

CORRECTING AN ANGLE OF LOLL

During the course of a voyage the stability of the ship should be closely monitored. It is recommended that a calculation of *fluid GM* and a corresponding GZ curve be produced for the *worst anticipated condition*. Calculations should be done for both departure and anticipated arrival conditions, these being adjusted to suit any changes that may take place as the voyage progresses.

An angle of loll situation may arise in ships carrying timber deck cargoes. Deck cargoes will absorb moisture causing G to rise. Fuel and water will also be consumed from low down in the ship raising G further due to the removal of weight from low down in the ship and the introduction of free surfaces in tanks that may have been initially full. These effects should be accounted for. Poor tank management may cause excessive free surface moments, leading to a similar loss of stability.

Unfortunately things do not always go to plan and mistakes may be made in calculations. Any number of things might happen such as a collision or a fire where water is introduced into a compartment for fire fighting purposes.

Whatever the cause, a situation might arise whereby you find that the ship is lying at an unexpected angle of inclination.

It is not possible to ascertain easily whether a ship is *listed* or *loll*ed and since the remedial action for each case is very different it is essential that the cause of the inclination be carefully investigated.

The following procedures should be carefully observed:

1. *Alter course to put the ship's head into the predominant waves.*

If the ship is in a loll situation it is essential that the ship stays loll to the same side. Wave action may cause the ship to roll through the vertical to loll on the other side. This is a dangerous situation since the ship will heel from the vertical of its own accord and the momentum it will have in lolling over to the other side may be sufficient to capsize it. In any event, the ship will initially heel beyond the angle of loll before settling at the angle of loll whereby cargo shift may result which will worsen the situation further.

2. *Check that port and starboard listing moments are the same.*

By verifying tank soundings and checking for cargo shift it should be possible to account for any listing moments that may cause the ship to be in a listed situation. If it is calculated that there are no net listing moments then a case of instability may be assumed and the ship will be lying at an angle of loll.

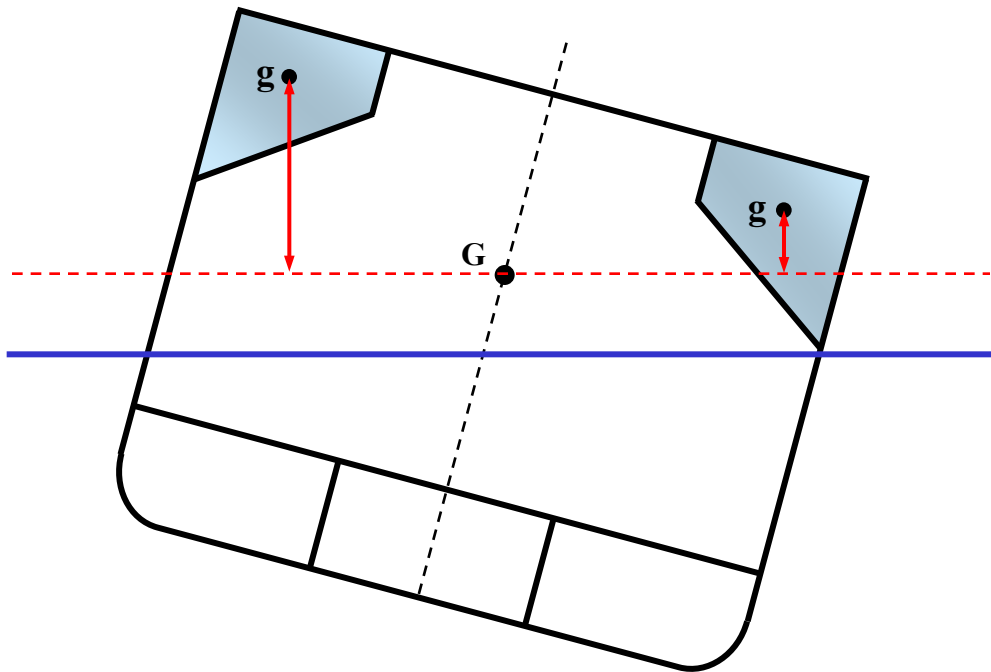
3. *Check for slack tanks*

In carrying out (2) above it should also be evident if there are excessive free surface moments causing a loss of GM sufficient enough to make the ship unstable. In this case a loll situation may be confirmed.

4. *Take action to lower G (reduce KG)*

It would be impractical to consider shifting weights on board using ship's lifting equipment at sea. If the ship has high ballast tanks that are full then these may be emptied, ***discharging ballast from the high side tank first - the greater vertical distance between G of the ship and g of the weight being discharged will ensure that the greatest lowering of G will take place in the first instance.***

Once the high side tank is empty the one on the low side may then be emptied.



