Capsize Resistance and Survivability when Smaller Vessels Encounter Extreme Waves

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The presentation begins with a review of the 1998 Sydney-Hobart Race in which it was reported that, "Yachts that experienced problems or encountered difficulties and even those that continued racing reported that "exceptional" waves were responsible for inflicting the damage or causing severe knockdowns. These waves were always a minimum of 20% and up to 100% bigger than the prevailing seas and always came from a direction other than the prevailing wave pattern."

The Society of Naval Architects and Marine Engineers is sponsoring a new ad-hoc panel on fishing vessel safety whose goals are to 1) Improve survivability for smaller vessels and their crews when they encounter extreme waves 2) Improve predictions of dangerous wave conditions and develop small vessel stability criteria appropriate to the type of vessel and its operating area 3) Identify hazards associated with small vessel capsizes and develop guidelines to reduce wave impact damage and personal injuries 4) Develop better ways to communicate the importance of following reasonable stability and survivability guidelines.

The presentation discusses two capsize modes: 1) Loss of waterplane area (hull form) stability on a wave crest in steep waves and/or spilling breakers, a high risk for improperly loaded vessels in storms and 2) Wave impact capsize caused by a plunging extreme wave, a lower risk for stable vessels in storms, i.e. being in the wrong place at the wrong time. Short video clips of small vessel capsizes will be included in the presentation.

Existing stability standards are intended to provide significant capsize resistance for the vessel during storms that contain few rogue waves. Satisfying the voluntary IMO Torremolinos criteria for fishing vessels longer than 24 meters, for example, does not provide the capability to survive a direct hit by rogue waves or by other extreme (breaking) waves. Capsize resistance criteria generally do not address or insure crew survivability, which frequently involves escaping from a vessel that may be stable while inverted. Crew members who abandon a vessel in a major storm can be in danger of life threatening capsizes in many types of life rafts. Of the six men who died in the 1998 Sydney-Hobart race, three were attempting to survive in a life raft that capsized repeatedly in extreme waves.

The long-range goal of this project is to create a small vessel research program to develop a new set of scalable, non-dimensional parameters for designing and building safer small vessels. It is expected that the effects of variations in length, beam, draft, freeboard, sheer line, bulwark and deckhouse arrangements and loading conditions can be correlated with a new set of design parameters for increasing small vessel safety and survivability in a variety of situations.