



# **NATIONAL TRANSPORTATION SAFETY BOARD**

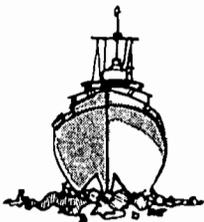
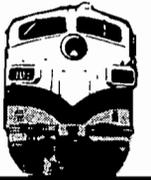
WASHINGTON, D.C. 20594

## **MARINE ACCIDENT REPORT**

**COLLISION OF AMERICAN CONTAINERSHIP  
SS SEA-LAND VENTURE AND DANISH  
TANKER M/T NELLY MAERSK  
INNER BAR CHANNEL  
GALVESTON, TEXAS  
AUGUST 27, 1978**

**NTSB-MAR-79-16**

**UNITED STATES GOVERNMENT**



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MARINE ACCIDENT REPORT

Adopted: September 27, 1979

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COLLISION OF  
AMERICAN CONTAINERSHIP SS SEA-LAND VENTURE  
AND DANISH TANKER M/T NELLY MAERSK  
INNER BAR CHANNEL, GALVESTON, TEXAS  
AUGUST 27, 1978

INTRODUCTION

This accident was investigated jointly by the National Transportation Safety Board and the U.S. Coast Guard. A formal investigation was convened in Galveston, Texas, on August 30, 1978. This report is based on factual information and testimony developed in the investigation. The Safety Board has considered all facts pertinent to the Safety Board's statutory responsibility to determine the cause or probable cause of the accident and to make recommendations.

The Safety Board's recommendations are made independently of any recommendations proposed by the Coast Guard. To assure public knowledge of all Safety Board recommendations and responses, all such recommendations and responses are published in the Federal Register.

SYNOPSIS

About 0340 c.d.t., <sup>1/</sup> on August 27, 1978, the American containership SS SEA-LAND VENTURE collided with the Danish tanker M/T NELLY MAERSK when the SEA-LAND VENTURE attempted to overtake the NELLY MAERSK in the Galveston-Houston Ship Channel. There were no injuries or deaths. Damage to the vessels was estimated at \$1.4 million.

The National Transportation Safety Board determines that the probable cause of the accident was the inaccurate evaluation of the closing rate and late initiation of the rudder order by the pilot of the SEA-LAND VENTURE while attempting to overtake the NELLY MAERSK at a bend in a narrow channel where the risk of collision was much greater than in a straight portion of the channel.

1/ All times herein are central daylight time based on the 24-hour clock.

## INVESTIGATION

### The Accident

On August 27, 1978, the Danish tanker M/T NELLY MAERSK was proceeding 1 mile off the Galveston sea buoy and slowed to embark a pilot at 0305. The tanker, loaded with medium crude oil, was en route from Marsa al Hariga, Libya, to Deer Park, Houston, Texas. At 0312, the vessel proceeded to the Galveston Bay Entrance Channel with the pilot, master, first officer, helmsman, and an apprentice seaman in the wheelhouse. It entered the channel at full speed ahead at 13 kns on course 301° T. The pilot took charge of the navigation of the vessel at the sea buoy.

Shortly after the pilot boarded the tanker, the master told him that the draft was 40 ft 1 in. forward and aft, that the engine was on bridge control, and that there were no problems with steering. He also explained the "curves of squat effect" for the vessel, which showed the effect of speed on the vessel's draft in open and confined (shallow) waters.

The wheelhouse of the vessel contained a VHF radiotelephone with two speakers -- one monitoring channel 12 (communications with Houston Vessel Traffic Service (VTS) and the other monitoring channel 16 (distress, safety, and calling). The pilot had a portable radiotelephone which he used intermittently on channel 13 (bridge-to-bridge navigation safety) for communications with other ships' pilots. The vessel could have monitored channel 13 by using a portable radiotelephone or by substituting channel 13 for channel 16, which is not required to be monitored by foreign vessels, but did neither. The master relied on the pilot to relay any communications he received.

The pilot was voluntarily participating in the Houston-Galveston VTS. He had informed Houston VTS of his arrival at the sea buoy, reported the vessel's draft, and had given other information required by the service. Houston VTS then informed the pilot of the inbound and outbound traffic in the channel.

At 0310, a pilot embarked on the U.S. containership SEA-LAND VENTURE when the vessel was 2 miles from the sea buoy; the destination of the vessel was City Dock 16, upstream from Deer Park. The pilot, master, third mate, and quartermaster were on the bridge. The vessel was on engine room control, and the engine order telegraph was in use. The SEA-LAND VENTURE, loaded with containers, was at an average draft of 29 ft. The pilot had ordered turns for about 12 kns to cross the approach to Galveston Bay Entrance Channel where a strong current was setting southwesterly. He reported to Houston VTS and received the traffic summary. The helmsman was steering gyrocompass courses. 2/ There was zero gyro error.

When the pilot came aboard, the master discussed the vessel's handling capabilities, the draft, and the particulars of the ship, including present course

2/ Steering by gyrocompass courses is the usual mode of steering for the watches at sea. It allows the helmsman to use as much rudder as he thinks is necessary to keep the vessel on course.

and speed. He told him he had no problems with the vessel, but he did not tell him about a "built-in" lag which he thought the rudder angle indicator had. At that time, the NELLY MAERSK was 1 1/2 miles ahead of the SEA-LAND VENTURE.

