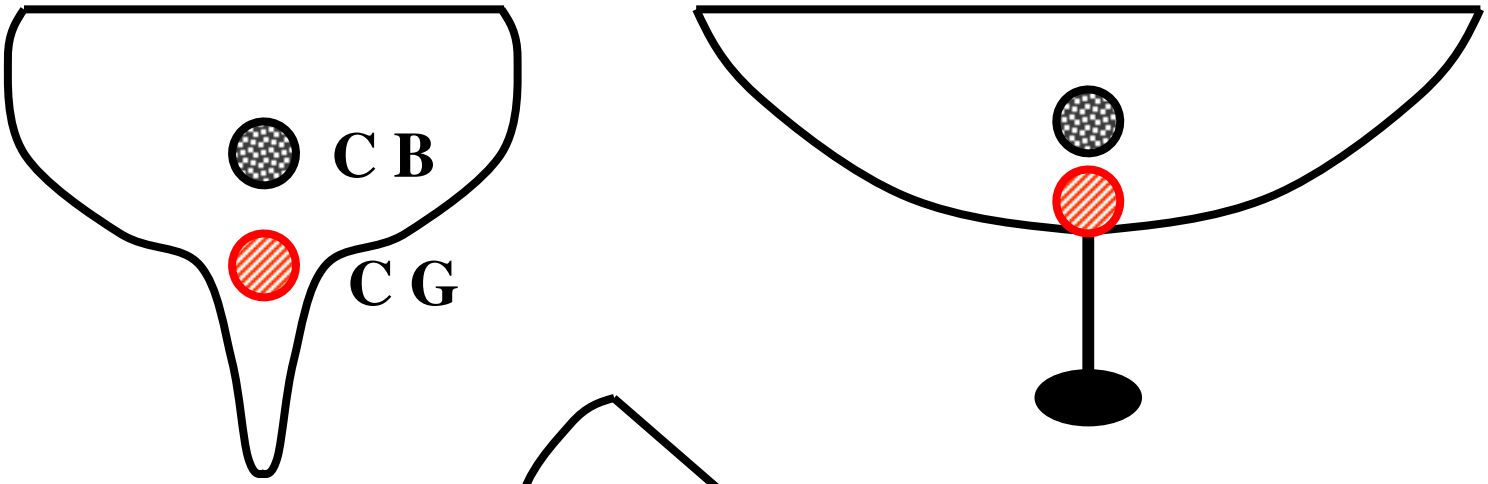
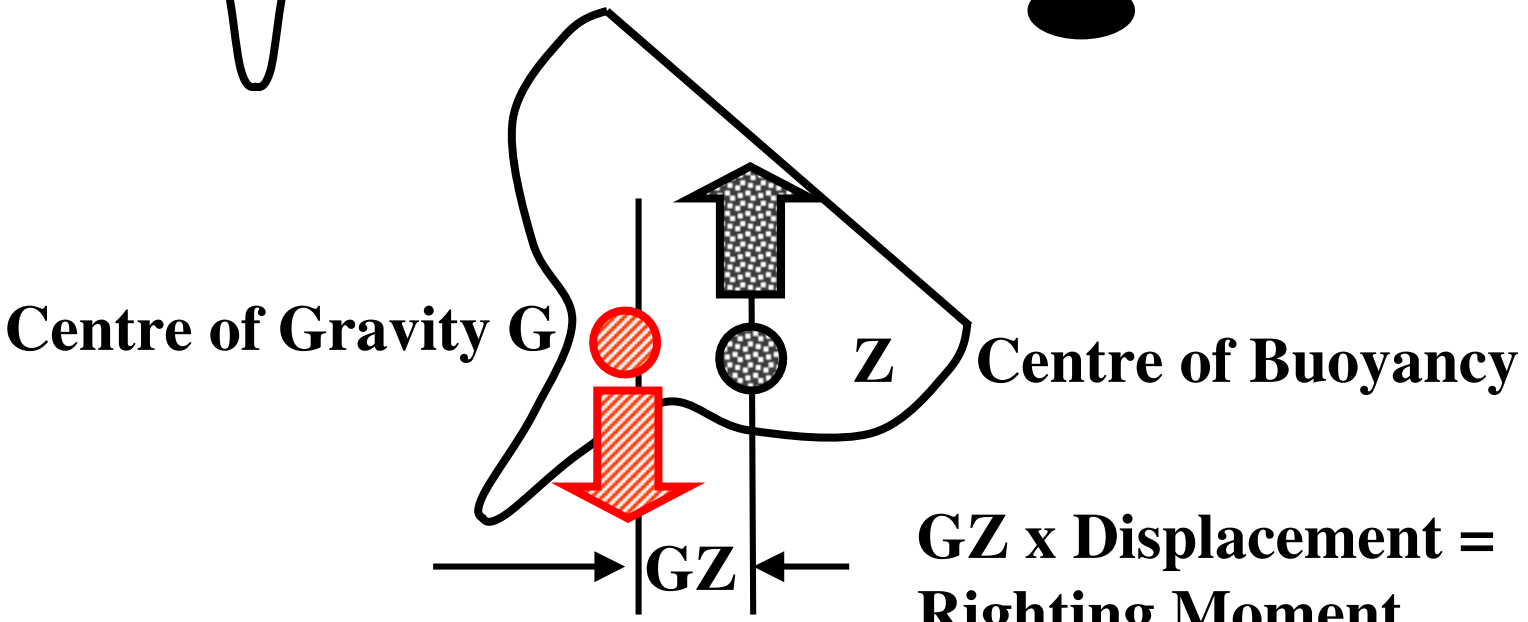
STABILITY

