



# National Transportation Safety Board

Washington, D.C. 20594

## Safety Recommendation

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During the early morning hours of December 29, 1997, the 34-foot recreational sailing vessel *Morning Dew* struck the rock jetty on the north side of the shipping channel into the harbor of Charleston, South Carolina. The boat was later found about 15 yards south of the jetty, submerged in about 12 feet of water. The owner/operator of the vessel and his three passengers, all members of the same family, died as a result of the accident.<sup>1</sup>

The National Transportation Safety Board determined that the probable cause of the sinking of the *Morning Dew* was the operator's failure to adequately assess, prepare for, and respond to the known risks of the journey into the open ocean that culminated in the vessel's allision with the jetty at the entrance to Charleston Harbor. Contributing to the loss of life in this accident was the substandard performance of U.S. Coast Guard Group Charleston in initiating a search and rescue response to the accident.

According to statements of several members of the victims' family, the operator of the *Morning Dew* planned to make the entire trip from South Carolina to Florida within the confines of the Intracoastal Waterway (ICW). While transiting Winyah Bay, however, the operator left the ICW and proceeded into the Atlantic Ocean. The Safety Board considered whether the operator's departure from the ICW was the result of a navigation error. Witnesses stated that southbound boaters following the ICW through Winyah Bay sometimes lose track of the ICW and inadvertently follow the main shipping channel toward the ocean.

Based on its investigation, the Safety Board concluded that the route of the ICW through Winyah Bay is marked on the ICW charts and navigation aids such that any boater who properly uses them should recognize and be able to follow the ICW routing through the bay. The Safety Board is concerned, however, about reports that some boaters mistakenly follow the ship channel in Winyah Bay rather than the ICW and believes that the Coast Guard should review the

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<sup>1</sup> For more information, see Marine Accident Report—*Sinking of the Recreational Sailing Vessel Morning Dew at the Entrance to the Harbor of Charleston, South Carolina, December 29, 1997* (NTSB/MAR-99/01).

navigation aids marking the route to the ICW at Winyah Bay and make any changes necessary to reduce the likelihood that southbound recreational boaters intending to follow the ICW will inadvertently depart that waterway.

At 0217 on December 29, 1997, the communications watchstander at U.S. Coast Guard Group Charleston received a radio call on VHF Channel 16. The watchstander said he was standing at the coffee pot just outside the door of the communications center when the call was received and that he heard only the portion of the message consisting of “U.S. Coast Guard...”

The watchstander stated that the call was weak and affected by static. According to recordings of the radio transmissions, about 14 seconds later, the watchstander used the Mount Pleasant antenna to broadcast, “Vessel calling Coast Guard, this is Coast Guard Group Charleston, over.” He then repeated the transmission using all six high-site antennas and invited the caller to respond on channel 16. He did not receive a reply.

The watchstander later stated he considered the call to be a routine call, either for information or as a radio check, possibly from a distant vessel. He did not log the call, nor did he consider it necessary to replay the recording of the call or to inform the operations duty officer, who was sleeping in a nearby room.

Later replaying by the Safety Board of the tape recording of the call revealed what sounded like the voice of an excited adolescent male. The transmission, which lasted about 3 seconds, consisted of “May...mayday, U.S. Coast Guard come in.”

When the watchstander dismissed the call as requiring no further attention, he did not consider such factors as the unusual hour at which the call was received or the prevailing weather, which was not conducive to recreational boating.

If the watchstander had taken a few moments to replay the tape, he would have recognized immediately that a potential emergency existed. But it apparently never occurred to the watchstander that he might not have heard or understood the complete transmission when it was first received or that the circumstances surrounding the call suggested that additional attention or follow up might be appropriate.

Judging from the watchstander’s actions, neither his training nor his experience had made him fully aware of the limitations of the equipment or the listening environment, and he obviously had not been trained to use all available means to aggressively follow up on all uncertain calls—especially those received under unusual circumstances—in an attempt to determine their nature. Thus, the Safety Board concluded that if the watchstander had properly analyzed the circumstances surrounding the call, such as his listening position, the time of day, and the weather, he might have decided to replay the recording of the radio transmission, which would have enabled him to determine the true nature of the call.

The watchstander had completed on-the-job training on the qualification guide in “3 to 4 weeks” and spent only 20 to 30 minutes before his oral qualifications review board. At the time of the accident, his entire experience as a communications watchstander consisted of 6 months’ duty at Group Charleston.

The *Group and Stations Communications Watchstander Qualification Guide* provides excellent additional training for the novice watchstander candidate. The document contains 5 divisions of qualification tasks comprising reading assignments and a number of tasks in each division (22 in all) to be completed and practiced in sequence by the student, with the help of the instructor.

In order to complete the guide in 4 weeks, as the Group Charleston watchstander did, the candidate watchstander must, two or three times each week, complete and master more than two tasks, including completing the associated reading assignments. The Safety Board considers this pace of learning, even for the less complicated tasks, to be too fast to allow the candidate watchstander to grasp the material or to be able to thoroughly practice the task to the extent necessary to achieve proficiency.

The Safety Board contends that novice watchstanders should be provided with ample opportunity to practice what they were taught during their formal schooling and on-the-job training and to demonstrate a suitable level of proficiency before they are deemed qualified to stand watch. The Safety Board concluded that the Coast Guard search and rescue communications effort would benefit if novice radio watchstanders were provided with ample opportunity to practice what they were taught during their formal schooling and on-the-job training and to demonstrate their knowledge or proficiency at regular intervals until they reach the journeyman level.

About 0628 on December 29, while the watch was being changed at the communications center and the oncoming (day) and outgoing (night) watchstanders and the 0600 operations duty officer were present, the harbor pilot dispatch office called to relay a report that the boatswain of an inbound ship (the *Pearl Ace*) had heard cries for help coming from the water near buoy 22 and that a pilot boat was on its way to conduct a search in that area. The telephone call was answered by the night watchstander, who had also received the 0217 radio call earlier that morning. The watchstander told the caller that he would “alert the station and they’ll determine if they want to get underway also.” Unfortunately, because he did not attach any importance to the call he had received at 0217, the watchstander did not link the two calls.

