

Log M-392-A

NATIONAL TRANSPORTATION SAFETY BOARD

Washington, D.C. 20594



Safety Recommendation

Date: AUG - 3 1994

In Reply Refer To: M-94-18, -19, and -20

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Vice President
Marine Operations/Passenger Operations
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About 1532 on August 18, 1993, the 224-foot-long passenger vessel YORKTOWN CLIPPER, with 134 passengers and 42 crewmembers, was southbound in Glacier Bay, Alaska, when it struck an underwater rock. The hull was pierced in several locations, and the vessel began to flood. The passengers and most of the crew were transferred to assisting vessels, and the YORKTOWN CLIPPER was moved to a shallow, sheltered cove where it could be beached if necessary. After temporary repairs, the vessel sailed to a shipyard for permanent repairs.¹

The National Transportation Safety Board determines that the probable cause of the grounding of the YORKTOWN CLIPPER was the failure of the second officer to plot his courses and positions, due to the Clipper Cruise Line's and master's inadequate oversight of the watch officers' navigational planning and procedures. Contributing to the accident was the Coast Guard's lack of a requirement that watch officers on small passenger vessels equipped with radar be qualified in radar navigation.

¹For more detailed information, read Marine Accident Report--*Grounding of the Passenger Vessel YORKTOWN CLIPPER in Glacier Bay, Alaska, August 18, 1993* (NTSB/MAR-94/02).

A copy of the Clipper Cruise Line operations manual was kept on the bridge of the YORKTOWN CLIPPER. The manual mentioned navigational procedures only in connection with the maintenance of the vessel's official logbook. According to the manual, whenever a vessel is under way, navigational entries are to be logged "at intervals not to exceed 1 hour." It also stated that "course changes should never be logged without a fix...." The manual sets no standards for the quality of the fixes, the charting of fixes, putting course lines on the chart, or other navigational factors that decrease the risk of grounding. The master had not issued any written standards for navigational procedures.

During the passage south in Glacier Bay, the YORKTOWN CLIPPER watch officers did not plot the vessel's position on the chart. They only entered the fix information--a radar range and radar bearing--hourly in the log. They did not attempt to project their courses on the chart. Had they done so, they would have known the hazards that lay ahead and how close the vessel would pass to them. They did not determine or show on the chart the expected times of arrival at the waypoints for course changes and the new courses. Consequently, as the second officer approached Geikie Rock, he did not have a fix on the chart to show him the vessel's position. He did not know what the next course was going to be or when it would occur. Had he plotted several fixes, he could have determined whether the vessel was being affected by currents. Had he known the time or time interval to the next course change, he could have recognized that he should not begin his turn when he did. Had he plotted the course that the YORKTOWN CLIPPER would have to take to reach Whidbey Passage if he turned the vessel right when it was 1 1/2 miles from Drake Island, it would have been immediately obvious to him when he turned prematurely that the vessel was not aligned for the approach to Whidbey Passage and that therefore the vessel was not where he thought it was. And had he plotted a fix right after he did make his right turn and advanced his new course line, he would have seen that it would take the vessel perilously close to the rocky shoals. There would have been time, about 5 minutes, to change the vessel's course and prevent the grounding.

Even if the second officer had plotted the information for the fixes, the quality of the fixes would have been suspect. Most of the hourly positions recorded in the vessel's log consisted of a single range and a single bearing taken on identifiable objects on the radar screen. The accuracy of radar bearings depends to some extent on the skill of the operator. Furthermore, the radar manufacturer's manual states: "The simultaneous measurement of the ranges to two or more fixed objects is normally the most accurate method of obtaining a fix with radar alone. Preferably at least three ranges should be used." The manual adds: "A distinct disadvantage [of fixing position by a single range and a single bearing], however, is that this method is based upon only two intersecting position lines...." By using three or more lines of position and plotting the intersecting lines, the accuracy of the fix is improved and any significant error may be detected.

Because the vessel's watch officers were not plotting the fixes but were merely entering the readings in the log, they may not have been sensitive about the quality of the fixes. Single

range and bearing fixes can be taken quickly and easily, but provide less accuracy. They also had the option of taking and plotting fixes using the GPS. Had either the Clipper Cruise Line or the master provided written standards for taking fixes, the watch officers might have plotted the fixes more often and more accurately. Consequently, they could have known when they were heading into danger.

While plotting quality fixes can reduce the chance of grounding, safe navigation also requires that the master and the watch officers plan routes in detail and evaluate the risks they may encounter. Neither Clipper Cruise Line nor the master required any passage planning. Such planning would have involved the vessel's officers in selecting safe routes, placing course lines on the chart, selecting waypoints where courses would be changed, selecting safe speeds, and determining tide and current conditions along the routes. The planning was particularly needed in this case because the master and the other two watch officers were relatively new to navigating the YORKTOWN CLIPPER in these waters. The need for such passage planning also was demonstrated on the voyage 2 weeks earlier, the second officer's first voyage through this area. He was uncertain whether he should navigate between Geikie Rock and Lone Island or between Geikie Rock and the land to the west. He asked the first officer, who happened to be on the bridge. But the first officer did not know. He had not navigated through that area either. Had the Clipper Cruise Line or the master required passage planning, the officers would have been forced to resolve such questions earlier when there was ample time to evaluate the risks and review the decisions.