Which boat is more stable?



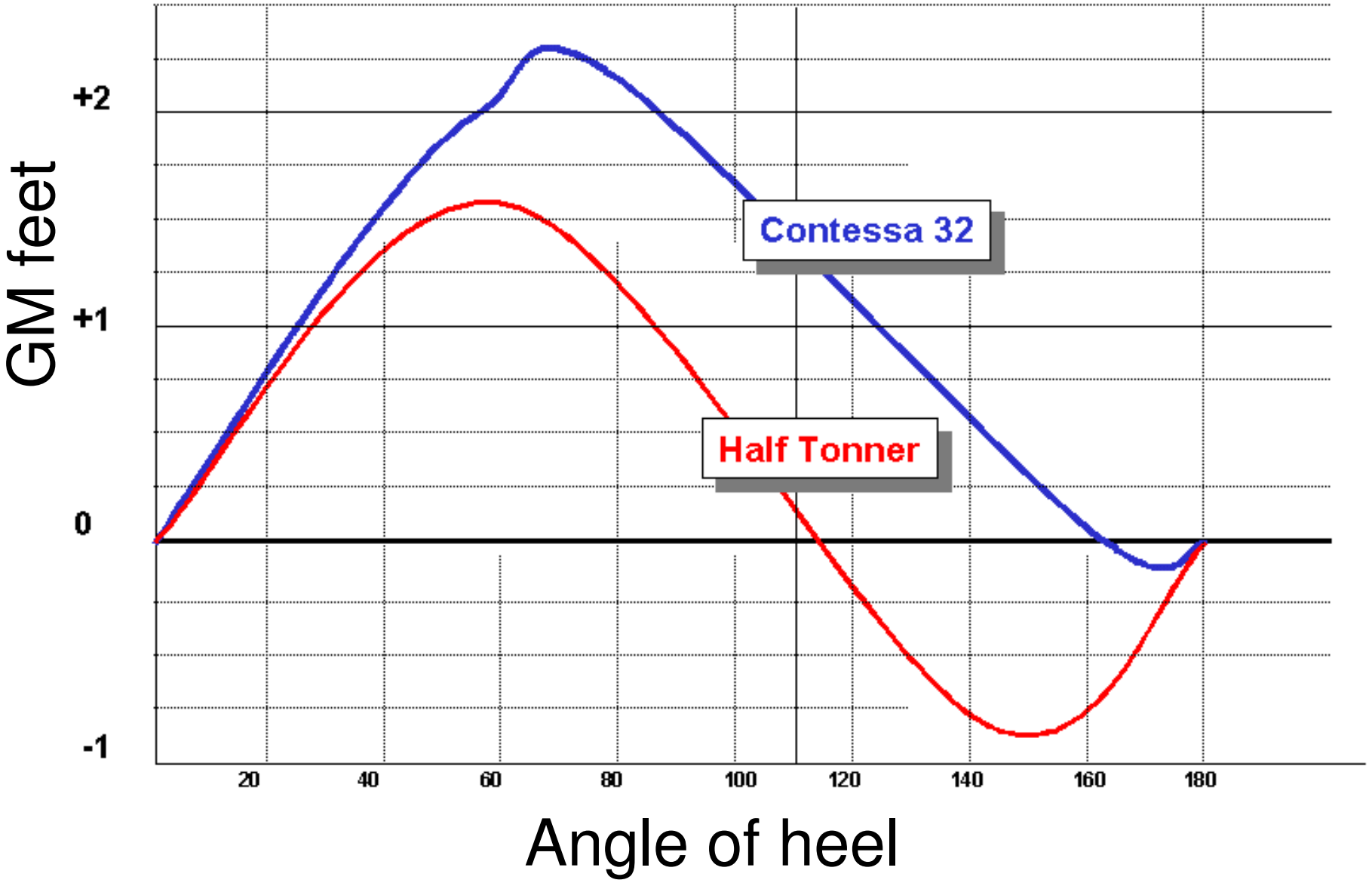


GZ x Displacement = Righting Moment

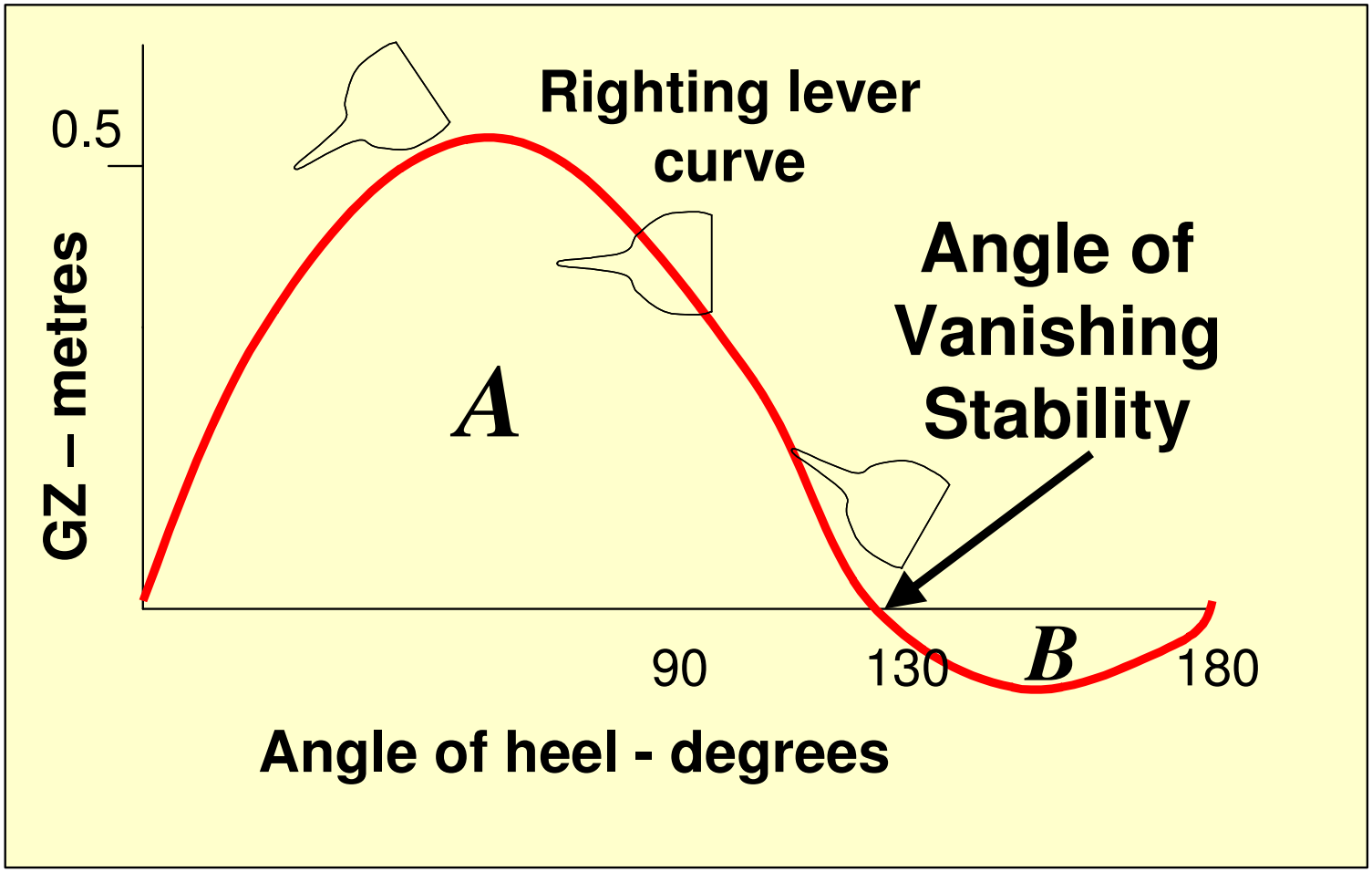
What affects stability?

