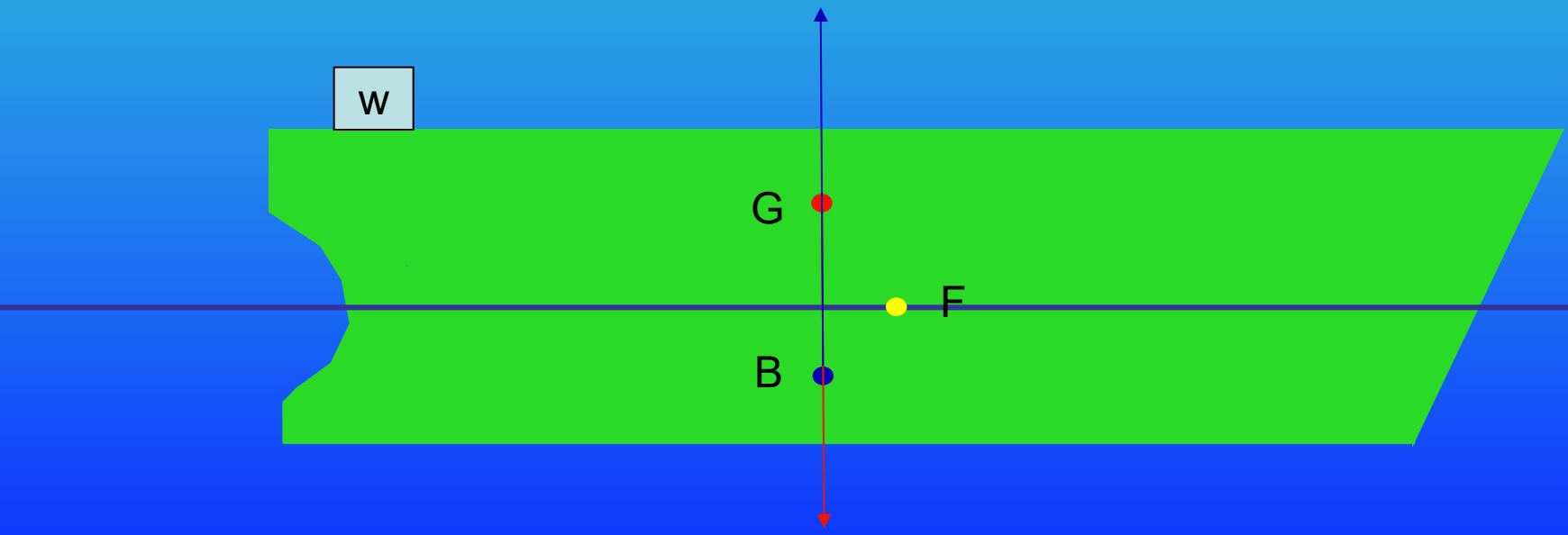
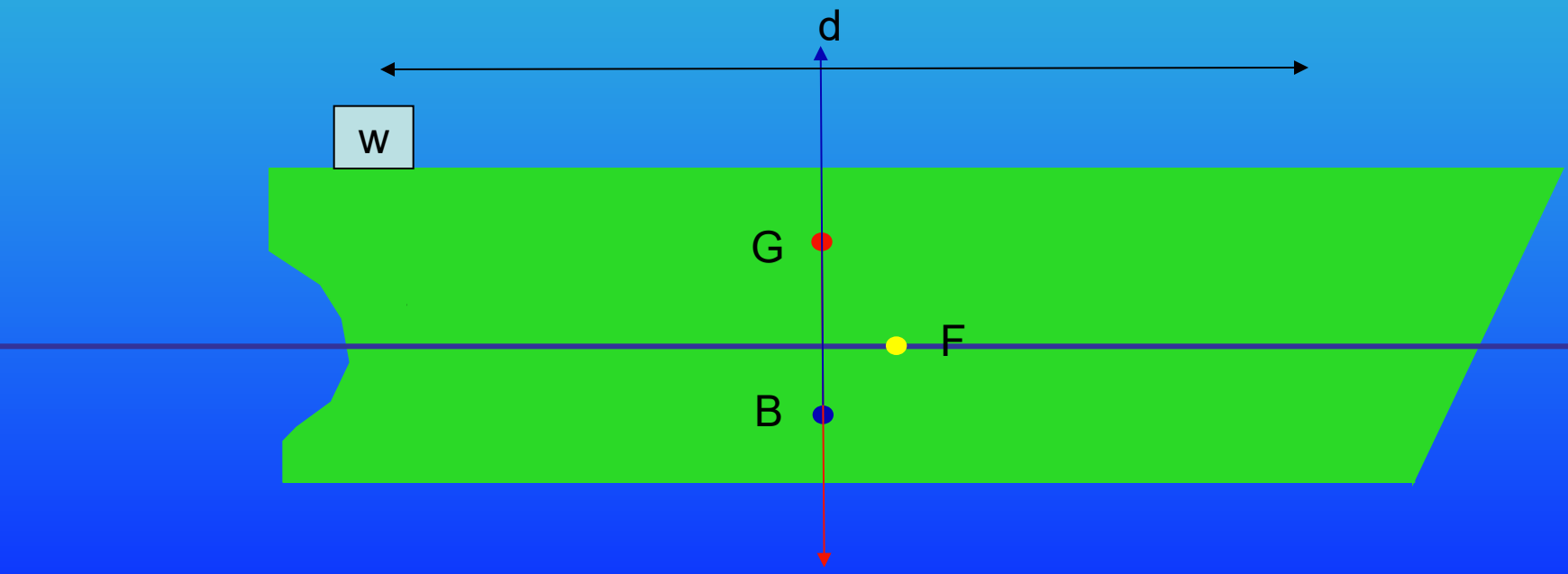
Trim by LCB~LCG