The Safety Board concludes that the navigational planning and positioning procedures used by the second officer were inadequate to accurately identify the vessel's position or to warn him of the danger of running aground. The Safety Board also concludes that had Clipper Cruise Line and the master exercised more oversight in the navigation of the vessel, such as requiring passage planning in preparation for every voyage and setting standards for the accuracy and plotting of fixes, the vessel would have been navigated more safely in the vicinity of Geikie Rock.

When the radar aboard the YORKTOWN CLIPPER was used to take bearings for recording the vessel's position, the bearing of the charted object selected was automatically depicted on the radar screen numerically. This bearing, however, was a relative bearing and had to be combined with the vessel's heading to convert it to a true bearing if it was to be plotted on the chart. Such calculations not only delay getting the results, but also increase the probability of making arithmetic errors and add to the workload of the navigating watch officer.

Any yawing, which occurs normally because of sea motion or steering errors, would also adversely affect the timeliness and accuracy of the radar bearings used for obtaining fixes. The yawing causes the relative bearings to change constantly and also smears the radar picture, making the location of the radar bearing uncertain. The problem can be minimized by having a second person (usually the helmsman) read the compass heading while the watch officer operates the radar. As the sole member of the navigational watch, however, the second officer

would have had to perform the two tasks sequentially, thus introducing time delays and possible errors into the fix data.

These handicaps can be readily eliminated by connecting the gyrocompass output to the radar, which normally is designed to accommodate this input. The radar then becomes stabilized so that the radar presentation does not smear as the vessel yaws, and all bearings are shown as true bearings that can be plotted without being modified, assuming the gyrocompass has no error. Such direct, rapid reading of radar bearings may encourage the taking and plotting of fixes. Also, such radar stabilization provides other safety benefits when the radar is used for collision avoidance.

The YORKTOWN CLIPPER was equipped with a gyrocompass, and the installed radar was designed to accept the gyrocompass input with slight modification. However, Clipper Cruise Line had not installed the modification that would have stabilized the radar. The Safety Board concludes that had the radar been gyrostabilized, it would have facilitated the taking and plotting of accurate fixes.

The grounding impact was felt and heard throughout the vessel. The master did not sound the general alarm and waited about 15 minutes before making a public address announcement. He wanted to assess the situation and inform the passengers in a way that would not cause unnecessary alarm. At the moment of impact, one large group of passengers was meeting in the vessel's dining room. After the impact, they continued to meet even after the vessel began to list, until they heard the master's announcement about preparing to evacuate. Most crewmembers were prepared to react to the emergency, but the lack of a general alarm signal created uncertainties about their actions. In fact, the first officer had to instruct crewmembers he encountered to go to their emergency stations.

In this accident, the procedure used by the master to assess the danger before using the public address system did not adversely affect passenger safety. However, under other circumstances, a delay in getting the passengers into their life jackets and getting the crew and passengers to their emergency stations could be critical to their survival. The Safety Board believes that precisely because the seriousness of the situation is unknown immediately after an accident, the general alarm should be sounded. Rather than creating confusion, sounding the alarm will inform the passengers and crew that the master is aware of the emergency and is taking action. Further, time spent making an evaluation before making a public announcement cannot be recovered, and if a vessel is about to sink, there may be insufficient time left to conduct a safe and orderly abandonment. After immediately sounding the general alarm to alert the passengers and sending the crew to the emergency stations, the master can then make any reassuring or explanatory announcements he deems necessary. The Safety Board concludes that the passengers and crew would have been better prepared to respond to the emergency if they had been informed of the situation immediately after the grounding.

Therefore, the National Transportation Safety Board recommends that Clipper Cruise
Line:

Develop written instructions specifying safe standards for passage planning, radar navigation, dead reckoning, and charting, and require that the masters and navigating watch officers aboard your vessels adhere to these standards. (Class II, Priority Action) (M-94-18)


Modify the radar on your vessels to accept input from the gyrocompass so the radar can be used in the stabilized mode, and require that it be used in the stabilized mode when plotting. (Class II, Priority Action) (M-94-19)

Encourage the masters of your vessels to use the public address system without delay to alert passengers and crew of an emergency in the event the general alarm is not sounded immediately. (Class II, Priority Action) (M-94-20)

Also, the Safety Board reiterated Safety Recommendation M-88-9 and issued Safety Recommendations M-94-15, -16, and -17 to the U.S. Coast Guard.

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 recommendation in this letter. Please refer to Safety Recommendations M-94-18, -19, and -20 in your reply. If you need additional information, you may call the Chief of the Marine Division at (202) 382-6860.

Acting Chairman HALL and Members LAUBER, HAMMERSCHMIDT, and VOGT concurred in these recommendations.


By: Jim Hall
Acting Chairman