UNITED STATES COAST GUARD

INVESTIGATION INTO THE CIRCUMSTANCES SURROUNDING THE COLLISION BETWEEN THE

M/V SAUDI MAKKAH AND THE M/V TURTLE QUEEN

ON MARCH 12, 1997, IN THE CHESAPEAKE BAY WITH NO INJURIES, NO LOSS OF LIFE AND NO POLLUTION

U.S. Department of Transportation
United States Coast Guard

Commandant
United States Coast Guard

2100 Second Street, S.W.
Washington, DC 20593-0001
Staff Symbol: G-MOA
Phone: (202) 267-1418
FAX: (202) 267-1416

16732/MC97003534
MAR 16 1998

COLLISION BETWEEN M/V SAUDI MAKKAH, LLOYDS NO. L7900077, AND M/V TURTLE QUEEN, LLOYDS NO. L8600571, IN THE CHESAPEAKE BAY ON MARCH 12, 1997, WITH NO INJURIES, NO LOSS OF LIFE AND NO POLLUTION

ACTION BY THE COMMANDANT

The report of the Investigating Officer and forwarding comments of the Commanding Officer, Marine Safety Office Hampton Roads and the Commander, Fifth Coast Guard District (Am), have been reviewed. The report is approved subject to the following comments.

ACTION ON RECOMMENDATIONS

Recommendation 1: That a copy of this report, once approved, be forwarded to the governments of Panama and Saudi Arabia for action, as deemed appropriate, regarding the roles of the Masters of the Turtle Queen and Saudi Makkah.

Recommendation 2: That a copy of this report, once approved, be forwarded to the Virginia Department of Professional and Occupational Regulation for action, as deemed appropriate, regarding the roles of the pilots of the Turtle Queen and Saudi Makkah.

Recommendation 3: That a copy of this report, once approved, be provided to all parties-in-interest so that they may take appropriate action to address the conclusions and recommendations in the report.

Action: We concur with recommendations 1 through 3. Copies of the report will be forwarded as recommended.

Recommendation 8: That the National Shipping Company of Saudi Arabia install rate of turn indicators on the Saudi Makkah and Saudi Riyadh.

Action: We concur. A copy of the report will be forwarded to the National Shipping Company of Saudi Arabia for action as appropriate.

Recommendation 9: That the Virginia Pilots establish a formal system for sharing information about a vessel's maneuvering characteristics within their organization.

Action: We concur with this recommendation and forwarding comments of the Commander, Fifth Coast Guard District (Am). Copies of the report will be forwarded to pilot organizations and Coast Guard Marine Safety units for action as appropriate.

Recommendation 10: That Marine Safety Office Hampton Roads hold meetings with the membership of the Virginia, Maryland, and Federal pilots at least annually.

Action: We concur with this recommendation and forwarding comments of Commander, Fifth Coast Guard District (Am). Copies of the report will be forwarded to pilot organizations and Coast Guard Marine Safety units for action as appropriate.

Recommendation 13: That the Coast Guard establish a voluntary near miss reporting system, to complement data gathered in casualty investigations. This can be accomplished through existing partnerships with industry organizations such as the American Waterways Operators, American Pilots Association and Passenger Vessel Association.

Action: We concur. A project to develop a voluntary incident reporting system is currently underway. A Memorandum of Agreement has been signed by the Coast Guard and the Maritime Administration to develop and implement a non-attribution national maritime safety reporting system that will capture near miss, safety, and accident precursor information and encourage and permit changes to be made in the transportation system that will help prevent accidents from occurring.

Recommendation 14: That the Coast Guard initiate rulemaking to revise 33 CFR Part 164 to require the use of course recorders, bell recorders and echo depth sounding device recorders, where installed, while vessels are navigating in U.S. waters.

Action: We concur with the intent of this recommendation. This recommendation will be considered during the upcoming review of the navigation safety regulations.

W. D. RABE
By direction

(Am)
16732/MC97003534
15 Oct 97

SECOND ENDORSEMENT on formal investigation 16732/MC97003534 dtd 26JUN97

From: Commander, Fifth Coast Guard District (Am)
To: Commandant (G-MOA)

Subj: COLLISION BETWEEN M/V SAUDI MAKAH, LLOYDS NO. L7900077, AND M/V TURTLE QUEEN, LLOYDS NO. L8600571, IN THE CHESAPEAKE BAY ON 12 MARCH 1997 WITH NO INJURIES, NO LOSS OF LIFE AND NO POLLUTION.

1. This report is forwarded recommending approval.

2. Recommend that subject report's recommendations 9 and 10 be expanded to national level to include all pilot organizations and Coast Guard Marine Safety units.

A. REGALBUTO

Copy: CG MSO Hampton Roads

16732/MC97003534
25 September 1997

FIRST ENDORSEMENT on formal investigation 16732/MC97003534 dtd 24 Sep 97

From: Commanding Officer, CG Marine Safety Office Hampton Roads
To: Commandant (G-MOA)
Via: Commander, Fifth Coast Guard District (Am)

Subj: COLLISION BETWEEN M/V SAUDI MAKKAH, LLOYDS NO. L7900077, AND M/V TURTLE QUEEN, LLOYDS NO. L8600571, IN THE CHESAPEAKE BAY ON 12 MARCH 1997 WITH NO INJURIES, NO LOSS OF LIFE AND NO POLLUTION

1. This report is forwarded recommending approval.

2. Recommendations 1, 2 and 3 require action by Commandant. The government of Panama has already made a request for a copy of the report to the investigating officer for this purpose. The Commonwealth of Virginia has taken disciplinary action against the pilots, including fines and suspensions.

3. I have initiated civil penalty action as suggested in recommendations 4, 5, 6 and 7.

4. Recommendation 8 requires action by The National Shipping Company of Saudi Arabia. Their representative has indicated the installation of rate of turn indicators is under consideration.

5. Recommendation 9 has been discussed with the Virginia Pilots. They are considering this recommendation in consultation with legal counsel to resolve liability concerns.

6. I concur with recommendation 10 and have consulted with the pilots' associations to resolve the best way to accomplish this goal. A planned focus group meeting for June was cancelled because of scheduling difficulties. Members of the MSO staff will attend the next general membership meeting of the Virginia Pilots.

7. Action on recommendations 11 and 12 has been completed. All investigating officers have been trained in field sobriety tests and use of the Alco-Sensor III test equipment. Required parts for the Alco-Sensor III equipment were purchased and a test kit added to the investigations response bag used by the duty investigating officer.

8. Recommendation 13 requires action by Commandant. Prior to pursuing a nationwide near miss reporting system, I recommend a pilot program be established in a few high traffic, high risk ports. The information gathered by such a system would be useful in risk assessment, regulatory evaluations and the Prevention Through People initiative.

9. Recommendation 14 requires action by Commandant. The navigation safety regulations as written focus on requirements for the installation of equipment and assumes the prudent mariner will use the equipment because of the benefits to navigation. Experience has shown this not to be the case with recording devices, which are frequently not used. The data provided by these devices may not be ideal but are critical to post casualty investigations.

R. E. BENNIS

U.S. Department of Transportation

United States Coast Guard

Commanding Officer
U.S. Coast Guard
Marine Safety Office

200 Granby Street
Norfolk, VA 23510-1888
Staff Symbol: Investigations
Phone: (757) 441-3276

16732/MC97003534
24 September 1997

From: U.S. Coast Guard Investigating Officer
To: Commandant (G-MOA)
Via: (1) Commanding Officer, CG Marine Safety Office Hampton Roads
(2) Commander, Fifth Coast Guard District (Am)

Subj: COLLISION BETWEEN M/V SAUDI MAKKAH, LLOYDS NO. L7900077, AND M/V TURTLE QUEEN, LLOYDS NO. L8600571, IN THE CHESAPEAKE BAY ON 12 MARCH 1997 WITH NO INJURIES, NO LOSS OF LIFE AND NO POLLUTION

FINDINGS OF FACT

SUMMARY

At about 1700 local time on 12 March 1997, the container ship SAUDI MAKKAH proposed overtaking the partially loaded collier TURTLE QUEEN via VHF radio. Both vessels were outbound from the Port of Hampton Roads in Thimble Shoal Channel, west of the Chesapeake Bay Bridge Tunnel (CBBT). The pilot on the TURTLE QUEEN assented to the overtaking. At about 1715, with the vessels approximately one quarter mile apart, the SAUDI MAKKAH maneuvered from Thimble Shoal Channel to the South Auxiliary Channel with a rapid series of rudder commands: starboard 10, starboard 20, midship, starboard 10, starboard 20 and then midship. During this maneuver the SAUDI MAKKAH traveled from one quarter mile west of Thimble Shoal Channel Lighted Bell Buoy "9" (LLNR 9255) to a position about 100 feet abeam of the buoy. The ship's head was 123 degrees true. The pilot then ordered the rudder port 10 degrees to bring the ship to the channel course of 108 degrees true, followed 4-5 seconds later by port 20 to increase the rate of swing. As soon as the rudder indicator reached port 20 degrees the pilot ordered the rudder midship, and from midship went immediately to hard starboard. As the ship's head reached 112 degrees true the pilot realized the ship was in extremis. The pilot contacted the TURTLE QUEEN'S pilot and told him "the ship is not steering." At 1717, just 2 minutes after commencing the maneuver, the port bow of the SAUDI MAKKAH hit the TURTLE QUEEN in way of the number 7 cargo hold, pushing the TURTLE QUEEN to port and into the path of the inbound U.S. Navy salvage ship USS GRASP and the inbound bulk freighter GLOBAL VICTORY. By this time the stern of the SAUDI MAKKAH was swinging to port in response to the hard starboard rudder command, and the two vessels collided a second time in way of the life boats on both vessels. The collision occurred in position 36-58.32N 076-07.09W, about 1500 yards west-northwest of Thimble Shoal Channel Lighted Buoy "7" (LLNR 9235). The USS GRASP and the GLOBAL VICTORY observed the collision and took early action to avoid a close quarters situation. After separating the vessels proceeded to Lynnhaven Anchorage. There were no injuries, deaths or pollution as a result of this casualty.

