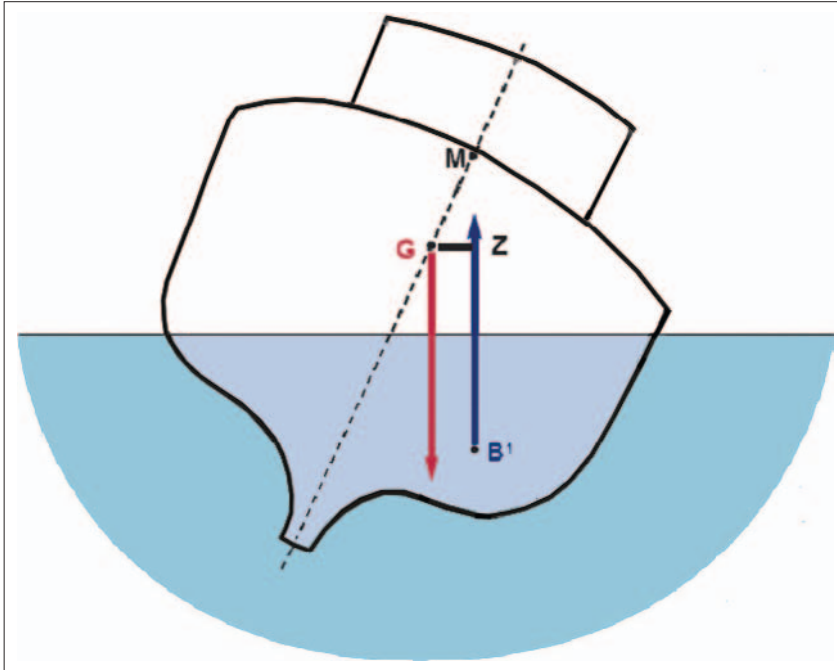
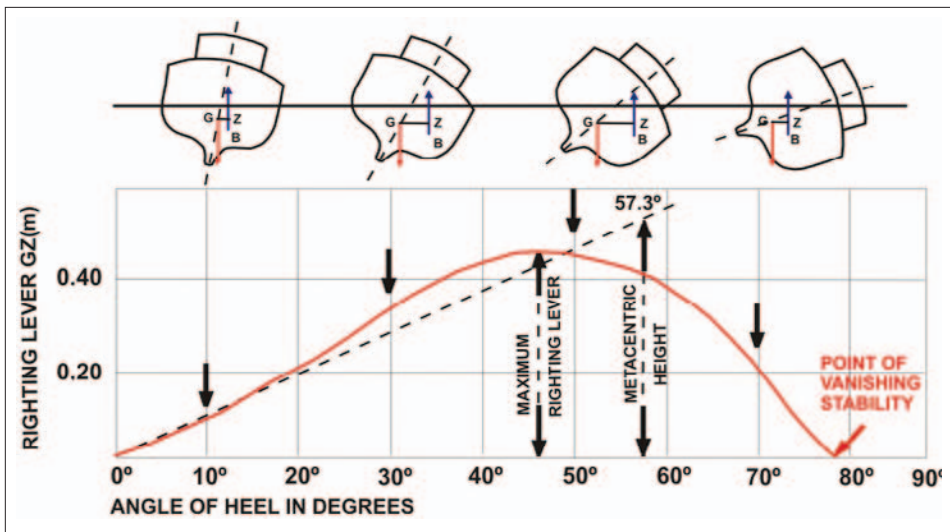


The vessel's centre of gravity (G) has a distinct effect on the righting lever (GZ) and consequently the ability of a vessel to return to the upright position. The lower the centre of gravity (G), the bigger is the righting lever (GZ).



Should the vessel's centre of gravity (G) be near the metacentre (M) the vessel will have only a small metacentric height (GM) and the righting lever (GZ) will also be a small value. Therefore, the moment of statical stability to return the vessel to the upright position will be considerably less than that of the previous illustration.

