



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Log M-359

Date: February 22, 1990

In reply refer to: M-90-1 through -7

Honorable H. Lawrence Garrett, III
Secretary
U.S. Navy
Washington, D.C. 20350-1000

At approximately 0820, on August 29, 1988, the nuclear-powered aircraft carrier USS DWIGHT D. EISENHOWER (CVN 69), while entering the harbor at Hampton Roads, Virginia, struck the anchored Spanish bulk carrier URDULIZ. The URDULIZ was anchored adjacent to the Entrance Reach Channel waiting for a berth at the coal loading piers at Lamberts Point, Norfolk, Virginia. The EISENHOWER was returning to its home port of Norfolk, Virginia, after a 6-month deployment in the Mediterranean Sea. No one was injured. The accident resulted in \$2 million in estimated damage to the EISENHOWER and \$317,128 in damage to the URDULIZ.¹

At the time of the accident, the URDULIZ was anchored in a designated anchorage (anchorage "A," berth "Z") with its bow about 400 yards from what had been the northern edge of the Entrance Reach Channel prior to March 30, 1988, or about 200 yards from the new channel edge established by buoy relocations on March 30, 1988. The preplanned track of the EISENHOWER in the Entrance Reach Channel was to follow the northern edge of the previous 1,500-foot-wide channel (this was also the southern limits of anchorages "A" and "B"). The EISENHOWER bridge watch was aware that the URDULIZ was anchored in berth "Z," as the bridge watch had been informed about 1 hour before the accident by a naval vessel preceding the EISENHOWER into Norfolk. Visibility was at least 5 miles and the bridge watch had the URDULIZ in sight for about 30 minutes before the accident. Thus, the knowledge and the adequacy of the position of the anchored vessel, and visibility were not factors in this accident.

During periods of restricted maneuvering, such as when the vessel is within the confines of a harbor, precise movement and control of the vessel is required. At those times, the workload increases dramatically for the visual navigation team on the bridge and for the radar navigation team located in a compartment aft of the bridge. The level of activity on the bridge is considerably greater as communications increase between stations to

¹For more detailed information, read Marine Accident Report--"Ramming of Spanish Bulk Carrier URDULIZ by the USS DWIGHT D. EISENHOWER at Hampton Roads, Virginia, August 29, 1988" (NTSB/MAR-90/01).

make certain that the exact position of the vessel is known, and that the vessel follows a safe course.

The visual navigation team, under the supervision of the navigator, must monitor the progress of the vessel by plotting its exact position on the bridge navigation chart at frequent intervals using information communicated to the bridge from visual bearing takers at remote stations. This process allows the navigation team to accurately report the location of the vessel to the conning crew. Each position report establishes the location of the vessel at the time the bearings were taken. Due to reporting and plotting delays, however, the navigation teams report the position of the vessel, relative to the desired track, about a minute after the vessel has actually left that position. Due to reporting and plotting delays, however, the navigation teams report the position of the vessel, relative to the desired track, about a minute after the vessel has actually left that position.

Based on his knowledge of where the vessel was located a minute earlier, the navigator anticipates the changes in rudder and speed necessary to keep it on a predetermined track. However, doing this in restricted waters under rapidly changing conditions is difficult, if not impossible, at times. Under such conditions, it is necessary to compensate for a lack of formal or plotted navigation information by visually observing the changing situation. Markers, buoys, ranges, landmarks, and other prominent objects then serve as an aid to visual plotting or navigating "by eye." Because there were no visual fixes between 0810 and 0817, and the radar fixes were 3 minutes apart, the navigator had to act as a pilot. However, the navigator was not a pilot who routinely navigated through these waters and was not trained to do so.

Without visual or radar fixes, it is difficult to estimate and anticipate the effect of the current and the wind on the movement of the vessel, especially in a setting with which the navigation team is unfamiliar. When piloting visually, the experienced eye uses physical indicators such as the wake or angle of lean of a buoy to estimate the current. The lateral displacement, or set, of the vessel which is being experienced due to the effects of wind or cross-current is often determined by comparing the relative movement of fixed objects. The act of piloting visually in any restricted waterway is a skill which is developed over time.

During the EISENHOWER's 6-month deployment, the Entrance Reach Channel had been reduced in width and shifted slightly northward, and buoys had been moved in the Entrance Reach and in the Thimble Shoal Channels. The conning crew was aware of the new buoy locations from the Notice to Mariners and the new positions were plotted on their navigation charts. However, the conning crew on the EISENHOWER did not have any experience navigating the "new" channel and had not seen Norfolk harbor for 6 months. The Safety Board believes that although the crew's lack of familiarity with the "new" channel did not cause this accident, they would have benefited from a pilot's knowledge and extensive experience in handling large, deep draft vessels in the restricted waters of Hampton Roads. A harbor pilot probably would have recommended against slowing the vessel under the current and wind conditions which existed in the restricted waters of this channel. More importantly, a

harbor pilot would have been able to recognize earlier that the vessel was setting to starboard and deviating from the intended track.

