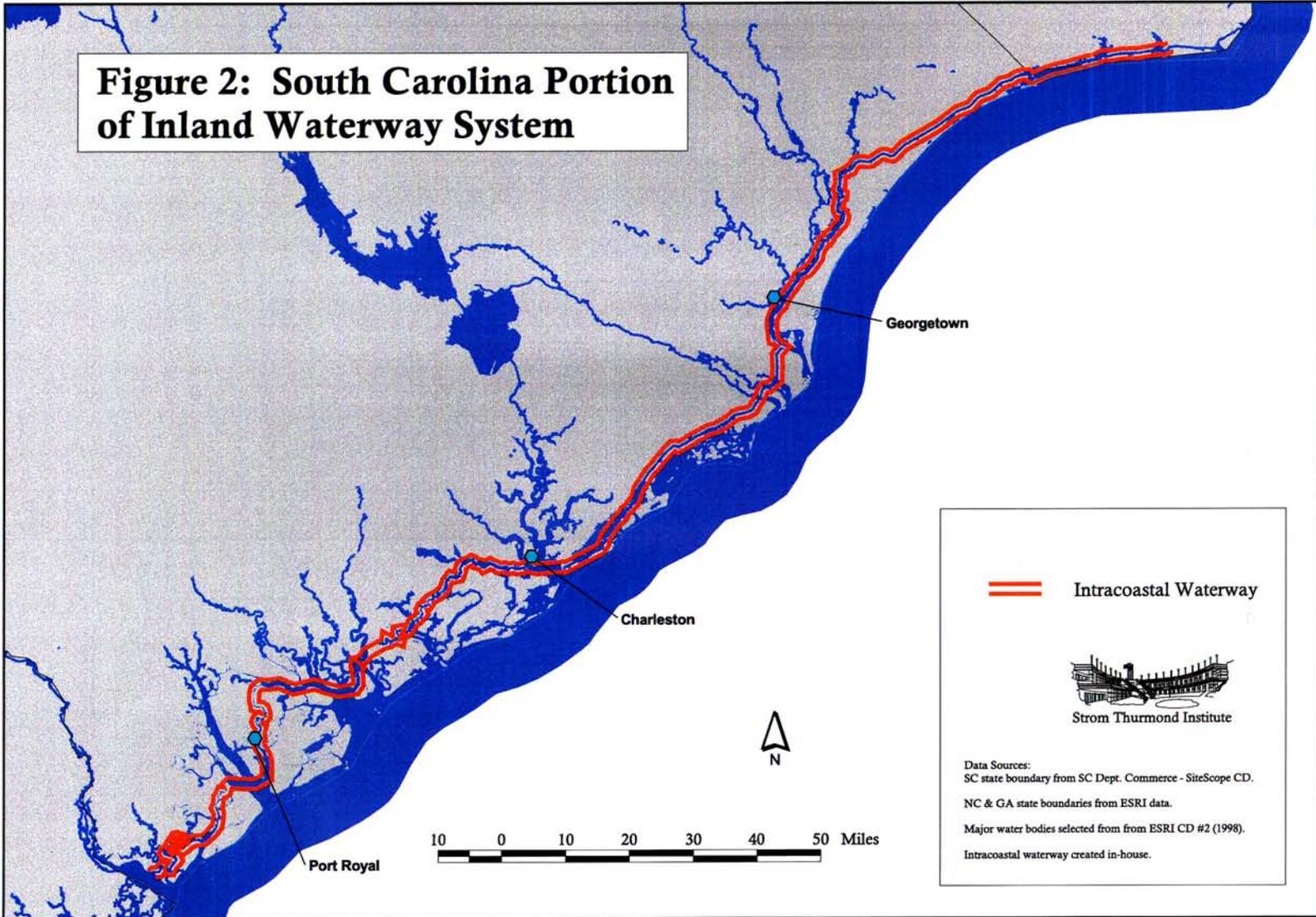
THE INTRACOASTAL WATERWAY SYSTEM

The Intracoastal Waterway (ICW) is a part natural, part man-made waterway system connecting seaports along the U.S. Atlantic and Gulf coasts. The Atlantic portion is approximately 1200 (navigable) miles in length, extending from Norfolk, VA to Key West, FL. The Gulf portion is approximately 1300 (navigable) miles in length, extending from Carabelle, FL to Brownsville, TX.

The U.S. Corps of Engineers is responsible for maintaining the ICW, i.e., maintaining channel depth and navigation aids. Most of the waterway has a minimum depth of 12 feet. In a few sections the minimum depth is 7 feet. The ICW handles both recreational and commercial traffic.

Parallel to the ICW are major coastal highways. Along the Atlantic coast, US 17 stretches from Wilmington, NC to Jacksonville, FL after which US 1 connects Florida's coastal cities from Jacksonville to Key West. Similar highway systems parallel the Gulf coast. The Intracoastal Waterway can be considered both a primary inland water transport system and *as a backup* to the land highway system. Figure 2 shows South Carolina's

Figure 2: South Carolina Portion of Inland Waterway System



portion of the ICW and its relationship to the ports of Georgetown, Charleston, and Port Royal.

