



Risk Analysis and Management for Marine Systems

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Abstract

Sources of risk to marine systems include equipment failure, external events, human error, and institutional error. Equipment failure, the most readily recognized hazard on ships, may be categorized as either independent failure, such as the loss of steering due to failure of a power steering pump, or common-cause failure, such as the loss of propulsion and steering resulting from a total loss of electrical power to the ship. Risk from external events arises from hazards such as collision by other ships; sea state; wind, and ice, or other weather factors. Humans provide another source of risk to marine systems when they lack skill, are excessively fatigued, or commit sabotage. Institutional failure creates risks from poor management including inadequate training, poor communications, and low morale.

Risk studies may be classified according to whether they focus primarily on assessment, management, or communication; these aspects of risk studies are described to prepare users and readers of this paper for performing risk-based analysis of marine systems. Methods are provided in the paper that can be used to develop risk-based standards for system safety. The relationship between risk and standards is studied from a historical perspective. Great successes in controlling risk to health and safety are exemplified by the development of design methods for buildings, bridges, or super tankers that render them capable of withstanding extreme storms. Yet, familiar risks persist while less familiar ones escape attention and new ones appear. Ironically, managements of some of the most difficult risks has led to improved standards of living.

This paper provides background information, introduces fundamental concepts, and offers examples of risk methods applied to marine systems.