NATO STANDARD

AGeoP-24

USE OF GEOMAGNETIC MODELS

Edition A Version 1

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NORTH ATLANTIC TREATY ORGANIZATION

ALLIED GEOGRAPHIC PUBLICATION

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NORTH ATLANTIC TREATY ORGANIZATION (NATO)

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NATO LETTER OF PROMULGATION

16 March 2017

1. The enclosed Allied Geographic Publication AGeoP-24, Edition A, Version 1, USE OF GEOMAGNETIC MODELS, which has been approved by the nations in the MILITARY COMMITTEE JOINT STANDARDIZATION BOARD, is promulgated herewith. The agreement of nations to use this publication is recorded in STANAG 7172.

2. AGeoP-24, Edition A, Version 1, is effective upon receipt.

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4. This publication shall be handled in accordance with C-M(2002)60.

Edvardas MAŽEIKIS
Major General, LTUAF
Director, NATO Standardization Office

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RECORD OF RESERVATIONS

CHAPTER	RECORD OF RESERVATION BY NATIONS
Note: The reservations listed on this page include only those that were recorded at time of promulgation and may not be complete. Refer to the NATO Standardization Document Database for the complete list of existing reservations.	

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RECORD OF SPECIFIC RESERVATIONS

[nation]	[detail of reservation]
LVA	Requirements will be applied to military geospatial information produced within LVA MoD domain
Note: The reservations listed on this page include only those that were recorded at time of promulgation and may not be complete. Refer to the NATO Standardization Document Database for the complete list of existing reservations.	

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CHAPTER 1 USE OF GEOMAGNETIC MODELS

1.1. GEOMAGNETIC INFORMATION

1. Many military activities, from navigation using a personal compass to reducing the magnetic signature of a ship, require some knowledge of the effect of the Earth's magnetic field. As the effect varies with location and through time it is necessary to model the field in order to provide information to the user, wherever and whenever is needed.

2. AGeoP-24 establishes the World Magnetic Model as the standard global model of the Earth's magnetic field to be installed in instrumentation and to generate data for geographic products. Information on the World Magnetic Model can be accessed at the British Geological Survey (BGS) web site (www.geomag.bgs.ac.uk) or the National Geophysical Data Center (www.ngdc.noaa.gov).

3. Applications of the use of the World Magnetic Model include the following:

   a. Navigation

   b. Attitude determination in 3-Dimensional space

   c. Magnetic signature reduction for naval vessels

   d. Magnetic detection

   e. Communications equipment

1.2. MAGNETIC MODELS FOR INCLUSION IN SYSTEMS

4. Nations agree to use the World Magnetic Model for any system that needs a global model to be installed in order to maintain interoperability of systems.

5. Nations agree to ensure that the World Magnetic Model is installed in a format that allows the model to be updated easily whenever a new model is produced.

6. The World Magnetic Model will be supplied by the US National Geospatial Intelligence Agency (NGA) or the UK Defence Geographic Centre (DGC). Users requiring the World Magnetic Model should register their requirement with either organisation in order to receive new models, when produced.

NGA Geomatics Office
NGA-SN, Mail Stop L-41
3838 Vogel Road
Arnold, MO 63010-6238
U.S.A.
WGS84@nga.mil

DGC
Elmwood Avenue
Feltham
Middlesex TW13 7AH
U.K.
JFIGFndn-DGCRGeodesy@mod.uk

7. Users requiring more stringent geomagnetic information than available from the World Magnetic Model (eg. more accurate, real-time) should contact the specific country or the supplier of the World Magnetic Model.

8. A variety of software tools are available to utilise the World Magnetic Model. Standard algorithms are provided at the BGS web site, (go to Data & Services - Models and Compass Variation – Worldwide – World Magnetic Model (WMM) - WMM Calculator) The WMM model, coefficient files, associated software and the WMM Technical Report/Test Values, maps and shapefiles, are available through the NGA web site, http://earth-info.nga.mil/GandG/ (go to “Geomagnetic Data & Models” - “World Magnetic Model”). The specification for the World Magnetic Model is U.S. MIL-PRF-89500A World Magnetic Model (WMM) dated 30 October 2015”.