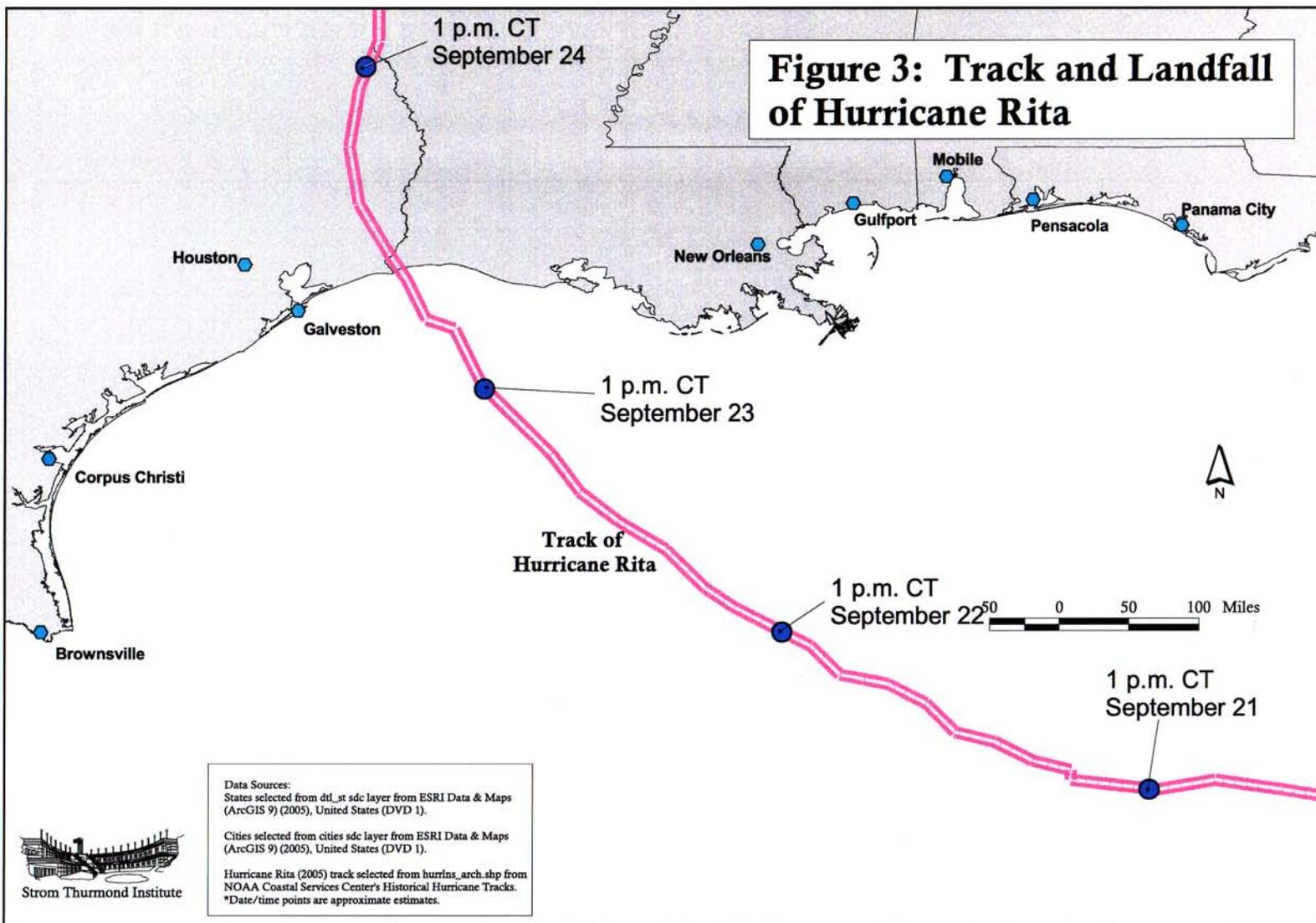
ASSETS: SEAFARERS

Crew members for U.S. flag merchant ships and Military Sealift Command naval support vessels are provided by national maritime unions and private company associations. The largest maritime union is the Seafarers International Union. It provides unlicensed crews for all ships in the Ready Reserve Force. The International Organization of Masters, Mates and Pilots, American Maritime Officers Union, and the Marine Engineers Beneficial Association, are sources for licensed deck and engine officers.

Crew shortages developed when RRF ships were activated for service in the Persian Gulf War (1990). In the Iraq War (2003) crewing RRF vessels was not a problem. There would be no problem in crewing hurricane relief vessels in 2005 and the foreseeable future. (4) However, there could be a long term problem in crewing RRF vessels should the number of U.S. flag ships decline in numbers due to competition from lower cost, foreign flag tonnage.