The 0600 duty officer took no action with regard to the 0628 report of cries being heard from the water. Faced with an undeniable indication of a mariner in distress and the location of the emergency, he apparently never seriously considered launching available Coast Guard resources. He stated that he believed that no action was necessary because a pilot boat was on its way to search the area. He surely was aware of the difficulty of seeing a person in the water, especially under conditions of darkness and rough seas, yet he acknowledged that he knew nothing about the pilot boat’s capability or the equipment it had with which to conduct a search. He did not know whether the operator of the pilot boat was experienced in establishing and following a pre-planned search pattern or knowledgeable about other search techniques that can optimize the success of a search mission. He did not know whether the boat would be called away for some commercial task before it could complete a search. Furthermore, the duty officer did not inform his supervisor of his decision not to respond, nor did he log the call.

The duty officer implied some uncertainty or doubt about the validity of the call. And yet, the report of hearing cries for help was sufficiently credible for experienced professional mariners to have relayed the report to the Coast Guard and to have directed that a commercial vessel leave its assigned station and conduct an impromptu search. If the duty officer had doubted the validity of the apparent distress and the credibility of the report, he could have used the VHF-FM radio to call the *Pearl Ace* to make inquiries that could have resolved his uncertainties. He did not do so. The Safety Board therefore concluded that the operations duty officer at Group Charleston disregarded clear indications of a marine distress situation when he took no action in response to the report of cries for help being heard from the water.

The current focus of the training for communications watchstanders is on the proper operation of hardware and the use of standardized responses to typical situations. However, communications watchstanders do not handle only typical situations. They also encounter atypical situations that require them to use analytical skills to make judgments and formulate decisions that may have life-and-death implications.

For example, as noted above, the watchstander in the *Morning Dew* accident failed to take into account such factors as his location when the call was received, the urgency in the voice of the caller, the time of night, and the prevailing weather when he concluded that the 0217 call from the vessel did not require action. Similarly, in regard to the 0628 report of cries from the water, the operations duty officer did not take into account the nature of the report, the credibility of those making the report, or the potential effectiveness of the pilot boat when he allowed that vessel to conduct an independent search even when Coast Guard resources were available.

Questionable decision-making was also an issue in a 1995 recreational boating accident the Safety Board investigated in Oswego, New York.<sup>2</sup> In that accident, a boater saw a capsized boat in about 16 feet of water and reported the sighting and the location to someone at a local marina. The marina operator called Coast Guard Station Oswego and relayed the report. The watchstander at Station Oswego notified the duty officer of the call, but the duty officer decided that no immediate action should be taken. The boat was found the next day by a local law enforcement marine patrol boat after the boat was reported overdue. Three people died in the accident.

In order to appropriately assess the situation and respond correctly in atypical situations, watchstanders must have the ability to skillfully apply judgment and analytical thinking to the watchstanding task. Review of the telecommunications school curriculum indicates that the telecommunications specialist school did not offer courses in judgment and analytical and decision-making skills. Such courses have been developed for personnel in other transportation modes, particularly general aviation, to prepare students to apply critical judgment to rapidly evolving situations, and such training has proven effective in accident prevention. The Safety Board therefore concluded that specialized training designed to enhance analytical and decision-making skills could better prepare Coast Guard watchstanders to make appropriate judgments about matters affecting public safety.

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<sup>2</sup> For more information, see Marine Accident Brief DCA95MM031, "Capsizing of 18-Foot-Long Thunderbird Cheyenne Motorboat, PA 1980 BH, and Drowning of Three Occupants, Mexico Point, Lake Ontario, Near Oswego, New York, on April 14, 1995," adopted March 27, 1997.

Because of the life-or-death nature of the work that Coast Guard watchstanders perform, the staffing of these communications centers must be adequate both in terms of numbers and quality of watchstanders. ALDIST 209/99 established interim policy on staffing levels and watch duty length at group/activity command and communications centers. Staffing for a 12-hour watch was established at one supervisor and five watchstanders per watch position, and duty length was established at a maximum of 12 hours. This interim policy was established pending the results of an analysis of workload and staffing of all group/activity functions by the Center for Naval Analysis (CNA). In the view of the Safety Board, the permanent communications center staffing level policy the Coast Guard will eventually adopt, whether based on the work of the CNA or others, must take into account the effects of single-person and 12-hour watches, as discussed below.

Current Coast Guard policy allows a single watchstander to stand the communications center watch. A single watchstander is typical during the night, for example, when the operations duty officer is sleeping. In the *Morning Dew* accident, a newly qualified and inexperienced communications watchstander was on duty, alone, for 6 to 8 hours, and it was during this time that he failed to detect the word “mayday” in the 0217 transmission and subsequently misidentified the call.

In the view of the Safety Board, permanent staffing policies should require at least two alert, attentive persons on watch. The purpose of having more than one alert watchstander is to provide oversight and supervision of relatively inexperienced watchstanders, to have a backup in evaluating incoming radio calls, and to generally provide redundancy in the overall listening and decision-making process.

A second watchstander present and alert would provide a second pair of ears to listen to the incoming transmissions and would further provide someone with whom the watchstander could contemporaneously discuss and evaluate the significance of the transmission. Had there been a second watchstander present and alert at Group Charleston when the *Morning Dew* distress call was received, it is possible that the second watchstander might have heard the first words of the transmission (at least one of which was revealed by the recording of the transmission as “mayday”) or that a discussion between the watchstanders might have resulted in the replaying of the transmission for further evaluation. In either event, the outcome of the accident might have been different. In cases in which more than one incident requires Coast Guard attention simultaneously, one watchstander could concentrate on prosecuting the first incident while the other watchstander prosecutes the second.

Either as a quality-of-life issue or a perceived requirement brought on by personnel shortages, many Coast Guard activities operate with 12-hour shifts for watchstanders. All work schedules, whatever the duration of a shift, must take into consideration human limitations to achieve acceptable performance. Vigilance<sup>3</sup> is particularly susceptible to degradation due to lengthy time on task, residual effects of sleep loss, distraction by other tasks, and other factors. Establishing an appropriate watch duration and rotation is therefore paramount.

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<sup>3</sup> *Vigilance* is defined as a readiness to respond to infrequent, low-intensity signals (or those which are not easily differentiated from non-meaningful information) occurring at unpredictable temporal intervals.

Despite the Coast Guard's current practice of maintaining 12-hour and 24-hour watch regimens at group headquarters, the Coast Guard has apparently not undertaken any systematic study of communications watchstanders' work hours or conducted a scientific study to assess the optimum work schedule for attaining maximum vigilance and the highest levels of overall watchstander performance at its communications centers.

