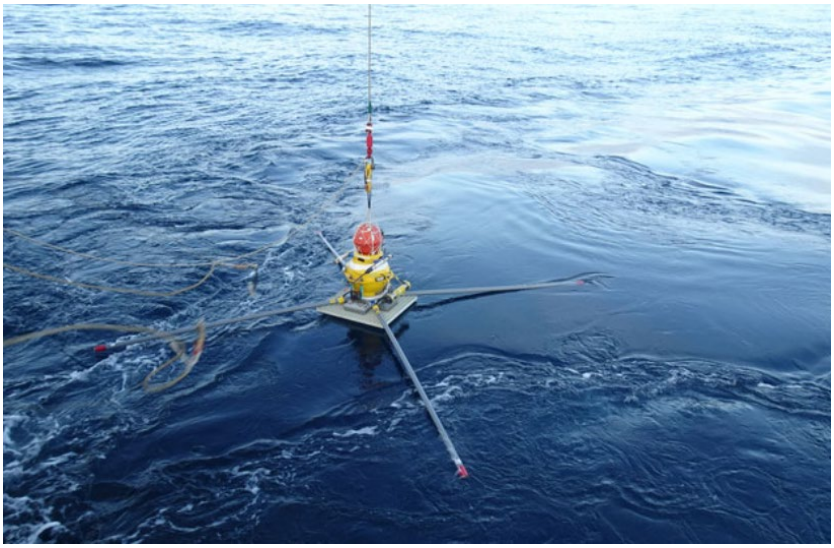
Application Note: Compass Pad Survey



OVERVIEW

Magnetic compasses used on certain aircraft need to be checked at regular interval to check their accuracy. This check, called a compass swing test, is performed most regularly with the compass installed on the aircraft.

To ensure the best accuracy, the test has to be performed over a magnetically quiet location which has markings of magnetic north and directions every 30 degrees (to mark the full circle). The area, as per legal requirement, has to be certified non-magnetic at periodical interval, the interval being dependent on the accuracy achieved.

The magnetic cleanliness is checked by ensuring that no point of the compass pad area is seeing a deviation from the background magnetic field of no more than either 0.1 or 0.25 degrees. It is carried out using 2 magnetometers to measure precisely the declination of the Earth's magnetic field.

Revised March 15, 2022

Equipment

- 2x Mag-01H D/I systems

Applications

- Map the magnetic anomalies over a compass rose in airports or military air bases

GMW Associates

www.gmw.com
sales@gmw.com
+1-650-802-8292
955 Industrial Road
San Carlos, California, USA

Data Acquisition

The first stage of the survey is carried out using a total field magnetometer and consists of locating a suitable location for the reference D/I system, that is a location where there are no large local magnetic anomalies.

Using the same total field magnetometer, the compass pad is also checked to identify any strong anomalies. Anomalies showing on the total field will likely cause distortion in excess of the tolerated limits and will therefore prevent a new pad from being setup, or should be investigated to find the source of the anomaly on existing pad.

Once a suitable location for the reference system and the pad is 'clean', the survey proper can start.

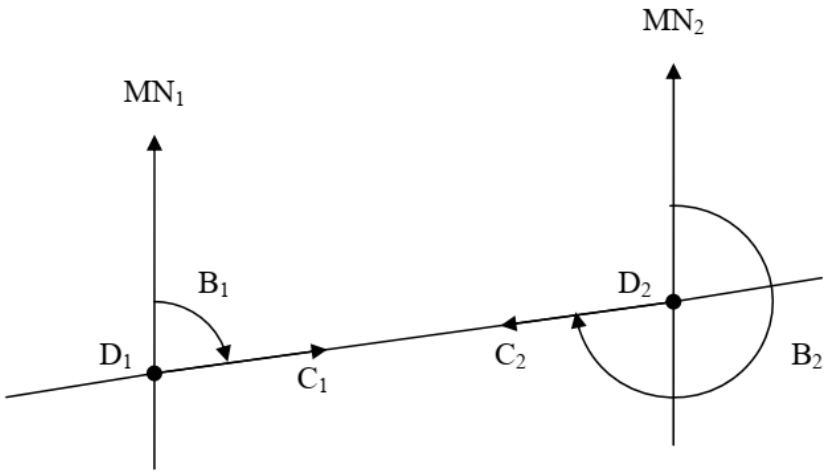
The first D/I system will be placed at the reference location and will left there for the entire duration of the survey. The second, roaming D/I system, will be moved across a grid of points on and around the compass pad, with a set of measurement taken for each grid point.

The set of measurement consists of a Magnetic North and a reciprocal measurement of the other D/I system.

As with all D/I systems, the Magnetic North is not measured directly, but instead we are seeking a 0 magnetic field amplitude which corresponds to either an East or West magnetic directions. These can either be taken with the magnetic probe up (above the telescope of the theodolite) or probe down (probe below the telescope). However, whichever position is selected, the same should be used throughout the survey for both D/I system. Additionally, both sets of measurements should be taken synchronously on the two D/I systems.

Once the measurements at one point have been taken, the roaming D/I system can be moved onto the next point until you have a set of measurement for each grid point.

Data Processing



The diagram here shows the set of measurements for each of the system where MN (1 and 2) and C (1 and 2) are the circle readings for the Magnetic North and reciprocal readings.

The reciprocal bearings can be calculated as B1=C1-MN1 and B2=C2-MN2.

As MN1 and MN2 are parallel B1 = B2-180, and B1-(B2-180) should be 0 (in a perfect world).

However, instrument errors, local magnetic field anomalies and local disturbances of the field will mean that the value will differ from 0. As instrument errors and local disturbances

are either constant or affecting both magnetometers equally, these will create a mean offset during the survey. The residual error minus this mean will give you the localized anomaly over the compass pad (complete details of the calculations can be found in Guide for Calibration a Swing Base by L. Loubser and L Newitt).

Once the localized anomaly has been calculated for each of the point, you can create a map of anomaly and determine the Class of the compass pad.