Most naval vessels do not utilize the services of pilots, at least in part because they believe that the use of a pilot implies that the crew does not measure up to the navigation task. However, all commercial vessels departing on, or returning from a foreign voyage are required to hire a State pilot, no matter how familiar, or competent, or how many times the master or other deck officers have transited the waterway to or from sea. Even though, a master or deck officer on a U.S. or foreign vessel may have a Coast Guard pilot license for the area, and the vessel is departing on or returning from a foreign voyage, the vessel still is required by state law to use a State pilot. Mariners who have not been in the harbor recently are not as aware of changes in channel configurations or of the effects of such changes as is a pilot. A pilot would have the latest local knowledge about the peculiarities of currents, the problems of navigating each channel, local conditions, and movement habits of local vessels.

The CO of the EISENHOWER stated that he was not aware of any official guidelines for the use of pilots from the U.S. Navy. However, he also stated that a pilot would have had more knowledge of local conditions, including the new harbor configuration, and would have been able to devote full time and attention to the navigation of the vessel.

The Safety Board believes that the use of a pilot was not necessary to avoid this accident. However, the Safety Board also believes that a pilot probably would have recognized in a timely manner that the vessel was deviating from its course and taken action in time to avoid the accident.

The use of harbor pilots should be strongly encouraged by higher command. Navy regulations provide a broad statement about pilot use, but do not provide specific guidance as to when they should be used. The Safety Board believes that the Navy should develop more detailed guidelines to provide CO's a basis for deciding when to use pilots. Such guidance should include consideration of changes in harbor configuration, crew experience in transiting the harbor, the length of time since the harbor was last transited, the extent of congestion and restriction of the waterway, and the size of the vessel. Further, this guidance should be provided in a manner that helps to minimize the belief that only crews who do not measure up to the navigation task need to hire a pilot.

The Safety Board is concerned that the CO did not hear the engine order during critical moments in the navigation of the vessel and was not aware of the speed reduction which had taken place during a time when the CO's attention was focused on other responsibilities. Because of the numerous demands upon the CO, including the many non-navigational duties which existed during the entrance to the harbor, the CO appears to have diverted his attention from the navigation of the vessel.

Because of other design priorities, space on the navigation bridge of an aircraft carrier is very limited and consequently a large number of stations which affect and are necessary for control of the vessel are located remotely

from the bridge. These remote stations, including the radar navigation team, lookouts, the combat information center, primary flight operations, and others, communicate with the navigation bridge using sound powered telephones and electronic means, including radio, intercom, and video. Frequent communication between these stations and the bridge is necessary to coordinate the safe movement of the vessel. There were at least 20 crewmembers involved in the navigation and the conning of the vessel into port. In addition, there were 6 to 8 Tigers, the press, and other crewmembers not required to be on the bridge for arrival into port. These additional persons, merely by their presence, may have averted the CO's attention.

The CO did not know, and the Safety Board could not precisely determine, the duty or demands of his position that caused the CO to divert his attention away from his monitoring of the navigation of the vessel and prevented him from hearing the order to the engine order operator to reduce speed. However, the crowded and noisy environment of the aircraft carrier navigation bridge was not conducive to the safe maneuvering of the vessel in the restricted channel. The URDULIZ, a similar sized civilian vessel, had been piloted to its anchorage with only four persons (pilot, master, mate, and helmsman) on its much larger sized bridge (about 13 feet by 54 feet, plus port and starboard bridge wings measuring about 10 feet by 37 feet), in contrast with more than 20 persons on the much smaller bridge (about 10 feet by 40 feet) of the EISENHOWER.

Because of the high activity, noise, and congestion levels on the bridge of a vessel of this size and complexity, a considerable potential for distraction is perhaps inevitable. But, obviously, to the extent practicable the sources of such distraction should be eliminated. Therefore, the Safety Board believes that the Navy should prohibit all non-essential persons from admittance to the navigation bridge of its vessels when they are being piloted through restricted waterways such as the channels to Hampton Roads.

The Safety Board is concerned also that, on the one hand, the CO did not explicitly direct the watch officers to keep him informed of developments as they occurred and, on the other hand, that neither the OOD nor the navigator took positive action to advise the CO. As a result, although sufficient operational information existed on the bridge to permit a successful transit of the Entrance Reach Channel, the CO did not become aware of it in time to use it effectively. The Safety Board believes that if there had been a more positive exchange of essential operational information among the key members of the bridge navigation team, the casualty almost certainly would have been averted.