MODEL ASSUMPTIONS

1. Major seaports along the Atlantic and Gulf coasts have plans in place to return their respective ports to partial operational status within 48 hours after a category 2 or greater hurricane makes landfall at or near the port. The plan would include provisions/shelter for supervisors and a minimum number of longshoremen. (5)
2. Ten pre-positioned hurricane relief ships, in standby status, are located at major seaports along the Atlantic and Gulf coasts during hurricane season--1 June – 30 November. (Peak of the hurricane season is from mid August to late October) These ships can be ready for sea within 36-48 hours. For purposes of this study five vessels are pre-positioned on each coast.
3. Pre-positioned ships can be loaded with relief supplies/ equipment from designated land storage sites in 36-48 hours.
4. Hurricane landfalls can be forecast within a 200-mile coastal area 48 hours out with 75 percent accuracy. (6) Figure 3 shows the track and landfall of Hurricane Rita, which struck the Gulf coast on September 23, 2005



SELECTED SCENARIOS

1. Five hurricane relief ships (not loaded) are berthed at Norfolk, VA, Wilmington, NC, Charleston, SC, Jacksonville, FL, and West Palm Beach, FL.

A major hurricane (category 3-5) warning is issued for the North Carolina, South Carolina coast from Georgetown, SC to Morehead City, NC. The hurricane is predicted to make landfall in *72-96 hours*. South Carolina-North Carolina Emergency Management Division (EMD) plans activated.

Note: Data in this scenario is hypothetical and *is not* based on data from Hurricane Diane, which made landfall near Wilmington, NC in 1955.

Hurricane advisory predicts landfall in 72 hours. Predicted landfall area is a 300 mile coastal area centered 20 miles south of Wilmington, NC. EMD concern is that relief efforts from land sites may be delayed by hurricane damage to roads leading into and within impacted area.

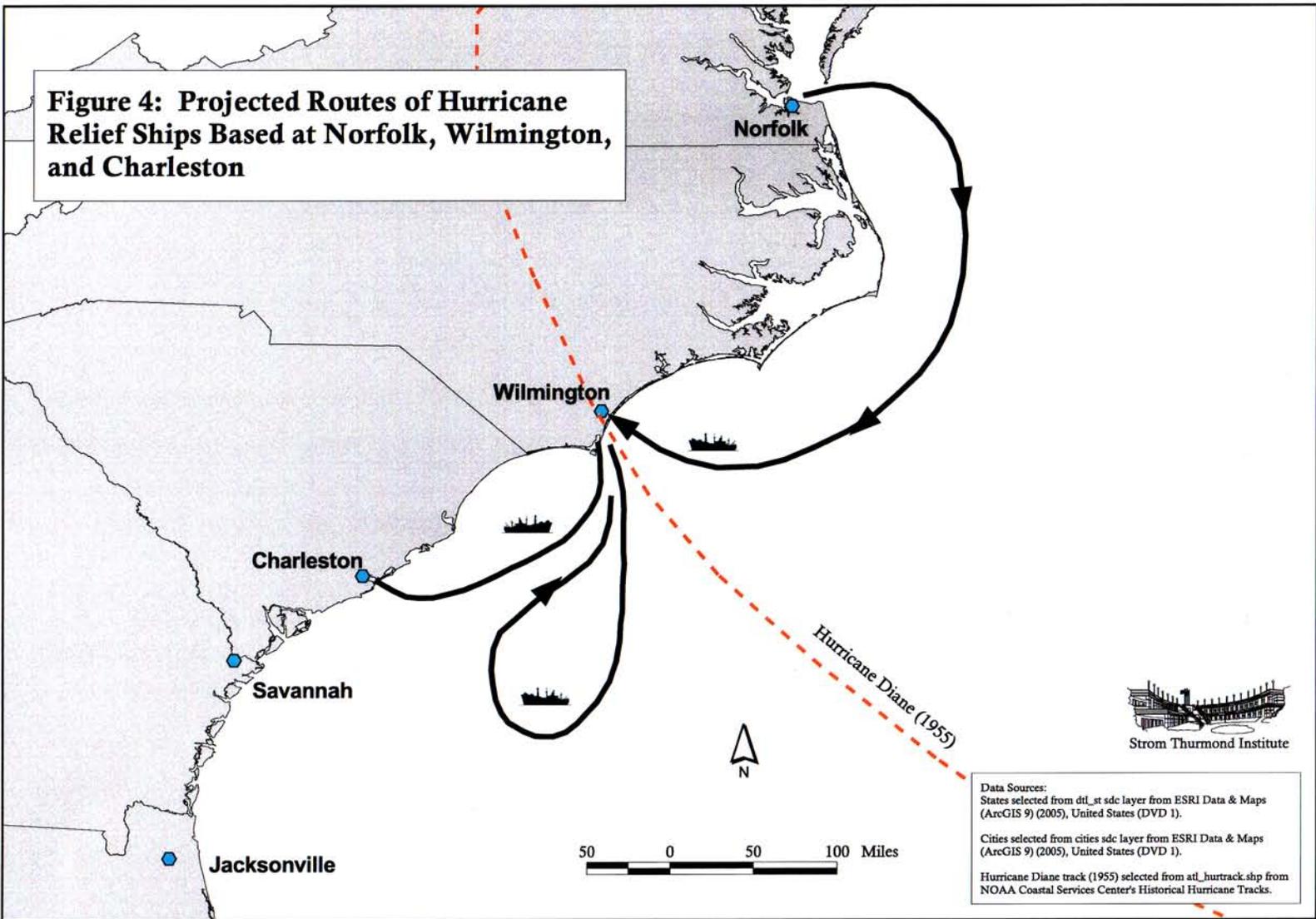
Wilmington port authority activates plans for port recovery. Designated berths prepared for incoming relief ships. Longshoreman/port personnel are housed in pre-arranged shelters. Order is given to begin loading relief ships at Norfolk, Wilmington, and Charleston. (7) Concurrently, relief ships begin preparing for sea, i.e., assembling crews, taking on bunkers as necessary.