16732/MC97003534
24 September 1997

VESSEL DATA

Name:	SAUDI MAKKAH
Flag:	Saudi Arabia (SA)
Lloyd's Number:	L7900077
Call Sign:	HZQZ
Service:	Freight Ship (container/RO/RO)
Gross Tons:	29259.00
Net Tons:	8778.00
Dead Weight Tons (DWT):	27905.50
Length (overall):	200.26 meters
Breadth (molded):	31.73 meters
Depth (molded):	18.80 meters
Home Port:	Dammam
Date Built:	December 31, 1981
Place Built:	Saint Nazaire, France
Built by:	Ch. Nav. de La Ciotat
Owner:	The National Shipping Company of Saudi Arabia 7 Sitteen Street P.O. Box 8931 Riyadh, SA 11492
Operator:	Same as owner
Propulsion:	Diesel Direct
Horsepower:	29000
Master:	Stephen L. Holloway
Classification Society:	Germanischer Lloyd (GL)

Name:	TURTLE QUEEN
Flag:	Panama (PN)
Lloyd's Number:	L8600571
Call Sign:	3FHA4
Service:	Freight Ship (bulk)
Gross Tons:	76324.00
Net Tons:	46907.00
Dead Weight Tons (DWT):	146019.00
Length (overall):	268.00 meters
Breadth (molded):	43.00 meters
Depth (molded):	24.10 meters
Home Port:	Panama
Date Built:	January 30, 1987
Place Built:	Nagasaki, Japan
Built by:	Mitsubishi Heavy Industries Ltd.
Owner:	Caledonia Shipholding S.A. 53rd Street Urbanizacion Obarrio Torre Swiss Bank, 16th Floor Panama City, PN
Operator:	Shinwa Kaiun Kaisha Ltd. Fukoku Seimei Building #2-2 2-Chome, Uchisaiwai-Cho Tokyo 100, JA
Propulsion:	Diesel Direct
Horsepower:	14800
Master:	Takeshi Chikamawari
Classification Society:	Nippon Kaiji Kyokai (NKK)

RECORD OF DEAD

None.

RECORD OF INJURED

None.

NARRATIVE DESCRIPTIONS

a. Weather Conditions

At the time of the collision the sky was clear with visibility greater than 10 miles. Winds were from the east/northeast at less than 5 knots and the seas were calm.

b. Tides

The predicted tides for the Chesapeake Bay Entrance are based on National Oceanic and Atmospheric Administration Station No. 4481, located at Thimble Shoal Channel Lighted Buoy "10" (LLNR 9260). The predicted tides for Wednesday, 12 March were:

		CURRENT	
TIME	TIDE	SPEED	DIRECTION
0254	SLACK	N/A	N/A
0440	MAX EBB	-.3	105 DEG T
0712	SLACK	N/A	N/A
1044	MAX FLOOD	.9	285 DEG T
1457	SLACK	N/A	N/A
1645	MAX EBB	-.3	105 DEG T
1913	SLACK	N/A	N/A
2302	MAX FLOOD	1.0	285 DEG T

c. Thimble Shoal Channel

Thimble Shoal Channel begins 2.3 miles northwest of Cape Henry Light (LLNR 370) and extends approximately 13 miles west-northwestward. The main channel is marked by nine sets of red and green lighted buoys. Each set of buoys is 1.4 miles apart through Thimble Shoal Channel Lighted Buoy "15" (LLNR 9285) and Thimble Shoal Channel Lighted Buoy "16" (LLNR 9290).

The main channel is 1000 feet wide. The outbound element is 650 feet wide and is maintained at a project depth of 50 feet. The remainder of the main channel is maintained at 45 feet. To the north of the main channel is the inbound north auxiliary channel and to the south the outbound south auxiliary channel. The project depth for the auxiliary channels is 32 feet.

The CBBT crosses Thimble Shoal Channel at right angles about 500 yards west of Thimble Shoal Channel Lighted Buoy "7" (LLNR 9235) and Thimble Shoal Lighted Gong Buoy "8" (LLNR 9240). The channel cuts between Trestles A and B of the CBBT. The channel width and

depth are maintained through the bridge opening and the distance between the man-made tunnel islands is about 1800 yards.

d. Aids to Navigation

The Coast Guard Aids To Navigation Team Kennebec conducted a post-casualty survey and found the following buoys on station and watching properly:

Thimble Shoal Channel Lighted Bell Buoy "9"	(LLNR 9255)
Thimble Shoal Channel Lighted Buoy "10"	(LLNR 9260)
Thimble Shoal Channel Lighted Buoy "11"	(LLNR 9265)
Thimble Shoal Channel Lighted Gong Buoy "12"	(LLNR 9270)

e. Personnel

Captain Takeshi Chikamawari, Master, TURTLE QUEEN

Captain Chikamawari is licensed by the governments of Japan and Panama as Master unlimited. Japanese licenses do not expire, but are endorsed every five years. Panamanian licenses expire every five years. Captain Chikamawari's licenses were valid on March 12, 1997.

Captain Chikamawari attended a Japanese maritime academy for five years prior to beginning his career at sea. Since graduating he has spent 32 years at sea, 20 as a deck officer and 12 as a master. On March 12 he was employed by Shinwa Kaiun Kaisha, operators of the TURTLE QUEEN, a position he had held for the previous eight months.

Captain Chikamawari testified that he had ten hours sleep between 2100 on March 11 and 0700 on March 12. He described himself as being in good health and was not taking any medications on March 12. He did not consume any alcohol in the eight hour period prior to getting underway.

Captain Stephen L. Holloway, Master, SAUDI MAKKAH

Captain Holloway holds a British Class One Deck Master Mariner's Certificate, a Bahamas Class One Master Mariner's Certificate and a GMDSS Radio Operator's Certificate. The designation "Class One" means worldwide unlimited master mariner. Captain Holloway's licenses were valid on March 12, 1997.

Captain Holloway served a four year apprenticeship on various British freight and passenger vessels before earning his third officers license. He has served at sea since 1969, serving as master since 1986. On March 12 he was employed by Mid East Ship Management as master of the SAUDI MAKKAH, a position he held since joining the ship on February 25, 1997 in Galveston, Texas. This was his first voyage on the SAUDI MAKKAH and his first voyage to the Port of Hampton Roads.

Captain Holloway testified that he slept from 0500 to 0830 on March 12, and later rested in his cabin (but did not sleep) after departure of the Coast Guard boarding team about 1130. He described himself as being in good health and was not taking any medications on March 12. He did not consume any alcohol in the eight hour period prior to getting underway.

Captain Thomas D. Rutter, Pilot, TURTLE QUEEN

Captain Rutter holds a Virginia license as state branch pilot issued by the Board for Branch Pilots and a U.S. Coast Guard license as master of inland steam or motor vessels of any gross tons. He received his U.S. Coast Guard license in December, 1983 and his first state license in August, 1982. Over the years he added additional first class pilotage endorsements for different routes to his U.S. Coast Guard license and earned his "full branch" state license in August, 1985. [A "full branch" license covers vessels of all sizes and drafts.] The Coast Guard license must be renewed every five years and the state license renewed annually. Captain Rutter's licenses were valid on March 12, 1997.

Captain Rutter served a five year apprenticeship before becoming a "shareman." As a shareman the apprentice performs the same duty as a pilot at half a share. During this time the apprentice must earn a license on one of the three main rivers, the Elizabeth, James or York. The actual river selected is dictated by the Board. Once the apprentice obtains this license they can "buy in" as a full share.

Captain Rutter has no formal maritime academy training. He has attended courses in the Rules of the Road, ship handling, bridge resource management and radar use. Captain Rutter estimated that he has made more than 2,000 trips over the routes covered by his license. About 80% of these trips were through Thimble Shoal Channel, either inbound or outbound to the Port of Hampton Roads.

Captain Rutter testified that he had about seven or eight hours of sleep the night of March 12, arising just before 0700. He was off on Tuesday, March 11, and had last piloted a vessel on Monday morning, March 10. He described himself as being in good health but had recently had the flu. He took two medications on the morning of March 12, an expectorant (Phenylfenesin LA) and an antibiotic (Cefaclor). Neither drug causes drowsiness. He did not consume any alcohol in the eight hour period prior to getting underway.