Moreover, as discussed below, the Coast Guard currently lacks a mechanism for effectively monitoring watchstander performance. In the absence of such a mechanism, decreased alertness and diminished vigilance can persist unchecked. Watchstanders cannot know what they do not hear; lapses in vigilance are thus undetectable and uncorrectable without intervention. Because the communications watchstander cannot control the timing or distribution of incoming radio transmissions, he or she must maintain a heightened level of alertness always. And, while individuals experiencing sleep loss can usually rally momentarily to perform at their non-sleep-deprived levels, their ability to maintain that performance becomes increasingly limited in duration as sleep loss progresses. Because vigilance necessitates *consistent* and *constant* alertness, the impact of insufficient sleep can have severe consequences for performance.

Sleep loss has immense potential to exacerbate the problems of excessive shift length, monotony, and boredom. If split shifts or other rotations are considered as a means to mitigate the limitations posed by time-on-task without significantly increasing personnel requirements, the impact of these alternatives on watchstanders' ability to obtain sufficient sleep must be addressed. Perhaps most troubling is research indicating that performance decrements are more likely to be found in those with less experience<sup>4</sup> and to negatively impact reasoning tasks<sup>5</sup> or nonstimulating tasks.<sup>6</sup>

Watchstander vigilance and overall performance should be the primary criteria in determining whether a watch duration of 4 hours, 6 hours, or 8 hours should be employed. What is clear from research relating to fatigue and worker vigilance is that 12-hour shifts are detrimental to optimum worker performance, especially in positions requiring high levels of alertness and responsiveness. While the Safety Board acknowledges the quality-of-life issues integral to watch scheduling, the Safety Board nevertheless holds the view that the criticality of the communication watchstander's function necessitates that watchstander performance be regarded as the driving force in the determination of shift length and the constitution of the watch rotation. The Safety Board therefore concluded that measures to improve safety and performance at Coast Guard communications centers must look beyond staffing allocations for an effective solution and must include systematic consideration of watchstanders' tasks, shift lengths, and shift rotation. Consequently, the Safety Board believes that the Coast Guard should ensure that the CNA

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<sup>4</sup> Light, A.I., Sun, J.H., and McCool, C. "The Effects of Acute Sleep Deprivation on Level of Resident Training," *Current Surgery*, 46 (1976), pp. 29-30.

<sup>5</sup> Beatty, J., Ahern, S.K., and Katz, R. "Sleep Deprivation and the Vigilance Of Anesthesiologists During Simulated Surgery," in R.R. Mackie [Ed.], *Vigilance: Theory, Operational Performance, and Physiological Correlates*, New York: Plenum Press, (1977), pp. 511-527; and Hawkins, M.R., Vichick, D.A., Silsby, H.D., "Sleep and Nutritional Deprivation and Performance of House Officers," *Journal of Medical Education*, 60, 1985, pp. 530-535; and Poulton, E.C., Hunt, G.M., Carpenter, A., and Edwards, R.S., "The Performance of Junior Hospital Doctors Following Reduced Sleep and Long Hours of Work," *Ergonomics*, 21 (1978), pp. 279-295.

<sup>6</sup> Friedman, R.C., Bigger, J.T., and Kornfeld, D.S., "The Intern and Sleep Loss," *New England Journal of Medicine*, 285 (1971), pp. 201-203.

workload and staffing analysis fully incorporates existing human performance research on vigilance, attention, and fatigue in the determination of shift length, shift rotation, and staffing levels at Coast Guard search and rescue communications centers.

Coast Guard search and rescue responses are predicated upon the Coast Guard's receiving and properly evaluating distress calls. Under the Coast Guard's search and rescue communications system, the evaluation is performed by individuals making decisions and judgments more or less autonomously. Under such circumstances, a consistently high level of performance can be achieved and maintained only through effective and ongoing management oversight. Unfortunately, as shown by the accident involving the *Morning Dew* and several other accidents the Safety Board has investigated, the Coast Guard does not always exercise effective oversight of its operations and communications centers.

For example, as noted above, communications watchstanders sometimes stand solo watches in the evening, with no immediate oversight. Further, in the *Morning Dew* accident, the operations duty officer's decision to do nothing when he received a report of cries for help coming from the water was not subject to any review. Moreover, even though all communications over the distress frequency and all communications center telephone calls are recorded, it is not standard Coast Guard practice to review tape recordings of radio broadcasts and telephone conversations. Even after a search and rescue case, the tapes are not routinely reviewed unless the review is considered necessary because of special circumstances.

The distress call that was received at 0217 from the *Morning Dew* would never have come to light if the watchstander had not brought it to the attention of the command. Similarly, in a June 1998 accident the Safety Board is investigating involving the recreational boat *Florida Air Specialist*, a distress call from the sinking boat was logged by Coast Guard Auxiliary watchstanders as a hoax. The Coast Guard did not initiate a review of the recorded radio communications until after the only survivor of the accident reported that a distress call had been transmitted. Had no one survived the *Florida Air* accident, the Coast Guard would never have known that the distress call had been made.

At Group Charleston, transcripts of radio transmissions and telephone conversations recorded around the time of the *Morning Dew* accident revealed a large number of personal telephone calls made by watchstanders, which could conflict with the level of attentiveness with which they should conduct their watchstanding duties. Without a Coast Guard program to routinely review the telephone recordings, any detrimental impact such conversations may have on the watchstanders' attentiveness cannot be addressed and corrected.

Also, without a program to maintain oversight of the full range of communications center activities, the Coast Guard cannot know if its procedures and protocols are effective, or if they are even being followed. For example, in a January 1999 accident the Safety Board is investigating involving the fishing vessel *Adriatic*, the operator of the rapidly sinking vessel radioed a mayday that was received by the Coast Guard. Radio watchstanders from three units—Group Atlantic City, Barnegat Light Station, and Station Manasquan Inlet—converged on the airwaves all within the first few seconds, overlapping one another in response to the mayday call. Commandant Instruction M2300.7 (*Radiotelephone Handbook*) states that “all stations hearing a

distress call shall immediately cease transmissions capable of interfering with the distress traffic and shall continue to listen on the frequency on which the call was heard.” This procedure was not followed by Group Atlantic City, Barnegat Light Station, and Station Manasquan Inlet.

In that same accident, another Coast Guard unit, Group Philadelphia, made an unscheduled marine information broadcast at the same moment the call outs were initialized. Commandant Instruction M16120.5A<sup>7</sup> states: “Units hearing the distress signal should cease transmitting and listen for at least 3 minutes before resuming communications.” No one knows whether the operator of the *Adriatic* attempted to transmit a second distress call because such a call may have been overridden by the four other units broadcasting over VHF channel 16.