Hurricane advisory predicts a category 4 hurricane will make landfall on a 150 mile coastal area centered on Wilmington in *18 hours*. Decision is made for Wilmington relief ship to put to sea rather than ride out storm in port.

An *8-hour hurricane advisory* predicts hurricane landfall will be approximately 25 miles south of Wilmington. Figure 4 illustrates hypothetical deployment of relief ships. Actual courses would depend on location of the hurricane and its projected path.

Relief ships arrive at Wilmington at landfall plus 12 hours. Distribution of relief supplies/equipment begins. Wilmington relief ship is designated command center for relief response in city area. It coordinates with inland-based command center.

2. Hurricane relief ships are already loaded. Otherwise activation is the same as described in scenario #1.
3. Hurricane approaching Wilmington is expected to be a category 1-2 when it makes landfall. Decision is to keep Wilmington-based relief ship in port. EMD estimates damage to land routes leading into and within impact area will be minimal and will not adversely affect relief efforts. Relief ships at Charleston and Norfolk remain in port.



4. Hurricane approaching Wilmington is expected to be a category 5 or greater. Activation is same as described in scenarios #1 and #2. Relief ships home ported along Gulf coast begin preparing for sea.

HURRICANE RELIEF SHIP CHARACTERISTICS/CAPABILITIES

There are two classes of ships in the RRF and Retention categories that are suitable as hurricane relief vessels. These are RO/ROs and break bulk ships. (8)

One advantage of a RO/RO is that it can be quickly loaded and discharged, important characteristics for a hurricane relief vessel. Since relief supplies/equipment would be on wheeled vehicles---dry cargo trucks, tractor trailers, containers on tractor trailers, and liquid cargo carriers, their cargoes can be quickly distributed using the existing highways leading into the port area.

A Class "D" RO/RO could load 73 fifty-three foot tractor trailer combinations (9) similar to those used to move WalMart goods from its distribution centers to its retail outlets. Note that a hurricane relief ship would typically have a mix of vehicles. Figure 5 shows the different classes of RO/ROs in the RRF.



Another advantage of the RO/RO is that the only shore requirement to load and unload is a flat, hard surface dock area with sufficient depth alongside. As with ships in general, RO/ROs can rely on their own power when shore power is not available. They can also be adapted to meet special requirements such as increasing their first aid capabilities, providing shelter for relief personnel, e.g. port personnel, expanding the galley to feed hurricane victims as well as relief personnel, accommodate helicopters used for rescue and distribution tasks, supply power to reefer trucks/containers, and act as an emergency communication center.

The second class of ship suitable for hurricane relief is the break-bulk freighter. Like the RO/RO it is not dependent on shore power or dock equipment to load and unload its cargo. A Class "A" break-bulk vessel has a cargo capacity of 42, 800 sq. feet (6910 net tons); a Class "B" 54,000 sq. feet (6320 net tons). Cargo, including containers and wheeled vehicles are stored in the holds or on deck. Containers can be off loaded onto a dock or directly onto flatbed trucks. More dock labor would be required to unload a break-bulk vessel compared to a RO/RO.

Like the RO/RO the superstructure on a break bulk ship can be adapted to meet special requirements. An advantage of a RRF break-bulk vessel is that, on average, they are a knot or two faster than a RO/RO.

