THE ADMIRALTY GYRO-MAGNETIC COMPASS - TYPE 5

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This new compass, which is now being fitted extensively in H.M. ships, represents the latest development in transmitting magnetic compasses combined with gyro stabilization to reduce the effects of accelerations which arise in fast turns and complicated manoeuvrings. It has the high inherent accuracy of the pivoted needle magnetic compass combined with the stability of gyroscopically controlled instruments.

The advantages should be particularly apparent in high latitudes where both simple magnetic and gyro-compasses are liable to be erratic, for though the magnetic element may be unsteady, its mean position is that of the magnetic meridian, while a free gyroscope, such as that used in this instrument, is unaffected by speed and latitude changes and continues to provide the necessary short-term stability.

Other practical advantages over the gyro-compass are the short time required to start up and to settle (5 minutes or so compared with several hours) and the rapidity with which the system settles after being disturbed (2 minutes or so after a rapid turn). A gyro-compass, with its 85-minute period, is liable to be much in error in high latitudes (20 minutes or so after a turn). The limitations of the system are the accuracy to which variation is known and the accuracy to which the compass position is corrected.

The system consists of a free gyroscope operating a normal data transmission system. Included in the transmission link is the follow-up and bowl system of a transmitting magnetic compass. Thus the gyro azimuth is represented by the bowl of the compass and the direction of the magnetic meridian by the magnet system of the compass. They are continuously comparable. The compass bowl contains the electrode system of the conventional Admiralty transmitting magnetic compass, which provides an out-of-balance signal when bowl and magnet system are misaligned.

When the ship makes an alteration of course there would be no change of alignment between bowl and magnet system, since the ship moves equally with respect to the direction of the gyro axis and to the direction of the magnetic meridian. Hence no out-of-balance signal arises. Should the gyro drift, the bowl is moved out of alignment with the magnet system and the resulting out-of-balance signal is used to correct the drift. A correction is applied to the transmission system (and not to the gyro which is allowed to wander freely) thereby maintaining the repeaters correctly orientated and restoring the compass bowl to its balanced position. Acceleration errors, which disturb the magnet system, are normally transient effects, and since the rate of correction is of the order of 4°/min., no serious errors can build up. This can be understood by imagining the compass system to be oscillating at its natural period of about 30 seconds Misalignment lasts over half a period, i.e. 15 seconds. Thus only 1° error can build up on each oscillation however great the amplitude of the magnet system may be.

Successful trials have been carried out in a motor torpedo-boat, in which the first equipment has been in use since December 1951. In calm weather, on a steady course, and using the Sun's azimuth as a datum, the probable error (standard deviation) is 0.2°, which means that the accuracy of a single observation is better than 1/2°. Errors up to 4°, which disappeared 2 minutes after the turn ceased, were encountered during turns.