Similarly, events surrounding the accident involving the Coast Guard Auxiliary vessel *Puppet* suggest that the search and rescue response was hampered by confusion wrought by the undisciplined use of VHF-FM channel 16 by participants in a fishing derby.<sup>8</sup> As a result, calls for assistance related to the *Puppet* were suppressed by the sheer volume of radio operators transmitting routine calls over the distress frequency.

In its investigation of the *Rite of Passage*<sup>9</sup> accident, the Safety Board learned that the Coast Guard Group Charleston communications watchstander did not follow proper procedures to obtain critical information concerning the physical condition of a boat operator calling to report that his engine would not start. The operator died after apparently falling overboard in violent surf while the Coast Guard was preparing to tow the vessel. Had proper procedures been followed, the Coast Guard might have realized the true seriousness of the situation and would likely have initiated a more timely response and would have reached the operator before his situation became hazardous.

Such instances show that breakdowns in communications and operations center responses to distress situations occur and indicate that improved management oversight of communications and operations center personnel is needed. Such oversight would provide an opportunity for the Coast Guard to prevent or correct mistakes and to improve overall mission performance.

In the view of the Safety Board, recorded transmissions represent an opportunity for the Coast Guard to evaluate watchstander performance and to discern areas where improvements may be needed. Review of tapes need not be of the entire recording in “real time.” An effective review program could be instituted by listening to a sampling of recorded broadcasts for each watchstander or by reading a transcription of a sample portion of the tape-recorded transmissions on a regular basis. Just having the knowledge that such sampling is taking place would, in all likelihood, spur watchstanders to improve their performance and their adherence to established procedures.

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<sup>7</sup> Chapter 3. SAR communications, Section 312 (B).

<sup>8</sup> For more information, see Marine Accident/Incident Summary Report—*Capsizing of Questar Motorboat and Drowning of Operator South of Shelter Island Near Juneau, Alaska, August 21, 1994.* (NTSB/MAR-96/01/SUM).

<sup>9</sup> For more information, see Marine Accident Brief Report No. DCA93MM023, “Falling Overboard from U.S. Recreational Boat *Rite of Passage*, Isle of Palms, Near Charleston, South Carolina, on August 4, 1993.” Adopted March 25, 1994.



The Safety Board therefore concluded that watchstander and duty officer performance would be improved by the establishment of a program of effective management oversight that includes a regular review of recorded radio transmissions and telephone conversations at Coast Guard communications centers.

The Safety Board's examination revealed that the watchstander's radio equipment was functioning and that he knew how to use it. All radio transmissions and telephone calls were recorded, and the watchstander could have replayed the 0217 distress call to help him discern its contents. Although the Stancil recording system was cumbersome, it was functional, and the watchstander testified that he knew how to use it.

One of the primary resources of the watchstander was the duty officer, who was sleeping nearby. The watchstander could have awakened him and asked his assistance and advice. He said he knew procedures were in place that directed him to awaken the duty officer if he had any question about a transmission he received. He also stated he had no negative pressure or reluctance to awaken the duty officer; he simply did not think it was necessary.

Likewise, the Safety Board determined that the duty officer's response following the 0628 call were not influenced by a lack of manpower or equipment. The duty officer had two telecommunications specialists at his disposal who could have taken some of his workload, made telephone calls, or gotten in touch with the pilot on the *Pearl Ace* to verify or get more information related to the report of the cries from the water. Or, if he had any doubt about the nature of the 0628 message, he could have had one of the watchstanders play back the telephone conversation between the watchstander and the pilot boat dispatcher. Finally, he had at his disposal a boat that he could have launched on his own authority to search the area of the ship channel in the vicinity of buoy 22. The Safety Board therefore concludes that the communications watchstander who received the 0217 transmission and the operations duty officer who received the 0628 telephone call had resources available that, had they been used, could have resulted in a more timely response to the *Morning Dew* accident.

Critical to the Coast Guard's timely search and rescue response to a request for assistance is the effective detection, identification, and evaluation of a radioed call for help and a means of determining the origin of the call. Because distress calls to the Coast Guard may be weak, incomplete, garbled, or barely audible, the Coast Guard's ability to easily locate and replay radio transmissions is crucial. But detection and analysis of a radio signal includes not only knowing what is said but where the call originates. Radio DF systems have traditionally been used to determine the *direction* of a radio call; however, a DF system that includes a suite of DF receivers working together can fix the actual *position* of a call, and such a capability, in the view of the Safety Board, has the potential to save lives.

To be effective in the performance of their duties, communications watchstanders must be able to quickly and easily play back recorded transmissions. The emphasis should be on "easily" because the easier the task, the more likely it will be performed.

The Coast Guard has initiated a program to replace the current recorders with new digital voice loggers (DVLs). While these recorders are more intuitive and user-friendly, they still lack

the important capability to rapidly replay the last recorded transmissions. It is noteworthy that the Canadian Coast Guard's recording equipment at the Prince Rupert Marine Communications Traffic Services station is capable of replaying the last transmissions received by simply pressing a single button. In the case of the *Morning Dew*, the watchstander stated that he never considered that he might need to replay the recording of the 0217 call. However, had he analyzed it correctly and had he been able to rapidly replay it, he would have correctly identified it as a distress call. The Safety Board concluded that the capability to instantly replay radio transmissions could assist radio watchstanders in the performance of their duties and thereby enhance the effectiveness of the Coast Guard's search and rescue efforts.

The Safety Board acknowledges the Coast Guard's efforts to upgrade its DVLs to include an instant playback capability. However, the addition is part of an overall upgrade that may take years to complete. In the view of the Safety Board, this capability is too important to delay when equipment that could perform the job is already available.

With the communication system in place at Group Charleston at the time of the *Morning Dew* accident, the watchstander who received the 0217 call could determine only that the call had been received by the Mount Pleasant high-site antenna. Had he properly analyzed the situation, played back the recording of the call, and recognized it as a distress call, he still would have had no information about the location of the vessel, since Group Charleston's direction finding equipment (DF) was minimally functional and, according to reports of watchstanders, was usually turned off. Even had it been turned on, the DF screen was located behind him, and unless he was watching it at the time the call was received, he would have gotten no useful information from it. In any event, the best he could have gotten would have been a single line of bearing of the transmission rather than a position fix of the vessel.