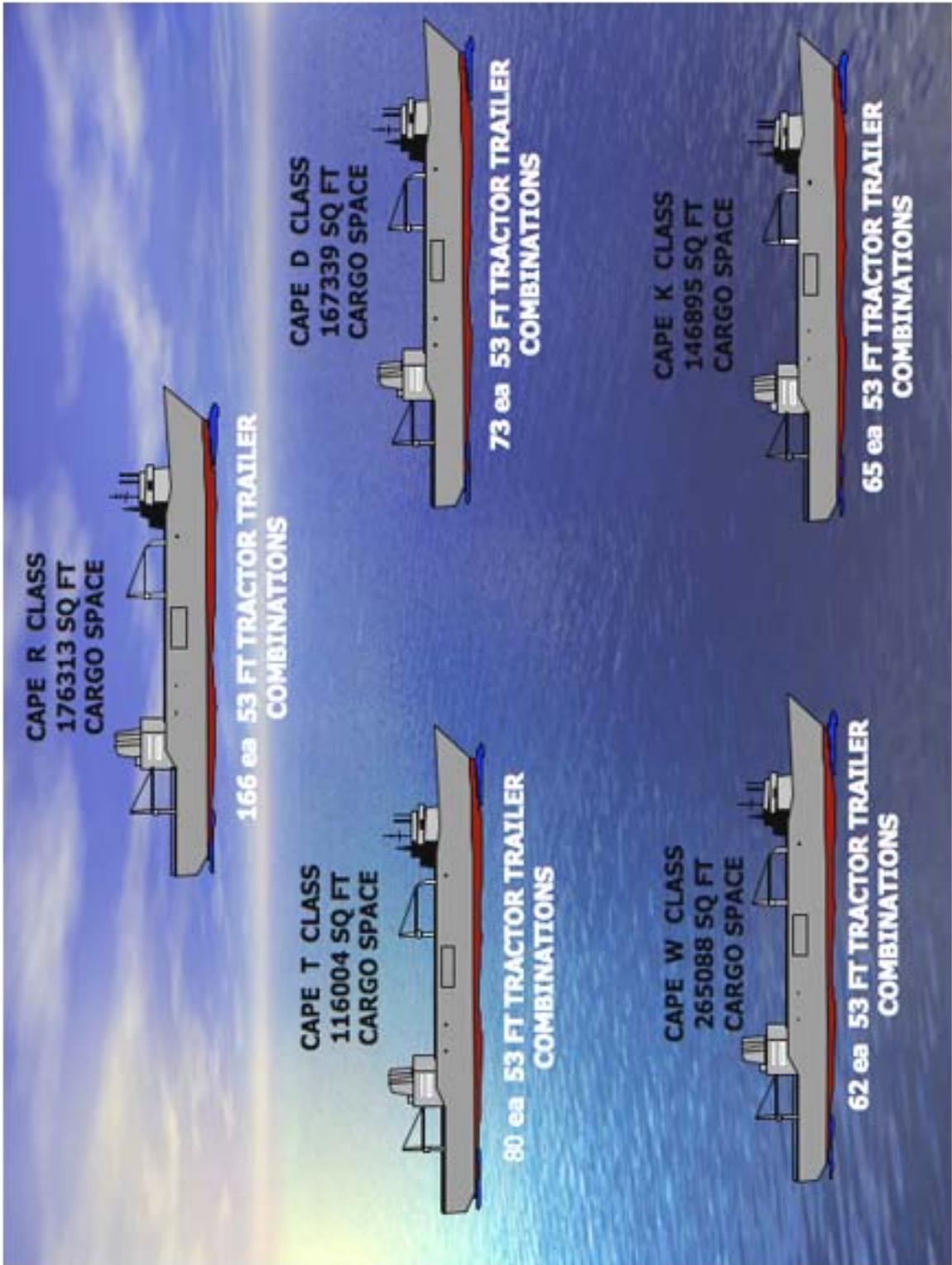


Figure 5. Classes of RO/RO Courtesy of Department of Defense Surface Deployment and Distribution Command

SHIP ACQUISITION

There are several options with respect to acquiring suitable hurricane relief vessels.

1. Atlantic and Gulf coast states could, collectively or individually, purchase or request use of suitable vessels from Marad's NDRF. Participating states would be responsible for activation, management, and ROS costs. State(s) would in all likelihood request funding support from the Department of Homeland Security. (DHS)
2. The Department of Homeland Security could acquire suitable ships from the NDRF Retention fleet and be responsible for activation, management and ROS costs. Costs for program would be included in DHS annual budget. (10) Operational control would be tasked to the Federal Emergency Management Agency (FEMA)
3. Suitable ships now in the RRF (ROS-4) could be designated as hurricane relief ships. This option would require DoD Transportation Command (Military Sealift Command) agreement since the RRF is funded by the Navy Department's National Defense Sealift Fund (NDSF). In this option, an agreement between DHS and DoD would specify the conditions under which RRF ships would be made available and how costs would be shared. Hurricane relief ships would be maintained in ROS-4 status. (11)

In options #1 and #2 the cost and time of activating a Retention break-bulk freighter (12) is between \$3-4 million dollars with an activation time of 60-75 days. Time and cost could vary depending on the class and condition of the ship.

Option #3, utilizing suitable RRF ships as hurricane relief ships is the least cost option. Absent a major, fast breaking contingency, there are a sufficient number of ships in the RRF fleet that are already in, or could be brought, to ROS-2 status without compromising national security requirements. Should the need arise for RRF ships designated as hurricane relief ships, national security interests would prevail.

THE 48-HOUR WINDOW

The defining difference between relief from the sea in the case of Katrina (and Rita), and the program proposed in this study, is that Katrina/Rita relief efforts were *not pre-planned*. Port recovery was a part of general recovery. Ships capabilities, for the most part, were the same as before the hurricane, that is, having the capability to provide shelter and food for relief workers, provide fuel for emergency power supplies, and provide medical assistance.

This study takes the position that a far greater "relief from the sea" capability can be obtained by *pre-planned* use of existing assets while, at the same time, recognizing

that execution of the plan is of the greater importance since it must take place in a severely constrained time frame--- within 48 hours before a major hurricane makes landfall. (13) Within this time period the below actions will take place.