While waiting on the pilot boat, the pilots of each vessel had agreed that the SEA-LAND VENTURE would overtake the NELLY MAERSK whenever the vessels caught up with each other but before reaching the end of the 800-ft channel where it narrowed to a 400-ft width about 8 nmi upstream. They had agreed that when the SEA-LAND VENTURE caught up with the NELLY MAERSK, the NELLY MAERSK would slow down and give the SEA-LAND VENTURE plenty of room to pass. The pilots had made the agreement so that the SEA-LAND VENTURE would not be delayed while the NELLY MAERSK was being berthed downstream from the SEA-LAND VENTURE's destination.

At 0325 when the NELLY MAERSK was between buoys No. 5 and No. 6, the master noticed the SEA-LAND VENTURE astern. At 0331 when the NELLY MAERSK was between buoys No. 7 and No. 8 and was entering Outer Bar Channel from Galveston Bay Entrance Channel, the pilot changed course at the bend to 282.5° T, the charted channel course, and reduced the speed to half ahead, or 10 kns. The distance to the next bend between buoys No. 9 and No. 10 was 1.4 nmi. At 0332, the vessel's speed was reduced further to slow ahead, or 7 kns, and was not changed until full ahead was ordered about a minute before the collision. The pilot on the NELLY MAERSK informed the pilot on the SEA-LAND VENTURE of this speed change. While standing on the port wing of the bridge, the master of the NELLY MAERSK became aware that the SEA-LAND VENTURE was going to overtake his vessel.

At the channel entrance, the pilot of the SEA-LAND VENTURE increased the speed to about 13.5 kns to overtake the NELLY MAERSK and continued on gyrocompass courses up the channel. He used rudder angle orders at 0335 when his vessel was between buoys No. 7 and No. 8 at the turn into Outer Bar Channel but then resumed using gyrocompass courses.

As the NELLY MAERSK approached the bend into Inner Bar Channel and the SEA-LAND VENTURE was astern about 1/2 mile, a two-whistle exchange was made between the vessels. It was intended that the SEA-LAND VENTURE would pass on the portside of the NELLY MAERSK. There were no other vessels in the area which would interfere with the maneuver.

At 0338, the NELLY MAERSK entered the Inner Bar Channel and began the left turn to 266° T, the new channel course. The bow of the overtaking SEA-LAND VENTURE was then about 200 yards astern.

As the SEA-LAND VENTURE entered between buoys No. 9 and No. 10 with the stern a little left of the centerline of the channel and the bow to the right of the centerline, the pilot ordered left 20° rudder. The quartermaster acknowledged the command by repeating the order, which was heard by both the master and third mate, and he testified that he began turning the steering wheel left slowly. The vessel's speed was still at 13.5 kns with the separation between the vessels closing fast. After a few seconds, the pilot said that he saw the rudder angle indicator at

10° right and going to the right. He told the quartermaster that he was "going the wrong way" and then yelled for him to come "hard left." The quartermaster testified that at the "hard left" order he was turning the wheel left slowly in execution of the previous left 20° rudder order. The rudder angle indicator was coming left and showed 6° right just as he spun the wheel for "hard left."

The pilot on the NELLY MAERSK called to ask if the SEA-LAND VENTURE's pilot was able to turn and what he was going to do. As the vessels closed to 200 ft apart with the bow of the SEA-LAND VENTURE swinging left, the pilot of the SEA-LAND VENTURE informed the NELLY MAERSK that the quartermaster had put the rudder the wrong way and that he had just ordered "back full." The pilot then yelled on his portable radiotelephone to the pilot of the NELLY MAERSK to go ahead full. At the time, the NELLY MAERSK was already ahead full; it was just beyond the bend on heading 269° T and was steadying on the new channel course. The NELLY MAERSK's pilot stopped the engine just before the collision at 0340 as both vessels blew the danger signal on their whistles. When the pilot of the SEA-LAND VENTURE realized that he was not going to clear, he ordered the rudder to be shifted to right full to assist the transverse thrust effect of the propeller. In the ahead mode, the propeller was right-turning and when reversed would have moved the stern to the left. The avoidance tactics failed, and the pilot estimated that the forward speed of the SEA-LAND VENTURE was 11 kns as she struck the NELLY MAERSK on the port quarter. About 1 minute elapsed from the time the pilot ordered left 20° rudder to collision. (See figure 1.)

As a result of the collision, the NELLY MAERSK could not steer because it was pivoted to the left off the bow of the SEA-LAND VENTURE and grounded in the left bank of the channel on a heading of 180° T, 1,000 ft from buoys No. 9 and No. 10. The NELLY MAERSK anchored, and the crewmembers began an investigation of the damage. After the collision, the SEA-LAND VENTURE veered to the right and crossed the channel to Bolivar Roads Anchorage, where it anchored at 0346 in 31 ft of water.

Houston VTS was informed of the collision by the pilot on the NELLY MAERSK, and the channel was closed by the Captain of the Port at Galveston. The channel was opened at 0446.