1. Beam: Wide, flat-bottomed hulls will have great initial (*Form*) stability at normal sailing angles but not when heeled past 90 degrees.
2. Draft: Plenty of hull area beneath the waterline tends to lower the CB, carrying the ballast as low as possible lowers the CG.
3. Freeboard: High freeboard will improve both the maximum righting moment and the limit of positive stability.
4. Deck structure: A flush-decked boat or one with a very low profile coachroof will be more stable when inverted than a similar hull with a high, narrow superstructure.
5. Centre of Gravity: adding extra weight above the waterline, (radar, in mast reefing) raises the CG.
6. Flood water increases the range of positive stability.

Stability Curves – Intact boat



Angle of Vanishing Stability



Area '*A*' indicates the resistance of boat to capsize

Area '*B*' indicates wave energy required to right the boat

STIX FACTOR (Stability Index)

scores a boat's stability on a scale of 1 to 100, using the boat's length as its prime factor, adjusted by other factors including assessments of the boat's:

1. ability to withstand a capsize by considering the area under its GZ curve
2. recovery from inversion by looking at its AVS and mass
3. recovery from knockdown by overcoming water in the sails
4. displacement-length factor, giving credit for a heavy displacement for a given length
5. beam-displacement factor, recognising problems associated with topside flare and excessive beam
6. wind moment representing the risk of flooding due to a gust
7. the risk of downflooding in a broach or knockdown
8. reserve buoyancy.

Breaking Waves

A boat beam on to a breaking wave is in greatest danger of capsize.

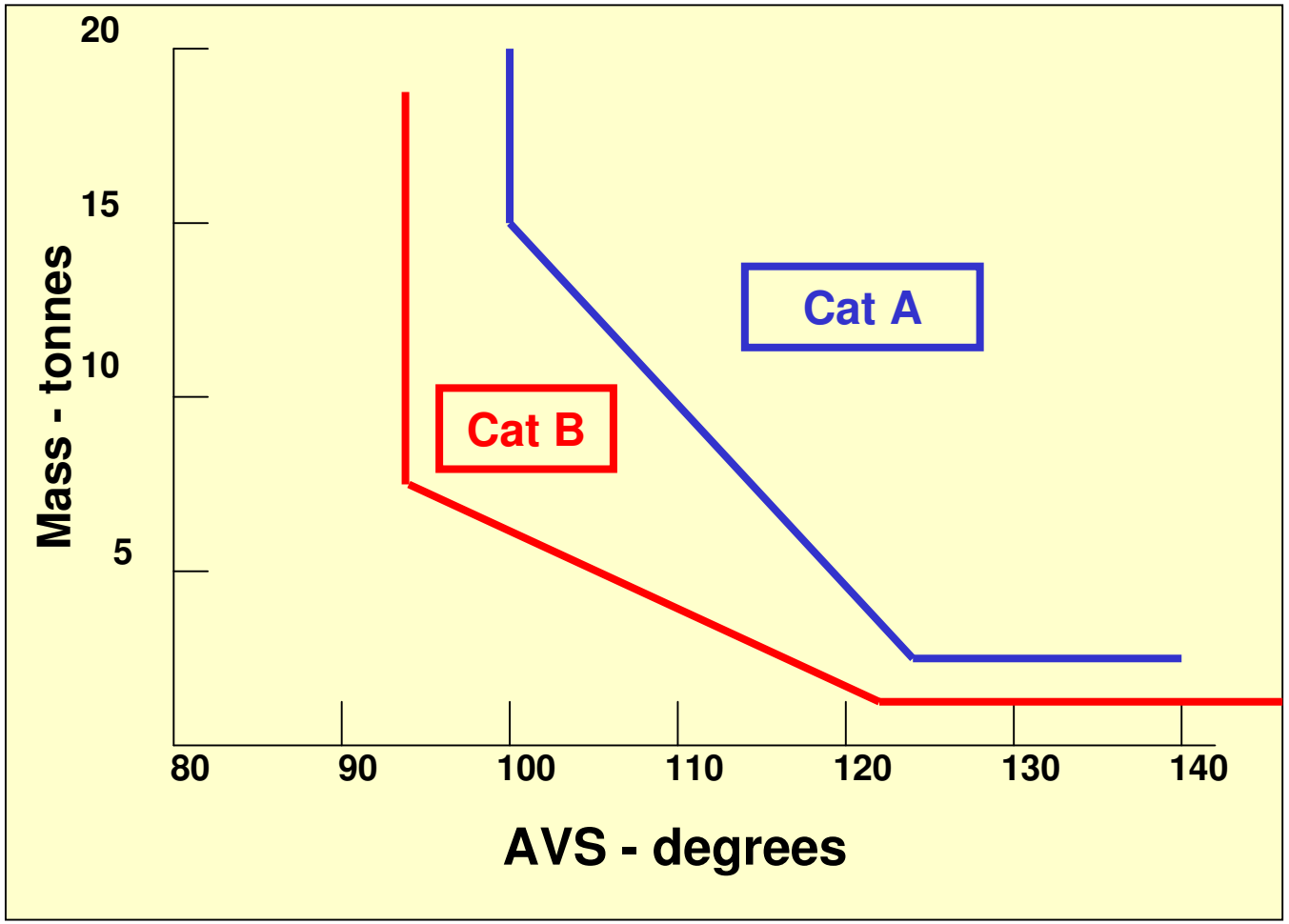
A breaking wave need only be the same height as the beam of the boat to roll it over.

