The Problem of Magnetic Compass Deviation at Contemporary Conditions

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ABSTRACT: The problem of accuracy magnetic compass for contemporary condition is described. The technique of actualization of deviation's table at conditions of voyage is offered. The methods and means of actualisation is described also.

1 INTRODUCTION

According to requirements of Register the table of deviation is legitimate during 1 year after compensation of deviation, however, at navigation in ice or in storm conditions it can be not actual already after some days of navigation. It cannot be guarantee for high accuracy compass during one e\year at all conditions.

The role of a magnetic compass at the modern vessel today is reserving of navigation. This role of magnetic compass is explained by means of high accuracy of gyrocompass and high accuracy of GPS receiver. Such decrease in a role of a magnetic compass is involuntarily reflected in carefulness of his service.

At the same time, normative documents do not provide any indulgence to quality of the maintenance and service of compasses, including to quality of deviations service.

It is known, that if expensive services do not raise efficiency of works them try to avoid by every way. It now occurs on fleet regarding carrying out deviation's works, that, certainly, does not promote a safety of navigation.

Today the navigator has such technical and theoretical base, that he can possibility to provide carrying out the deviation's works itself, but he is not accustomed to this during all history of fleet development. He prefers to pay, especially not from the pocket.

The passive relation of the navigator to monitoring and compensation of deviation is explained by the complication of contemporary methods. It is necessary for stimulation of navigator to monitoring of compass the new effective and simple methods which are not demanding essential time expenses.

2 THE ANALYSIS OF DEVIATION'S FACTORS AT CONTEMPORARY SHIPS

The analysis of stability of deviation's factors [2] shows, that factors A and E for contemporary vessels practically do not exceed $0,6^0$ and are very stable. Not compensated factor D for new building ship always is positive and is in limits $3^0 \div 5^0$. The factor D is high stability.

As a rule, at annual compensation of deviation only the least stable factors of deviation B and C is compensated and under compensation the table of deviation is anew recalculated entirely.

The modern methods of deviation's works are carried out usually according to the hard algorithms which are not admitting any variations and the account of concrete circumstances.

Actually on the vessel at practically constant factors A, D and E from year to year are anew determined all factors of deviation and the table of deviation is recalculated. It happens even so, that factors again accepted to the account A, D and E have accuracy below, than it was in the old table. It is explained, first of all, that values of these factors are commensurable with a margin error their calculations.

It turns out so, that annual determinations of factors A, E and D at their small value and high stability it is inefficient expenditure of time and resources.

At typical procedural deviation's works the factors B and C of half circle deviation are compensated. Obviously, it is necessary to use elastic algorithms for counting these changes.

At such state there is a question about expediency of compensation of factor B and factor C up to zero. If the factor B and C to return to former tabulated values position, that there is not necessity of recalculation of deviation's table anew.

3 THE ACTUALISATION OF DEVIATION'S TABLE AT CONDITION OF VOUAGE

At the same circumstances all deviation's work can be executed for example at the course N and E, instead of twelve courses as it take place at typical procedural works. Thus, the time of manoeuvres can be reduced in 6 times. This prize is rather essential.

In addition from process of deviation's works it is excluded the cultivation of measuring information and calculation of the new table of deviation. The old table of deviation is prolonged for new term. Instead of one and a half hours of time without taking into account expenses for transition up to special aquatory and back it is enough to spend $10 \div 15$ minutes of time without any calculations.

The sequence of operations is according to:

- The deviation of magnetic compass is determinated at the compass course 0^0. If the value of deviation is differed from tabulated value less than $0,5^0$ it is not necessity of correction. If the different of deviation is more than $0,5^0$ it is necessary to recover the value of deviation from the table.
- The deviation of magnetic compass is determinated at the compass course 90^0. If the value of deviation is differed from tabulated value less than $0,5^0$ it is not necessity of correction. If the different of deviation is more than $0,5^0$ it is necessary to recover the value of deviation from the table.
- The time of correction must be written at the table. The signature of executor must be at the table also.

Such simplified way for correction of half circle deviation demands enough solid data about magnetic declination. From this reason the choice of a place for carrying out of such works it is necessary to avoid areas of magnetic anomalies, etc.

4 THE REQUIREMENT OF ACCURACY AT ACTUALISATION OF A TABLE

The deviation of a magnetic compass is determined from one of a formulas:

$$D = TC - CC - V$$

$$D = TB - CB - V$$

From these formulas it is visible, that accuracy of determination of deviation and also accuracy of restoration of its former value depends, first of all, from accuracy of knowledge TC or TB and from accuracy of values of variation V. The standard error of restoration of deviation up to its tabulared value is determined accordingly on one of formulas:

$$\mathrm{m_D} = \sqrt{\mathrm{m_{TC}^2} + \mathrm{m_{CC}^2} + \mathrm{m_V^2}}$$

$$\mathrm{m_D} = \sqrt{\mathrm{m_{TB}^2} + \mathrm{m_{CB}^2} + \mathrm{m_V^2}}$$

Such simplified procedure of deviation's works reminds inherently a computer option "restoration of system". This option very much frequently helps users of personal computers, allowing to return the lost elements of system " Windows ", due to periodic automatic records of installations of system.

If to carry out this analogy, that the values of deviations on the course N and E represents the written down(at the table) values of deviations. This value is nominative to restoration.

Comprehension of such fact allows the navigator widely using a computer in the daily practice, to find for an offered method a corresponding place in uniform philosophy of maintenance of navigating safety of navigation.

5 CONCLUSION

Such simplified method of restoration of a urgency of the out-of-date table of deviation can be made within $4 \div 5$ years if not it was made significant repair work.

Such statement of a question will allow to harmonize expenses for maintenance of efficiency of a magnetic compass and feedback from its party, both in aspect economic, and in aspect of safety of navigation.

LITERATURE

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