The Safety Board believes also that increased emphasis on information exchange and coordination undoubtedly could improve bridge management of other naval vessels and enhance the safety of their navigation. But achieving such performance would require the development of bridge operating procedures and practices specifically designed to facilitate information exchange and crew coordination; it also would require systematic indoctrination of CO's and bridge team members in the use of such procedures

and practices through specially designed training courses and practice exercises.

Safety Board marine accident investigations frequently have identified shortcomings in bridge management and coordination among masters, the navigation watch, and pilots as contributing factors in marine navigation casualties. As a result, the Safety Board repeatedly has advocated that greater attention be given to this aspect of marine operations. Fortunately, some progress has been made in the maritime community in developing bridge management and teamwork training courses for masters and bridge watch personnel, using bridge simulators, with encouraging results.

The Safety Board is aware also that the Navy has devoted considerable effort and resources to the development and implementation of crew coordination and cockpit resource management training for flight crews of its large aircraft; and it has developed team performance training for its shipboard combat information centers. However, it does not have comparable training programs for its shipboard commanding officers and bridge navigation personnel.

In light of the large number of Naval personnel involved in shiphandling operations, the immense value of the assets involved in the operation of vessels of the U.S. fleet, and the potentially catastrophic consequences of navigation casualties, the Safety Board believes that the Navy should allocate the necessary resources to research, develop, and implement a program of bridge crew management and teamwork training for all vessel commanding officers and bridge navigation personnel.

If the EISENHOWER had followed its planned trackline, with its bridge on the northern edge of the previous Entrance Reach Channel (700 feet wide at buoy "1ER"), its flight deck would have shadowed or visually blocked out about 590 feet of channel on its port beam, leaving about 110 feet of the channel visible from the navigation bridge to buoy "1ER" and the southern side of the new Entrance Reach Channel. Had the LIPSCOMB followed a trackline of about 100 to 150 feet to the left of buoy "1ER", the EISENHOWER's bridge watch may not have been able to see the submarine. The large shadow zone on the port side of the EISENHOWER prevents a continuous view of a vessel with a low profile or a small vessel, if it passes too close, especially a vessel such as a submarine.

The Safety Board believes that although the passage of the LIPSCOMB did not contribute to the accident, the Port Operations Department should have coordinated the departure time of the LIPSCOMB so that it would not have been in the Entrance Reach Channel at the same time as the EISENHOWER. The Safety Board also believes that the Port Operations Department should control naval vessel traffic so that deep draft naval vessels (vessels with a draft of 25 feet or more) do not encounter another deep draft naval vessel when transiting the Entrance Reach Channel.

After an aircraft carrier is in the Entrance Reach Channel, and shortly before it arrives at buoy "3," it must slow down as much as possible, and still maintain steering control, to embark a docking pilot. The docking

pilot attempts to board the vessel at or before reaching buoy "3." After he boards and after tugs are positioned, the vessel is maneuvered into its berth. This operation normally takes about 45 minutes and the channel is effectively blocked during this period inhibiting other vessel transits. Also during this period, the vessel is operating at a very low speed and is greatly hampered in its ability to maneuver, thus posing a hazard both to itself and other vessels in the narrow channel. Even if an aircraft carrier or other large naval vessel pivots only partially in the channel, there is no room available for a vessel to pass safely within the Entrance Reach Channel. The 1,000-foot width of the channel is narrower than the length of most aircraft carriers and only about 100 feet wider than battleships are long. The anchorage area north of the Entrance Reach Channel may not always be void of vessels to allow for vessels to move outside the channel and past a vessel maneuvering into its berth at the Naval Station. The Safety Board believes that the amount of channel available to another vessel in the Entrance Reach Channel, when a large naval vessel is maneuvering into a berth at the Naval Station, is too narrow for safe navigation. There is insufficient room to maneuver to avoid another vessel due to bad weather, or for a steering or other casualty. To avoid maneuvering difficulties with other marine traffic and as an added measure of safety, the Safety Board believes that the Navy should request the Coast Guard to expand the regulated navigation area at 33 CFR 165.501(d)(11) (prescribed for moving aircraft carriers and other large naval vessels to, or from, the Norfolk Naval Shipyard) to include the Entrance Reach Channel.

The Safety Board interviewed numerous U.S. Navy personnel, formally and informally, in the course of its investigation. Many of the personnel interviewed had little or no relevant information and were extremely curious about the facts of this accident. They requested information about the accident so that they might learn from the experiences of the crew of the EISENHOWER.