STIX Values

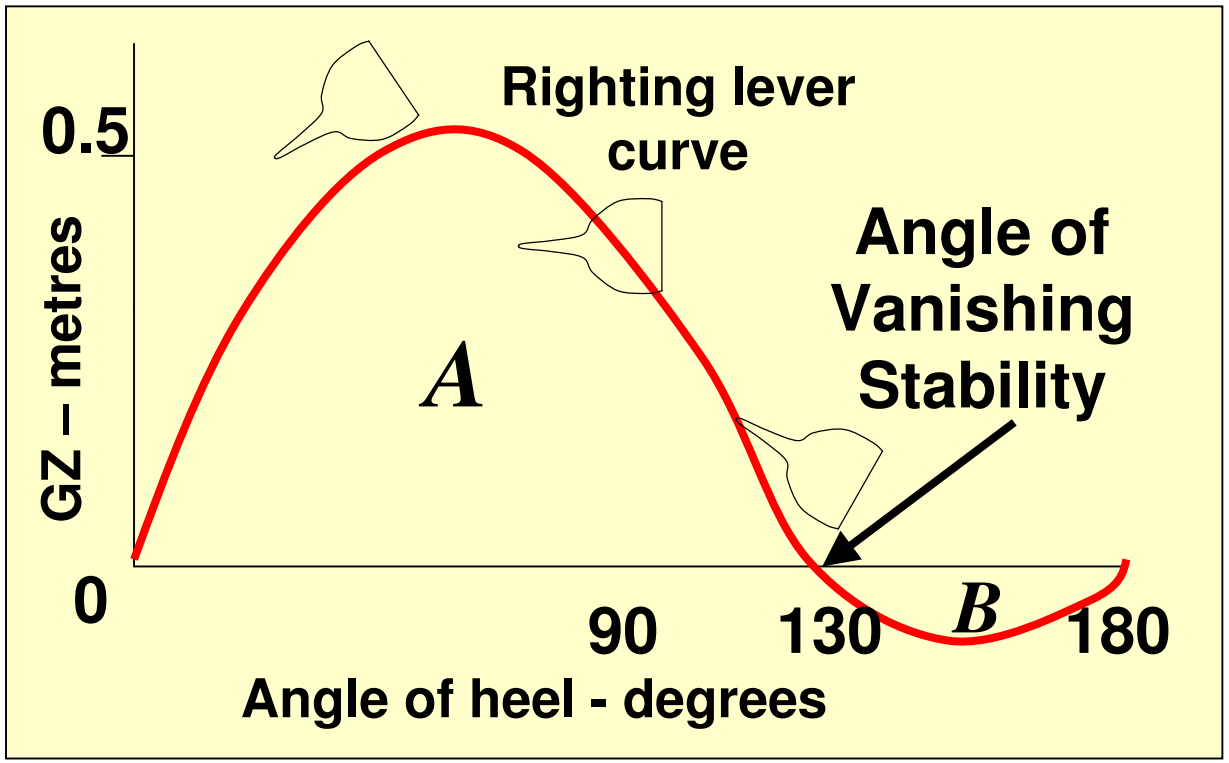
Design Category	A	B	C	D
	Ocean	Offshore	Inshore	Sheltered
Wave Height (significant)	7m	4m	2m	0.5m max
Wind Beaufort	10	8	6	4
Minimum STIX Value	32	23	14	5
Minimum Mass *M*	3,000 kg	1,500 kg	-	-
Minimum AVS (deg)	130°- 0.002**M* (≥100°)	130°- 0.005**M* (≥ 95°)	90	75

The significant wave height is the mean height of the highest one third of the waves, which approximately corresponds to the wave height estimated by an experienced observer. Some waves will be double this height.