Captain Leighton E. ["Ted"] Causey, Jr., Pilot, SAUDI MAKKAH

Captain Causey holds a Virginia license as state branch pilot issued by the Board for Branch Pilots and a U.S. Coast Guard license as master of inland steam or motor vessels of any gross tons. He received his U.S. Coast Guard license in October, 1959 and his first state license in March, 1958. Captain Causey's licenses were valid on March 12, 1997.

Captain Causey served a two year apprenticeship to earn his state license. The SAUDI MAKKAH was the 11,475 vessel he has piloted. About 10,000 of those trips were transits between Cape Henry and Hampton Roads. Captain Causey had piloted both the SAUDI MAKKAH and SAUDI RIYADH on several occasions before March 12. He also testified that he had piloted about 500-1,000 vessels of the length and tonnage of these vessels. In his experience on the SAUDI vessels he had not observed any unusual handling characteristics or experienced any shiphandling problems. In fact, Captain Causey testified that the SAUDI MAKKAH "...handled beautifully."

Captain Causey testified that he had about eight hours of sleep the night of March 12. He had last piloted a vessel on Tuesday March 11, from Lambert's Point to sea. He described himself as being in good health and mentally alert on March 12. He did not take any medications and did not consume any alcohol in the eight hour period prior to getting underway.

f. Post-Casualty Chemical Testing

The Coast Guard's Marine Safety Officer of the Day (MOOD) contacted the Virginia Pilots by telephone at 2130 on 12 March to require post-casualty chemical testing based on the determination of the responding investigating officer (IO) that the incident was a Serious Marine Incident. The agents for the involved vessels were advised of the requirement for post-casualty chemical testing by the MOOD at 0140 on 13 March. The MSO response team boarded the SAUDI MAKKAH at 2100 on March 12 and the TURTLE QUEEN at 0052 on 13 March. During interviews of personnel present on the bridge of the vessels at the time of the collision, including the pilots, the IOs did not observe any behavior or other indications that alcohol use was a factor in this collision.

No one in the response team was qualified to administer field sobriety tests or use the Coast Guard's standard Alco-Sensor III test equipment. The MSO has two Alco-Sensor III kits, both stored at the MSO. The instruments had not been calibrated in more than two years.

Pilots

Captain Rutter was breath tested for alcohol and submitted a urine specimen for drug testing at 0000 on 13 March at Riverside Business Health Services in Newport News, Virginia. The test results were negative.

Captain Causey was breath tested for alcohol and submitted a urine specimen for drug testing at 0225 on 13 March at Riverside Business Health Services in Newport News, Virginia. The test results were negative.

SAUDI MAKKAH

The following crewmembers of the SAUDI MAKKAH tested negative for alcohol in a breath test conducted by Captain Thomas E. Garrett, a U.S. licensed master representing the marine employer, OOA 0715 on 13 March:

Leonardo M. Cuadra	Second Officer
Stephen L. Holloway	Master
Aldrin P. Panopio	AB/Helmsman
Brian C. Springhall	Chief Engineer

The entire crew of the SAUDI MAKKAH tested negative for drugs based on urinalysis conducted by Employee Health Programs, Bethesda, Maryland using urine specimens collected on 13 March.

TURTLE QUEEN

Alcohol testing was not conducted.

The following crewmembers of the TURTLE QUEEN tested negative for drugs based on urinalysis conducted by Internal Medicine Specialists, Inc. of Norfolk, Virginia using urine specimens collected on 15 March:

Ruben A. Cantillana	Chief Officer
Takeshi Chikamawari	Master
Nicasio P. Galinato, Jr.	Second Officer
Bernardino Vasquez	AB/Helmsman

g. Coast Guard Vessel History

TURTLE QUEEN

According to information in the Coast Guard's Marine Safety Information System (MSIS), the TURTLE QUEEN has visited the U.S. 20 times. The vessel has been boarded by the Coast Guard 10 times since April, 1988 including 5 boardings by Marine Safety Office Hampton Roads. There were no marine violation cases and no marine casualty cases documented in MSIS.

The most recent boarding of the TURTLE QUEEN was an annual examination completed on 4 March 1997 in Hampton Roads, Virginia. The Coast Guard boarding team tested all bridge navigation equipment, examined the navigation charts and publications and tested the steering gear, with no deficiencies noted. Two deficiencies were noted in other systems: a frozen sheave on the port lifeboat davit and a hull fracture in the port sideshell at frame 147 in way of cargo hold number 6. This fracture led to a structural exam by Mr. Paul Sezjk, representing the vessel's classification society, NKK. Mr. Sezjk noted a total of 19 fractures in internal structural members in cargo holds 1, 2 ,3, 5 and 6. These fractures were permanently or temporarily repaired to Mr. Szejk's satisfaction prior to the vessel's departure on 12 March.

SAUDI MAKKAH

According to information in MSIS, the SAUDI MAKKAH has visited the U.S. 460 times. The vessel has been boarded by the Coast Guard 89 times since May, 1984 including 9 boardings by Marine Safety Office Hampton Roads. There were 3 marine violation cases and 2 marine casualty cases documented in MSIS. A synopsis of the casualty cases follows:

> On 17 May 1996 the SAUDI MAKKAH collided with the U.S. Navy submarine USS JACKSONVILLE about 16 miles southeast of Virginia Beach, Virginia in international waters. This casualty was investigated by the Navy, therefore the cause of the casualty was not determined by the Coast Guard. The Commanding Officer of the USS JACKSONVILLE was relieved of command.
>
> On 23 January 1992 the WLADYSLAW SIKORSKI (now SAUDI MAKKAH) grounded in New York Harbor while departing port in severely restricted visibility. The pilot initially refused to get underway, whereupon the master took the conn and got underway. The limited visibility, confusion on the bridge and a strong ebb tide contributed to the casualty. Civil penalty action was initiated against both the master and pilot.

The most recent boarding of the SAUDI MAKKAH was an annual examination completed on 12 March 1997 in Hampton Roads, Virginia. The Coast Guard boarding team tested all bridge navigation equipment, examined the navigation charts and publications and tested the steering gear, with no deficiencies noted.

h. Voyage of the TURTLE QUEEN

The TURTLE QUEEN arrived in the Port of Hampton Roads on Wednesday, March 4, 1997 to load coal at Norfolk Southern Coal Pier No. 6, Norfolk, Virginia. The vessel departed with 95,542.638 cubic meters of cargo, a partial load. The vessel was scheduled to load additional cargo in South Africa before proceeding to a discharge port in Japan. The vessel's draft at departure was 13.50 meters (44.1 feet) aft and 12.27 meters (40.1 feet) forward.

Captain Rutter, Virginia pilot, arrived on the TURTLE QUEEN at about 1430 (all times local). He physically checked the draft forward before boarding, then proceeded to the bridge where he reviewed the speed vs. RPM table and observed the maneuvering characteristics. [In his testimony Captain Rutter dismissed the validity of the maneuvering characteristics because "...we would not be in any conditions where the maneuvering characteristics would have any basis." His conclusion was based on his belief that the maneuvering characteristics were valid only in deep water.] The master, Captain Takeshi Chikamawari, informed

communicating ship to ship.] Captain Causey informed Captain Rutter the SAUDI MAKKAH was awaiting line handlers, therefore Captain Rutter made no attempt to reduce speed to allow the SAUDI MAKKAH to proceed outbound ahead of the TURTLE QUEEN. This was the first of four radio conversations between the pilots of these vessels on March 12.

Captain Rutter observed the undocking maneuvers of the TURTLE QUEEN and noted the vessel responded to helm and engine commands as he expected a vessel of that size, type and draft. He stated the TURTLE QUEEN ran "...as straight as can be...handling like a top." The helmsman and deck officer responded properly to Captain Rutter's commands, which he gave directly to them without relay through the master. He reported no communications difficulties with the bridge crew.

Captain Rutter next spoke to Captain Causey just prior to 1700, when the TURTLE QUEEN was about one third of a mile from passing between Thimble Shoal Channel Lighted Bell Buoy "13" (LLNR 9275) and Thimble Shoal Channel Lighted Buoy "14" (LLNR 9280). The SAUDI MAKKAH was about two miles behind the TURTLE QUEEN at this time. Captain Rutter's recollection of this conversation is that Captain Causey requested permission to overtake and he assented because he had no objections at that time. Captain Rutter assumed the SAUDI MAKKAH would overtake the TURTLE QUEEN in Thimble Shoal Channel on the TURTLE QUEEN'S port side, however, the maneuver was not discussed in detail. Captain Rutter reported the TURTLE QUEEN'S speed as 11 or 12 knots in response to Captain Causey's question. [Captain Rutter observed that the TURTLE QUEEN'S GPS and Doppler Speed Log differed by .2 to .4 knots, with the Doppler reporting the higher speed.] There was no further discussion of the maneuver. Captain Rutter did not ask the SAUDI MAKKAH'S speed or request any minimum sea room. He did not request the SAUDI MAKKAH reduce speed or inquire about the location for the overtaking. Neither pilot raised the potential for interaction between the vessels as an issue. Captain Rutter did not advise the TURTLE QUEEN'S master that he had agreed to an overtaking. He considered it a routine maneuver and stated the master had not taken an active part in the trip out.