#### Events Preceding the Accident

The pilot on the NELLY MAERSK testified that the vessel did not go aground anytime as it proceeded up the channel. The fathometer was working accurately and recorded 6 ft or more water under the keel from the channel entrance to the collision area. The vessel had two transducers: one forward or 15 meters (49 ft) aft of the bow and the other the same distance from the stern. A selector switch at the recorder was used to check the readings from both locations.

The master of the NELLY MAERSK had anticipated that the overtaking would take place above the turn into Inner Bar Channel in the 1 1/2-mile stretch above buoys No. 9 and No. 10. He did not know that the pilots of each vessel had discussed the overtaking plan when they were waiting on the pilot boat, and he had not heard them discussing the overtaking agreement over their radiotelephones.



Before the left 20° rudder order, the quartermaster of the SEA-LAND VENTURE had been steering a gyrocompass course and testified that he was at about 10° right rudder to maintain the course. He testified that when he executed the left 20° rudder, he turned the wheel slowly to the left because he wanted to give the rudder a chance to catch up to his left turning of the wheel. He further testified that the SEA-LAND VENTURE was a good steering ship but that the rudder angle indicator was not accurate; it was slow to react by about 3°.

The pilot of the SEA-LAND VENTURE testified that previously he had piloted a sister ship of the SEA-LAND VENTURE and that he found no peculiarities in the steering and piloting of the SEA-LAND VENTURE before reaching the Inner Bar Channel.

The master of the SEA-LAND VENTURE had overheard all of the conversations between the two pilots and was aware of the overtaking agreement. He assumed that the overtaking would take place in the Inner Bar Channel because the NELLY MAERSK was too far ahead to accomplish it in the Outer Bar Channel. He was 12 ft from the pilot and could hear his orders clearly. When the quartermaster was steering gyrocompass course 282° T and as the vessel was approaching buoys No. 9 and No. 10, the master was anticipating the pilot's order for left 20° rudder. About 3 seconds after he heard the pilot's order and after he heard the quartermaster repeat it, the master saw the rudder angle indicator registering 10° right and going to the right, and he shouted "left" just as the pilot ordered "hard left." It was too dark for the master to see any movements of the quartermaster at the wheel. After hearing the hard left order, the master's immediate interest was in slowing the vessel. As he was walking to the engine order telegraph to ring up full astern, he heard the pilot give the order, which was carried out by the third mate. The engine backed for less than a minute before the collision.

The master of the SEA-LAND VENTURE testified that his first indication of a problem was when he became aware that the rate of closing between the two vessels was suddenly increasing as the SEA-LAND VENTURE entered the Inner Bar Channel. He said it appeared to him that the NELLY MAERSK had almost come to a stop as she rounded the bend.

The master of the SEA-LAND VENTURE did not formally relieve the pilot of the navigation of the ship although he could have done so had he had any apprehension concerning the overtaking. There does not appear to have been any clear-cut basis for concern prior to the increase in closing rate during the overtaking maneuver at the bend because passing whistle signals had been exchanged. When it became clear there was a problem, the pilot was already reacting to the hazard in the manner the master was in the process of undertaking, viz: repeating the rudder order and ordering full speed astern.

The third mate, who was 5 ft 4 1/2 in tall, was standing at the rear of the wheelhouse about 14 ft from the forward bulkhead and could not see out the windows. He was near the engine order telegraph awaiting orders from the pilot and was only about 6 ft from the pilot and quartermaster. It was dark and although he could not see the wheel or any movements made by the quartermaster, he saw the rudder angle indicator at 10° right with increasing movement to the right

just before the pilot ordered "hard left." He testified that at this command the rudder angle indicator came left "pretty fast."

#### Injuries to Persons

There were no injuries.

#### Damage to Vessels

Damage to the SEA-LAND VENTURE consisted of a crushed stem, a torn and buckled forward bulwark, torn and distorted deck plates, and punctured, torn, and cracked bow shell plates. The damage extended aft from the stem about 100 ft and was estimated to amount to \$400,000.

The damage on the NELLY MAERSK was aft of the cargo tanks. All four decks of the after deckhouse on the portside were crushed for 40 ft, and along the hull the side shell plates above the waterline were buckled and pushed inboard. The damage was estimated at \$1 million. There was no oil pollution.

#### Crew Information

The NELLY MAERSK was manned by a Danish crew of 24; all were properly licensed or documented. Both the master and first mate were fluent in the English language. The SEA-LAND VENTURE was manned by an American crew of 38; all were properly licensed or documented. (See appendix A.)

#### Vessel Information

The NELLY MAERSK was a Danish tanker owned and operated by A.P. Moller. The vessel was of steel construction, 811 ft long, 105 ft wide, 57 ft deep, 29,027.7 net tons, 39,279.7 gross tons, and 68,400 tons deadweight (dwt). It was diesel-propelled with 16,800 horsepower for a maximum speed of 16.5 kns. The ship was built in the Lindoe Shipyard, Denmark, in 1978.

