



National Transportation Safety Board

Washington, DC 20594

Safety Recommendation

Date: June 29, 2015

In reply refer to: M-15-5 through -7

Admiral Paul F. Zukunft
Commandant
US Coast Guard
2703 Martin Luther King Jr. Ave, SE
Washington, DC 20593

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating transportation accidents, determining their probable cause, and making recommendations to prevent similar accidents from occurring. We are providing the following information to urge your organization to take action on the three safety recommendations in this letter. The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. Information supporting the recommendations is discussed below. The NTSB would appreciate a response from you within 90 days addressing the actions you have taken or intend to take to implement our recommendations.

Background

The recommendations are derived from the NTSB's investigation of the January 23, 2010, accident in which the 810-foot-long oil tanker *Eagle Otome* collided with the 597-foot-long general cargo vessel *Gull Arrow* at the Port of Port Arthur, Texas. A 297-foot-long barge, the *Kirby 30406*, which was being pushed by the towboat *Dixie Vengeance*, subsequently collided with the *Eagle Otome*. The tanker was inbound in the Sabine-Neches Canal with a load of crude oil en route to an ExxonMobil facility in Beaumont, Texas. Two pilots were on board, as called for by local waterway protocol. When the *Eagle Otome* approached the Port of Port Arthur, it experienced several unintended heading diversions culminating in the *Eagle Otome* striking the *Gull Arrow*, which was berthed at the port unloading cargo.

A short distance upriver from the collision site, the *Dixie Vengeance* was outbound with two barges. The towboat master saw the *Eagle Otome* move toward his side of the canal, and he put his engines full astern but could not avoid the subsequent collision. The *Kirby 30406*, which was the forward barge pushed by the *Dixie Vengeance*, collided with the *Eagle Otome* and breached the tanker's starboard ballast tank and the no. 1 center cargo tank a few feet above the waterline. As a result of the breach, 862,344 gallons of oil were released from the cargo tank, and an estimated 462,000 gallons of that amount spilled into the water. The three vessels

remained together in the center of the canal while pollution response procedures were initiated. No crewmember on board any of the three vessels was injured.¹

The NTSB determined that the probable cause of the collision was the failure of the first pilot, who had navigational control of the *Eagle Otome*, to correct the sheering motions that began as a result of the late initiation of a turn at a mild bend in the waterway. Contributing to the accident was the first pilot's fatigue, caused by his untreated obstructive sleep apnea and his work schedule, which did not permit adequate sleep; his distraction from conducting a radio call, which the second pilot should have conducted in accordance with Sabine Pilots Association guidelines; and the lack of effective bridge resource management by both pilots. Also contributing was the lack of oversight by the Jefferson and Orange County Board of Pilot Commissioners.

Pilot Oversight and Bridge Resource Management

The Sabine Pilots Association, to which the two pilots on board the *Eagle Otome* belonged, had developed piloting guidelines specifying the duties and responsibilities during two-pilot operations in the Sabine-Neches Waterway. The piloting guidelines were detailed in a printed document, "Guidelines Governing Aboard Vessels Requiring Two Pilots When Transiting the Sabine-Neches Waterway." In the postaccident Marine Board of Investigation hearing convened by the US Coast Guard in Port Arthur, March 9–11, 2010, the chairman of the Jefferson and Orange County Board of Pilot Commissioners ("the commission"), which had regulatory authority over the Sabine pilots, stated that the commission was not a party to the Sabine Pilots Association's piloting guidelines or other guidelines pertaining to ship operations in the Sabine-Neches Waterway and that the commission was not aware of the piloting guidelines until they were introduced as evidence during the hearing. The commission chairman also stated that he had a standing invitation to attend the meetings held by the Southeast Texas Waterways Advisory Council (SETWAC, a safety committee for the ports and waters of the Sabine-Neches Waterway) but had not attended a meeting since his term began in 2001.

The Sabine Pilots Association guidelines were intended to encourage pilots to form two-person navigation teams. This intent was commendable; the use of teams in operating complex systems, such as navigating large vessels in narrow waterways, is preferable to using single operators. Researchers have noted the following:

Teams have become the strategy of choice when organizations are confronted with complex and difficult tasks. Teams are used when errors lead to severe consequences; when the task complexity exceeds the capacity of an individual; when the task environment is ill-defined, ambiguous, and stressful; when multiple and quick decisions are needed; and when the lives of others depend on the collective insight of individual members.²

The use of two operators to navigate large vessels on the Sabine-Neches Waterway is consistent with human factors principles; given the complexity of the task, the use of teams on the waterway enables pilots to share navigation-related tasks so that one pilot does not become

¹ For more information, see National Transportation Safety Board, *Collision of Tankship Eagle Otome with Cargo Vessel Gull Arrow and Subsequent Collision with the Dixie Vengeance Tow, Sabine-Neches Canal, Port Arthur, Texas, January 23, 2010*, Marine Accident Report NTSB/MAR-11/04 (Washington, DC, 2011), available at <http://www.nts.gov>.

² E. Salas, NJ Cooke, and MA Rosen, "On Teams, Teamwork, and Team Performance: Discoveries and Developments," *Human Factors* 50 (2008): 540.

overloaded. For example, while one pilot focuses on vessel navigation tasks, the other pilot communicates with nearby vessels. Teams also enable pilots to monitor each other's performance to reduce errors and their consequences, which is consistent with good bridge resource management (BRM) practice.

The two Sabine pilots on board the *Eagle Otome*, however, were not consistently applying these piloting guidelines. When the pilot who had the conn in the accident area should have been focusing on the upcoming turn in the waterway, he was conducting a radio call with the *Dixie Vengeance* master; the second pilot should have been handling radio communications.