At 1700 the empty bulk freighter GLOBAL VICTORY weighed anchor from Lynnhaven Anchorage and proceeded across and into Thimble Shoal Channel inbound to the Port of Hampton Roads. Captain John A. Jones, Jr., Virginia pilot, had the conn. Captain Jones was aware of the TURTLE QUEEN and SAUDI MAKKAH and requested the pilot tower contact each of these vessels to report that the GLOBAL VICTORY was underway inbound. Captain Jones testified that he heard the tower make these calls, and Captain Causey remembered being called; however, Captain Rutter reported that he overheard the tower advise the SAUDI MAKKAH of the GLOBAL VICTORY, but could not recall being directly informed by the tower.

Captain Rutter of the results of the pre-underway tests and the maximum draft. Captain Rutter did not discuss a voyage plan with any of the TURTLE QUEEN'S deck officers, although a rudimentary plan had been prepared by the second officer.

At 1515 the TURTLE QUEEN began dropping lines under the direction and control of the docking pilot, Captain Warren Merritt. At about 1540, Captain Rutter relieved Captain Merritt of the conn and the docking pilot departed. The TURTLE QUEEN was in Craney Island Reach just north of the Lambert's Point (Norfolk Southern) coal pier, headed outbound.

Present on the bridge after Captain Merritt's departure were the master, pilot, chief engineer (Takao Shinozaki), third officer (Vladimir Delos Reyes) and helmsman (name unknown). Prior to the collision the third officer was relieved by the second officer (Nicasio Galinato, Jr.) and the helmsman was relieved by AB Bernardino Vasquez. The chief officer (Ruben Cantillana) also reported to the bridge sometime prior to the collision.

The TURTLE QUEEN was navigating visually throughout the outbound voyage. An exclusive lookout was not assigned, but the master, chief officer, officer on watch and helmsman all testified they were assigned as lookouts in addition to other duties. The officer on watch was assigned as a radar watch in addition to other duties.

Both radars were operating with true north on the ship's head. The range settings on the radars were frequently changed to suit the situation as different people used the radars. The pilot, master, chief officer and second officer all reported using one or both of the radars during the outbound transit and found the picture clear and the radars operating properly. Although the Automatic Radar Plotting Aid (ARPA) was on and working properly, it was not used to acquire, track or plot other vessels, nor were vessels plotted or tracked using a maneuvering board to solve for the closest point of approach (CPA). [Such a practice is not common on merchant vessels, particularly in congested waters or when visibility is good.]

The vessel's position was noted on the chart as the vessel passed between various sets of channel buoys. These "fixes" were noted on the navigation chart by either the chief officer or the officer on watch. The times noted were based on the ship's wall clock and were recorded to the nearest minute.

While the TURTLE QUEEN was still under the conn of the docking pilot, maneuvering to get underway, Captain Rutter contacted the SAUDI MAKKAH on Channel 11 using one of the ship's two fixed VHF radios. Captain Rutter spoke to Captain Causey, the Virginia pilot assigned to the SAUDI MAKKAH. [The Virginia Pilots communicate using "unit numbers" to prevent confusion. Captain Rutter was unit 60 and Captain Causey was unit 27. This convention ensures the pilots know who they are talking to when

Upon hearing that the GLOBAL VICTORY was inbound, Captain Rutter assumed the SAUDI MAKKAH would abandon the planned overtaking since there would be no room for the overtaking in the main channel on the TURTLE QUEEN'S port side. However, prior to 1715, Captain Causey contacted Captain Rutter for the third time, and informed him that the SAUDI MAKKAH was reducing speed and entering the South Auxiliary Channel. Again there was no discussion of sea room, speed or interaction between the vessels. At this time the TURTLE QUEEN was approaching Buoy "9" and the SAUDI MAKKAH was about one half mile or more astern. The TURTLE QUEEN was on a course of 107-108 degrees true, the outbound channel course for Thimble Shoal Channel, and was in a position just to the right of the channel centerline.

Captain Rutter walked to the starboard side twice to check the location of the SAUDI MAKKAH, and noted on the second time that he did not have the 350-500 feet of maneuvering room he had anticipated. He moved to a location near the helmsman and second officer so that he would be in a better position to respond to any reaction of the TURTLE QUEEN. He altered course left to open up and give more lateral distance between the vessels with a port 10 and then port 20 command. He also told the helmsman and second officer of the overtaking ship for the first time. He considered the TURTLE QUEEN "in extremis" at the point where he could see the foremast of the SAUDI MAKKAH abeam of the TURTLE QUEEN'S starboard bridge wing.

About 30-60 seconds later Captain Causey contacted Captain Rutter for the fourth and last time, to report that he was at hard starboard and the vessel [SAUDI MAKKAH] was not steering. Within seconds of this last radio conversation the port bow of the SAUDI MAKKAH collided with the TURTLE QUEEN at a 10-15 degree angle in way of the TURTLE QUEEN'S number 7 cargo hold. Within seconds the vessels collided a second time astern, in way of both vessel's life boat stations.

Captain Rutter requested maximum emergency full ahead and ordered hard port rudder. This command had little or no effect until after the SAUDI MAKKAH'S stern passed the bow of the TURTLE QUEEN. The combined effect of the hard port rudder and the collision caused the TURTLE QUEEN to swing to port about 20 degrees off course, stopping at about 090 degrees true.

At the time of the collision the second officer and chief engineer were at the engine controls, the helmsman at the helm, the master about 25 feet to the right of the bridge centerline and the chief officer at the radar. Upon seeing the foremast of the SAUDI MAKKAH the master became very excited and called out "Dangerous!" The chief officer looked up and saw the name "SAUDI" and then braced for the collision. No one sounded the general alarm and no one sounded the danger signal on the ship's whistle.

The master repeatedly stated his attention was focused exclusively on the meeting situation with the inbound GLOBAL

VICTORY. Although the master acknowledged that he had observed the SAUDI MAKKAH astern at an estimated distance of more than one mile, he did not post a lookout or direct a plot on the vessel be maintained. Other than Captain Rutter and the master, no one else on the bridge was aware of the approaching SAUDI MAKKAH, and only Captain Rutter knew of the SAUDI MAKKAH'S intention to overtake.

After the vessels were clear of one another Captain Rutter regained control of the TURTLE QUEEN by breaking the port swing and steadying on the channel course of 108 degrees true. He then reduced speed from emergency full ahead to half ahead, slow ahead and then dead slow ahead. At 1910 the TURTLE QUEEN anchored in Lynnhaven Anchorage Alpha.

After regaining control Captain Rutter contacted Captain Jones on the GLOBAL VICTORY, which had moved from the main channel to the north auxiliary channel in response to the collision, and advised him he could return to the main channel. The GLOBAL VICTORY passed using the north auxiliary channel before returning to the main channel.

There were no radio communications between the TURTLE QUEEN and the USS GRASP. Upon witnessing the collision, the USS GRASP turned to starboard and left Thimble Shoal Channel completely, leaving the north auxiliary channel for the GLOBAL VICTORY, which was astern of the USS GRASP.

During the outbound voyage the TURTLE QUEEN'S propulsion, steering and navigation equipment operated properly. There were no equipment failures or alarms. The course recorder and automatic bell recorder were operating properly. The recorder for the echo depth sounder was operable but was not turned on. [The navigation safety regulations in 33 CFR Part 164 require vessels be equipped with the depth recorder but do not require the equipment be used. The course recorder and bell recorder are not required by regulation.]

A Coast Guard marine inspector boarded the TURTLE QUEEN in Lynnhaven Anchorage at 2044 on 12 March to conduct a damage assessment. An IO followed at 0140 on 13 March after completing a boarding of the nearby SAUDI MAKKAH. The team interviewed the master, chief officer, second officer and helmsman separately. Each crewmember provided a written statement. The pilot had already departed the vessel. The master completed the Report of Marine Accident, Injury or Death (CG-2692) and provided a drawing depicting the collision. The original course recorder tape and bell recorder tape were collected. A copy of the rough log, official logbook, ship's particulars, crew list and chart were also collected. The master indicated the damaged areas on a partial copy of the ship's capacity plan. The team departed the vessel at 0232 on 13 March.

i. Voyage of the SAUDI MAKKAH

The SAUDI MAKKAH arrived in the Port of Hampton Roads on Wednesday, March 12, 1997 to discharge and load general cargo at Norfolk International Terminals (NIT), Norfolk, Virginia. Some cargo was packaged in containers and other cargo was "RoRo" (Roll on Roll off) cargo. The vessel moored at NIT at 0442. The SAUDI MAKKAH'S next port of call was Baltimore, Maryland, where shoreside labor had been arranged for 0700 on 13 March. The vessel's draft at departure was 8.85 meters (29.03 feet) aft and 7.4 meters (24.27 feet) forward.

The SAUDI MAKKAH planned to sail sometime between 1330 and 1630 on 12 March. The pilot was ordered for 1530 and arrived at 1515, however, departure was delayed awaiting line handlers. This delay was not sufficient to create a need to make up the lost time on the voyage to Baltimore.

A Coast Guard boarding team arrived at 0830 to conduct an annual Port State Control exam. The master, Captain Stephen L. Holloway, assisted with the exam, which was completed at 1115.

Captain Causey, Virginia pilot, arrived on the SAUDI MAKKAH at 1515. He went directly to the bridge, where he checked the draft and reviewed the voyage plan, which was laying on the chart table. He also reviewed the speed vs. RPM table and had a brief discussion with the master.

