What!? How Small a Wave Can Capsize My Boat?

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Certainly, the tragedy in Oyster Bay on July 4th, points to the urgent need for more understanding by boat captains of capsizing. There is a tremendous amount of data on "righting moments", centers of buoyancy and gravity, thanks to the US Navy and the US Coast Guard, amongst many institutions that literally live and die by these metrics. We've also seen a couple of columns here about wind and waves, which are the agents of capsizing *(see SSP, "Wave Theory and Practice", 3/23/11 and "Wave Theory and Practice, Part II", 7/21/10.)*

Some Background

To understand the forces of a capsizing, and how those forces change when you load the boat *(see SSP, "We All Get Heavier With Age – Including Our Boats", 3/02/11)*, let's get some terms under our belt. Most of us understand "center of gravity" (G) instinctually. But what is the center of buoyancy? The center of buoyancy (B) is the center of the volume of water which the hull displaces. When a ship is stable, the center of buoyancy is vertically in-line with the center of gravity of the ship. So, as long as the center of gravity (G), pushing the boat down, is above the center of buoyancy (B), pushing the boat up, we're good. How good? That is a very good question and as with many good questions, it requires more information to answer properly. Take a look at diagram A.

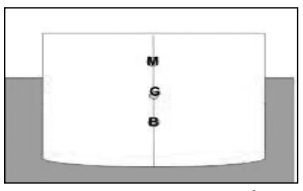

Diagram A - Courtesy of US Coast Guard

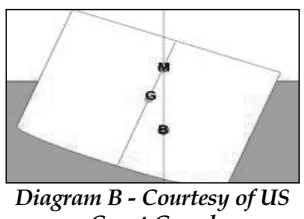

Diagram B - Courtesy of US Coast Guard

What is that "M" sitting up there above our trusty center of "G"ravity and the center of "B"uoyancy? That is something very important called the "M"etacenter. The metacenter remains directly above the center of buoyancy regardless of the heeling (tilting caused by external factors like wind or waves) or listing (tilting caused by internal factors such as poorly stowed cargo or on-boarding of water by wind or waves) of a boat. Take a look at Diagram B. If you are starting to worry about the distance between "G" and "M", called the "Metacentric height" (or "GM" in naval architecture parlance), you're catching on quickly. The math gets pretty complicated from here but suffice it to say, that the ability of the boat to right herself, i.e., her "righting arm" or "righting moment", has a lot to do with GM. The larger the GM acting as a lever, the better.

Sail boats are designed to operate with a higher degree of heel (greater GM) than motor boats but the principles are exactly the same.

From This to Wave Height?

Yes. You can infer that your motor boat's center of gravity and center of buoyancy can't be too far apart when the entire distance from the keel to the floor boards is probably something like 2' or 3'. Think of her draft. It isn't a big number, even for a 40'er. No reason to panic but you now realize that M, G and B can't be that far apart – which means that GM just can't be that great either. And GM is a surrogate for the righting ability of your boat.

But wait. I've been out in some pretty steep seas and I think the boat handled it well. Yes, because studies conducted by the Society of Naval Architects and Marine Engineers (SNAME) determined that 3 things must exist for a capsizing to occur:

1. The boat is broadside to the wave. Yes, a boat can be pitch-poled (tossed end-over-end), but the size of the wave needed to do that greatly exceeds the size of the smaller wave needed to knock a boat down when broadside to a wave.
2. The boat is struck by a breaking wave.
3. Wave height must exceed a certain percentage of the boat's length.

At this point the wave contains enough energy to overcome a boat's righting moment.

So, what is that "certain percentage?" At only 30% of your boat's length, (about 6' from tough to crest for a 20' boat), things enter directly into the realm of high danger. At 60%, it is nearly certain that one wave will catch you and then you, the crew and the boat may well come to grief.

One Last Thought…

No one wants to "pile on" when a tragedy ensues. A family that loses 3 young members is in pain that is immeasurable. But lest more tragedy befalls us as a community, as you change the weight of the boat, you lower the center of gravity. This makes the boat "more tender", i.e., it reduces the righting arm – which makes the boat easier to capsize. With 27 people on a 34' boat, you have to wonder just how much that righting arm was reduced…

BTW, if you are interested in being part of USCG Forces, email me at JoinUSCGAux@aol.com or go direct to the D1SR Human Resources department, who are in charge of new members matters, at DSO-HR and we will help you "get in this thing…"