The need for the Coast Guard to have effective DF receivers was also highlighted in the accident involving the *Adriatic*. In this case, the Coast Guard communications watchstanders knew they were dealing with a vessel in distress, but they had no idea of the vessel's identity or location. Even without its identity, if Group Atlantic City had been equipped with a DF system similar to that employed by the Canadian Coast Guard at Prince Rupert, it may have been able to obtain a position fix and could have immediately initiated search and rescue procedures.

According to Coast Guard search and rescue statistics for fiscal years 1984-1997,<sup>10</sup> the Coast Guard, in FY 97, spent more than 400,000 hours on search and rescue sorties. Yet, the service reports that 287 lives were lost after the Coast Guard was notified. A DF system that could help pinpoint the location of a distress call could, in the view of the Safety Board, reduce the amount of time needed to locate mariners in distress. And some of this time savings could translate to lives saved. If the Coast Guard had had an effective DF system in FY 97, at least some of the 287 people who died after Coast Guard notification may have been saved. The Safety Board concluded that the Coast Guard's ability to respond effectively to distress calls, and thereby to save lives, would be improved significantly through the installation of DF systems that provide position fixes for incoming calls and the capability to retrieve and review DF data.

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<sup>10</sup> Available on the World Wide Web at <http://www.uscg.mil/hq/g-o/g-occ/servicewide.htm>.

The Safety Board notes that the Coast Guard reports that, in the near term, it is providing funds to its communications centers that are not currently equipped with DF systems for the purchase of such equipment. According to the Coast Guard, however, the expectation is that the purchased equipment will be similar to that now in place at Group Charleston and other communications centers. Because the existing equipment has been shown by a survey conducted by the Naval Surface Warfare Center, Carderock Division (NSWC-CD), for the Safety Board and by testimony of Coast Guard members to be ineffective to the point that it is often not turned on, the Safety Board fails to understand how this program will significantly improve the Coast Guard's search and rescue response capability.

The need to modernize the National Distress System (NDS), including adding state-of-the-art DF capability, is well known and fully appreciated by the Coast Guard; however, the Coast Guard's ongoing efforts to develop a modern distress communications system have not accomplished that goal and will not do so for at least another 5 years. While the Safety Board recognizes that some technologies require further research and development in order to be used effectively in a search and rescue application, DF is one technology that has been available for years and is immediately available to the Coast Guard "off the shelf." DF systems have been used in search and rescue operations internationally by a number of developed countries, including Canada, for at least 7 years. The Safety Board therefore believes that the Coast Guard should immediately begin to equip its search and rescue communications centers with currently available, commercial, off-the-shelf DF systems that provide, at a minimum, the capability to establish a position fix and to record position data for later retrieval and analysis

The NSWC-CD examination of the type and quality of communications equipment and resources available to watchstanders at Group Charleston revealed that the watchstander's radio equipment was adequate and functioning. All radio transmissions and telephone calls were recorded, and the watchstander could have replayed the 0217 distress call to help him discern its contents. Although the Stancil recording system was cumbersome, it was functional, and the watchstander testified that he knew how to use it. However, the NSWC-CD's evaluation of communications system performance at Group Charleston and Group Mobile found deficiencies in programmed maintenance that would affect the early detection of faults; a lack of frequency management that contributed to signal interference; a lack of condition-based monitoring that would provide continuous remote monitoring of vital equipment; degradation of antenna signal through the existing phone line service; recording/playback equipment of limited capability or user-friendliness; and inaccurate, unreliable, and obsolete DF equipment.

The Safety Board considers it noteworthy that the NSWC-CD found that the same or similar problems existed in the communications systems at Coast Guard group offices in two widely separated locations. Since the Coast Guard employs the same basic communications infrastructure throughout most of the country, the Safety Board concluded that problems similar to those identified by the NSWC-CD at Group Charleston and Group Mobile may be present at other Coast Guard Groups throughout the Nation. The Safety Board therefore believes that the Coast Guard should conduct a comprehensive review, similar to the one conducted by the NSWC-CD at Group Charleston and Group Mobile, of the communications infrastructure at all Group communications centers.

The Safety Board considers it vitally important to the efficient and effective performance of communications watchstanders that important equipment be conveniently located. If watchstanders have to leave their normal station to perform a task, they are removed from other equipment necessary for the performance of their duties which, in the Board's view, is a disincentive to perform the task.

The NSWC-CD's ergonomic assessment of Coast Guard communication facilities at Group Charleston and Group Mobile found that the Stancil recording and playback device was not located conveniently to the watchstander. The NSWC-CD further reported that in the Group Charleston center, the DF equipment was mounted behind the watchstander. Once a modern DF system is installed, it should quickly become something that the watchstander will come to rely on for position data on incoming radio calls. It should be mounted for easy viewing and convenient operation.

All auditory and visual elements should be afforded special consideration in laying out the watchstander's workstation. For example, all equipment that must be viewed during the handling of a call should be located at an appropriate distance and angle for concurrent, effective viewing. Similarly, care should be used in the placement of speakers within the workstation. By separating speakers horizontally, auditory masking of one speaker's transmission by another is minimized, enabling the watchstander to selectively attend to the transmission of interest. Also, horizontal speaker separation enhances the watchstander's ability to identify the source of the transmission, which can aid in differentiating transmissions related to more than one concurrent case. The Safety Board concluded that all the equipment necessary for watchstanders to carry out their responsibilities should be installed in such a way as to facilitate the performance of the work and to minimize the likelihood of errors and omissions.

In order to make the appropriate ergonomic changes at its group communications center, the Coast Guard needs to conduct a watchstander task/activity analysis to identify the essential task elements. Once these elements are identified, the relationships among the tasks can be determined so that equipment can be placed correctly. In carrying out this analysis, the Coast Guard should consider related activities, such as use of the restroom or the coffeemaker, during a normal watch routine. This information should be used, in conjunction with appropriate techniques such as operational sequence diagramming or link analysis,<sup>11</sup> in arranging components within the watchstander workstation so as to facilitate the performance of all job functions.

The overall effectiveness of the Coast Guard's search and rescue mission is largely a function of the readiness of its operations and communications centers. These centers are the primary links between mariners in distress and people who have the assets and the skills to render assistance. If those links are weak, the effectiveness of the overall search and rescue effort may be compromised. Evidence gathered during the Safety Board's examination of the *Morning Dew* and

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<sup>11</sup> *Link analysis and operational sequence diagramming* are analytical techniques used in optimizing the location and relationships among functional components within a work space. For more information, see Laughery, K.R., Sr. and Laughery, K.R., Jr., "Analytic Techniques for Function Analysis," in G. Salvendy [Ed.], *Handbook of Human Factors*, Wiley-Interscience (1987); and "Physical Space and Arrangement," in Sanders, M.S. and McCormick, E.J., *Human Factors in Engineering and Design* (Sixth Edition), McGraw-Hill (1987).

other accidents indicates that operational readiness at some Coast Guard communications centers may have become substandard.