The diagram below shows a vessel on an even keel and indicates each of the following;
G Longitudinal Centre of Gravity
B Longitudinal Centre of Buoyancy
F Longitudinal Centre of Floatation
A weight w tonnes is sitting on the after deck of the vessel.



Trim by LCB~LCG

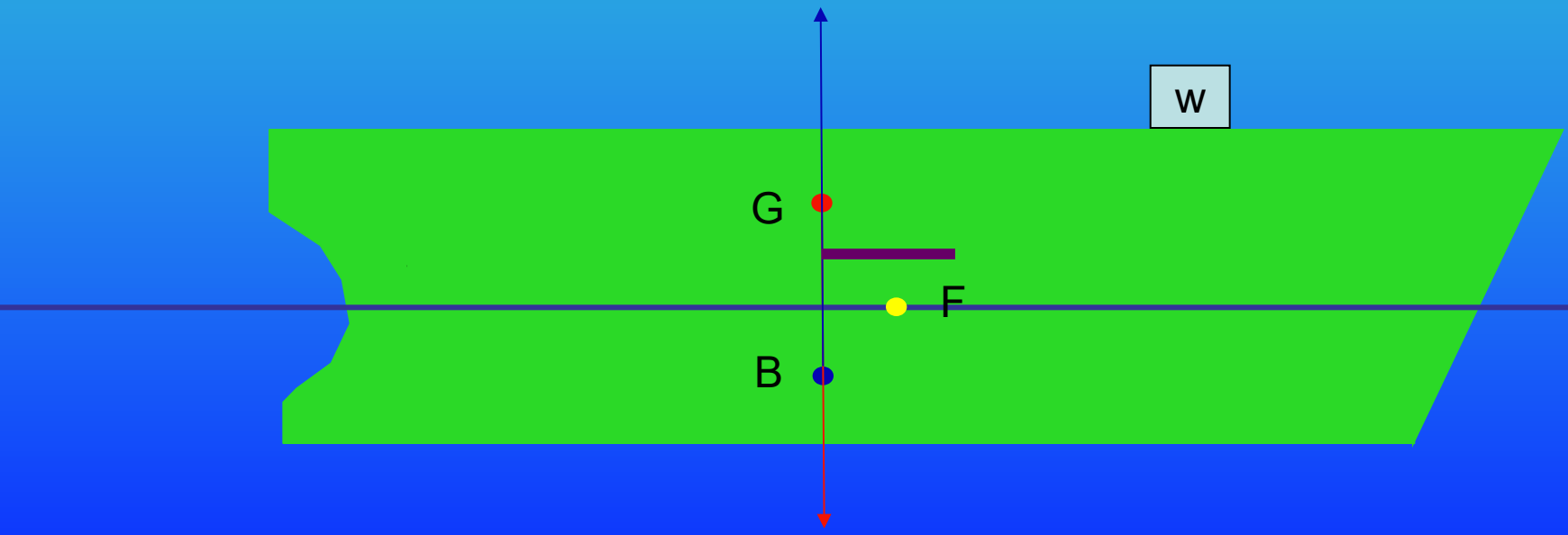
The weight w is moved forward through a distance of d meters. What will happen to the centre of gravity?