- * The nearest port to the projected landfall identifies and prepares berths that will handle incoming relief ships. Plans include having dock labor and key personnel sheltered in immediate area, harbor pilot(s) notified to be on standby to bring in relief ships, necessary dock equipment secured, and emergency power in place.
- * If a hurricane relief ship is based at a port near the projected hurricane landfall, decision is made to begin loading (if ship is not already loaded). Decision is made as to whether the ship will remain in port or put to sea. (14)
- * Hurricane relief ship at a port near projected hurricane landfall begins preparations for sea. Crews are brought to full complement, Coast Guard waivers are in place should ship be forced to sail short-handed. Sufficient bunkers and ship stores are taken aboard. In addition to crew, selected relief officials/workers are taken on board. A harbor pilot is on board if decision is made for ship to put to sea.
- * Hurricane relief ships in ports within 72 hours steaming time of the hurricane-impacted port begin loading and preparing for sea. Depending on hurricane category and estimated damage, relief ships at more distant ports are activated.



CONCLUSION

Relief from the sea, in the case of the United States, dates from colonial times. Relief ships saved a starving Jamestown colony. On the military side, the American Continental Army is in the debt of the French fleet stationed off Yorktown on October 19, 1781. History is replete with such examples.

Appendix III details the role of ships in the aftermath of hurricane Katrina (and Rita) that slammed into the Gulf coast on August 29, 2005.

When considering hurricane relief from the sea it should be noted that the ocean is a natural highway, essentially immune from destruction. And while it might be impassable at specific times and locations, it recovers quickly, something that cannot always be said of land transport systems after a disaster. In summary:

- * Hurricane landfalls can be predicted (within a 200 mile coastline) 48 hours out with 75 percent certainty, i.e., in enough time to implement relief from the sea plans.

- * With respect to a category 4-5 hurricane, a case can be made that relief from the sea in some situations can be delivered to disaster areas faster than relief from the land. Transport systems from a port's dock area(s) can be used to deliver relief supplies from arriving vessels or vessels already docked. Highways parallel to the coast (U.S. #17) and the Inter-coastal Waterway as discussed above, are examples in this regard.
- * Ship assets (RRF vessels) required to implement hurricane relief from the sea are already in place. At present, a specified number of RRF ships can be ready for sea in four days. This study argues that RRF ships in ROS-4 can be loaded and ready for sea in 48 hours.
- * Designated, pre-planned dock facilities can be operational 48 hours after a major hurricane makes landfall at or near a port.
- * If necessary, or by choice, pre-loaded hurricane relief ships can ride out a hurricane in port.

In making the case for hurricane relief from the sea, the assumptions and scenarios used in the study were for illustrative purposes only. (15)

Concluded is that the "Hurricane Relief From the Sea" concept is well worth consideration.



NOTES

1. U.S. Congress, *Merchant Ship Sales Act of 1946*. Public Law No. 321, 79th Cong. 2d sess., 1946.
2. U.S. Department of Transportation, Office of Ship Operations. *The National Defense Reserve Fleet* (Washington, D.C. Maritime Administration, 2005)
Preservation techniques for retention ships include: Dehumidification of internal spaces, and a cathodic protection system that suppresses corrosion and preserves the surface of the hull.
3. At one time the *SS United States*, still the world's fastest passenger ship, was a part of the NDRF berthed at Norfolk, VA. It is now privately owned, berthed at Philadelphia and for sale. A second historic ship, the *NS Savannah*, the world's first nuclear powered merchant ship is located at the James River reserve fleet site.
4. E-mail from Augustin Tellez, Vice President, Seafarers International Union dated 25 October 2005 acknowledges that SIU could provide unlicensed crews for RRF and Retention fleet ships.
5. There is no consensus among port officials as to the time it would take for a port to become operational or partially operational following a landfall at or near the port. Times range from 36 hours (partially operational) to 72 hours partially or fully operational.
6. A major goal of the U.S. Weather Research Program (USWRP) is to reduce track uncertainty. At present, a track prediction 72 hours out may call for a hurricane warning for 300-400 miles of coastline, while actual hurricane damage could be limited to 50-100 miles of coastline. Quoting from the 9/21/2000 USWRP draft plan "Based on past landfall forecast records, one in 20 landfall track predictions may have an error of 195 miles in 24 hours." For purposes of this report it is assumed that accuracy significantly increases as the hurricane approaches land from 72 hours out onwards.
7. Points in favor of pre-loading include: A time saving when time is very important and that the supplies/equipment loaded have been given more careful consideration as to anticipated needs. Against pre-loading: If the vessel is not used, at the end of the hurricane season, cargo must be unloaded and returned to land site storage. This involves a two way movement cost. Perishable food would be a problem unless refrigerated trailers/containers were in the cargo mix.
8. Not considered relief ship candidates in this report are three Lighter Aboard Ship (LASH) vessels home-ported in Beaumont and Orange, TX. Cargo on a LASH vessel is stored in barges that can be landed in a non-port environment, i.e., on a beach or in a shallow draft harbor. Should a "Hurricane Relief From the Sea"

program include the Bahamas, LASH vessels would be ideal ships should a hurricane make landfall in the Abacos, islands in the eastern part of the Bahamas. The same argument could be made for other areas of the Caribbean.

