Chapter 5 - Appendix F

Waterway Risk Model Explanation

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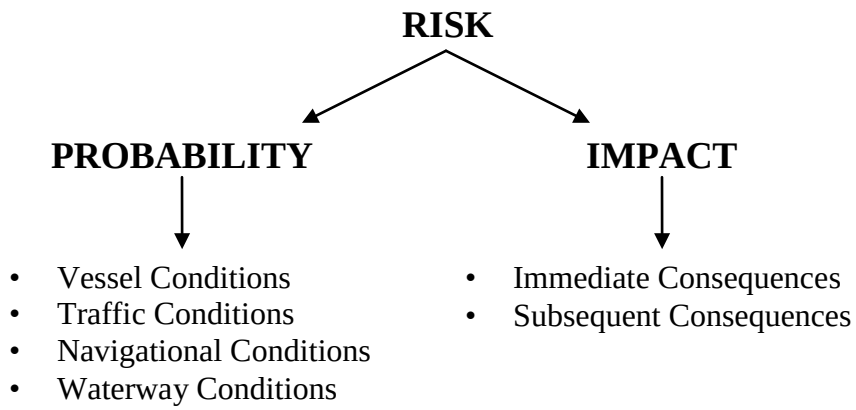
Risk is defined as the probability of an unwanted event TIMES the impact of that event. The 1997 National Dialogue Group developed an initial list of risk categories and factors that relate both to the causes or probability of marine accidents AND to the consequences or impact of those events. That list, which has been modified over time, was made into a Waterway Risk Model. The figure shown below provides a basic overview of the waterway risk model categories as they relate to the risk equation. The six risk categories, and their respective risk factors are listed and defined on the following pages.



Vessel Conditions – the quality of vessels and their crews that operate on a waterway; each waterway has what are considered to be high risk vessels, such as old vessels, vessels with poor safety records, vessels registered in certain foreign countries, vessels belonging to financially strapped owners, vessels with inexperienced crews / operators, etc. When assessing risk, the following items should be considered (as appropriate) for each risk factor: Maintenance, age, flag, class society, ownership, inspection record, casualty history, language barriers, fatigue related issues, and local area knowledge.

- *Deep Draft Vessel Quality* – the quality of the deep draft vessel itself and the proficiency and quality of the crew. Deep draft vessels are those large, ocean-going vessels, often in international trade, that usually are constrained by their draft to use dredged channels where such channels exist. Deep draft vessels include such things as: oil tankers, container ships, break bulk cargo ships, and cruise liners.

- *Shallow Draft Vessel Quality* – the quality of the shallow draft vessel itself and the proficiency and quality of the crew. Shallow draft vessels include all other commercial craft EXCEPT commercial fishing vessels. Examples include tugs / towboats, offshore supply vessels, charter fishing boats, and small passenger vessels (inspected under 46 CFR Subchapters T and K) such as dinner cruises and ferries.

- *Commercial Fishing Vessel Quality* – the quality of the commercial fishing vessel itself and the proficiency and quality of the crew. These vessels are included because they are not required to undergo annual vessel inspections nor are the crewmembers required to hold USCG licenses; therefore, there may be a greater potential for increased incidents involving commercial fishing vessels.

- *Small Craft Quality* – the quality of the small craft vessel itself and the proficiency and operating knowledge of the individuals who operate them. Small craft include all manner of boats used for noncommercial purposes (i.e., pleasure craft or craft used by indigenous people for transportation or subsistence fishing). They can be powered by an engine, the wind, or human exertion. Examples include yachts, personal watercraft (a.k.a., jet skis), and kayaks. Besides local knowledge, understanding of the rules of the road and inebriation also should be considered for this risk factor.

Traffic Conditions – the number of vessels that use a waterway and their interactions. Volume equals the absolute numbers on a waterway.

- *Volume of Commercial Traffic* – the amount of commercial vessel traffic using the waterway (i.e., the more vessels there are on the water, the more likely that there will be a marine casualty). Deep draft and shallow draft commercial vessels as well as commercial fishing vessels are included in this risk factor. Shoreside infrastructure is also addressed in this risk factor (i.e., can it handle the volume of commercial traffic within the waterway).

- *Volume of Small Craft Traffic* – the amount of noncommercial vessel traffic using the waterway. The volume may vary depending on the time of day, the day of the week, the season of the year, or during a major marine event.