Trim by LCB~LCG

G will move in a direction parallel to the weight by a distance given by the formula

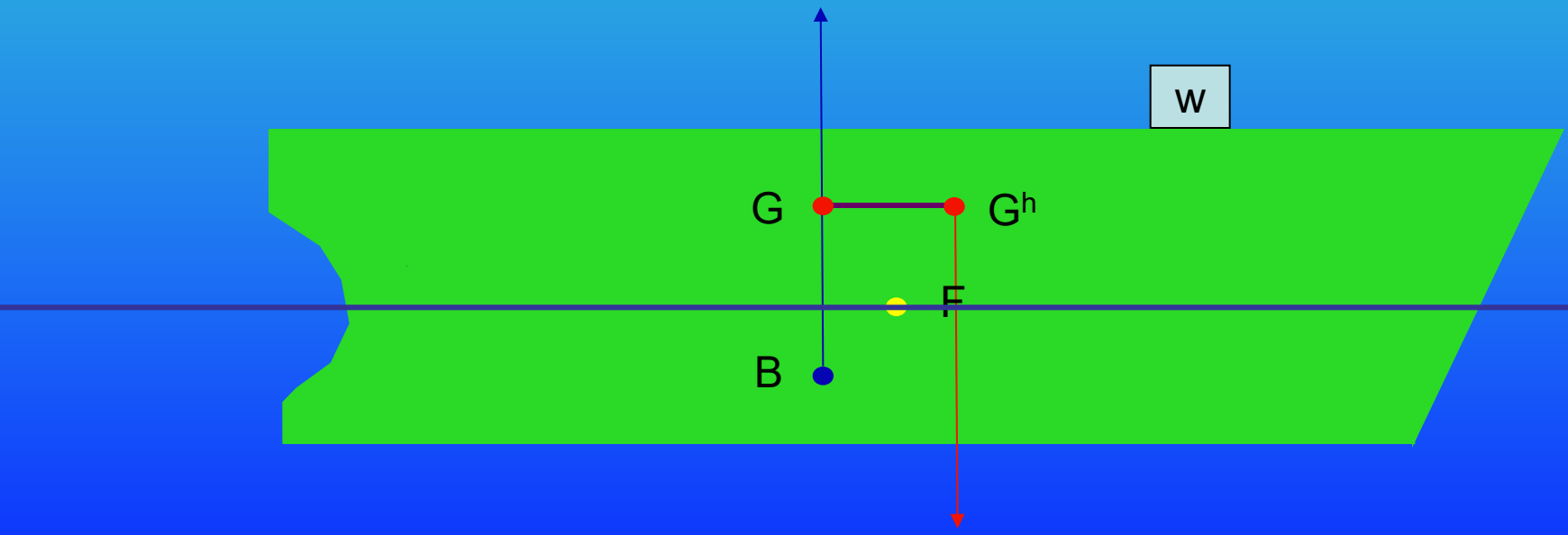
$GG^h = (w \times d) / W$



Trim by LCB~LCG

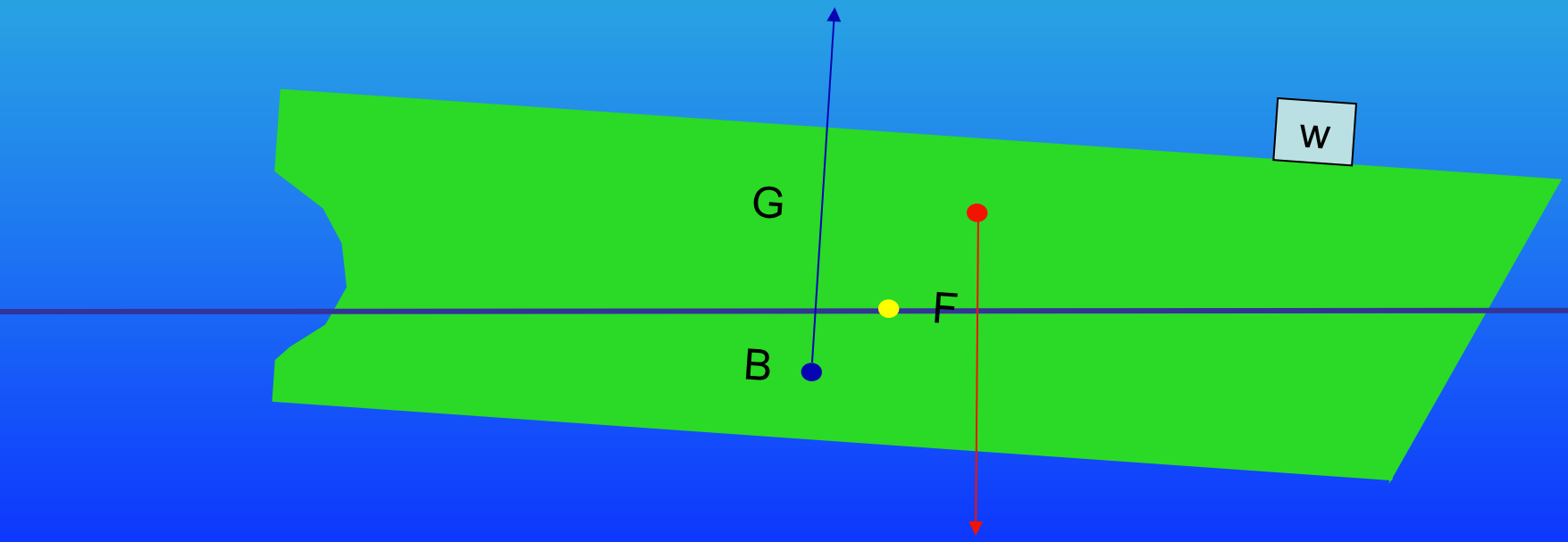
This now creates a trimming lever of value GG^h x W tonne metres.

This will cause the ship to rotate in a clockwise direction about F



Trim by LCB~LCG

The underwater volume of the vessel has now changed and B will move forward until it is again directly under G



Trim by LCB~LCG

From the vessels hydrostatic data we could find the following for a vessel on an even keel.

True Mean Draught

Displacement

LCB

MCTC

We know how to find the true mean draught for a vessel out of trim as well.

Therefore we can find the above data for any vessel.

Trim by LCB~LCG

The reason that the vessel trimmed was because B and G moved out of vertical alignment.

The trimming moment is the horizontal distance between LCB and LCG multiplied by the vessels displacement.

The formula for change of trim is given as follows

$$COT_{(EK)} = \text{Trimming Moment} / MCTC$$

$$= \{Disp \times (LCB \sim LCG)\} / MCTC$$

Or more commonly

$$COT_{(EK)} = \{ W \times (LCB \sim LCG)\} / MCTC$$

Trim by LCB~LCG

In a vessel which is initially trimmed it is easy to determine the change of trim from an even keel condition, this is simply the vessels initial trim in cemtimetres.

Knowing the initial trim we can also find the true mean draught.

This allows the determination of the following;

Displacement

MCTC

LCB

Trim by LCB~LCG

Given we can get all the information on the previous slide then we can do the following

$COT_{(EK)}$ = { W x (LCB ~ LCG)} / MCTC

We will know COT, W and MCTC therefore we could rewrite the above Formula as

($COT_{(EK)}$ x MCTC) / W = (LCB~LCG)

This will allow us to determine the length of the trimming lever that existed if the vessel would have been on an even keel before reaching her final trim.

Since we also know the position of LCB when on an even keel then we Simply add or subtract (LCB~LCG) to the value of LCB.

If the vessel is trimmed by the head then we need to ADD
If the vessel is trimmed by the stern then we need to SUBTRACT