ISO 12217 Required Mass and AVS Categories A and B

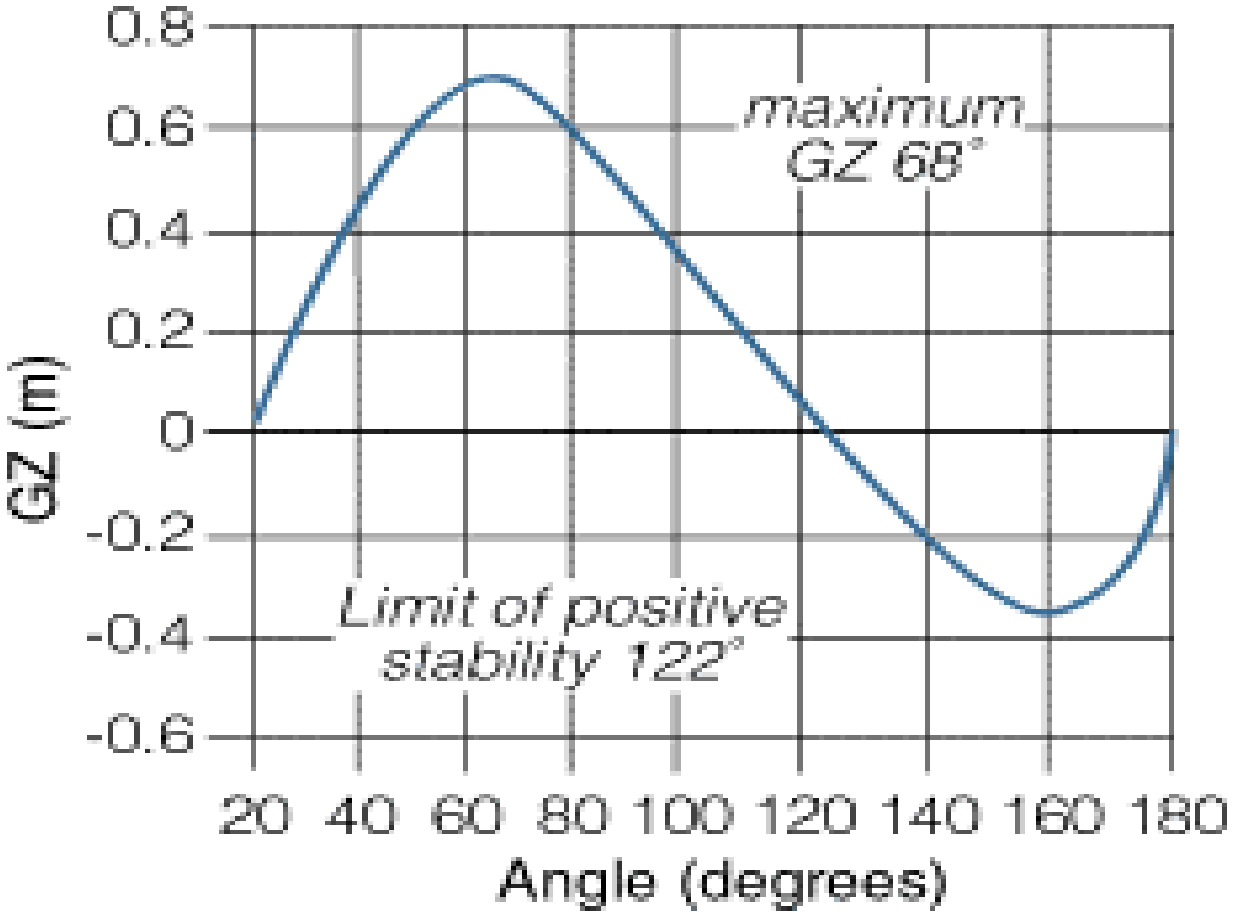


Angle of Vanishing Stability



Area '*A*' indicates resistance of boat to capsize

Area '*B*' indicates wave energy required to right the boat


0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
GZ (m)
maximum
GZ 68°
Limit of positive
stability 122°
20 40 60 80 100 120 140 160 180
Angle (degrees)