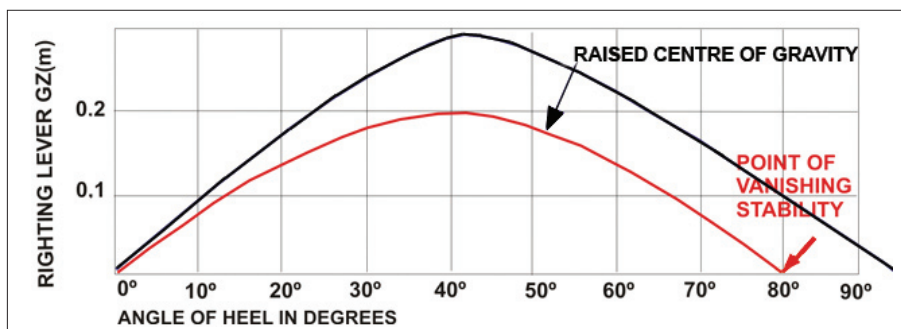
STABILITY CURVES (GZ CURVES)



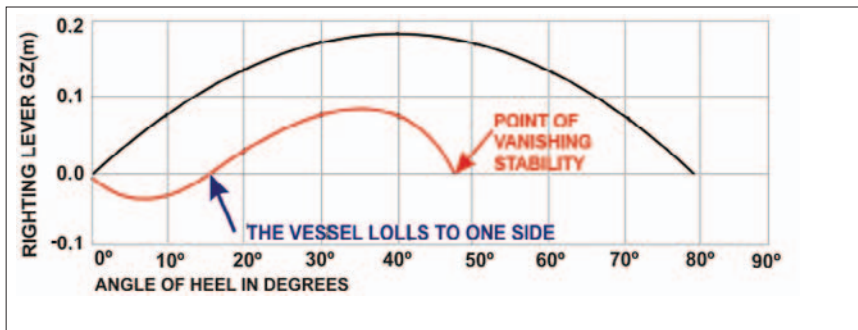
Stability curves (*GZ* curves) are used to show graphically the stability levers (*GZ*) exerted by a vessel to return itself to a position of equilibrium from the various conditions of heel. The curves have several general characteristics and the following factors should be observed:

- the metacentric height (*GM*);
- the maximum value of the righting lever (*GZ*); and
- the point of vanishing stability.

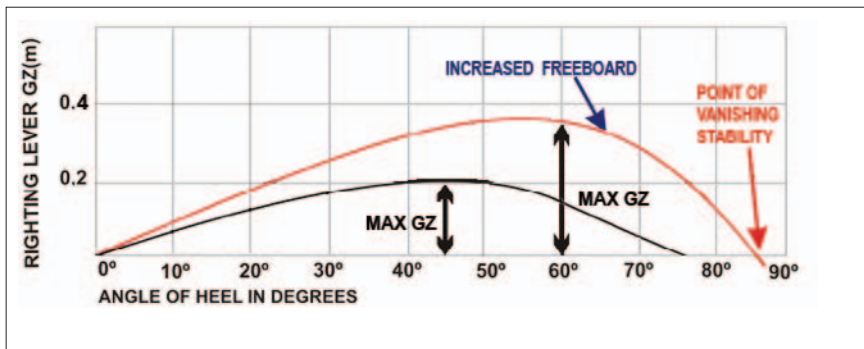
The shape of the righting lever curves is dependent on the form of the vessel's hull and its loading. The shape of the curve at small angles of heel generally follows the slope of the line plotted to the initial metacentric height (*GM*). In this regard, the freeboard and the ratio between the vessel's breadth and depth are also very important.



