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Feature Article

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They Rocked the Boat—Now What? An Overview of Marine Accident Reconstruction

In 2016, the Coast Guard reported that there were 11,861,811 recreational vessels registered in the United States, and counted 4,463 accidents that involved 701 deaths, 2,903 injuries and approximately $49 million of damage to property as a result of recreational boating accidents. 2016 Boating Accident Statistics, U.S. Coast Guard Office of Auxiliary and Boating Safety, Commandant P16754.30, May 22, 2017. In addition, the Coast Guard has identified nineteen categories of accidents, including collisions with objects or other vessels, falls overboard, boat/propeller strikes, fires and explosions, and carbon monoxide exposure, among several others. As a result, marine accident reconstruction is often required when these incidents are litigated, whether as part of an insurance matter or a product liability claim.

Unlike roadway vehicle accident reconstruction, marine accidents generally do not present the reconstructionist with much, if any, physical evidence at the scene of the accident. Boats on the water do not leave skid marks or fluid trails, and the body of water does not generally retain the vessels in their post-crash positions. As such, this lack of scene evidence and the complex vessel dynamics pose a unique set of challenges for the marine accident reconstructionist. While the equations of motion and the energy principles that are used in vehicular accident reconstruction can also be applied to boat accident reconstruction, the boundary conditions are changed. Roadway surfaces are rigid and fairly static as compared to the dynamic nature of the water in a lake or river, and as a result, it is critical that a marine accident reconstructionist has a thorough understanding of the fluid forces acting on the watercraft in addition to performing a comprehensive analysis of the resultant damage in a collision.

In spite of a potential lack of scene evidence, there is a great deal that can be done to properly reconstruct a marine accident, whether it is a collision with a fixed object, a collision with another vessel, or even a fire/explosion. The critical piece of physical evidence that is typically available after a marine accident is the damaged vessel(s). In the case of a collision, the damage that results from two boats colliding leaves distinct and identifiable characteristics that allow a reconstructionist to determine the relative positions and attitudes of the vessels at the point of impact. In addition, testing can be performed to assist in the reconstruction of the collision and may include on-water testing to evaluate the maneuverability and handling characteristics of the involved boats. This testing is critical to understanding the envelope of possible maneuvers and resulting trajectories that a boat can feasibly make under specific operating conditions. The results of on-water tests can be successfully used to apply the specific boat dynamics to the accident reconstruction, and to illustrate boat dynamics and maneuvering to a jury, who would not have the benefit of having ridden in the relevant watercraft, or knowing how the boat operates under different conditions and operator inputs (i.e., throttle application, steering, etc.) In the event of an occupant ejection from the boat, this same on-water testing can be used to evaluate the acceleration of the boat through maneuvers to determine whether the boat's movement was sufficient to throw a person overboard, and even help in assisting to determine whether or not an occupant was properly seated prior to the ejection.

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Often times in marine casualties, it may be alleged that a mechanical failure caused or contributed to an accident, and in these cases it is important for the marine expert to assess the condition of these components and, if damage is observed, determine if the damage was a potential cause of (as opposed to a result of) the subject accident. In this manner, a full understanding of the mechanics of the accident is necessary to defend the design and performance of the boat and its equipment. Often the presence of damage is misinterpreted as having been the cause of the accident rather than an effect. To adequately defend the boat and/or its equipment, testing may be necessary.

The investigation of boat explosions and/or fires also requires familiarity with specialty marine systems, as these systems come under close scrutiny during such investigations. Boats tend to operate in fairly harsh environments (humid, non-climate controlled, and corrosive saltwater environments), and even when marine vessels are designed and constructed in accordance with industry best practice, their various systems require periodic maintenance, which, if not performed, may have disastrous consequences. As such, when investigating a vessel or marina fire, careful attention should be paid to the boat's maintenance history, and all of the systems aboard the boat should be closely examined to rule out potential causes. Likewise, in the event of carbon monoxide exposures, it is important to evaluate the vessel's propulsion engines and generators, the ventilation system design of the vessel, and even the environment around the vessel at the time of the exposure, since many carbon monoxide exposures occur as a result of exhaust gases coming from outside sources, such as other vessels nearby.

With the abundance of recreational boats on our inland lakes, marine accidents are a common occurrence, and the proper analysis and reconstruction of these accidents are often necessary. Having an expert who is familiar with the marine industry—their products, their practices, and their standards—is imperative to building a solid defense.

About the Author

Wendy Sanders, Ph.D., P.E., CFEI, CVFI is a licensed Professional Mechanical Engineer and Certified Fire and Explosion Investigator with forensic engineering expertise in marine and automotive accident reconstruction, fire and explosion investigation, thermal-fluid sciences, human factors, warnings, and general mechanical engineering fields.

Dr. Sanders's marine expertise includes accident analysis and reconstruction for recreational boating accidents, including propeller-related incidents, carbon monoxide exposures, and collisions. Her work includes the analysis of operator, occupant and pedestrian behaviors and human factors related to accident analysis, guardings, and warnings. Dr. Sanders conducts failure and design analysis of marine systems, subsystems, and components, including fuel and powertrain systems and full vehicle/vessel testing. Her fire and explosion investigation and origin and cause determination, includes structures, vehicles, and marine vessels as well as analysis and testing in consideration of carbon monoxide issues and sensing technologies.

She is a member of the American Boat and Yacht Council and is currently the vice chairman of its Technical Board, and has worked closely with the National Marine Manufacturer Association. Dr. Sanders is an experienced testifying expert and is exceptionally skilled in communication, technical writing and project management.

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