Present on the bridge at departure were the master, Captain Causey, the docking pilot (Captain John Hanna), chief officer (Derrick Brown), radio officer (Melvin Aguila) and helmsman (Jesus Medina). During the transit the chief officer was relieved by the second officer (Leonardo Cuadra) and the helmsman was relieved by AB Aldrin Panopio.

According to the vessel's log, the SAUDI MAKKAH dropped the last mooring line at 1615, under the direction and control of Captain Hanna. Captain Causey, however, recorded the last line off at 1606 by his watch. The master and docking pilot were on the bridge wing, the chief officer at the engine controls, the radio officer just outside the bridge wing door and the helmsman at the helm. Orders from the docking pilot were relayed by the master to the chief officer and helmsman through the radio officer. Captain Causey observed the undocking maneuver and described the vessel's handling and response to Captain Hanna's commands as "...perfectly normal." The master also testified that "...the ship was behaving as I expected to helm orders, to rudder orders and to engine orders." Shortly after getting underway Captain Causey assumed the conn from Captain Hanna (@1615 according to his wrist watch). The SAUDI MAKKAH had just passed NIT Pier 1 on a course of 312 degrees true. Captain Causey gave the commands for the vessel's turn into Norfolk Harbor Reach to a course of 004 degrees true.

The SAUDI MAKKAH was navigating visually throughout the outbound voyage. An exclusive lookout was not assigned, but the master testified that the officer on watch and helmsman were assigned as lookouts in addition to other duties.

The SAUDI MAKKAH is equipped with two radars located side by side on the starboard side of the bridge. The 10CM radar is inboard and the 3CM ARPA unit outboard. At undocking the 10CM radar was set on the .75 mile range and the ARPA on 1.5 miles. The master changed the range on the 10CM radar to 3 miles after getting underway, and after clearing the entrance reach the ARPA was used to scan on both 6 and 12 mile ranges. The ARPA was set with true north on the ship's head and the 10CM radar set as "gyro unstabilized" (meaning the 12 o'clock position represents the ship's course). All who used the radars testified the radars functioned properly and had a clear picture. The second officer used the ARPA to plot targets but did not maintain a paper plot to solve for CPA.

The vessel's position was noted on the chart as the vessel passed between various sets of channel buoys. These "fixes" were noted on the navigation chart by the master or second officer. The master also periodically checked the vessel's position using radar, but these were not noted on the chart.

Captain Causey testified that his commands were executed immediately without relay through the master. He stated there were no language or communication difficulties with the crew and that they responded properly and without hesitation. At the time he assumed the conn, Captain Causey was aware of the TURTLE QUEEN outbound ahead of the SAUDI MAKKAH. According to him the TURTLE QUEEN was already past the Norfolk Naval Base (NOB) Pier 12 and was not in sight, but the master testified the TURTLE QUEEN was in view about 3 miles ahead. At this point neither Captain Causey nor the master were expecting to overtake the TURTLE QUEEN.

Captain Causey noted the TURTLE QUEEN on the radar when the SAUDI MAKKAH was in the vicinity of Thimble Shoal Light (LLNR 9310). He estimated the distance between the vessels at 2.5 miles. He continued to watch the vessel by radar every 2-3 minutes, but did not request a radar plot be maintained or use the variable range marker to determine the exact distance.

At approximately 1700 Captain Causey contacted Captain Rutter on his portable VHF radio on Channel 13. He had earlier responded to a radio call from Captain Rutter while the SAUDI MAKKAH was still moored using the ship's fixed VHF radio on Channel 11. In the first conversation he informed Capatin Rutter the SAUDI MAKKAH was awaiting line handlers and would be delayed. In the second radio call Captain Causey testified he told Captain Rutter "...that I was overtaking him and when I caught up with his ship I would like to go into the south or asked permission to go into the south auxiliary channel." The SAUDI MAKKAH was just west of

Buoy "16" at this time. Captain Causey also testified that Captain Rutter reported the TURTLE QUEEN'S speed as 11 knots and estimated the SAUDI MAKKAH was making 16 knots. "I roughly calculated that I would be, oh, within a half a mile of his vessel when I arrived at Buoy 9." Captain Causey did not recall the exact words of Captain Rutter's agreement to the overtaking, but insisted he at no time discussed or even considered an overtaking in the main channel. The master did not request the overtaking, nor did he at anytime ask Captain Causey to make maximum speed or indicate there was a need for speed to make the ship's scheduled docking in Baltimore.

Prior to Captain Causey's radio call to the TURTLE QUEEN he and the master agreed that the SAUDI MAKKAH was overtaking the TURTLE QUEEN and discussed moving into the south auxiliary channel in the vicinity of Buoy "9", where the water depth outside the auxiliary channel is greater than at other areas west of Buoy "9." The master gave ten minutes notice to the engineroom to reduce speed to 85 RPMs, and testified this was accomplished in six minutes. He stated that reducing speed was "...prudent seamanship..." and that he "...didn't want to be in a position of overtaking a vessel doing full or somewhere between full sea RPM and in excess of maneuvering RPM..." At this time the master estimated the difference between his vessel's speed and the TURTLE QUEEN'S speed was 4-5 knots.

The master overheard the second radio call but could not recall specifically what was said. He did, however, state "...I gave him [Causey] the nod that I had heard his transmission." There was no discussion of the inbound USS GRASP and GLOBAL VICTORY, but Captain Causey was aware of the GLOBAL VICTORY because he had been notifed the GLOBAL VICTORY was underway by the pilot tower. The master acknowledged he had seen both the USS GRASP and GLOBAL VICTORY.

At 1715 the SAUDI MAKKAH began the maneuver into the south auxiliary channel. Prior to the first command, Captain Causey was advised by the master the vessel was at 85 RPMs, but did not personally check the bridge RPM indicator. No one calculated the SAUDI MAKKAH'S speed over the ground. At the same time, Captain Causey made his third radio call to the TURTLE QUEEN to advise Captain Rutter that the SAUDI MAKKAH was exiting the main channel. [He testified it was not his intention to get Captain Rutter's assent at this time, since he had already obtained agreement to the overtaking in the second radio call.] Captain Causey noted the TURTLE QUEEN was moving slightly toward the center of the main channel.

The first rudder order was starboard 10 degrees and was given about .25 miles before Buoy "9." The ship swung slowly so the order was increased to starboard 20 degrees. Captain Causey described the ship's response as "...a nice, easy swing." The third order was amidships, which slowed the swing to starboard. At this point Captain Causey was not satisfied with the ship's

heading and ordered starboard 10 degrees, starboard 20 degrees and amidship to achieve the desire course change. These six rudder commands occurred very quickly, with about 2-3 seconds between commands. After the completion of these orders the ship's head had swung from the channel course of 108 degrees true to 123 degrees true and the SAUDI MAKKAH had traveled from a position .25 miles west of Buoy "9" to a position abeam of the buoy, which was about 100 feet to port. Captain Causey testified "The ship behaved beautifully during the starboard turn. Just what I would expect."

The next series of rudder commands was intended to put the SAUDI MAKKAH back on a parallel course with the channel. Captain Causey ordered port 10 degrees. The ship swung slowly so the order was increased to port 20 degrees. Captain Causey described the resultant rate of swing as "...a normal rate..." and immediately put the rudder amidship, and as soon as the rudder reached amidship he ordered hard starboard. Captain Causey described these commands as "...one continuous swing from port 20 over to hard starboard. My intention, to check the ship, you know, within a few degrees, make sure it didn't get too much swing." He insisted the hard starboard command was to check the swing and was not in response to a sheer to port.

The hard starboard order was given when the SAUDI MAKKAH had reached 118-116 degrees true. After the hard starboard command the swing slowed. Captain Causey became concerned when the ship reached 112-110 degrees true and the swing did not stop. At this point he made the fourth radio call to the TURTLE QUEEN, telling Captain Rutter the rudder was hard starboard and the ship was "not steering." The swing from 123 degrees true to 110 degrees true had taken 30 seconds. Over the next 60-90 seconds the SAUDI MAKKAH continued to swing to port until it struck the TURTLE QUEEN.

At the moment of impact, the SAUDI MAKKAH'S course recorder showed the course as 93 degrees true and the TURTLE QUEEN'S course recorder showed the course as 105 degrees true, indicating an angle of impact of 12 degrees. SAUDI MAKKAH'S course recorder shows a continuous swing between 1715 and 1717, first to starboard and then to port. The SAUDI MAKKAH never steadied on any course during the maneuver leading up to the collision.

The collision occurred at 1717 in position 36-58.32N 076-07.09W, about 1500 yards west-northwest of Buoy "7." The second officer fixed the position by taking a range and bearing on the CBBT using the radar. The master recorded the time from his wrist watch, which agreed with the time of impact apparent on the course recorder. After the impact the SAUDI MAKKAH'S stern continued to swing to port, so Captain Causey ordered the rudder amidship to slow the swing of the stern and reduce the damage from the anticipated second impact. The two impacts occurred only seconds apart. After separating, the SAUDI MAKKAH proceeded to Lynnhaven Anchorage.

During the outbound voyage, including the series of ten rudder commands leading up to the collison, there were no alarms or equipment failures of any kind. The steering gear, propulsion and navigation equipment of the SAUDI MAKKAH operated properly. Captain Causey testified that the crew of the SAUDI MAKKAH responded properly and efficiently to every command.