The SEA-LAND VENTURE was a containership owned by the Reynolds Leasing Corporation and operated by Sea-Land Services, Inc.; it was registered under the American flag. The ship was built in Vegesack, Germany, in 1970 of welded steel construction, 721 ft long, 97 ft wide, 64 ft deep, 16,205 net tons, 24,773 gross tons, and 37,340 tons dwt. It was propelled by a steam turbine engine and had a maximum speed of 22 kns. The SEA-LAND VENTURE was classed by the American Bureau of Shipping (ABS) and had all the required international safety certificates. The vessel's bridge was forward, and there were containers stacked forward of the wheelhouse. With the containers in place, the designed line of sight forward from the wheelhouse windows to the water was about 270 ft measured horizontally out from the intersection of the waterline and the stem.

Both vessels were equipped with the navigation and communication devices normally found on large oceangoing ships. The equipment included VHF bridge-to-bridge radiotelephone, radiotelegraph, radio direction finder, depth sounder, gyrocompass, radars, and engine loggers. The SEA-LAND VENTURE had a gyro heading recorder. All of this equipment was operable at the time of the collision.

The master of the SEA-LAND VENTURE testified that for 2 1/2 years it was common knowledge that the rudder angle indicator had a "built-in" lag. It recorded the rudder position a few degrees behind the actual rudder angle reported by his engineers. He further testified that the rudder angle indicator could have indicated 10° right and going right slowly when the quartermaster had just changed from compass course orders to rudder orders. He thought that the rudder could have been right slightly more than 10° and moving right when the left 20° rudder was ordered, and the slow turning of the wheel to answer the order could have started the rudder moving left, although the rudder angle indicator showed it moving right. He added that the delay of the indicator would depend on how fast the wheel was turned left. The slower the wheel was turned left, the greater would be the delay of the rudder angle indicator to coincide with the wheel indicator and the rudder position. Had the wheel been spun rapidly to left 20° rudder, little or no lag would have been seen. The master also testified that he did not think the ship was swinging to the right before the ships collided. For the vessel to start swinging to either side, the master stated that the wheel had to be held for quite awhile on one side.

#### Waterway Information

The Inner Bar Channel, is part of the Galveston-Houston Ship Channel which extends from Galveston Harbor to Houston, Texas; it is about 44 miles long and is maintained by the U.S. Army Corps of Engineers. Based on the Corps of Engineers Report of August 1, 1978, the following information is provided:

<u>Channel</u>	<u>Date of Survey</u>	<u>Dredged Dimensions</u> <sup>3/</sup>		
		<u>Width (ft)</u>	<u>Length (nmi)</u>	<u>Depth (ft)</u>
Galveston Bay:				
Entrance Channel	8-78	800	4.2	42
Outer Bar Channel	8-78	800	1.4	42
Inner Bar Channel	8-78	800	2.4	40

#### 3/ Gulf Coast Low Water Datum

The National Oceanic and Atmospheric Administration, National Ocean Survey, Galveston Bay Entrance Chart No. 11324 is used to navigate the area of the accident.

#### Vessel Traffic Service

The Houston-Galveston VTS is a voluntary vessel movement reporting system operated by the Coast Guard. The service uses a VHF-FM communication network manned continuously by personnel in the Coast Guard Vessel Traffic Center (VTC) in Houston, Texas. The center processes information received from vessels and disseminates this information to other participating vessels operating in the VTS area. Channel 12 (156.60 MHz) is the designated radiotelephone frequency. VTC

maintains a continuous guard on this frequency and on VHF-FM channel 13 (156.65 MHz), the bridge-to-bridge navigation safety frequency. Both the SEA-LAND VENTURE and NELLY MAERSK were participating in the system.

The Coast Guard monitors radar which scans the Galveston Bay area, including the Inner Bar Channel. The electronic surveillance is intended to confirm reports of the users of the service; it is not a tracking radar. In their initial reports, both vessels were required to inform the Houston VTS of their names, types, positions, destinations, drafts, lengths, beams, and anticipated average speeds. Houston VTS responded by giving both vessels a traffic summary of all ships and tows in their general area of transit.

The Coast Guard was aware of the overtaking maneuver of the SEA-LAND VENTURE through the continuous guard maintained on channels 12 and 13, which the pilots used to make reports to VTS and to talk between themselves. In addition, the Coast Guard had radar available to detect the maneuver. Even though Houston-Galveston VTC is a manned station with electronic surveillance and communication equipment, it is not charged with controlling maneuvers of vessels in the channels.

#### Environmental Conditions

When the SEA-LAND VENTURE and the NELLY MAERSK collided, the ambient temperature was 84° F, the wind was from the east-southeast at 8 kns, the atmosphere was clear -- visibility more than 10 nmi -- and the channel waters were smooth. The tide which has a diurnal range of 1.3 ft was flooding about 1 kn. There was a crescentic moon at an azimuth of about 080° T and 20° altitude.

#### Tests and Research

On August 31, 1978, Coast Guard inspectors tested the steering system on the SEA-LAND VENTURE and found no significant lag in the rudder angle indicator or in the steering system. Comparison readings were taken simultaneously of the actual position of the rudder in the steering gear room and the rudder angle indicator on the bridge for various movements of the helm. The test was made under no-load conditions with the vessel moored alongside a dock in Galveston, Texas. No tests were conducted with the vessel underway.