For example, the operations duty officer who did not respond to a report of cries for help from the water in the *Morning Dew* accident was an experienced watchstander with more than 17 years of Coast Guard experience and 3 years as a watchstander at Group Charleston. Yet, he did not launch available resources. The fact that he had received a report of cries for help and had been given a specific location in which to search and yet took no action suggests that his level of readiness was below what it should have been.

A similar failure to respond appropriately to clear evidence of a potential distress situation occurred in the Oswego, New York, boating accident in which the Coast Guard received specific information regarding a capsized vessel and its location, but the person in charge opted to do nothing.

At Group Charleston, transcripts of radio transmissions and telephone conversations recorded around the time of the *Morning Dew* accident revealed a large number of personal telephone calls made by watchstanders, which could conflict with the level of attentiveness with which they should conduct their watchstanding duties.

In both the *Morning Dew* and Oswego cases, the responsiveness and overall performance of operations center personnel would appear to fall below what would have been expected by higher levels of Coast Guard management. Yet, unless the Coast Guard carries out ongoing oversight and evaluation of its land-based commands, groups, and units, degradations in the readiness of those units can occur gradually over a long period of time and remain hidden until brought to light by a tragedy such as the sinking of the *Morning Dew*.

The *Morning Dew* investigation revealed that the Coast Guard has no program or requirement for periodic inspections to measure the proficiency of its subordinate districts, groups, or other land-based units. For many military organizations, productivity and operational readiness are continuously measured at the command level through periodic inspections of subordinate command elements, including conducting unannounced exercises designed to measure the unit's readiness for its assigned tasks. Such exercises typically include both the knowledge and expertise of the command's personnel. The possibility of being subjected to an operational readiness inspection provides the incentive for subordinate commands and their personnel to remain current and proficient and to sustain a high level of performance.

The Safety Board concluded that the operational readiness of Coast Guard communications centers could be improved and gradual degradations in performance prevented by a program of periodic operational readiness inspections.

Throughout the response to the *Morning Dew* accident, the South Carolina Department of Natural Resources (SCDNR), the coroner, and local agencies participated in an incident command system (ICS) that allowed them to manage their personnel and resources and to control their communications. The fact that the Coast Guard did not participate in this system resulted, in several instances, in a lack of coordination between the Coast Guard and local agencies.

For example, both the coroner and the Coast Guard needed information from the families of the deceased. The Coast Guard needed to know how many people had been on the vessel, and the coroner needed to establish their identities. Had the Coast Guard participated in the ICS, Coast Guard representatives would have been aware of the coroner's procedures, and the notification process would have been much better coordinated.

In another instance, the SCDNR investigator-in-charge arrived on scene and was told that the Coast Guard had already requested that a commercial salvor send divers to identify the name on the sailboat. The SCDNR investigator-in-charge, wanting to preserve any evidence in case of a criminal investigation, had to tell the divers not to disturb any of the evidence. The preservation of evidence should have been discussed before divers were deployed.

It is true that a Coast Guard representative was in telephone contact with an SCDNR representative and Sullivans Island police officers during different phases of the response; however, the absence of a representative at the command post where decisions were being made resulted in the Coast Guard representative's not being able to efficiently track the progress being made in the joint investigation or to answer any questions. Moreover, by not being privy to the evolving investigation, he was not able to provide information known to the Coast Guard that may have facilitated the SCDNR investigation.

The problems in coordination that arose during this accident could have been avoided if the Coast Guard, the SCDNR, and local responders had been using a system that allowed them to manage a joint search and rescue operation. The ICS allows different agencies with different operating procedures to work together in one system to accomplish a common goal. The ICS also reduces the duplication of effort and the burden that can be placed on people involved in an accident investigation who must obtain similar information from different agencies. As noted earlier, in this accident, both the SCDNR and the Coast Guard needed information from the families of the deceased. Both agencies had standard operating procedures for obtaining the information. By working together and sharing information within the ICS structure, decisions could have been made initially about how to obtain the information without compromising the other agency's procedures. Furthermore, if the Coast Guard search and rescue personnel and the SCDNR and local agencies had participated in joint drills that used the ICS, Coast Guard personnel would have known about the other agencies' procedures and the SCDNR's desire to preserve evidence and may have contacted the SCDNR before having divers attempt to identify the sunken vessel. Also, information needed by other agencies, such as the SCDNR, could have been disseminated within the ICS before being given to the press. In this case, the SCDNR learned about information vital to the investigation from press releases issued by the Coast Guard.

The Safety Board concluded that the postaccident activities of the Coast Guard were not well coordinated with the activities of the other emergency responders because the Coast Guard did not participate in the ICS that was established in response to the accident. The Coast Guard's postaccident implementation of an ICS training program should help search and rescue personnel understand the structure and benefits of the ICS in responding to an accident. But in the view of the Safety Board, such training should be augmented by drills that allow all participating agencies to identify and correct any problems before the need arises to respond to an actual incident.

The SCDNR was not given immediate access to information the Coast Guard had that was vital to the SCDNR's investigation. This information included the report of the witness who saw the *Morning Dew* leaving Winyah Bay and the fact that Group Charleston had received two calls that were determined to have been distress calls from or involving the *Morning Dew*. Notwithstanding the fact that this information was critical in determining the time and nature of the accident, the SCDNR only learned it from accounts in the local newspapers or from second-hand reports from the family of the deceased operator months after the accident.

Coast Guard officials were aware as early as the evening of December 29 that a mayday call had been received between 0200 and 0230 that same day; yet no one outside the Coast Guard was told about it for more than 2 1/2 months, and then only after a FOIA request from the press made almost inevitable the eventual release of the tape recording of the call.

On December 30, an investigator from the SCDNR saw a newspaper and learned for the first time about the report from the *Pearl Ace* about voices from the water. The investigator called Group Charleston to inquire about this report. He specifically asked the group operations officer if any distress calls had been received in the hours preceding the accident. The carefully worded response led the SCDNR representative to believe the answer was no. The group operations officer's actual answer was that the watchstander had not "perceived" any mayday calls. But this answer, while perhaps technically accurate, was clearly, if not intentionally, misleading. The Coast Guard was well aware that, whether or not the watchstander had recognized it as such at the time, a mayday call had been received at 0217.

