



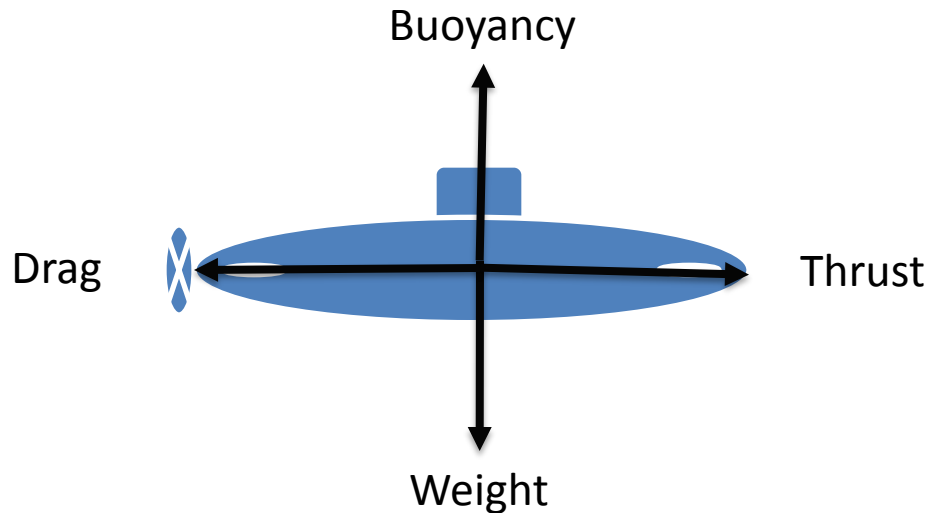
Leadership

In a nuclear submarine on patrol
in “hostile” waters

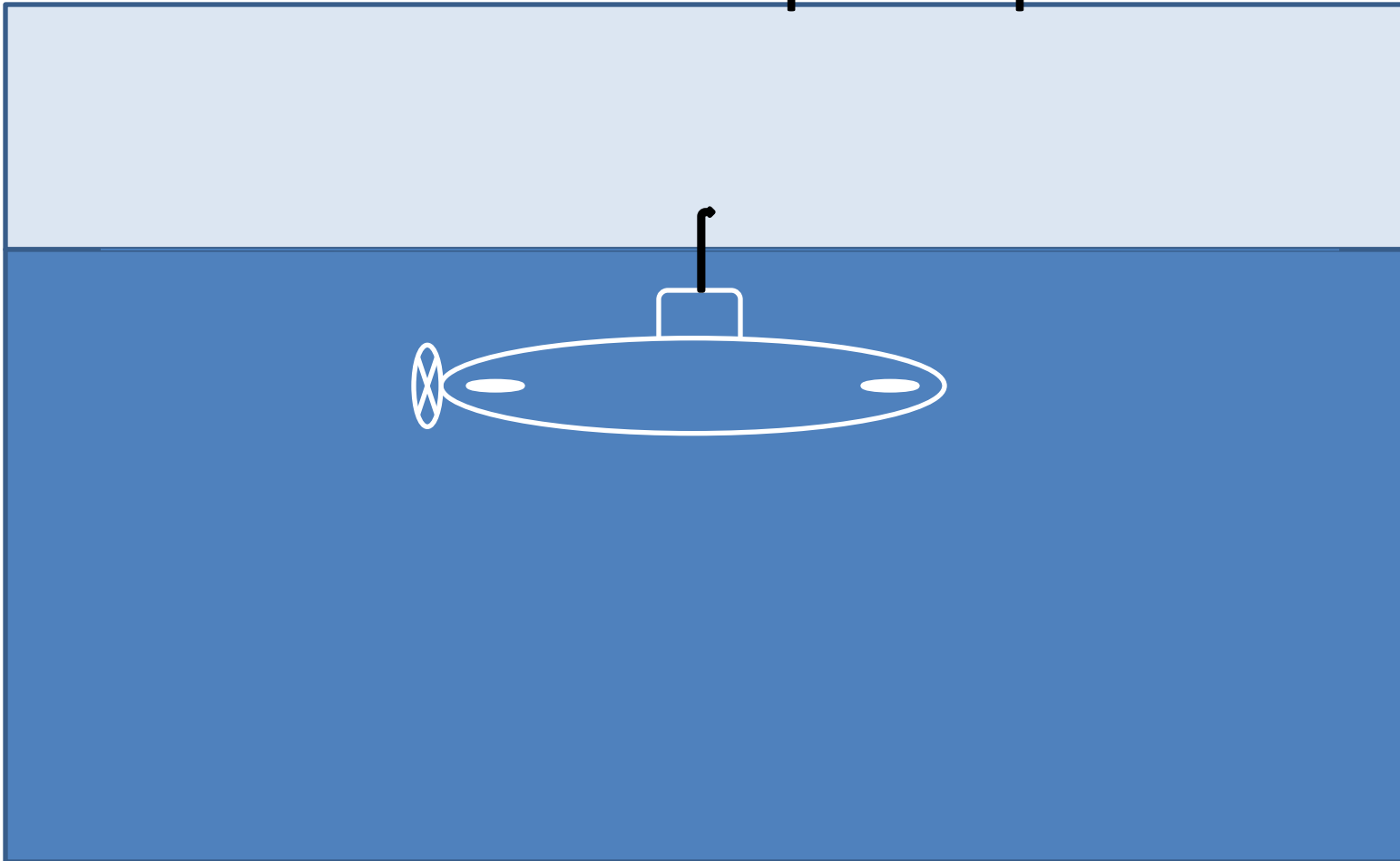
Background and Introduction

- The UK nuclear industry - controlled by the UKAEA
- A highly regulated environment
- Strict and onerous licensing arrangements
- Endless training and assessment of crews
- Unacceptable consequences of failure
 - release of fissile material into the atmosphere
- Total risk aversion

How a Submarine Works!