The SAUDI MAKKAH did not give any whistle signals before, during or after the collision; nor did they hear any whistle signals from any other vessels.

A Coast Guard investigating officer and marine inspector boarded the SAUDI MAKKAH in Lynnhaven Anchorage at 2100 on 12 March to conduct a damage survey and interview witnesses. The team conducted a steering gear test using each pump separately and both pumps together. The movement of the rudder was timed from hard port to hard starboard with one pump and two pumps and found to be about the required 28 seconds. Both followup and non-followup steering were tested, although the master testified the vessel never used the non-followup mode. The rudder angle indicator on the bridge was checked against the actual position of the rudder in the steering gear room and was found to be in agreement. The emergency steering was also tested. There were no deficiencies noted.

Mr. William R. Tye, a self-employed marine surveyor representing GL, the vessel's classification society, attended the SAUDI MAKKAH at Lynnhaven Anchorage on 12 March. He witnessed the steering gear test conducted by the Coast Guard, noting only a slight noise caused by an indicator arm binding on a metal casing. He testified the steering gear appeared to be well maintained and was free of defects. Neither Mr. Tye nor the Coast Guard tested the steering gear alarms.

The Coast Guard investigating officer interviewed the master, pilot, chief officer, second officer and helmsman separately. Each crewmember provided a written statement except the chief officer, who was not on the bridge at the time of the collision. The master completed the Report of Marine Accident, Injury or Death (CG-2692). The original course recorder tape and bell recorder tape were collected. A copy of the rough log, official logbook, ship's particulars, crew list and chart were also collected. The team departed the vessel at 0042 on 13 March.

j. Damage

SAUDI MAKKAH

The port forward bulwarks and sheer strake were damaged between frames 53-94 in way of the upper technical gallery area. The shell plating was fractured at frames 87 and 89. An internal exam was not conducted, but it is anticipated the associated internals between frames 53-94 will require repair.

The port boat deck was badly buckled and the port life boat davit damaged.

There was no flooding or pollution as a result of this damage. Temporary repairs were completed with permanent repairs deferred by class. Damage was estimated at more than $500,000.

TURTLE QUEEN

The sideshell between frames 91-131 was inset 30-45 centimeters (12-18 inches) along the deck edge. The damage was confined to the sheer strake area and extended downward toward the waterline 3 meters (approximately 10 feet) from the deck edge. The deck plating was twisted outboard in two areas 3-4 meters (10-12 feet) in length, resulting in the number 4 and 5 upper wing ballast tanks being open to the sea. At least 3 deep web frames and the watertight bulkhead between the upper wing ballast tanks were damaged. One scupper pipe was broken off in way of the number 4 upper wing ballast tank, leaving a 20 centimeter (8 inch) hole in the deck.

The handrails between frames 91-131 were either broken off or loosened. The accommodation ladder was also twisted and broken in the collision.

The forward portion of the boat deck between frames 31-43 was inset 30 centimeters (12 inches) from the deck edge. The deck was bowed and distorted. The embarkation light was missing and a navigation light stanchion and base was bent and displaced.

The upper deck between frames 34-40 was inset 30-45 centimeters (12-18 inches) with significant buckling of the deck plating. The weld along the deck to sideshell joint was fractured in way of the fuel oil tank. The diesel oil tank was also fractured at frame 31.

The sideshell was slightly inset and the plating scraped between frames 40-47.

There was no flooding or pollution as a result of this damage. Temporary repairs were completed with permanent repairs deferred by class. Damage was estimated at more than $1,000,000.

k. Sea Trials

The determination of the speed of the SAUDI MAKKAH was hampered by several factors:

> There were two different speed vs. RPM tables, one on the bridge console and one on the engineroom console, neither of which agreed with the table on the maneuvering characteristics posted on the bridge.

Engineroom bells were recorded on a paper tape by an automatic recorder located on the bridge. A manual bell log was not kept by the engineroom watch. There was conflicting testimony regarding whether the automatic bell recorder was recording engineroom orders or actual shaft RPM.

Although a Global Position System (GPS) receiver and Doppler speed log were available on the bridge, these devices were installed over the chart table in the rear of the bridge amidship, out of view of the conning position. Neither the pilot nor master consulted these devices, and relied exclusively on the engine RPM indicator on the bridge console.

The "fixes" plotted on the chart were recorded as the buoys passed abeam based on the ship's wall clock. The time was recorded to the most recent minute (i.e. rounded down, never up). Therefore the speed over the ground could not be accurately calculated based on the plotted fixes.

As a result of this conflicting evidence and due to the importance of speed as a causative factor in this casualty, a sea trial was conducted June 4, 1997 in Thimble Shoal Channel. The purpose of the sea trial was to verify the speed vs. RPM table and to determine whether the automatic bell recorder was recording engine orders or actual RPMs.

The Port Captain, Mr. Thomas Garrott, was present for the sea trial. He stated that no work other than routine maintenance had been completed to the vessel's propulsion or steering systems since the casualty. He also stated there had been no work performed on the bell recorder, speed log, GPS or RPM gauges since the casualty.

The following conditions were noted:

The engineroom RPM indicator was 2-3 RPMs higher than the mechanical shaft counter and this gauge occasionally stuck.

The bridge RPM indicator agreed with the mechanical shaft counter in the engineroom, (+) or (-) 1 RPM.

The speed vs. RPM table which had been found on the engineroom console was inaccurate. The speeds shown were significantly higher than the bridge speed vs. RPM table. The table was not replaced on the console after removal during the investigation.

The bridge speed vs. RPM table, which was prepared about one year ago using a hand-held digital GPS, was sufficiently accurate for navigation. This table was the one used to prepare the pilot card given to Captain Causey on March 12, 1997.

The automatic bell recorder does not record actual shaft RPMs. During the sea trial the RPMs recorded by this device were significantly lower than the actual RPMs read on the mechanical shaft counter.

During the sea trial the vessel's lines drawing was consulted to determine whether the hull form below the waterline aft was fully symmetrical. This review was undertaken because of speculation that the angled starboard stern ramp might affect the vessel's handling when the ramp is submerged due to the vessel's draft. Based on the drawing and a visual examination of the hull from a small boat, it was determined that the stern ramp would not be in contact with the water in any load condition. The hull form below the waterline is symmetrical.

1. Maneuverability of the SAUDI MAKKAH

During the investigation there was testimony and other evidence which alleged that the SAUDI MAKKAH and a sister vessel, the SAUDI RIYADH, had inherent maneuvering characteristics which contributed to this casualty.

Together the SAUDI MAKKAH and SAUDI RIYADH have made nearly 900 port calls in the U.S. The vessels have made numerous trips to Hampton Roads and transited both the Houston Ship Channel and C & D Canal, (significantly more challenging waterways than Thimble Shoal Channel), many times without incident. Of the three casualties documented in MSIS, none were related to the vessel's maneuverability. Further, neither Germanischer Lloyd (GL) or the Polski Rejestr Statkow (PRS), the vessel's present and former classification societies, has any record of casualty history related to the vessel's maneuverability. The post-casualty comment by the GL surveyor to the chief engineer that the SAUDI MAKKAH'S emergency steering gear "...was one of the fastest I'd ever seen..." has no bearing in this case. The steering was in the manual (emergency) mode during this test. The comment was an off-hand remark of no significance.

In addition to the two documented marine casualties previously discussed, the SAUDI MAKKAH was involved in a near miss while outbound in Thimble Shoal Channel on 9 August 1995. Captain John A. Jones, Virginia pilot, had the conn. Captain Jones testified that because of the wind he decided to cross the north auxiliary channel, ahead of the inbound loaded tank ship BONA SPRING, to make a lee for a shift to a Maryland pilot. He contacted the pilot on the tank ship, Captain Elias L. Guy, who agreed to the crossing. Captain Jones then gave a port 10 rudder command. According to Captain Jones, the SAUDI MAKKAH "...took off to the

left." He countered with starboard 20 degrees, and stated the SAUDI MAKKAH "...took off to the right." He countered with hard port, but the SAUDI MAKKAH continued to swing to the right, crossing Thimble Shoal Channel a second time ahead of the inbound tank ship. Captain Jones decided not to attempt any further rudder commands until he was well clear of the channel to the south, where he was able to bring the vessel under control. Captain Guy corroborated Captain Jones' testimony, describing in nearly identical detail the response of the SAUDI MAKKAH and the resultant "S" turn in front of his vessel. This incident was not reported to the Coast Guard, nor did Captain Jones share his experience with other members of the Virginia Pilots because there is no requirement or mechanism for sharing this type of information. Captain Jones testified that he commented on the incident to the Maryland Pilot that relieved him, who allegedly told him the Maryland Pilots had experienced that type of problem with these vessels in the Chesapeake & Delaware (C & D) Canal.