The SCDNR was prosecuting a death investigation as the responsible South Carolina marine law enforcement agency. As such, the agency had a right to all pertinent search and rescue information and should have been provided such information as soon as it became available. The information concerning the distress call and the timing of the call was crucial and had to be factored into the SCDNR investigation to determine the time of the accident and the time of death.

The SCDNR was also the South Carolina agency responsible for investigating recreational boating accidents under the State recreational boating safety laws. Since the Coast Guard does not investigate recreational boating accidents and the Safety Board rarely conducts such investigations, an SCDNR investigation would usually be expected to be the only safety investigation an accident such as this one would receive. It is therefore crucial to the interests of boating safety that organizations such as the SCDNR have access to all pertinent search and rescue information so that they can accurately assess safety lessons that might help prevent similar accidents in the future.

Asked about withholding information about the 0217 call, Coast Guard officials at every level of command, from Group Charleston to the Commandant's staff at Coast Guard Headquarters, cited their understanding that Coast Guard policy prohibits releasing information that is subject to an internal Coast Guard administrative investigation until the investigation is complete. But no written policy of withholding information existed. Furthermore, the Coast Guard official who responded to the SCDNR investigator's inquiry about a possible distress call did not tell the investigator that an ongoing investigation prevented him from releasing

information pertinent to the accident. Had he done so, the investigator could have pursued the matter with higher levels of Coast Guard management, and the policy, or lack of such a policy, would have been clarified, and the information would probably have been released. Instead, the Coast Guard officer provided an answer that essentially shut off one avenue of the investigation. The answer may also have been seen to help the Coast Guard avoid embarrassment.

The Safety Board concluded that the Coast Guard erred in not immediately providing all pertinent search and rescue information about the *Morning Dew* accident to the South Carolina Department of Natural Resources, and the failure to provide the information hampered the department's investigation of the accident.

In ALDIST 041/99, the Coast Guard provides guidance to Coast Guard field units for disseminating search and rescue information, whether or not an administrative investigation is ongoing. ALDIST 041/99 shifts authority for release of the information down the chain of command to the search and rescue controller (operations duty officer level) and mandates that search and rescue information be provided to State and local agencies in the absence of some overriding reason to withhold it.

Any decision at the controller level to withhold search and rescue information must have the concurrence of the district staff; thus, at least on the surface, the ALDIST appears to display a bias in favor of disseminating search and rescue information. The ALDIST does not, however, specify the nature of the "overriding reason" that would be considered sufficient to support the withholding of the information. Therefore, the Safety Board concluded that the new Coast Guard guidance regarding the release of search and rescue information, because it does not specify and limit the conditions under which such information can be withheld, leaves open the possibility that pertinent information can still be inappropriately withheld from duly authorized agencies or individuals.

Furthermore, an ALDIST is only temporary guidance, effective either for a limited time or until it is made a part of a standing instruction. Because, according to the chief of the Office of Search and Rescue, the issue of releasing information is still under study by the Coast Guard, the final disposition of the issue and resulting policy statement may be markedly different from the ALDIST. The Safety Board sees no justification for withholding from bona fide local, State, and Federal investigative agencies any facts about the Coast Guard's search and rescue activities that would be relevant to an accident or an accident investigation.

This lack of coordination documented during this investigation occurred despite the existence of a memorandum of understanding (MOU) between South Carolina and the Coast Guard that spelled out the duties and jurisdictions of each party in the event of a recreational boating accident. The commanding officer of Group Charleston stated that he was unaware of the MOU, even though it had been in place since 1984. Had he had knowledge of the agreement and its provisions, the coordination between the Coast Guard and the SCDNR in the aftermath of this accident may have been significantly improved.

Two issues concern the Safety Board in regard to the agreements now in place between the Coast Guard and the States. First, with both State and Federal government boating safety



programs responding to shifting responsibilities and sometimes erratic funding, the circumstances under which a particular MOU or statement of agreement was prepared can change. These changes need to be reflected in revised agreements. Second, turnover of personnel in State agencies, as well as in the Coast Guard, can lead to a situation such as that occurring in the *Morning Dew* accident in which a responsible Coast Guard individual was not aware that an agreement existed.

The Safety Board notes that at least some of the Coast Guard's agreements with the States delegating boating safety responsibilities have been updated since they were originally signed. The Safety Board further notes that the MOU the Coast Guard signed with the State of South Carolina was reviewed in 1994. However, in the 5 years since the update, personnel changes have undoubtedly occurred both in State agencies and in the Coast Guard, and relevant telephone numbers, points of contact, and agency responsibilities may also have changed. Such changes can quickly render agreements out of date, making them less effective in promoting the degree of cooperation and coordination envisioned when the agreements were originally prepared. And although ALDIST 041/99 directs district commanders to review existing agreements or MOUs for currency, the guidance does not provide a time frame for the completion of the reviews, nor does it provide for follow-up periodic review and updating, which is necessary to ensure that the agreements are kept current.

The Safety Board concluded that in order to ensure effective coordination and cooperation between the Coast Guard and the States in boating accident cases, the agreements between the Coast Guard and the States that govern such cases must be jointly revised or updated on a regular basis to keep them current and to keep the appropriate personnel aware of their contents.

The Coast Guard watchstander and duty officer were asked during comprehensive interviews whether they smoked, drank alcohol, or used illegal drugs. The Safety Board found no reason to suspect that drugs or alcohol might have been involved in the accident. However, the effects of alcohol and drugs could not be positively ruled out because the two men were not toxicologically tested.

In the view of the Safety Board, toxicological tests for alcohol and drugs were indicated in this case. The Safety Board did not become involved in the *Morning Dew* investigation until 4 months after the accident. At that point, it would have been useless for the Safety Board to have required alcohol and drug testing of the people involved in the accident. However, the commanding officer of Group Charleston knew on the day of the accident that at least one of his watchstanders was involved in the accident. He could have ordered the person involved to submit to an alcohol and drug test at that time; however, no Coast Guard guidance or directive required a toxicological test in cases not involving a Coast Guard accident (mishap) investigation.