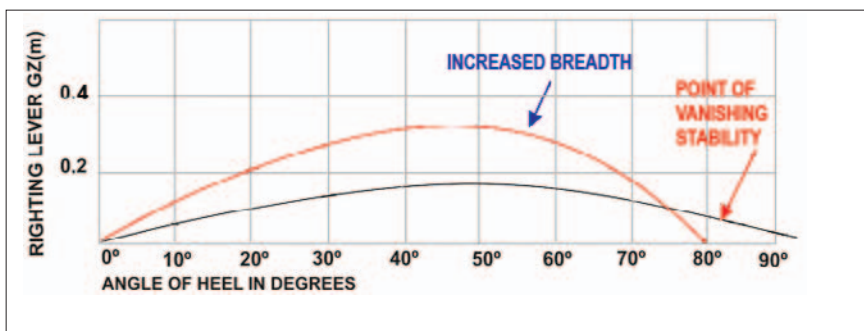
Raising the vessel's centre of gravity (*G*) causes a decrease in the metacentric height (*GM*) and thereby smaller values of the righting levers (*GZ*).



If the vessel's centre of gravity (G) is above the metacentre (M), the vessel is in an unstable equilibrium. The vessel has a negative GM and is not able to float upright. Either the vessel will capsize or float at an angle from the upright to one side. (See also the section on loll on page 5).



By loading less the vessel will have more freeboard and the values of the righting lever (GZ) will, in general, be higher. The point of vanishing stability will also be higher, i.e. the vessel's ability to return to upright after having been heeled to large angles of heel is better.



The hull form of a vessel is an important factor in determining the characteristics of its stability. Increased breadth (beam) will result in higher values for metacentric heights (GM) and righting levers (GZ). However, the point of vanishing stability will be less, i.e. the vessel will capsize at a **smaller** angle of heel.

DYNAMIC STABILITY

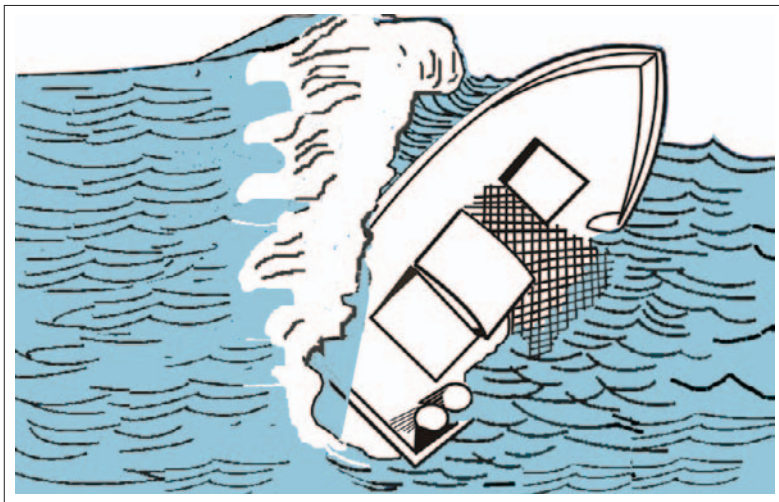
This is the stability characteristic of the vessel when moving (particularly rolling) and is the energy necessary to incline a vessel to a certain angle of heel and thereby counteract the **moment of static stability**.

The dynamic stability may be determined by measuring the area under the righting lever curve (**GZ** curve) up to a certain angle of heel. The larger the area, the better is the dynamic stability.

Waves are the most common external force that causes a vessel to heel. Steep waves with short wavelengths, particularly breaking waves, are the most dangerous to small vessels.

The relationship between a vessel's dynamic stability and wave energy is complex and is, for example, dependent on the speed and course of the vessel in relation to the speed and direction of the wave. However, in general, the smaller the vessels, the smaller the waves they are able to cope with.

The skipper should keep himself informed on weather forecasts in order to have sufficient time to avoid any weather conditions that could threaten the safety of his vessel.



CHANGES IN THE STABILITY CURVE DURING A VOYAGE

A fishing vessel's stability constantly changes during its voyage, depending on how the vessel is loaded and operated.

The following figures show typical stability curves for different operating conditions.

■ WATER ■ FUEL ■ CATCH