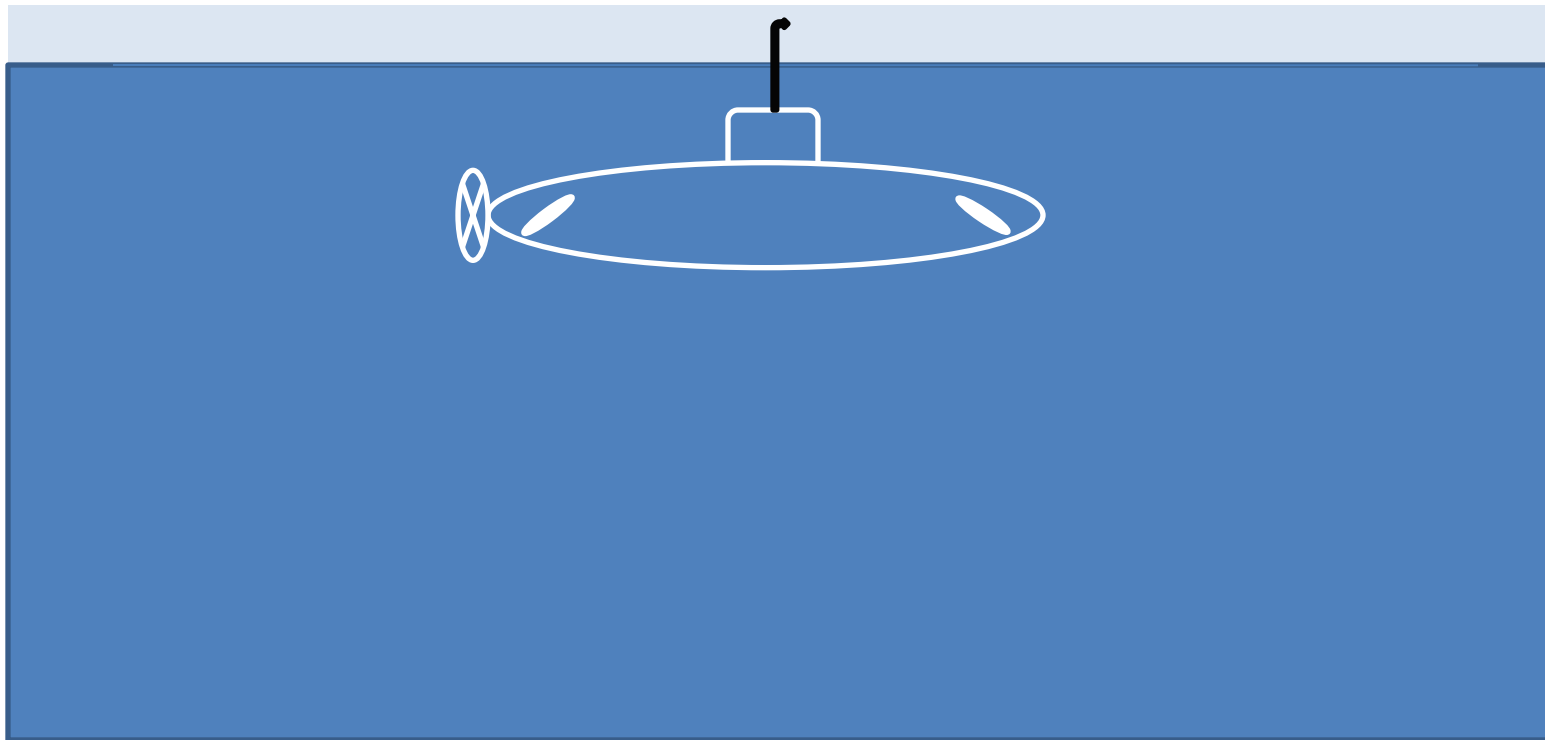


At Periscope Depth



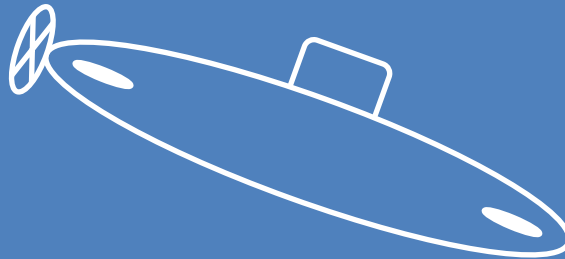
Changing Depth

- Achieved by changing the angle of the boat



Changing Depth

- This is what should happen – note the hydroplanes are now straight again



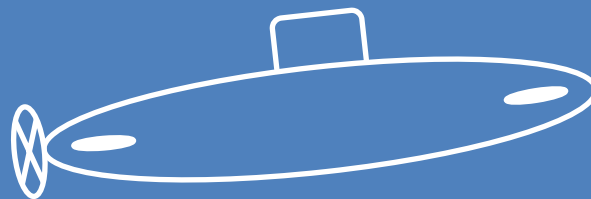
