



# National Transportation Safety Board

Washington, D.C. 20594

## Safety Recommendation

Date: September 18, 1990

In reply refer to: M-90-26 through -31

All shipping companies operating in  
the Prince William Sound  
(see attached list)

About 0009, on March 24, 1989, the U.S. tankship EXXON VALDEZ, loaded with about 1,263,000 barrels of crude oil, grounded on Bligh Reef in Prince William Sound, near Valdez, Alaska. At the time of the grounding, the vessel was under the navigational control of the third mate. There were no injuries, but about 258,000 barrels of cargo were spilled when eight cargo tanks ruptured, resulting in catastrophic damage to the environment. Damage to the vessel was estimated at \$25 million, the cost of the lost cargo was estimated at \$3.4 million, and the cost of the cleanup of the spilled oil during 1989 was about \$1.85 billion.<sup>1</sup>

The third mate had probably had very little sleep the night before the grounding and had worked a stressful, physically demanding day. Since deballasting and cargo handling activities were ongoing while the EXXON VALDEZ was at the Alyeska terminal, the third mate was unlikely to have obtained a full off-watch period of rest when he went to bed at some time after 0100 on March 23. Also, he may have been called as early as 0520 to relieve the second mate. According to the second mate, he and the third mate were covering the chief mate's watch essentially on a 6-hours-on and 6-hours-off basis. An unlicensed crewmember recalled seeing the third mate on deck during the first half of the afternoon 1200-to-1600 watch, and the third mate stated that he did work in the afternoon conducting a salinity test and that later he relieved the chief mate during supper. The third mate testified that he had had a nap in the afternoon, but the time that he would have been resting would have been between being on deck during the 1200-to-1600 watch and relieving the chief mate for supper.

The Safety Board concludes that the third mate could have had as little as 4 hours sleep before beginning the workday on March 23 and only a 1- to 2-hour nap in the afternoon. Thus, at the time of the grounding, he could have had as little as 5 or 6 hours of sleep in the previous 24 hours.

<sup>1</sup>For more detailed information, read Marine Accident Report--"Grounding of the U.S. Tankship EXXON VALDEZ on Bligh Reef, Prince William Sound Near Valdez, Alaska, March 24, 1989" (NTSB/MAR-90/04).

Regardless, he had had a physically demanding and stressful day, and he was working beyond his normal watch period.

Impaired task performance could normally be anticipated as a result of these conditions of partial sleep loss,<sup>2</sup> particularly since the preceding work day had consisted of demanding activities. However, the third mate's navigation tasks for starting the turn involved navigating the EXXON VALDEZ in a high-risk situation. If he made the turn too early, the vessel would encounter the glacial ice at maneuvering speed, possibly resulting in hull damage. If he waited too long to execute the turn, the vessel would ground on Bligh Reef. Thus, the significance of the course change and the anticipation of taking action should have increased the third mate's resistance to debilitation from fatigue, at least for the limited period of time involved.<sup>3</sup> Nonetheless, the insidious nature of fatigue is such that sleep could have overcome him at any time that he momentarily relaxed his vigilance.

As usual, the chief mate had been up during most of the deballasting and loading of the vessel and was in need of rest. Giving the chief mate responsibility for the loading and discharging of the cargo and/or ballast and having him on duty during all critical stages of these operations is widely practiced. The result is many hours of work for the chief mate and, in most cases, the assumption of his in-port watches by the other two mates. Thus, on three-mate vessels, the other two mates are essentially or in fact standing 6 hours on watch and 6 hours off, a schedule that seldom enables any officer to acquire adequate rest until the vessel returns to sea and can resume a three-watch system. Consequently, the first part of the voyage, the transit through the port and other confined or congested waters, is likely to be conducted by navigation watch officers who are in varying stages of fatigue. This problem is recognized by some masters, who assume the navigation watch until one of their watch officers has obtained sufficient rest to assume the watch, but this is not the practice on all three-mate vessels. The Safety Board believes that vessel operators should be held accountable for ensuring that a rested officer, in addition to the master, is available to stand the navigation watch when the vessel departs for sea. This could be achieved by the costly, but simple, procedure of keeping the vessel in port long enough after loading the cargo to enable an officer to acquire the needed rest. Also, a fourth deck officer could be assigned to the vessel, as was the practice in the past on many tankships, including those of the Exxon Shipping Company, or a qualified tankship officer could be temporarily assigned to assume the chief mate's watch in port. Furthermore, having an overworked, fatigued chief mate in charge of cargo transfer operations could result in a catastrophic accidental release of the cargo while the vessel is in port. The Safety Board also believes that the Coast Guard should monitor working conditions on tankships, both domestic and

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<sup>2</sup>Holley, D.C. et al., "Effects of Circadian Rhythm Phase Alteration on Physiological and Psychological Variables: Implications to Pilot Performance," NASA Technical Memorandum 81277, March 1981, p. 13.