9. Cargo loaded by computerized program at Department of Defense Surface Deployment and Distribution Command. In this example, vehicle height is a restrictive factor. Given its height, a standard size tractor trailer can only be parked on certain decks. The 73 WalMart tractor trailers hypothesized in this example did not utilize all of the available cargo space. A number of less height vehicles and other road equipment could be accommodated.
10. The FY 2006 Department of Homeland Security (DHS) contains \$30.6 billion in discretionary funds. The Federal Emergency Management Agency (FEMA) is allocated \$2.63 billion.
11. The FY 2006 National Defense Sealift Fund (NSDF) is budgeted at \$1,648.5 million dollars of which \$226.4 million is earmarked for NDRF Operations and Maintenance. Given there are 58 RRF ships, the cost per ship is approximately \$3.9 million per year. This is consistent with an earlier estimate of \$2-3 million per ship per year to maintain RRF vessels in ROS-4 to ROS-20 readiness status.
12. Ships in the Retention fleet other than break-bulk freighters include 3 containerships, six tankers and 1 RO/RO.
13. In a lesser category hurricane (1-2) the decision might be made to rely entirely on "from the land" relief efforts.
14. Ships that rode out Hurricane Rita include the *Cape Victory*, *Cape Vincent*, *Cape Farewell* at Beaumont, TX; the *Cape Florida* and *Cape Flattery* at Orange, TX; and the *Atlantic Forest* at Lake Charles, LA.
15. Decisions to be made in implementing hurricane relief from the sea include: Number of hurricane relief ships and their home ports, source of, and type of relief ship, types of supplies and equipment to be loaded on relief ships, priorities for space aboard relief ships, e.g. additional hospital space, etc., plans for port recovery, plans for relief ships to be in ROS-2 status, source of funds to implement program, agreements between federal agencies and coordination between federal, state, and local authorities, and the decision as to whether to pre-load relief vessels.

APPENDICES

APPENDIX I

BRIEF HISTORY OF THE NDRF 1946-77

The NDRF has well served the national interest. In the Korean War, 540 ships were broken out for military duty. During the Vietnam conflict 172 NDRF ships were used to move 30 percent of government cargo sent to Southeast Asia between 1965-69. In addition to serving military purposes, NDRF ships were also used to store surplus grain, and when needed to ship the grain overseas under the UN "Food For Peace" program. When the Suez Canal was closed in 1956 due to an Arab-Israeli conflict, approximately 200 dry cargo vessels and 30 tankers were activated to relieve tonnage shortages on the Persian Gulf to Europe and North America routes.

By 1975 many of the World War II built ships were approaching the end of their useful lives. The question was whether to upgrade the NDRF with more modern ships and, concurrently, preserve selected militarily useful ships already in the fleet, recalling that the initial rationale for the NDRF was national security.

In the mid 1970s the U.S. active, privately owned merchant fleet totaled less than 300 ships, ships the Department of Defense (DoD) counted on to support a military deployment. The difficulty was that on any given day these ships were scattered worldwide. The conclusion reached was that the amount of this tonnage available for military use in a 5-10 day time frame was insufficient for supporting a fast breaking military contingency. The Department of Defense response to this inadequacy was to request funds for a Ready Reserve Force (RRF) of selected NDRF ships and the pre-positioning of already loaded merchant type ships at selected U.S. and overseas ports. The RRF concept envisioned a fleet of militarily useful ships that could be crewed and ready for loading in 4-20 days. Funding for the RRF concept was included in the FY 1997 Navy budget.

APPENDIX II

INVENTORY OF USEFUL RRF AND RETENTION SHIPS LOCATED ON ATLANTIC AND GULF COASTS (As of September 30, 2005)

RRF Ships—Break Bulk

<u>Name of Ship</u>	<u>Homeport</u>
Wright	Baltimore, MD
RRF----Lash	
Cape Farewell	Beaumont, TX
Cape Flattery	Beaumont, TX
Cape Florida	Orange, TX

RRF----Roll On/Roll Off

Cape Decision	Charleston, SC
Cape Diamond	Charleston, SC
Cape Domingo	Charleston, SC
Cape Douglas	Charleston, SC
Cape Ducato	Charleston, SC
Cape Edmont	Charleston, SC
Cape Kennedy	New Orleans, LA
Cape Knox	New Orleans, LA
Cape Lambert	Wilmington, NC
Cape Lobos	Wilmington, NC
Cape Race	Portsmouth, VA
Cape Ray	Portsmouth, VA
Cape Rise	Portsmouth, VA
Cape Taylor	Houston, TX
Cape Texas	Houston, TX
Cape Trinity	Houston, TX
Cape Victory	Beaumont, TX
Cape Vincent	Beaumont, TX
Cape Washington	Baltimore, MD
Cape Wrath	Baltimore, MD

RRF----Tanker

Potomac	Beaumont, TX
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Subtotal 25