A letter dated April 20, 1995 signed by Captain Randall Bourgeois, Vice President of the Association of Maryland Pilots, to the operator of the SAUDI MAKKAH and SAUDI RIYADH, was offered as evidence by counsel for Captain Causey. The letter placed draft and trim restrictions on the vessels, which were intended to improve the vessels' handling when transiting the C & D Canal. Captain Bourgeois testified the letter was in response to concerns of their members about the handling characteristics of the vessels in the C & D Canal at slow speeds. Captain Bourgeois had piloted both vessels under their former names as Polish Ocean Lines (POL) vessels, both in the open waters of the Chesapeake Bay and the C & D Canal. He testified at length about his perception of these vessels' handling characteristics, calling the vessels "skittish" and specifically stating it was difficult to maintain the vessels in the center of the C & D Canal at slow speeds without "...extreme attention." The Maryland Pilots theorized the restrictions would permit more speed since there would be more water under the keel to account for squat. The letter also cited "hull configuration" as a reason for the restrictions. Captain Bourgeois stated this was based on "conjecture" by several members that the angled starboard side stern ramp was affecting the handling at deeper drafts. Captain Bourgeois also testified that the handling problems encountered by the Maryland Pilots were not reported to the Coast Guard or shared with other pilot associations.

Speculation that the angled stern ramp affects the vessel's maneuverability are unfounded. Such ramps exist on many vessels of this type. The stern ramp is never submerged when the vessel is underway at any draft, and the hull form below the waterline is symmetrical. The restrictions imposed by the Maryland Pilots for the C & D Canal, (a narrow, man-made canal with steep, nearly vertical banks), were based on complaints about slow speed handling, which was not the case here. Since the vessels have not transited the C & D Canal since imposition of the restrictions, it is not known whether the restrictions would have eliminated the problems experienced by the Maryland Pilots.

Five pilots testified during this investigation, three with experience on the SAUDI MAKKAH or the sister vessel SAUDI RIYADH. Although two pilots described the vessels as "lively" or "skittish," all five pilots testified they had piloted other vessels with similar characteristics. Four pilots mentioned the 1ST LT JOHN P. BOBO, and other vessels of that class, as being widely known as exceptionally responsive. Others mentioned the El Paso class of Liquified Flammable Gas tankers as vessels requiring special attention.

Mr. Ian S. Cairns, Vice President of Operations for North America for The National Shipping Company of Saudi Arabia, was called to testify with respect to the April 20, 1995 Maryland Pilots letter. Mr. Cairns was aware of the letter and its restrictions but had only joined the company ten months prior to the collision. He stated that the restriction was considered insignificant, since the usual draft on the SAUDI vessels upon departure from Baltimore precluded use of the C & D Canal. To his knowledge the vessels had not transited the C & D Canal since the restrictions were imposed, therefore he could not conclude whether the restrictions would have achieved the desired improvement in handling. To his knowledge the letter was not placed aboard the vessel, nor were the Maryland Pilots' concerns shared with other pilots during arrival briefings.

m. <u>The Overtaking Maneuver</u>

In <u>Shiphandling for the Mariner</u>, the author, Daniel H. MacElrevey, identifies planning ahead as key to shiphandling in a channel. "Understand ship behavior, properly reduce ship's speed...and, most important, think ahead of the ship so that she is reacting to your orders rather than your orders being given in reaction to the ship's behavior - these are the basics of excellent shiphandling." (47) The overtaking maneuver of the SAUDI MAKKAH was not properly planned or executed. The SAUDI MAKKAH commenced the maneuver from the main channel (50 feet of water) to the south auxiliary channel (31 feet of water) when it was too close to the TURTLE QUEEN and at an unsafe speed. Over the next 90 seconds Captain Causey gave 10 rudder commands, many following immediately upon the one before. The speed of the SAUDI MAKKAH and close proximity of the TURTLE QUEEN left no time and no room for the maneuver to be successful. "It takes time to start a swing, and it takes more time to stop the swing...After the rudder has been put hard over, the ship starts turning slowly, and it is only after the ship has swung through about 10 degrees that the turning motion picks up..." (Hoover, 31-35)

m. Danger Signal

The pilots and masters of the TURTLE QUEEN and SAUDI MAKKAH failed to sound the danger signal as required by Rule 34(c)(ii) and Rule 34(d) of the Inland Navigation Rules. When questioned on this issue, they raised several defenses:

> the danger signal was unnecessary because it would not have prevented the collision;
>
> the danger signal was unnecessary because the radio call notifying the TURTLE QUEEN that the SAUDI MAKKAH was not steering met the requirements for a danger signal; and
>
> sounding the danger signal might confuse the inbound USS GRASP and GLOBAL VICTORY.

These arguments are totally without merit. To accept these arguments one must assume the sounding of the danger signal is of benefit only to the parties involved. This is plainly not the case. The danger signal is intended to alert not only the vessels involved in a dangerous situation but nearby vessels as well. Although in this case the USS GRASP and GLOBAL VICTORY observed the developing close quarters situation and took early action to avoid collision, it cannot be assumed that every vessel in the area is aware of or capable of taking evasive action in time. The master of the TURTLE QUEEN was in doubt about the SAUDI MAKKAH'S intentions because his pilot failed to inform him of the overtaking agreement and because he failed to maintain an adequate lookout; under such circumstances the TURTLE QUEEN had a statutory responsibility to sound the danger signal, regardless of whether it could have prevented the casualty. "But it is clearly the duty of the overtaken vessel both in inland waters and on the high seas to sound the proper danger signal if she [sic] actually sees that collision is imminent." (Farwell, 314) [See also The Howard (CCA Md 1919) 256 F 987.] Further, the provision of the Rules which permits the use of the radiotelephone in lieu of sound signals does not apply to the danger signal. Finally, the Rules specify the danger signal as five or more short blasts (1-2 seconds duration) on the ship's whistle. This signal is intentionally distinct from any other in the Rules and cannot reasonably be expected to cause confusion.

n. Communications

Improper communications played a significant role in this casualty. There was no discussion between the pilots, or between the pilot and master of the SAUDI MAKKAH, of the potential for interaction between the vessels. The pilots did not discuss the location, speed or distance between vessels for the overtaking. In fact, after agreeing to the overtaking, the pilot of the TURTLE QUEEN did not know the SAUDI MAKKAH planned to overtake in the south auxiliary channel. Instead, he assumed the overtaking

would take place in the main channel on the TURTLE QUEEN'S port side, and later assumed the overtaking would not occur because of the inbound GLOBAL VICTORY. Both assumptions are prima facie evidence of the failure of the pilots to properly discuss the maneuver and communicate their intentions or concerns. Every overtaking in a narrow channel is dangerous; an overtaking agreement based only on assumptions is inexcusable.

The pilot of the TURTLE QUEEN failed to inform the master of his agreement to the overtaking. There is, however, no evidence to support the master's self-serving statement that he would have objected to the overtaking had he been apprised of the agreement. Nevertheless, Captain Rutter's failure to inform the master did not provide the master with the opportunity to object to the overtaking. Given the master's ultimate responsibility for his vessel's safety, the pilot has a responsibility to inform the master when he has agreed to a maneuver which will create a close quarters situation with another vessel.

o. Hydrodynamic Effects

All of the factors which contribute to interaction between vessels were present in this case: significant size, draft and speed differential and close proximity to each other and the bottom. The Bernoulli effect contributed to this casualty in two ways:

> First, the bank in the vicinity of Buoy "9" is steeper than at any other location in Thimble Shoal Channel, dropping off 5 feet over a distance of 50 feet. The contour of a bank governs the strength of suction. "Whenever the bank is straight up and down - like the wall of a lock - the suction is less than when the bank is sloping." (Plummer, 14) Due to the underkeel clearance of the SAUDI MAKKAH and its maneuver from deeper water toward the bank, it is likely there was some bank cushion enhancing the turn of the SAUDI MAKKAH to the left, toward the TURTLE QUEEN.
>
> Second, the water flow around the deep loaded TURTLE QUEEN created a pressure area at the bow and stern and an area of negative (suction) pressure near midship. This suction was greater than the bank cushion described above, and was a significant factor in this casualty.

Although the pilot of the SAUDI MAKKAH notified the pilot of the TURTLE QUEEN that his vessel was "...not steering," in fact the vessel did respond to the hard starboard command as evidenced by the swing of the stern to port, leading to the second impact. In assessing the vessel's response the pilot failed to consider rudder stall. "Stall is the same phenomenon encountered on an aerodynamic surface. It is the sudden discontinuity of lift on

the downstream surface of the rudder caused by an increasing angle of attack to the critical angle where separation occurs and when the normal flow pressures can no longer exist. [Rudder stall] inhibits, or occasionally, destroys the effectiveness of rudder action." (Gillmer, 155).

p. Speed

During the investigation, the speed over the ground of the SAUDI MAKKAH could not be accurately determined due to the manner in which the vessel's position was noted on the chart and discrepancies between testimony and the vessel's automatic bell recorder. However, there is evidence that the pilot of the SAUDI MAKKAH misjudged the vessel's speed, and was closer to the TURTLE QUEEN at the start of the maneuver into the south auxiliary channel than he had anticipated. The combination of this close proximity and the vessel's speed were factors in the Bernoulli effect.