- *Traffic Mix* – the interaction between vessels or boats of different sizes using the same waterway and their maneuvering characteristics. Conflicts occur as risk increases with each type of vessel's different maneuvering characteristics and actions that are often unpredictable (e.g. commercial mariners / recreational mariners using deep draft vessels / shallow draft vessels within the same waterway).

- *Congestion* – the ability of the waterway to handle the volume / density of traffic. Risk increases when a large number of vessels uses a small geographic area for an extended period or time. Risk also increases substantially when you get a larger than normal number of vessels together for a short time (e.g., fishing tournament or short season commercial fishery).

Navigational Conditions – the environmental conditions that vessels must deal with in a waterway relating to wind, currents, and weather.

- *Winds* – the difficulty in maneuvering vessels resulting from increased and/or unpredictable winds, particularly if the wind is from abeam.

- *Water Movement* – the difficulty in maneuvering vessels caused by water movement (river / tidal currents) flow and speed, often affected by seasonal variations and sustained winds. Tide rips and whirlpools can be created by strong currents and affect the maneuverability of smaller vessels. The frequency of occurrence and the location of the strongest currents in the waterway are critical considerations (e.g., if current speed can exceed vessel speed, timing is critical when transiting the area).

- *Visibility Restrictions* – the natural conditions that may prevent a mariner from seeing other vessels, aids to navigation, or landmarks, such as fog, severe rain squalls, etc.

- *Obstructions* – floating objects in the water that impede safe navigation and/or damage a vessel, such as ice, debris, fishing nets, etc.

Waterway Conditions – the physical properties of the waterway that affects vessel maneuverability.

- *Visibility Impediments* – the man-made objects (e.g., moored ships, condominiums, background lighting) or geographic formations (e.g., headlands, islands) that prevent a mariner from seeing aids to navigation or other vessels.

- *Dimensions* – the room available for two vessels to pass each other within the waterway. How big is the waterway compared to the vessels using it? In some areas, one-way traffic results from extremely narrow channels.

- *Bottom Type* – the material on the waterway bottom or just outside the channel, such as hard rock, mud, coral, etc. How much damage occurs to a vessel if it runs aground?

- *Configuration* – the arrangement of a waterway including elements such as waterway bends, multiple / converging channels, and perpendicular traffic flow.

Immediate Consequences – the instantaneous impacts of a vessel casualty (i.e., what happens right after a collision, allision, or grounding?). How well is the local community prepared to handle the immediate consequences resulting from a vessel casualty?

- *Personnel Injuries* – the maximum number of expected casualties. People can be injured, killed, or need to be rescued—the more people on the water, the more rescue personnel / efforts needed.

- *Petroleum Discharge* – the largest petroleum spill in the most probably worst-case scenario—the more cargo there is, the higher the risk to waterway safety, the more response personnel needed.

- *Hazardous Materials Release* – the largest chemical or hazardous material spill in the most probably worst-case scenario—the more cargo there is, the higher the risk to waterway safety and the more response personnel / efforts needed. It is necessary to differentiate between products shipped in bulk and those shipped in containers because containers provides a high degree of protection to the cargo such that a large, instantaneous release is far less likely to occur; therefore, the potential consequences will be far lower.

- *Mobility* – the infrastructure that is critical to the Marine Transportation System within the waterway (i.e., the significant structures upon which moving people and cargo through the marine transportation system depend). The waterway can be blocked and the shoreside Marine Transportation System can be disrupted, ultimately causing greater problems moving cargo through a port—both on the water and ashore.

Subsequent Consequences – the longer-term effects of vessel casualties that are felt hours, days, months, and even years afterwards, such as shoreside facility shut-downs, loss of employment, destruction of fishing areas, decrease or extinction of species, degradation of subsistence living uses, and contamination of drinking or cooling water supplies.

- *Health and Safety* – the potential consequences to the community that lives or works on or near the waterway. The more people who live or work in close proximity to a waterway, the greater the risk.

- *Environmental* – the risks to wetlands and endangered species and how sensitive people are to the quality of their environment. The more sensitive, the more people will expect in terms of both preparedness and response effectiveness for any marine accident that threatens environmental quality.

- *Aquatic Resources* – water dwelling life forms harvested for commercial or recreational reasons. Timing of a marine casualty could affect how serious the consequences would be (i.e., some species are only in the waterway at certain times of the year).

- *Economic* – the extent of the impact if a particular waterway is closed for some period of time. Most waterway communities are dependent on unrestrained use of waterways for their economic well-being. For some waterways, the economic impacts would only be felt by those who directly use that waterway for their livelihoods. But for other waterways those economic impacts could have national repercussions.