<sup>3</sup>Johnson, L.C. and Naitoh, P., "The Operational Consequences of Sleep Deprivation and Sleep Deficit," AGARD-AG-193, June 1974, p. 33.

foreign, in U.S. ports to ensure that enough officers are available in port to load the vessel so that at least one rested deck officer is available, besides the master, to take the vessel to sea.

What's more, the EXXON VALDEZ was operated with a reduced crew complement. Evidence indicated that watchkeeping safeguards on the EXXON VALDEZ had been compromised because of the manning level. The number of unlicensed crewmembers in the deck department was not sufficient to provide uninterrupted lookout capability when other routine deck-department duties arose. When one AB was required to serve as helmsman, the remaining ABs on duty had to cover all work and lookout responsibilities unless an AB from another watch was "turned to" on overtime. Moreover, when a lookout was required for long transits through congested waterways, no other qualified persons on duty were available to relieve that crewmember for breaks. As a result, on the EXXON VALDEZ, the lookout position routinely went unattended when the AB was called for other tasks or took a break.

The Exxon Seamen's Union officials testified during depositions that the sea passages for voyages between Alaska and California were not long enough for conducting necessary maintenance or permitting thorough crew rest between the around-the-clock demands of cargo handling in port. When the current minimum crew requirements were established for the EXXON VALDEZ, the vessel had been scheduled for the Valdez-Panamanian trade. But that trade was discontinued after December 1988, and the EXXON VALDEZ then began operating regularly between Valdez and ports in California. The mates on the EXXON VALDEZ were usually fatigued after cargo handling operations in Valdez, and the vessel usually put to sea with a fatigued crew. Although the EXXON VALDEZ had cargo handling automation, the equipment did not eliminate the need for deck officers to spend many hours on cargo watches.

Compliance with Exxon Shipping Company procedures that require two officers on the bridge during maneuvering may have provided sufficient sharing of the workload to prevent the grounding of the EXXON VALDEZ. However, the Safety Board is reluctant to endorse the routine use of two officers, who may not have had adequate rest, as a means of obtaining a sufficient number of personnel for a navigation watch. The Safety Board contends that manning levels aboard ships should incorporate realistic expectations for human endurance and fallibilities so that the amount of work required for peak periods, such as cargo handling in port and tank cleaning at sea, can be accomplished without debilitating fatigue.

The Safety Board considers the reduced manning practices of the Exxon Shipping Company generally incautious and without apparent justification from the standpoint of safety. The financial advantage derived from eliminating officers and crew from each vessel does not seem to justify incurring the foreseeable risks of serious accidents.<sup>4</sup> Regarding company manning practices that related to the EXXON VALDEZ, the Safety Board does not believe that the Exxon Shipping Company showed sufficient regard for the known debilitations that occur as a result of crewmember fatigue. Furthermore, the Safety Board could find no reasonable explanation for the following: the absence of company programs to ensure that crewmembers observed

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<sup>4</sup>The cost of cleanup is expected to exceed \$2 billion.

hours-of-service regulations; the lack of procedures to ensure that at least one rested deck officer, in addition to the master, was available for watch at departure; the practice of rating a crewmember's performance in part according to willingness to work overtime, thus giving an incentive to work an excessive number of hours; and the indiscriminate increase in work loads and standby time throughout the fleet before and after the grounding of the EXXON VALDEZ.