Leading up to the accident, neither pilot appeared to take full advantage of having an experienced and equal colleague on the bridge. The first pilot conducted both the conning and miscellaneous duties by himself, without the assistance of the second pilot. The second pilot lost situation awareness by reading the newspaper and disengaging from performing radio and miscellaneous duties specified in the piloting guidelines. When the second pilot was needed to assist the first pilot after the radio communication, he was not prepared to do so because he had not been sufficiently engaged in the navigation.

Both pilots had been trained in BRM, but their most recent training had taken place more than a decade before the accident. The NTSB concluded that although both pilots completed BRM training, they failed to apply the team performance aspects of BRM to this operation.

The NTSB recommended that governors of states and territories in which state and local pilots operate require local pilot oversight organizations to implement initial and recurring BRM training requirements. The NTSB now extends this recommendation to the US Coast Guard and asks that it require the same for federally credentialed pilots in the Great Lakes and St. Lawrence Seaway.

Mariner Fatigue

The NTSB determined that the first pilot, who had the conn of the *Eagle Otome* leading up to the accident, was fatigued because of his untreated obstructive sleep apnea and his work schedule, which did not preclude extended hours of wakefulness and disruption to circadian rhythms. For at least 3 days during the week before the accident, the first pilot maintained a day-awake, night-asleep work schedule. However, in the 1–2 days before the accident, he worked two consecutive piloting assignments that resulted in his being awake for at least 27 hours straight. He then rested during daytime hours, which was contrary to the circadian rhythms that he had been maintaining.

The Sabine Pilots Association had a rest period policy in place, but it was ineffective in preventing fatigue because it did not consider circadian rhythms or prevent extended wakefulness. The NTSB determined that no effective hours-of-service rules were in place that would have prevented the Sabine pilots from being fatigued by the schedules they maintained.

The circumstances of this accident illustrate the important role that hours-of-service rules play in preventing fatigue in transportation. The NTSB's concern about effective hours-of-service rules led it to issue Safety Recommendation M-99-1 to the Coast Guard calling for it to upgrade its hours-of-service rules to reflect advances in the science of sleep. The NTSB does not agree with the Coast Guard's position that mariner education and medical oversight are sufficient to prevent mariner fatigue. The NTSB has been disappointed with the Coast Guard's response to Safety Recommendation M-99-1, particularly in light of the extensive research

demonstrating the adverse effects of fatigue that has been gathered since the NTSB issued the recommendation.

Moreover, other federal transportation regulators have made considerable progress toward preventing fatigue by establishing or initiating scientifically based hours-of-service rules. For example, in August 2011, the Federal Railroad Administration upgraded its hours-of-service rules to include provisions that address the disruptive effect that working through nighttime hours has on circadian rhythms (49 *Code of Federal Regulations* [CFR] Part 228). In January 2012, the Federal Aviation Administration (FAA) promulgated upgraded flight, duty, and rest regulations for passenger air carrier operations (14 CFR Part 117). Among the new regulations' provisions is an accounting for circadian effects on aviation pilots' performance by requiring additional rest, or reduced hours of service, for flights beginning in what would be pilots' circadian low periods.

Further, the FAA regulation provides an alternative to hours-of-service rules—fatigue risk management systems (FRMS)—in which airlines work with the FAA to develop scheduling rules tailored to the routes aviation pilots operate and their particular needs (14 CFR 117.7). Sufficient experience has been gained to illustrate the benefits of FRMSs in preventing fatigue-inducing scheduling practices, as shown in a recent study of the application of FRMSs to transportation settings.³ The FAA stated that this approach comports with its requirements to implement effective, scientifically based hours-of-service programs to prevent schedule-induced fatigue, and the NTSB supports this approach. Pilot commissions and the Coast Guard may consider this method an acceptable means of implementing hours of service rules effective in preventing fatigue.

Recommendations

The NTSB now extends these safety recommendations to the US Coast Guard as the entity responsible for pilotage in the Great Lakes and St. Lawrence Seaway:

M-15-5

Effectively monitor and, through your rules and regulations, oversee pilotage practices in the Great Lakes and St. Lawrence Seaway to promote and ensure the highest level of safety.

M-15-6

Implement fatigue mitigation and prevention programs for pilotage practices in the Great Lakes and St. Lawrence Seaway that (1) regularly inform mariners of the hazards of fatigue and effective strategies to prevent it and (2) promulgate hours-of-service rules that prevent fatigue resulting from extended hours of service, insufficient rest within a 24-hour period, and disruption of circadian rhythms.

M-15-7

Implement initial and recurring bridge resource management training requirements for pilots in the Great Lakes and St. Lawrence Seaway.

³ P. Gander and others, "Fatigue Risk Management: Organizational Factors at the Regulatory and Industry/Company Level," *Accident Analysis and Prevention* 43 (2011): 573–590.

Chairman HART, Vice Chairman DINH-ZARR, and Members SUMWALT and WEENER concurred in these recommendations.

In response to the recommendations in this letter, please refer to Safety Recommendations M-15-5 through -7. If you would like to submit your response electronically rather than in hard copy, you may send it to the following e-mail address: correspondence@ntsb.gov. If your response includes attachments that exceed 10 megabytes, please e-mail us at the same address asking for instructions. To avoid confusion, please use only one method of submission, that is, do not submit both an electronic copy and a hard copy of the same response letter.

[Original Signed]

By: Christopher A. Hart,
Chairman