



AUSTRALASIAN INSTITUTE
OF MARINE SURVEYORS

Shipshape

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**WORLD'S LARGEST BATTERY-ELECTRIC SHIP
POWERS UP IN TASMANIA**

A novel approach to correcting a magnetic compass “stuck” on one heading throughout a 360° swing

A WELL-MAINTAINED magnetic compass will, under normal circumstances, align with the Earth’s magnetic field being a natural phenomenon (Figure 1), and point to magnetic north.

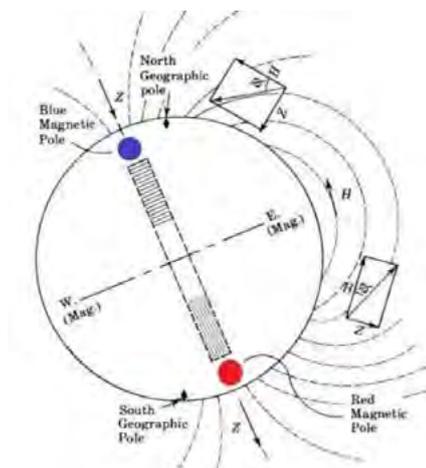


Figure 1: *Earth’s magnetic field*

Total compass error (T/E) is the numerical sum of variation and deviation. Variation is a natural observable value that varies with location. Deviation, on the other hand, is that component caused by magnetised iron (hard or soft) within the ship or an electromagnetic field created by electronic devices close to the compass position.

If a deviation causing magnetic field or electromagnetic field is stronger than the Earth’s magnetic field, then the compass needle will align itself to this new field (Figure 2).

On occasion, a vessel’s magnetic compass may become “stuck” on any one heading when the vessel is swung through 360°. This is usually due to the compass being affected by an overpowering magnetic field or electromagnetic field within the vessel. This, of course, may create a challenge to resolve, particularly when the cause is due to an electromagnetic field emitted from navigational electronic devices that the ship

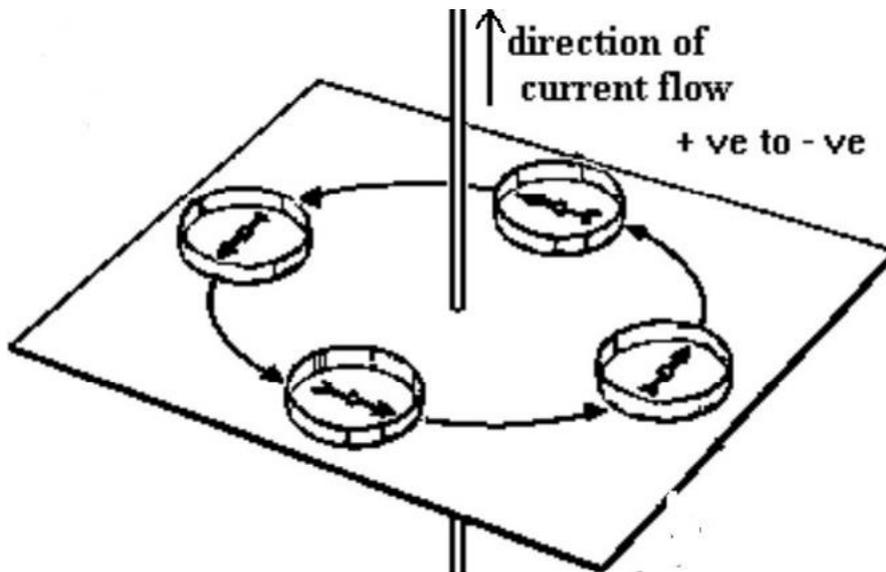


Figure 2: *Current flowing through a wire will create an invisible magnetic field at right angles to the direction of the wire. This is validated by observing the deflection of a compass needle about the wire.*



Figure 3: *A new-build 15-metre LOA foam-collared aluminium monohull.*

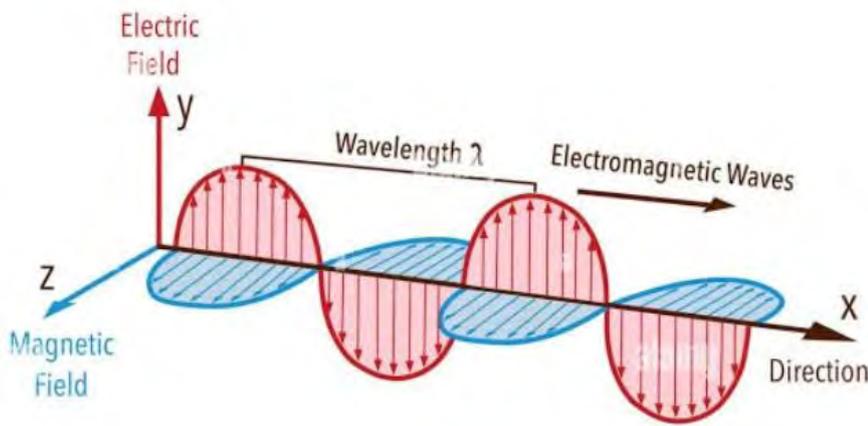


Figure 4: *Electromagnetic waves.*

owner is reluctant to move away from the preferred compass position.

Case study

After embarking a new build

(Figure 3), it became evident the magnetic steering compass heading was “stuck” on East when swung through 360°.

The vessel was fitted with



Figure 5: *The magnetic steering compass was removed from a circular hole in the console and a pocket (“cage”) was fashioned inside the hole using a sheet of aluminium foil and the compass reinstalled.*

numerous electronic devices in close proximity to the compass position.

The compass was removed from its intended place and found to work and behave as a normal compass. However, the builder was reluctant to move the compass away from the electronic devices deemed to be causing the “locked” compass. It seemed rational to conclude the compass was aligned with a very strong resultant electromagnetic field (Figure 4) directed athwartship, from starboard to portside.

Strategic positioning of powerful rare-earth magnets in the traditional manner had no effect and it was elected to try shielding the compass from the imagined, invisible electromagnetic field using a sheet of aluminium foil to create a quick, impromptu Faraday Cage (Figure 5).

Once completed, the compass was found to function normally and, following analysis, was corrected in the conventional way. The following coefficients were determined:

- Coeff A +0.375
- Coeff B Nil
- Coeff C +1.5
- Coeff D +1.0
- Coeff E +0.75

Conclusion

In light of the aforementioned, it would appear the application of a Faraday Cage to be a useful tool in some instances where a magnetic compass is “stuck” on one heading due to an adverse electromagnetic field at the compass position.

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