The Exxon alcohol policy directive in effect during 1985 when the master underwent treatment instructs supervisors to refer to the medical department employees whose job performance is unsatisfactory owing to the perceived use of alcohol. In this case, the master's supervisor was apparently unaware that the master had an alcohol dependency problem prior to his hospitalization. Upon learning of his dependency problem, his supervisor, according to Exxon procedures, was supposed to have referred his case to the medical department. The personnel documents provided by Exxon showed that a followup treatment program was recommended by the attending physician at the hospital. While it is documented that the master was given a 90-day leave of absence, no documents were provided to establish that this recommended outpatient treatment program was followed or that his progress was monitored by management. Nor does the Exxon medical department appear to have contacted the hospital where he received in-patient treatment. The lack of records suggests that no guidance, advice, or information was provided by Exxon management or the Exxon medical department to the master's supervisor. Furthermore, no one in the Exxon management structure seems to have consulted an expert on alcoholism about the following issues: the kind of support the master would need when he resumed his work, the kind of supervision and monitoring he would need, the chances that he would resume drinking, the signs that might indicate that he had resumed drinking, and the kind of assignments he could perform without risking his sobriety. The president of Exxon Shipping Company testified that the master "thought he was the most scrutinized employee in the company." If this scrutiny did take place, written records either do not exist regarding his supervision and evaluations during this period or the records have not been provided, except one that was constructed from memory after the grounding. Furthermore, the solitary nature of a master's job is not conducive to monitoring; thus, visits to his vessel during short port calls are not likely to have been very effective in determining whether the master was abstaining from alcohol. Some personnel performance records (evaluations) were unsigned; thus, their authenticity could not be established. It must be surmised from the absence of information that the EXXON management and the medical department were unprepared or unwilling to deal with an alcoholic master and made insufficient effort to become informed or knowledgeable regarding the problems of an alcoholic and the rate of recidivism even under the most ideal conditions. As is well known, a carefully constructed support system that includes frequent, continuous interaction with the support system is necessary to prevent an alcoholic from returning to alcohol abuse. In contrast, it is reasonable to assume that if Exxon had a technical problem, such as an autopilot failure, with one of its vessels, either the problem would be assigned to an expert within the Exxon company structure or an outside consultant would be hired to solve the problem. Considering the investment Exxon had made in the master, the potential cost of a marine accident in terms of human loss or environmental damage as a result of having an alcohol-impaired master, and the lack of oversight documentation, it can

be concluded that the Exxon corporate management demonstrated inadequate knowledge of and concern about the seriousness of having an alcohol-impaired master. The Safety Board concludes that Exxon should have removed the master from seagoing employment until there was ample proof that he had his alcohol problem under control.

The Safety Board recognizes that other tankship companies transporting North Slope crude oil from Port Valdez quite likely confront the same issues identified during the investigation of the EXXON VALDEZ grounding and that the safe transport of this important cargo could be enhanced if the safety recommendations pertaining to these issues were directed to all tankship companies loading crude oil at Port Valdez.

Therefore, the National Transportation Safety Board recommends that all shipping companies operating in Prince William Sound:

Eliminate personnel policies, including performance appraisal criteria, that encourage marine employees to work long hours without concern for debilitating fatigue and commensurate reduction in safety of vessel operations. (Class II, Priority Action) (M-90-26)

Implement manning policies that prevent excessively long working hours for crewmembers during cargo handling operations. (Class II, Priority Action) (M-90-27)

Institute a written policy forbidding deck officers to share navigation and cargo watch duties on a 6-hours-on, 6-hours-off basis, except in emergencies. (Class II, Priority Action) (M-90-28)

Require that two licensed watch officers be present to conn and navigate vessels in Prince William Sound. (Class II, Priority Action) (M-90-29)

Implement an alcohol/drug program for seagoing employees that prevents such personnel from returning to sea until their alcohol/drug dependency problem is under control. (Class II, Priority Action) (M-90-30)

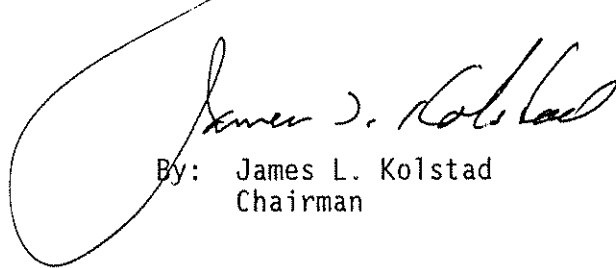
Train persons who monitor the alcohol/drug rehabilitation program in the recognition of recidivism after treatment, in the utilization of appropriate professional referrals, and in the interpersonal skills necessary for competent rehabilitation supervision. (Class II, Priority Action) (M-90-31)

Also, the Safety Board issued Safety Recommendations M-90-32 through -43 to the U.S. Coast Guard; M-90-44 through -47 to the Environmental Protection Agency; M-90-48 and -49 to the Alaska Regional Response Team; M-90-50 through 52 to the State of Alaska; M-90-53 through -58 to the Alyeska Pipeline Service Company; and M-89-59 to the U.S. Geological Survey. The Safety Board also reiterated Safety Recommendation M-88-1 to the U.S. Coast Guard and

Safety Recommendations I-89-1 through -12 to the Department of Transportation.

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-90-26 through -31 in your reply.

KOLSTAD, Chairman, COUGHLIN, Vice Chairman, and LAUBER and BURNETT, Members, concurred in these recommendations.



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