A graphic presentation of the gyro headings as recorded on the SEA-LAND VENTURE's course recorder corroborated the testimony of the quartermaster that he executed no turns to starboard just before the collision. The graph indicated that for 1.5 minutes before the collision, the vessel turned left in a steady turn from 281° T to 263° T, the approximate courses for the Outer Bar and Inner Bar Channels. According to the graph, for 2.2 minutes before this turn from Outer Bar to Inner Bar Channel was started, the vessel had maintained an average heading of 280° T with a variation of only +1° and -2° while transiting the Outer Bar Channel. The turn into Outer Bar Channel from Galveston Bay Entrance Channel to course 282° T from 304° T was made in 3.7 minutes. From the channel entrance until after the collision, there were no unusual heading changes to starboard.

## ANALYSIS

### The Collision

While the NELLY MAERSK was being overtaken, it made no maneuvers to confuse the SEA-LAND VENTURE, the overtaking vessel. The NELLY MAERSK had reduced its speed to about 7 kns in advance of the bend into Inner Bar Channel, was steadying its course before the collision, and was to the right of the center of the channel.

The sudden increase in closing rate between the two vessels just before the bend should not have been a surprise to an experienced pilot. The pilot on the SEA-LAND VENTURE should have anticipated the change in closing rate. He knew that the pilot of the NELLY MAERSK had planned to reduce its speed in the straight portion of Outer Bar Channel, and moreover, he should have realized that a vessel making a turn would be slowed further. The pilots of both vessels had been in communication with each other by portable radiotelephone so each was aware of the other's intentions.

The pilot on the SEA-LAND VENTURE did not reduce his speed before the turn into Inner Bar Channel until seconds before the collision. He testified that he "felt committed" to make the turn at 13.5 kns and not slow down for "fear of loss of steerage." The Safety Board believes that the pilot misjudged the effect of his overtaking speed at the bend into Inner Bar Channel. The Safety Board concludes that he had two alternatives: He could have slowed, made his turn, and then overtaken the NELLY MAERSK in the Inner Bar Channel, or he could have slowed and crossed her stern by steering to starboard and anchoring to the right of the channel. Because he chose instead to attempt to pass the NELLY MAERSK on the inside of the bend at a speed of 13.5 kns, he made an unwise and ultimately an unsafe decision that resulted in the collision.

It was normal for the quartermaster to steer by gyrocompass course as the SEA-LAND VENTURE proceeded up the Galveston Bay Entrance Channel, since this was the usual mode of steering for the watches at sea. Usually the amount of rudder varies inversely with the speed of the vessel. For 21 kns, the quartermaster testified he needed only 3° to 5°, but for 13.5 kns, he had to use slightly more than 10° rudder.

At each bend in the Galveston Bay Entrance Channel, the pilot of the SEA-LAND VENTURE used rudder angle orders. Rudder angle orders are executed by turning the wheel or helm right or left to a specified angle up to 35° depending on the order. It can be done quickly or slowly and this instruction is sometimes added to the order. The quartermaster testified that he heard only the left 20° rudder order for the turn into Inner Bar Channel and then he came left slowly on the wheel so that the rudder could "catch up." He had been steering a compass course of 282° T, and the helm and rudder angle indicator probably were at more than 10° right and going right at the time he got the rudder order. The pilot saw 10° right and going right slowly as he looked up at the rudder angle indicator only seconds after giving the order. The lag of the rudder angle indicator caused the indicator to show right 10° rudder even though the quartermaster now had his wheel moving slowly left to comply with the left 20° rudder order. Therefore, the pilot of the

SEA-LAND VENTURE thought that the wheel had been turned in the wrong direction. Convinced that there had been a slow response to his command, he ordered a desperate sequence of actions for helm and engine order telegraph. However, there was too little time available for any action to be effective in avoiding the collision.

Based on the information provided by the graph of the gyro headings from the course recorder, the Safety Board determined that the quartermaster did not put his helm in the wrong direction just before the collision. The graph indicated that for 2.2 minutes before the left turn began the gyro heading averaged  $280^{\circ}\text{T}$  with a variation of  $+1^{\circ}$  and  $-2^{\circ}$ . The left turn was then made for 1.5 minutes from a gyro heading of  $281^{\circ}$  to  $263^{\circ}\text{T}$ , the final heading at collision.

The Safety Board notes that in addition to the evidence previously cited regarding the maneuvering of the SEA-LAND VENTURE, the master of the NELLY MAERSK asserted that he and his pilot believed that the SEA-LAND VENTURE veered to starboard shortly before the collision. The Safety Board has carefully considered all of the evidence and believes that the helmsman's version of the events is inherently credible and that it is corroborated by the only objective evidence in the record -- the ship's course recorder trace. However, even if the helmsman responded slowly to the rudder command or in fact momentarily put the rudder over to starboard, either action would not have led inevitably to the collision if allowance had been made for steering errors. Moreover, close supervision of the helmsman should have promptly detected and corrected either error. A decision to undertake a maneuver at close quarters, particularly when alternative maneuvers are available, must be made in consideration of what could go awry rather than in the expectation that all will go well.