The Board has previously addressed the need for toxicological testing of Coast Guard personnel who are directly involved in the circumstances leading up to an accident. Coast Guard regulations require toxicological testing of its personnel during a mishap investigation when their actions can be causally linked to the accident. In the case of the *Morning Dew* accident, however,

the Coast Guard never convened a mishap investigation; instead, it conducted a single-officer administrative investigation.

The Safety Board concluded that the Coast Guard's procedures for the testing of its personnel for drugs and alcohol are inadequate in that they do not in all cases provide for the testing of personnel whose work performance may be linked to an accident. In the view of the Safety Board, involved personnel should be tested whether or not the Coast Guard decides to convene a mishap investigation. Since the determination of a possible causal link may well have to be made at the local level, such as was the case in the *Morning Dew* accident, procedures should be established to provide local commanders and unit safety officers with the necessary guidance to accomplish such testing.

After receiving the 1115 call from the police department reporting two bodies in the surf in the vicinity of Fort Moultrie, the duty officer briefed the operations officer, and they initiated a search and rescue response. At 1144, the duty officer received a call from the operator of a pilot boat stating that he had located a sailboat mast on the south side of the north jetty between buoys 16 and 20. Based on this information, the Group had sufficient information to develop a search and rescue action plan using a computer-based system to determine the probable search areas. Adequate resources were available to execute the plan.

At 1128, a helicopter was requested from the Seventh District Operations Center, and the request was approved at 1137. The helicopter was on scene near the north jetty at 1151. The 41-foot utility boat was underway at 1159, after the helicopter had been requested, and arrived on scene 100 yards from the sailboat at 1217. Although the utility boat was at the Coast Guard boat station and should have been launched sooner, the delay did not hamper the search and rescue efforts. Helicopters and the utility boat were prepared to launch within 30 minutes of being notified. Two helicopters and a utility boat completed five parallel searches that included the area where the sailboat mast was located, along the shoreline, and the harbor entrance and the jetties.

The National Park Service, the sheriff's department, and local volunteers assisted in the search and in the transport of emergency responders to the north jetty. The Safety Board concluded that the Coast Guard's search efforts were appropriate, even though the search was not initiated in a timely manner.

Despite the fact that the search efforts in response to this accident were appropriate, the Safety Board concludes that if Coast Guard search and rescue personnel were made aware of all the circumstances of this accident, they may have a heightened awareness of the full range of elements that contribute to a successful search and rescue effort.

Based on its investigation of the *Morning Dew* accident, the Safety Board makes the following safety recommendations to the United States Coast Guard

For all your operations and communications center watchstanders, develop and implement a course or training program designed to develop or enhance those individuals' judgment and decision-making skills. (M-99-2)

Improve your telecommunications specialist qualification program, in concert with the telecommunications school and the guidance in the *Group and Stations Communications Watchstander Qualification Guide*, to provide for increasing levels of watchstanding responsibility under the direct supervision of experienced mentors and to allow for full telecommunications specialist certification only after candidate watchstanders have passed comprehensive proficiency tests that demonstrate their skills. (M-99-3)

Immediately institute procedures to provide improved management oversight of the performance of all your communications and operations centers, including instituting a program to periodically review the tapes of recorded radio transmissions and telephone calls. (M-99-4)

Institute a system of periodic operational readiness inspections for all your subordinate land-based search and rescue communications commands, groups, and units as a means of evaluating and improving the search and rescue communications effort at those activities. (M-99-5)

Institute a permanent policy of promptly sharing pertinent search and rescue information with properly constituted local, State, and Federal investigative agencies so long as the release of such information does not compromise the ability of the Coast Guard to perform its search and rescue mission. (M-99-6)

Take the steps necessary to immediately begin to provide all Coast Guard search and rescue communications centers with the capability for watchstanders to easily and instantly replay the most recent recorded radio transmissions. (M-99-7)

Immediately begin to equip all your search and rescue communications centers with currently available, commercial, off-the-shelf direction-finding systems that provide, at a minimum, the capability to establish a position fix and to record position data for later retrieval and analysis. (M-99-8)

Review the ergonomic adequacy of equipment layouts in all Coast Guard group communications centers and make changes as necessary to ensure that equipment critical to the proper performance of the watchstanders' duties is placed in the optimum ergonomic arrangement. (M-99-9)

Conduct a comprehensive review, similar to the one conducted by the Naval Surface Warfare Center, Carderock Division, at Group Charleston and Group Mobile, of the communications infrastructure at all Group communications centers and take immediate steps to correct any deficiencies found. (M-99-10)

Ensure that the workload and staffing analysis for which you have contracted with the Center for Naval Analysis fully incorporates existing human performance research on vigilance, attention, and fatigue in the determination of shift length, shift rotation, and staffing levels at all Coast Guard search and rescue communications centers. (M-99-11)

Implement a program whereby Coast Guard emergency response personnel participate in drills with local agencies within their area of responsibility in order to exercise their role in the incident command structure and gain experience in using the incident command system. (M-99-12)

Within 6 months, and at least biennially thereafter, review and revise, as necessary, all boating safety agreements between the Coast Guard and the States to ensure that those agreements (1) are coordinated between local Coast Guard authorities and the appropriate agencies within the States and (2) accurately reflect current responsibilities and jurisdictions in such areas as boating casualty accident investigation and reporting, search and rescue, and related boating safety issues. (M-99-13)

Disseminate the National Transportation Safety Board's report on the *Morning Dew* accident to all your group operations and communications center personnel as a way of informing them of the circumstances of the accident and the lessons to be learned from it. (M-99-14)

Establish procedures for toxicological testing for alcohol and drugs of Coast Guard personnel in group and unit operations and communications centers whose work performance may be linked to an accident. (M-99-15)

Review the navigation aids marking the route of the Intracoastal Waterway (ICW) at Winyah Bay and make any changes necessary to reduce the likelihood that southbound recreational boaters intending to follow the ICW will inadvertently depart that waterway and follow the main shipping channel toward the open ocean. (M-99-16)

Also, the Safety Board issued Safety Recommendations M-99-17 to the Governors of the 50 States, M-99-18 to the National Association of Boating Law Administrators, M-99-19 to the U.S. Coast Guard Auxiliary, M-99-20 to the U.S. Power Squadrons, M-99-21 to the National Safe Boating Council, and M-99-22 to the Boat Owners Association of the United States.

Please refer to Safety Recommendations M-99-2 through -16 in your reply. If you need additional information, you may call (202) 314-6457.

Chairman HALL, Vice Chairman FRANCIS, and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred in these recommendations.

By: Jim Hall  
Chairman