Tides for Moriches Inlet starting with July 11 2012

Day		High/ Low	Tide Time	Height Feet	Sunrise/ Sunset	Moon	Time	% Moon Visible
Wed	11	High	1:12 AM	2.7	5:30 AM	Rise	12:04 AM	52
	11	Low	7:11 AM	0.4	8:23 PM	Set	1:54 PM	
	11	High	1:45 PM	3.0				
	11	Low	8:08 PM	0.7				
Thur	12	High	2:02 AM	2.6	5:31 AM	Rise	12:34 AM	42
	12	Low	8:05 AM	0.5	8:22 PM	Set	2:52 PM	
	12	High	2:33 PM	3.0				
	12	Low	9:06 PM	0.7				
Fri.	13	High	2:55 AM	2.5	5:31 AM	Rise	1:07 AM	33
	13	Low	8:57 AM	0.5	8:22 PM	Set	3:49 PM	
	13	High	3:23 PM	3.0				
	13	Low	9:58 PM	0.6				
Sat.	14	High	3:51 AM	2.5	5:32 AM	Rise	1:45 AM	24
	14	Low	9:47 AM	0.5	8:21 PM	Set	4:43 PM	
	14	High	4:16 PM	3.0				
	14	Low 1	0:46 PM	0.5				
Sun.	15	High	4:48 AM	2.5	5:33 AM	Rise	2:27 AM	17
	15	Low	10:35 AM	0.5	8:21 PM	Set	5:35 PM	
	15	High	5:07 PM	3.1				
	15	Low	11:32 PM	0.4				
Mon.	16	High	5:39 AM	2.6	5:34 AM	Rise	3:15 AM	10
	16	Low	11:22 AM	0.4	8:20 PM	Set	6:23 PM	
	16	High	5:53 PM	3.2				
Tues.	17	Low	12:17 AM	0.2	5:35 AM	Rise	4:09 AM	5
	17	High	6:26 AM	2.7	8:20 PM	Set	7:07 PM	
	17	Low	12:08 PM	0.3				
	17	High	6:35 PM	3.3				
Wed.	18	Low	1:01 AM	0.2	5:35 AM	Rise	5:07 AM	1
	18	High	7:08 AM	2.9	8:19 PM	Set	7:46 PM	
	18	Low	12:54 PM	0.2				
	18	High	7:13 PM	3.4				
Thur.	19	Low	1:43 AM	0.1	5:36 AM	Rise	6:08 AM	0
	19	High	7:48 AM	2.9	8:18 PM	Set	8:22 PM	
	19	Low	1:39 PM	0.2				
	19	High	7:51 PM	3.4				
Fri.	20	Low	2:22 AM	0.0	5:37 AM	Rise	7:12 AM	0
	20	High	8:27 AM	3.0	8:17 PM	Set	8:55 PM	
	20	Low	2:22 PM	0.2				
	20	High	8:28 PM	3.4				
Sat.	21	Low	3:00 AM	-0.1	5:38 AM	Rise	8:17 AM	3
	21	High	9:07 AM	3.0	8:17 PM	Set	9:25 PM	
	21	Low	3:04 PM	0.1				
	21	High	9:08 PM	3.4				

FISHING WITH TONY

North Shore Fishing: The "Quest" For A Triple Play

■ *by* **Tony Salerno**

I'll admit I don't fish as often as I'd like to. I'm sure you can relate. However, when my good friend, expert fly fisherman and book author Angelo Peluso, suggested that he and I put together a chartered fishing trip for our group of members of the Long Island Outdoor Communicators Network (LIOCN), I was all in. Who would say "No" to the opportunity of fishing with some of the best outdoor writers and book authors in the world of outdoor sports today.

The day had finally arrived and at promptly 7 A.M., Captain Chris Kadlec, one of several excellent skippers that pilots the boats of the Celtic Quest Fleet set sail from the village marina setting his course to our first destination of the day, which was the local fluke grounds of the Mount Misery Shoal. Captain Chris, positioned the boat so that all 30 anglers on board would all have an equal shot at filling their limits with tasty fluke fillets. A toot of the horn signaled lines down, as anglers began bouncing jigs along the bottom where the fish responded immediately keeping deckhands, Pete and Dominick, busy with the net as fluke ranging from shorts to 5-pounds, began flying over the rails. The action was fast and steady for a solid two hours, when Captain Chris instructed Pete and Dominick to convert those fluke jigs to scup rigs and it was off to the scup grounds, a half hour east of the fluke terrain.

Pete and Dominick set out the anchor and the chum pots and before long, the action became lock and load, as porgies from medium to jumbos found themselves flapping on the decks around the boat. As buckets started brimming with hefty pork chops, it was time to hit the tide just right and chase after some spirited stripers. Captain Chris, announced it would be about a 20-minute ride to one of his favorite bass stops and diamond jigging would be the method of choice.

Once at the spot and anglers let their lines go, the jigs were greeted by hungry stripers and by the time the drill was over, 20 quality bass to 18-pounds found their way to the fillet table, while as many shorts were safely released to fight another day.

Indeed a story, as such can, be found in a fishing fairy tale book. However, rest assured that these are a reality and a way of life aboard the Celtic Quest. And while everyday in the world of fishing varies, you can triple your bet that Captain Desmond and crew will give it their all to put you into the action. So this summer, do yourself a favor, grab the family and friends and enjoy a day or evening on one of Long Island's best-kept secrets. You can visit them at celticquestfishing.com.