Submarine Deep

- Straight and level in perfect trim
- *i.e.* Buoyancy = weight



Submarine Deep

- Imperfect trim: *i.e.* Weight $>$ buoyancy
kept on depth by thrust



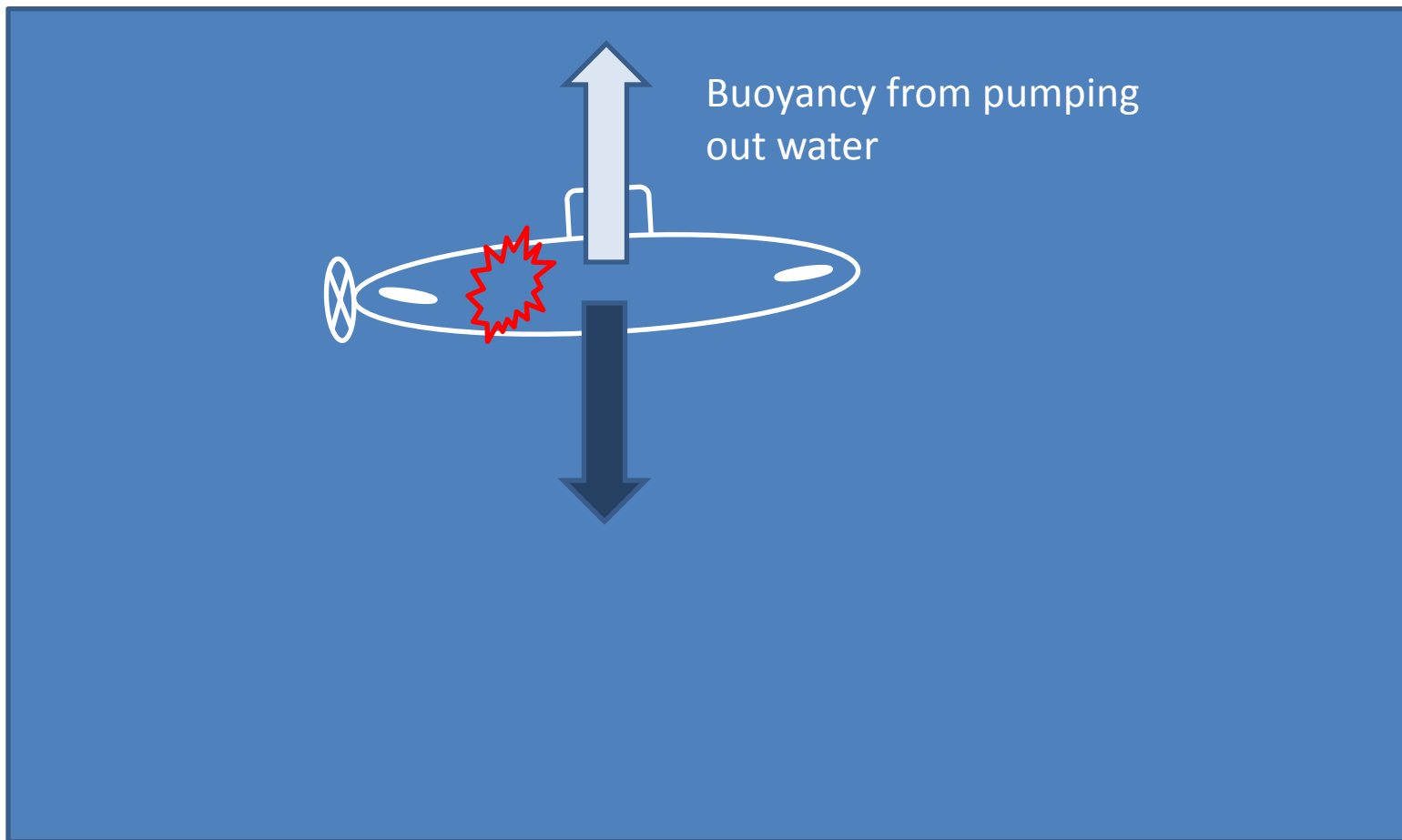
Submarine Deep

- Imperfect trim: *i.e.* Weight $>$ buoyancy
When there's no more thrust ...