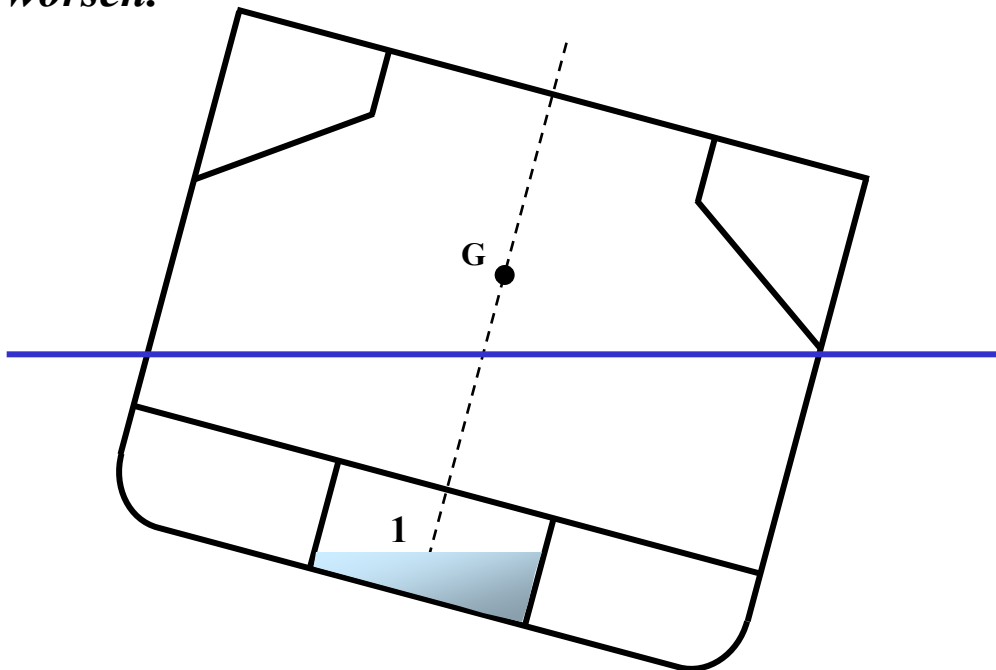
5. *Minimise Free surfaces*

Having sounded all the tanks any that are slack will be identified. Minimise the loss of GM due to free surface effect by topping up low down ballast tanks and transferring fuel as necessary. This action alone may remedy the situation.

6. *Ballast tanks low down in the ship*

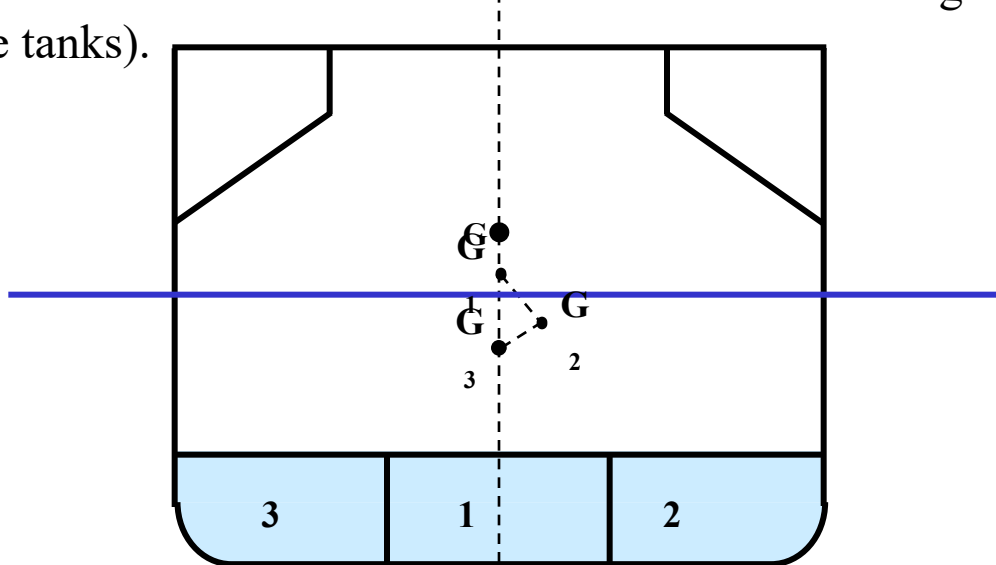
Select a set of suitably subdivided double bottom tanks to ballast. Ideally start with tanks that have the smallest free surface areas to minimise the effects of free surface whilst filling. The order of filling is as follows and must be strictly adhered to:

- (a) Start by filling the centre tank (No. 1) as shown. *Because of the introduction of more free surfaces whilst filling the situation will initially worsen.*



- (b) When the first tank is completely full, **fill the low side tank (No. 2).**
- (c) When the low side tank is full, fill the final tank (No. 3)
- (d) If G is lowered sufficiently then the ship should complete in an ***upright condition*** (having initially verified that the port and starboard moments were the same).

The movement of G after completely filling each of the tanks is as shown (ignoring the upward movement of G which arises as a result of the introduced free surface at intermediate stages of filling the tanks).



If the situation is not remedied then a second set of tanks must be chosen for filling, the process is repeated.

Note

Once a loll situation is confirmed only ever fill one tank at a time.

Always fill low side tanks first (or centre tank and then low side).

The angle of loll may initially worsen because the introduced free surfaces when initially starting to fill the tank may cause a greater rise of G than the fall of G caused by the added bottom weight. Hence the importance of filling small tanks first.

If there is any doubt as to whether the ship is lolled or listed, always assume it is a lolled situation and take appropriate action.

When correcting a ***list*** it is sufficient to shift a weight to the high side. This may be achieved by shifting weights on deck or by transferring ballast from a listed side tank to a high side tank. Alternatively, excess ballast from the listed side (possibly low down in the ship) may be discharged.

To treat a loll situation in the same way would have disastrous consequences for reasons already explained!