Although the NELLY MAERSK's engine was ordered to full ahead a minute before the collision and then brought to stop just as she was struck, the speed changes had no effect on the collision. The vessel had been at slow ahead and was beginning to accelerate to full speed ahead, but no significant change in speed was attained in time to avoid the collision. Full power could not have been applied for more than 1/2 minute due to the normal lag in the execution of the order.

The shift of the rudder from port to starboard by the pilot on the SEA-LAND VENTURE when the propeller was backing just before the collision had the effect of sheering the vessel to starboard after it became disengaged from the NELLY MAERSK. The vessel still had about 11 kns headway at collision even with her engines backing full so the rudder shift to starboard was not effective in swinging the bow to port away from the stern of the NELLY MAERSK. With headway, the rudder caused the bow to swing to the right after the two ships separated.

#### Rudder Orders

The quartermaster at the wheel of the SEA-LAND VENTURE repeated each rudder order to the pilot just as he heard it. This seamanlike practice assured the pilot that his order was understood. The quartermaster then executed the order; however, he did not inform the pilot when the order was completed. Had the quartermaster reported the completion of each order to the pilot, it would have provided the pilot confirmation of when the rudder had reached its proper position; it would have given him some indication of the speed of rudder response; and it

might have allowed an early discovery of a wrong rudder application. The Safety Board believes that this practice should be carried out for all rudder orders to helmsmen by ship's masters, pilots, and deck officers when they have the ship's conn.

#### Master—Pilot Relationship

The master-pilot relationship on each vessel was not ideal. The pilots had agreed on the overtaking maneuver while they were waiting on the pilot boat and had discussed the maneuver over their VHF radiotelephones. The masters were not made aware of the details of the plan. Both pilots should have conferred with their respective masters well in advance of the plan's execution so that each master could have evaluated the merits of the plan and modified it if he thought it necessary. The master of the SEA-LAND VENTURE should have discussed his thoughts about the "built-in" lag of the rudder angle indicator with his pilot. If the lag was a significant factor as the master believed, and if the pilot had been told about it, the pilot may not have attempted to overtake the NELLY MAERSK at the bend. The Safety Board has issued two recommendations to the Coast Guard related to the need for a master-pilot conference to take place before initiating maneuvers. (See appendix B.) These recommendations were reiterated in a recent Safety Board accident report. <sup>4/</sup> The matter is still unresolved. As a result of this accident, the Safety Board reiterates the need for action to implement them.

#### Overtaking at Channel Bends

It is not an easy task for a deep-draft vessel in the Galveston Bay Entrance Channel, to and including the Inner Bar Channel, to overtake another deep-draft vessel, especially at the bends and in total darkness. The Inner Bar Channel is only 800 ft wide where the ships collided. The combined width of the two ships was 202 ft, leaving only 598 ft for the two vessels to pass clear of each other as well as to stay in the dredged channel sides. The maneuver to pass at a bend left little margin for error or misjudgment in the limited space. The pilot had to watch many things almost simultaneously and continuously. He had to watch the relative movement of the two vessels and the rate of turn of his own vessel, and he had to be alert to make exacting rudder and speed changes when necessary. The pilot of the SEA-LAND VENTURE was doing all those things, but he permitted the SEA-LAND VENTURE to close too fast on the NELLY MAERSK by not starting his left turn soon enough. Since the overtaking maneuver was attempted in midchannel, it is unlikely that bank effect on either vessel contributed to the accident, and there was no evidence that this was the case.

At the speeds used, the vessels would have taken about 2 1/2 min for the SEA-LAND VENTURE to overtake the NELLY MAERSK. Since the Outer and Inner Bar Channels are short, only 1.4 and 2.4 nmi respectively, an agreement to overtake anywhere in these two channels, whenever the faster vessel caught up with the slower one, would have involved high probability that some part of the overtaking would have occurred at a bend. For this reason, the basic agreement

<sup>4/</sup> "Marine Accident Report -- Spanish Motor Tankership RIBAFORADA Collision with Barge MB-5, Three Wharves and Cargo Ship M/V TIARET, New Orleans, Louisiana, December 4, 1977." (NTSB-MAR-79-15)

that the overtaking would be accomplished at an unspecified place in these two channels was a poor one.

Both pilots testified that it was not unusual for deep-draft vessels to overtake one another at bends in the Galveston Bay Entrance Channel, to and including the Inner Bar Channel. However, the risk is great because the success of the maneuver depends on many simultaneous judgments by the pilot of the overtaking vessel. A slight misjudgment or inattention during the maneuver can produce a catastrophe quickly. By eliminating the overtaking maneuvers by deep-draft vessels now common at the bends in the Galveston Bay Entrance Channel, to and including the Houston Ship Channel, which is north of the Inner Bar Channel, the risk of collision would be reduced and the task of the pilots would be made easier. Overtaking in the straight portions of the channel would eliminate a complicated factor -- judging the relative turning movement of two vessels in a bend -- from the many considerations which the pilot has to evaluate in an overtaking situation.