There was no discussion of the potential for interaction between the vessels, nor did the pilot or master accurately determine the speed of the SAUDI MAKKAH. The master gave ten minutes notice to the engineroom for a reduction to 85 RPMs about 1700, and he testified that he observed the RPM indicator at 85 RPM before the maneuver commenced; however, neither the pilot nor master determined the vessel's actual speed over the ground despite having several different means to do so. "Overtaking in narrow channels is much more dangerous than passing. If it cannot be avoided, it should be done with reduced speeds only...Moreover, the effect on [the vessels] is anything but helpful, so that the only way to do it safely is to reduce the effects as much as possible by keeping the speed down." (Hoover, 95)

q. Lookout Duties

Although the master, chief officer, second officer and helmsman of the TURTLE QUEEN all testified that their duties included serving as a lookout, only the master was aware of the SAUDI MAKKAH astern of his vessel. Between the time he first saw the SAUDI MAKKAH, more than one mile astern, and the time he saw the foremast of the SAUDI MAKKAH, the master and other ship's officers devoted their entire attention to the meeting situation with the approaching GLOBAL VICTORY. The master did not assign anyone to maintain a visual or radar watch on the approaching SAUDI MAKKAH.

CONCLUSIONS

The cause of this casualty was negligence on the part of the pilot and master of the SAUDI MAKKAH. The overtaking maneuver was unnecessary, poorly planned and executed in an unseamanlike manner.

The SAUDI MAKKAH failed to keep out of the way of the TURTLE QUEEN as required by Rule 13 of the Inland Navigation Rules.

The TURTLE QUEEN maintained course and speed while being overtaken.

At the time of the collision, the speed of the TURTLE QUEEN, including the effect of the ebb tide, was 10-11 knots.

At the time of the collision, the speed of the SAUDI MAKKAH, including the effect of the ebb tide, was at least 14 knots.

The SAUDI MAKKAH struck the TURTLE QUEEN nearly midship. This is directly attributable to the Bernoulli (suction) effect.

The propulsion, steering and navigation equipment on the SAUDI MAKKAH and TURTLE QUEEN operated properly. There were no equipment failures that contributed to this casualty.

The SAUDI MAKKAH responded properly and as should have been expected to the rudder commands given by the pilot. Captain Causey's on-the-spot conclusion that the vessel was not steering was incorrect. The vessel was, in fact, responding. There simply was not enough time and distance for the vessel to respond completely before the collision.

There is insufficient evidence to support claims of an inherent design flaw affecting the maneuvering characteristics of the SAUDI MAKKAH and SAUDI RIYADH.

The overtaking maneuver was unnecessary. The SAUDI MAKKAH could have reduced speed and remained behind the TURTLE QUEEN without resulting in a delay to the vessel. Had the maneuver been successful, the SAUDI MAKKAH intended to remain in the south auxiliary channel, and reduce speed to shift to a Maryland Pilot. During this time the TURTLE QUEEN would have overtaken the SAUDI MAKKAH.

Improper communications contributed to this casualty. Specifically, the pilot of the TURTLE QUEEN agreed to the overtaking even though he did not understand the intentions of the SAUDI MAKKAH. In addition, he failed to inform the TURTLE QUEEN'S master that he had agreed to the overtaking.

When properly planned and executed, overtakings involving vessels of the size, draft and type of the TURTLE QUEEN and SAUDI MAKKAH can be safely accomplished anywhere in Thimble Shoal Channel, including the vicinity of the CBBT.

The TURTLE QUEEN failed to maintain a proper lookout as required by Rule 5 of the Inland Navigation Rules. Had a proper lookout been maintained, the master would likely have learned of the SAUDI MAKKAH'S intention to overtake sooner and could have sounded the danger signal to indicate his doubt about the SAUDI MAKKAH'S intentions.

The pilots and masters of the TURTLE QUEEN and SAUDI MAKKAH failed to sound the danger signal as required by Rule 34(c)(ii) and Rule 34(d) of the Inland Navigation Rules.

The SAUDI MAKKAH and SAUDI RIYADH are not equipped with rate of turn indicators, nor are they required by SOLAS, U.S. or class rules. Although these indicators would not have prevented this casualty, they would be beneficial to pilots who lack experience on these vessels.

The course recorders on both vessels and the bell recorder on the TURTLE QUEEN were very helpful in this investigation. The SAUDI MAKKAH'S bell recorder could not be reliably used because the RPMs recorded did not agree with the actual shaft RPMs.

There is no U.S. regulation or SOLAS requirement that vessels be equipped with course recorders or bell recorders, or that these devices be used in pilot waters where installed. Had these devices not been operating on the TURTLE QUEEN and SAUDI MAKKAH the investigation would have been severely hampered.

There is no U.S. regulation or SOLAS requirement that vessels equipped with echo depth sounder recorders operate these devices in U.S. waters. Had the SAUDI MAKKAH'S depth recorder been operating the record would have been helpful in this investigation.

The Virginia Pilots do not have a system for pilots to share information regarding the handling characteristics of vessels. If such a system existed, it is possible that the near miss involving the SAUDI MAKKAH in August, 1995 would have been reported and known to other pilots. Such information may be helpful to pilots in deciding whether to undertake certain maneuvers with a particular vessel, such as overtaking.

There is no regulation requiring reporting of near miss casualties and no voluntary system for reporting or tracking near misses to the Coast Guard. If such a system existed, it is likely that the near miss involving the SAUDI MAKKAH in August, 1995 would have been reported to the Coast Guard. Such information can be just as important as investigations of actual casualties in conducting port risk assessments. The information could also be shared with the marine community to assist in reducing marine casualties.

The Coast Guard has an open and effective partnership with the Virginia Pilots in the Port of Hampton Roads; however, MSO Hampton Roads has not met with the "Pilots Focus Group" since 1993. These forums provide an opportunity for pilots and the Coast Guard to communicate freely and openly about issues of concern, including topics such as near miss reporting.

The actions of the Commanding Officer of the USS GRASP and the pilot of the GLOBAL VICTORY in taking effective, early action to avoid a collision are commendable.

The pilots of the SAUDI MAKKAH and TURTLE QUEEN were acting under the authority of their duly issued state licenses. The agency responsible for oversight is the Commonwealth of Virginia Department of Professional and Occupational Regulation.

All aids to navigation in the vicinity of the collision were on station and watching properly.

Weather did not contribute to this casualty.

The tidal current did not contribute to this casualty.

Fatigue did not contribute to this casualty.

The use of drugs did not contribute to this casualty.

There is no evidence that alcohol contributed to this casualty. Although the Coast Guard failed to require post-casualty alcohol testing in a timely manner and was unprepared to administer field sobriety or alcohol breath tests, Coast Guard personnel had contact with the involved vessel crewmembers within a short period after the collision and detected no evidence of alcohol use.

Except as noted above, there is no evidence of actionable misconduct, negligence, inattention to duty, or willful violation of law or regulation on the part of any licensed or certificated persons, nor evidence that any material failure, nor evidence that any personnel of the Coast Guard, or any other government agency, or any other person contributed to this casualty.

RECOMMENDATIONS

1. That a copy of this report, once approved, be forwarded to the governments of Panama and Saudi Arabia for action, as deemed appropriate, regarding the roles of the masters of the TURTLE QUEEN and SAUDI MAKKAH.

2. That a copy of this report, once approved, be forwarded to the Virginia Department of Professional and Occupational Regulation for action, as deemed appropriate, regarding the roles of the pilots of the TURTLE QUEEN and SAUDI MAKKAH.

3. That a copy of this report, once approved, be provided to all parties-in-interest so that they may take appropriate action to address the conclusions and recommendations in this report.

4. That civil penalty action be initiated against Captain Leighton E. Causey, Jr., pilot of the SAUDI MAKKAH, for negligence and for violating the Inland Navigation Rules.

5. That civil penalty action be initiated against The National Shipping Company of Saudi Arabia, operators of the SAUDI MAKKAH, for negligence and for violating the Inland Navigation Rules.

6. That civil penalty action be initiated against Captain Thomas D. Rutter, pilot of the TURTLE QUEEN, for violating the Inland Navigation Rules.

7. That civil penalty action be initiated against Shinwa Kaiun Kaisha Ltd., operators of the TURTLE QUEEN, for violating the Inland Navigation Rules.

8. That The National Shipping Company of Saudi Arabia install rate of turn indicators on the SAUDI MAKKAH and SAUDI RIYADH.

9. That the Virginia Pilots establish a formal system for sharing information about a vessel's maneuvering characteristics within their organization.

10. That Marine Safety Office Hampton Roads hold meetings with the membership of the Virginia, Maryland and Federal pilots at least annually.

11. That Marine Safety Office Hampton Roads revise the Quick Response Cards (QRC) used by the MOOD to ensure that post-casualty drug and alcohol tests are conducted by either the marine employer or Coast Guard in cases where a casualty is, or is likely to become, a Serious Marine Incident.

12. That Marine Safety Office Hampton Roads ensure that all IOs are qualified and equipped to conduct field sobriety and breath testing. MOODs should be trained in the requirements for post-casualty drug and alcohol testing in cases where a casualty is, or is likely to become, a Serious Marine Incident.

13. That the Coast Guard establish a voluntary near miss reporting system to complement data gathered in casualty investigations. This can be accomplished through existing partnerships with industry organizations such as the American Waterways Operators, American Pilots Association and Passenger Vessel Association.

14. That the Coast Guard initiate rulemaking to revise 33 CFR Part 164 to require the use of course recorders, bell recorders and echo depth sounder recorders, where installed, while vessels are navigating in U.S. waters.

J. R. CROOKS, JR.