The Navy has a periodic publication, FATHOM, which includes information concerning accidents involving its vessels, similar to a publication associated with its aviation accident advisory program. Notwithstanding this publication, COs, navigation department personnel, and deck watchstanders, report that they are rarely exposed to detailed information as a result of the investigations which examine vessel maneuvering accidents in the fleet. These persons could use the knowledge learned from the details of vessel accident investigations and analysis to operate their vessels more safely and avoid accidents. However, the FATHOM is distributed to many agencies who may not need such information and the Navy may not deem it appropriate to include the in-depth information that could benefit its navigation personnel in the FATHOM.

Thus, the Safety Board believes that the Navy, in an effort to inform its personnel and prevent accidents involving its vessels, should establish an internal comprehensive marine accident information newsletter or similar publication to disseminate to its personnel in command, navigation, and other shiphandling assignments, reports of collisions and groundings, and related accident prevention information. Further, the Safety Board believes that the Navy should provide to commanding officers and navigation

departments of its aircraft carriers copies of the Safety Board's EISENHOWER accident report.

Toxicological specimens were not obtained from the conning crew or the navigation teams, or any other person aboard the EISENHOWER, following the accident. Postaccident toxicological testing was not required by Navy regulation, and as a result, neither the conning crew nor the navigation teams of the EISENHOWER were requested to provide samples, precluding such testing. However, there was no evidence discovered during the course of the investigation to suggest that the conning crew was medically unfit, fatigued, or under the influence of alcohol or other drugs at the time of the accident.

In its accident investigations, the Safety Board routinely examines the toxicological aspects of accident causation, and it believes that the Navy should do so during its accident investigations as well, and that it should obtain and examine toxicological specimens from any crewmember whose activities could be associated with the circumstances of the occurrence. By requiring such testing following all accidents involving Navy vessels, especially those which involve civilian vessels, the Navy would enhance the safety of its operations, its personnel, and other seafarers.

Therefore, the National Transportation Safety Board recommends that the U.S. Navy:

Provide in an appropriate U.S. Navy directive, guidance and requirements to commanding officers of vessels about the use of Federal or State pilots; consider such areas as changing harbor configurations, the crew's experience in transiting the harbor, the length of time since the harbor was last transited, the extent of congestion or restriction of the waterway, and the size of vessel. (Class II, Priority Action) (M-90-1)

Develop and implement a program of bridge crew management and teamwork training for shipboard commanding officers, navigators, and other bridge navigation personnel. (Class II, Priority Action) (M-90-2)

Establish a policy which excludes non-essential persons from the navigation bridge of U.S. Navy vessels maneuvering in restricted waters. (Class II, Priority Action) (M-90-3)

Require the Norfolk Naval Station to schedule and control naval traffic departing or arriving at Norfolk so that no deep draft naval vessels meet in the Entrance Reach Channel. (Class II, Priority Action) (M-90-4)

Request the Coast Guard to extend the Regulated Navigation Area at Title 33 Code of Federal Regulations Paragraph 165.501(d)(11) in Norfolk harbor to include the

Entrance Reach Channel for aircraft carriers and other large naval vessels. (Class II, Priority Action) (M-90-5)

Establish and publish an internal newsletter or other publication that provides comprehensive vessel accident information, including U.S. Navy vessel accident reports and related accident prevention information, and disseminate it to personnel in command, navigation, and other shiphandling billets. (Class II, Priority Action) (M-90-6)

Disseminate this accident report to commanding officers and navigation department personnel of all aircraft carriers in the fleet. (Class II, Priority Action) (M-90-7)

Also, the Safety Board reiterates the following safety recommendation to the U.S. Navy:

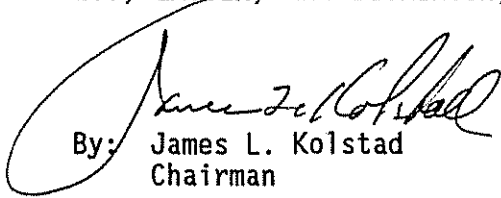
M-88-38

Amend OPNAVINST 5350.4 (Substance Abuse Prevention and Control) to require drug testing of U.S. Navy personnel directly involved in an accident with a U.S. civilian vessel in international waters or any civilian vessel in U.S. waters.

The National Transportation Safety Board is an independent Federal agency with the statutory responsibility "... to promote transportation safety by conducting independent accident investigations and by formulating safety improvement recommendations" (Public Law 93-633). The Safety Board is vitally interested in any action taken as a result of its safety recommendations. Therefore, it would appreciate a response from you regarding action taken or contemplated with respect to the recommendations in this letter. Please refer to Safety Recommendations M-90-1 through -7 in your reply.

As a result of this investigation, the Safety Board also issued Safety Recommendation M-90-8 to the U.S. Coast Guard.

KOLSTAD, Acting Chairman, and BURNETT, LAUBER, and DICKINSON, Members, concurred in these recommendations.


By: James L. Kolstad
Chairman