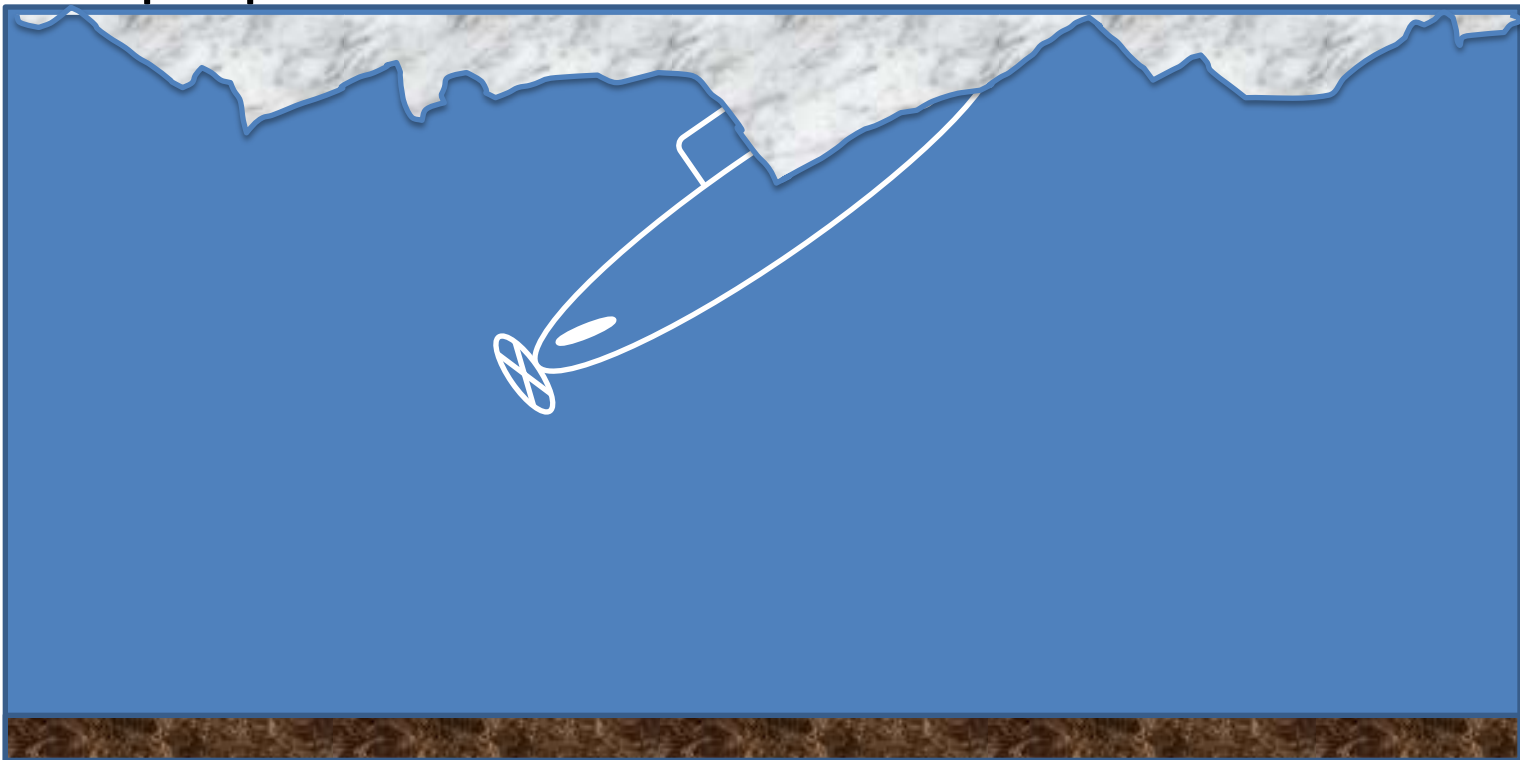
Emergency: Loss of Propulsion

- The submarine was too heavy



Slowly Sinking

- As the speed drops, insufficient buoyancy and no propulsion





The Leadership Challenge

- We had done everything we could do save the submarine
- Every member of the crew had acted in exactly the way I would have hoped
- There was nothing I could add to improve our chances of recovery
- The crew needed something from me – this was the first time I had been required to show real leadership