Retention Ships----Break Bulk

Banner	Beaumont, TX
Buyer	Beaumont, TX
Cape Alva	James River, VA
Cape Alexander	James River, VA
Cape Ann	James River, VA
Cape Archway	James River, VA
Cape Avinof	James River, VA
Cape Chalmers	Charleston, SC
Cape John	Beaumont, TX
Cape Johnson	Cheatham, VA
Cape Juby	James River, VA
Cape Nome	James River, VA
Courier	Beaumont, TX
Del Monte	Little Creek, VA
Del Valle	Beaumont, TX
Del Viento	Beaumont, TX
Gulf Banker	Beaumont, TX
Gulf Farmer	Beaumont, TX
Gulf Merchant	Beaumont, TX
Gulf Shipper	Beaumont, TX
Gulf Trader	Beaumont, TX
Ohio	Beaumont, TX
Pioneer Commander	Beaumont, TX
Pioneer Contractor	Beaumont, TX
Pioneer Crusader	Beaumont, TX

Retention----Container

Allison Lykes	Beaumont, TX
Mallory Lykes	Beaumont, TX
Resolute	James River, VA

Subtotal 28

Total 53

Retention class ships not listed include heavy lift, passenger, national register, and other.

Source: Maritime Administration, Division of Reserve Fleet

APPENDIX III

RELIEF FROM THE SEA IN RESPONSE TO HURRICANES KATRINA AND RITA

Ship	Type/Status	Hurricane	Location/Operation	Relief Effort
Cape Victory	RO/RO-RRF	Rita	Beaumont, TX	Two days prior to Rita landfall ship loaded with 200 emergency type vehicles. Ship remained in port offering shelter to vehicles
Cape Vincent	RO/RO-RRF	Rita	Beaumont, TX	Same as Cape Victory
Diamond State	Crane ship-RRF	Katrina	Orange, TX to New Orleans	Supporting emergency facilities and housing needs at New Orleans
Cape Kennedy	RO/RO-RRF	Katrina	New Orleans	HQ for Port of New Orleans staff and other relief personnel
Equality State	Crane ship-RRF	Katrina	Beaumont, TX to Port Sulphur, LA	Support for USCG in oil spill response
Wright	Helicopter repair ship-RRF	Katrina	Baltimore to New Orleans	Housing for port workers, Oklahoma National Guard, DOT personnel
Cape Flattery	LASH-RRF	Katrina	Orange, TX. Standby status; ready for sea	Can operate in a non-port or damaged port environment
State of Maine	Training ship	Katrina	Provisioned and sailed from home port to New Orleans	Housing, feeding harbor pilots, dock workers, Coast Guard, Red Cross
Empire State	Training ship	Katrina	Alliance, LA	Housing for refinery workers, medical personnel, New Mexico National Guard
Sirius	Training ship	Katrina	New Orleans	Housing/food Army National Guard, police, port workers
Pollux	USNS	Katrina	Massero, LA	Provided fuel for Army National Guard, emergency vehicles, hospital generators
Comfort	Hospital ship	Katrina	New Orleans	Provided emergency medical assistance. Later as Level One trauma center
Bellatrix	USNS	Katrina	New Orleans	Support for relief workers, two doctors, ten local veterinarians; sheltered 300 cats and dogs
Harry Truman	Navy carrier	Sent to Gulf after Katrina to act as floating command center		

Sources: Marad Katrina Relief Web site. Mariners and ships in Hurricane Katrina. Web site www.usmm.net/katrina.html.
Seafarers International Union. *Seafarers Log* (October 2005). SIU web site. Ships mobilized for hurricane recovery.

BIBLIOGRAPHY

- Intercoastal Waterway: Definition and Much More.* Web site.
answers.com/topic/intercoastal-waterway.
- Intercoastal Waterway-Facts, Info, and Encyclopedia Article.* Web site.
absoluteastronomy.com/encyclopedia/i/in/intercoastal_waterway.
- United States, Department of Defense, *Department of the Navy Fiscal Year 2006/FY2007 Budget Estimates* (National Defense Sealift Fund). 2005.
- United States, Department of Defense, Military Sealift Command, "Military Sealift Command." (*MSC Website 9/15/05*).
- United States, Department of Transportation, Maritime Administration. *Annual Report To Congress FY 2004.* (January 2005).
- United States, Department of Transportation, Maritime Administration. *National Defense Reserve Fleet Inventory Ending September 30, 2005* (October 4, 2005).
- United States, Department of Transportation, Maritime Administration. *Ready Reserve Force.* 2005.
- United States. U.S. Weather Research Program. "Draft 9/21/2000 USWRP Implementation Plan—Hurricane Landfall." Web site 11/2/05.
- Whitehurst, Clinton H. Jr., *The U.S. Merchant Marine: In Search Of An Enduring Maritime Policy.* Annapolis, MD: U.S. Naval Institute Press, 1983.
- Whitehurst, Clinton H. Jr., *The Defense Transportation System: Complement or Competitor to the Private Sector.* Washington, D.C.: American Enterprise Institute, 1976.
- Whitehurst, Clinton H. Jr., "Small Ports and Shipyards: Mobilizable?" *U.S. Naval Institute Proceedings.* (February 1984)
- Whitehurst, Clinton H. Jr., "The National Defense Reserve Fleet: Past, Present and Future." U.S. Naval Institute Proceedings (June 1977)