Both pilots knew that the NELLY MAERSK was fully loaded with medium crude oil, a highly volatile liquid. They should have considered the risk when the decision was made for the overtaking anywhere in the 800-ft-wide part of the channel. The dangers and risks involved in collisions with vessels carrying crude oil have been well publicized. The outcome of this collision resulted only in vessel damage. However, oil pollution, fire, and explosion could have resulted in loss of life as well as loss in millions of dollars worth of property. The Safety Board believes that the pilots did not exercise the degree of extreme caution and extraordinary care that should have been exercised in the Galveston-Houston Ship Channel in piloting deep-draft vessels, particularly when one was carrying a hazardous cargo, such as crude oil.

#### Houston-Galveston VTS

The basic purpose of the Houston-Galveston VTS is to prevent accidents. Although both vessels were participating in the service, the VTS was not charged with controlling the maneuvering of vessels. Both pilots had a combined experience of almost 50 years as Houston pilots and were proven shiphandlers. Despite their experience and the assistance the VTS provided to prevent an accident, it still occurred. If the VTS incorporated controls over vessel movements which dictated where overtaking and meeting maneuvers would take place, the accident would likely have been prevented. The Safety Board believes that deep-draft vessels using the Galveston-Houston Ship Channel should be restricted from overtaking and meeting at the bends in the channels and that a regulation should be issued to establish this restriction.

### CONCLUSION

#### Findings

1. The actions of the pilot, officers, and crewmembers of the NELLY MAERSK during the overtaking maneuver did not contribute to this accident.

2. The pilots of the SEA-LAND VENTURE and the NELLY MAERSK could have reduced the risk of collision by having agreed to pass in the straight portion of the Inner Bar Channel.
3. The lack of an exchange of information between the respective ship's pilots and masters of the two ships involved included the planned overtaking maneuver in the channel, the lag of the rudder angle indicator on the SEA-LAND VENTURE, and that information which passed between the pilots on their portable VHF radiotelephones.
4. The quartermaster on the SEA-LAND VENTURE could have been using 10° or more right rudder to correct his heading just before getting the order for left 20° rudder from the pilot.
5. The rudder command of the SEA-LAND VENTURE's pilot for left 20° rudder may not have required rapid shifting of the steering wheel as compared to his command for hard left.
6. A slow shift to left rudder in executing the rudder order could have resulted in the rudder angle indicator registering 10° right and going right had the quartermaster just used right rudder while steering by compass.
7. The graphic presentation of the gyro headings as recorded on the SEA-LAND VENTURE's course recorder controverts the pilot's contention that right rudder was applied to the helm after he gave the order for left 20° rudder.
8. Although it appeared to both the pilot and master of the SEA-LAND VENTURE that the NELLY MAERSK almost stopped after rounding the entrance of Inner Bar Channel, the vessel did not ground momentarily nor had the engine rpms been further reduced.
9. The pilot of the SEA-LAND VENTURE could have prevented the accident by slowing down before reaching buoys No. 9 and No. 10 and delaying overtaking the NELLY MAERSK until beyond the bend or he could have passed under her stern and anchored in the anchorage area to the right of the channel.
10. The speed change to ahead full from slow ahead on the NELLY MAERSK a minute before the collision was not effective in preventing the collision.
11. The shifting of the SEA-LAND VENTURE's rudder from left to right just before the collision was not effective in swinging the bow clear of the stern of the NELLY MAERSK.

#### Probable Cause

The National Transportation Safety Board determines that the probable cause of the accident was the inaccurate evaluation of the closing rate and late initiation of the rudder order by the pilot of the SEA-LAND VENTURE while attempting to overtake the NELLY MAERSK at a bend in a narrow channel where the risk of collision was much greater than in a straight portion of the channel.

RECOMMENDATIONS

As a result of its investigation of this accident, the National Transportation Safety Board made the following recommendations—

—to the U.S. Coast Guard:

"Issue a regulation to prohibit deep-draft vessels overtaking or meeting each other at the bends in the channels when traversing the Galveston-Houston Ship Channel. (Class II, Priority Action) (M-79-112)

"Require helmsmen in the U.S. Merchant Marine to inform the officer in charge of the navigation of the vessel when rudder orders have been executed, in addition to the present practice of repeating them as they are given. (Class II, Priority Action) (M-79-113)"

—to the Galveston-Texas City Pilots Association and the Houston Pilots Association:

"Require member pilots piloting deep-draft vessels to refrain from overtaking or meeting other vessels at the bends in the Galveston-Houston Ship Channel. (Class II, Priority Action) (M-79-114)

—to the Galveston-Texas City Pilots Association, the Houston Pilots Association, and the American Pilots Association:

"Require member pilots to confer with ships' masters on any maneuvering agreements made over the radiotelephone well in advance of the execution. (Class II, Priority Action) (M-79-115)"

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JAMES A. KING  
Chairman

/s/ ELWOOD T. DRIVER  
Vice Chairman

/s/ FRANCIS H. McADAMS  
Member

/s/ PATRICIA A. GOLDMAN  
Member

/s/ G.H. PATRICK BURSLEY  
Member

September 27, 1979

APPENDIX A

SEA-LAND VENTURE AND NELLY MAERSK  
Crew Information

SEA-LAND VENTURE

Captain Neill W. Ray, 53, pilot, graduated from Kings Point Maritime Academy in 1944 and served in World War II on troopships and freighters. He sailed tankers as second mate, chief mate, and master. He became a Houston Pilot in 1958.

