Steps towards warship invisibility

February 29 2008

Naval warships might look like all-powerful vessels but they are also highly vulnerable to being spotted by the enemy. That fear of being detected has led the military to develop new stealth technologies that allow ships to be virtually invisible to the human eye, to dodge roaming radars, put heat-seeking missiles off the scent, disguise their own sound vibrations and even reduce the way they distort the Earth's magnetic field, as senior lecture in remote sensing and sensors technology at Britannia Royal Navy College, Chris Lavers, explains in March's *Physics World*.

Wars throughout the twentieth century prompted advances in stealth technologies. Some of the earliest but most significant strides towards invisibility involved covering ships with flamboyant cubist patterns – a technique known as "dazzle painting". During the Second World War, the US military even worked out a way of using lights to make the brightness of a ship match that of the background sea.

When British physicist Robert Watson Watt was charged with designing a 'death ray' to destroy entire towns and cities during the Second World War, he calculated it impossible. He did conclude however that radio waves could be used to detect ships and aircrafts too far way to be seen by the naked eye.

Radar was born. For ships to dodge radar, both a ship's geometry and a ship's coating have to be considered. Radars are particularly receptive to right angles, which is why modern battleships are often peculiarly shaped. Special paint and foam-coating have also been used to cover

ships, which convert radio-waves into heat and stop radio waves being reflected, rendering the signals useless.

The “stealthiest” ship that currently exists is Sweden’s Visby Corvette. Apart from being painted in grey dazzle camouflage and made of low-radar reflectivity materials, it also does not use propellers, which are the noisiest part of a ship. The vessel also has the lowest “magnetic signature” of any current warship.

But the next generation of warships could be truly invisible by exploiting “metamaterials” – artificially engineered structures first dreamt up by physicist John Pendry at Imperial College, London. Metamaterials are tailored to have specific electromagnetic properties not found in nature. In particular, they can bend light around an object, making it appear to an observer as though the waves have passed through empty space.

About the research, Chris Lavers writes, “If optical and radar metamaterials could be developed, they might provide a way to make a ship invisible to both human observers and radar systems, although the challenges of building a cloak big enough to hide an entire ship are huge.”

On the net: physicsworld.com

Source: Institute of Physics