Captain Philip U. Roussakis, 43, master, graduated from New York State Maritime College in 1957 with a third mate's license. He was employed by Sea Train Services, Inc., for 16 years and has sailed as master for over 11 years. He had been master of the SEA-LAND VENTURE for over 2 1/2 years.

Quartermaster Herman R. Byrd, 41, helmsman, held a rating as able seaman, any waters unlimited, electrician, fireman/watertender, steward's department (FH). He testified that he had experience in steering many ships and had been aboard the SEA-LAND VENTURE for 1 month.

NELLY MAERSK

Captain Roy R. Faulkner, 50, pilot, had been a Houston Pilot since 1950.

Captain Arne Tingberg Sorensen, master, had been onboard for only 3 months, as the ship was new. In 1960, he passed his mates' examinations and began sailing. He had been sailing as master first class since 1972.

APPENDIX B  
MASTER-PILOT CONFERENCE RECOMMENDATIONS

On May 22, 1974, the Safety Board issued marine safety recommendation M-74-15 addressed to the U.S. Coast Guard:

"Require that every master of an oceangoing vessel inform himself of the pilot's plan to maneuver his ship in or out of a harbor and that the master determine, with the pilot's assistance, the critical aspects of the maneuver, including the pilot's plan for emergencies. The master should then be required to instruct his crew to insure that high-risk tasks receive priority."

This recommendation was developed from the investigation of the SS AFRICAN NEPTUNE collision with the Sidney Lanier Bridge at Brunswick, Georgia, on November 7, 1972 (USCG/NTSB-MAR-74-4). This recommendation is classified as open by the Board.

Following the issuance of M-74-15 the Coast Guard published a Notice of Proposed Rule Making (NPRM) in the Federal Register on May 6, 1976. This rulemaking action requested comments on a proposed new part to Title 33 of the Code of Federal Regulations (CFR). The proposed new Part--33 CFR 164-- contained the following relative to M-74-15:

in the preamble:

"The pilot-master conference required in proposed 164.11(m) would minimize misunderstandings. Although the pilot is of course qualified, every vessel has its own peculiarities which frequently are known only to the crew and which often vary with draft, speed, trim, and sea state. Similarly, every channel and harbor is unique. A short explanation by the pilot of unusual navigation or maneuvering techniques necessary for safe navigation in the waterway will help to ensure the close cooperation required by the pilot and master in maneuvering the vessel, particularly if emergency action becomes necessary."

and in the  
proposed rule:

"164.11 The owner, master, or person in charge of each vessel underway shall ensure that:

"(m) If a pilot other than a member of the vessel's crew is employed--

(1) The pilot is informed of the maneuvering characteristics and peculiarities of the vessel and of any abnormal circumstances on the vessel that may affect its safe navigation; and

(2) The master or person in charge of the vessel is informed by the pilot of abnormal characteristics of the area to be transited that may affect the vessel's safe navigation and of non-routine maneuvers before the pilot makes them."

The final rule for Part 164 was published in the Federal Register on January 31, 1977, with an effective date of June 1, 1977. The final rule did not contain 164.11(m)(2); the reason for its omission was stated in the preamble as:

"Paragraph (m)(2) in the proposal, which would have required the pilot to inform the master of abnormal characteristics of the area, is not included in this final rule. It may be the subject of a separate rulemaking at another time."

On November 10, 1977, the Safety Board issued marine safety recommendation M-77-33, also addressed to the U.S. Coast Guard:

"Amend 33 CFR 164.11(k) to require that masters and pilots discuss beforehand and agree to the essential features and relevant checkpoints of maneuvers expected to be undertaken."

This recommendation was developed from the investigation of the SS EDGAR M. QUEENY collision with the S/T CORINTHOS at Marcus Hook Channel, Pennsylvania, on January 31, 1975 (USCG/NTSB-MAR-77-2). This recommendation is classified as open by the Board.

On April 13, 1978, the U.S. Coast Guard responded to M-77-33 as follows:

"The Coast Guard is preparing a Notice of Proposed Rulemaking to publish proposed requirements for a Master-Pilot Conference prior to any substantial maneuvering of all vessels which require a pilot. This would require the master to ensure that he or the person in charge of the vessel is informed of the nature of planned vessel maneuvers and the pertinent features of the maneuver before maneuvering is begun. The requirement of agreement on essential features and relevant checkpoints as a prerequisite to a maneuver impinges on the traditional Master/Pilot relationship and will not be included. The primary responsibility of the master for the safety of his vessel will be maintained.

"It is planned that this regulation will be contained in a new part of 33 CFR Part 163. These regulations are presently being drafted by the Coast Guard."

The Safety Board has not been made aware of action to publish an NPRM to carry out the Coast Guard response to M-77-33. This current accident highlights the need for a mandatory conference between Master and Pilot so that each is aware of the other's plans, and so that each can properly fulfill his responsibilities.