1.3. MAGNETIC INFORMATION ON GEOGRAPHIC PRODUCTS

9. Geomagnetic information shall be shown on geographic products in one of the following forms:

a. Three-Norths diagram (for Topographic maps)

b. Isogonals (for Air Charts and Small Scale Nautical Charts)

c. Isogrivs (for Air Charts showing a Navigational Grid)

d. Compass Rose (for Nautical Charts)

e. Magnetic variation object (MAGVAR) (for Electronic Navigational Charts (ENC) and Additional Military Layers (AML))

10. In all cases, the date of the geomagnetic information shall be given along with an indication of the annual change. The date to be used will be that defined in the relevant product specification.

1.3.1. THREE-NORTHS DIAGRAM

11. This is a diagram showing the relative directions of the three north references; Grid North (labelled GN), True North (symbolised by a star) and Magnetic North (symbolised by a half-arrow). The preferred format of the diagram is as given in STANAG 3676.

12. For topographic maps the important information is the Grid Magnetic Angle, the angle from Grid North to Magnetic North. In the diagram, (see STANAG 3676) the convention is to leave all angles unsigned but shown in their relative position. For geomagnetism margin notes not accompanied by diagrams, the convention is to append suffix “E” for a clockwise rotation from North or suffix “W” for a counter-clockwise rotation from North. In the very few cases where the local geomagnetic field is heavily anomalous, the diagram should represent the best approximation for the sheet and have the note “large geomagnetic anomalies in this area - approximate magnetic information”.

1.3.2. ISOGONALS

13. Isogonals show lines of equal Magnetic Declination and are plotted across the face of a chart at various intervals of declination, according to product specification. Isogonals are only shown where at least two isogonals appear on the chart. When Magnetic Declination is approximately the same over all areas of the chart, so that less than two isogonals would be plotted, a note in the marginalia should instead state the approximate Magnetic Declination over the whole chart.

1.3.3. ISOGRIVS

14. Isogrivs are similar to isogonals but instead show lines of equal Grivation, equivalent to Grid Magnetic Angle, for Navigational Grids. These are generally used for charts covering Polar Regions, where the declination varies wildly. In polar areas isogrivs show much less variation than isogonals by using a grid north instead of geographic north as a reference, so giving a much better indication of direction.

1.3.4. COMPASS ROSE

15. A compass rose diagram is depicted on the face of the chart showing a complete 360° graduated circle oriented to True North. A Magnetic North arrow, shown within the compass rose, contains a note stating the magnetic declination in degrees and decimals of a degree (degrees and minutes may be used if appropriate), the date and rate of change in minutes per year. The compass rose may appear in several places across the chart as required to indicate the change in declination. Large scale maritime plans may state a note of magnetic variation.

1.3.5. MAGNETIC VARIATION OBJECT

16. On electronic nautical charts such as ENC and AML, magnetic declination information is included using the object Magnetic Variation or MAGVAR populated with the appropriate attributes.

1.4. USE OF MODELS

17. Participating nations agree to use the World Magnetic Model in military systems that calculate the effect of the Earth's magnetic field and to provide geomagnetic information on geographic products in formats specified.

18. Nations agree to use geomagnetic models for generating magnetic information on geographic products as follows:

a. Global products and series. Use the relevant epoch of the World Magnetic Model.

b. National or regional products and series. Use either the latest World Magnetic Model or, if required, a local magnetic model where one is available and more accurate than the World Magnetic Model.

CHAPTER 2 GLOSSARY OF TERMS

Annual change / variation annuelle
The annual change in magnetic declination. This is not constant with respect to time, which is why the model must be replaced periodically.

Convergence / convergence
The angle from true north (TN) to grid north (GN) at a point on a particular mapping grid, clockwise regarded as positive.

Declination / déclinaison
See magnetic declination.

Grid magnetic angle / déclinaison magnétique renforcée (DMR)
Angle from grid north (GN) to magnetic north (MN) at a point on a particular mapping grid, clockwise regarded as positive. Also known as grivation and grid variation.

Grivation / décligrille
Angle from grid north to magnetic north, clockwise regarded as positive. This term is mainly used in connection with a navigational grid. *See grid magnetic angle*.

Isogonal / isogone
A line on a chart which joins points of equal magnetic declination for a given date.

Isogriv / isogrille
A line on a chart which joins points of equal grivation for a given date. (A line on a map or chart which joints points of equal angular difference between grid north and magnetic north.)

Magnetic declination / déclinaison magnétique
Angle from true north (TN) to magnetic north (MN), clockwise regarded as positive. Declinations vary with time as well as with position. In some services this is known as “magnetic variation”.

magnetic variation / variation magnétique
Identical to *magnetic declination*. This term is more commonly used in nautical and aeronautical applications.

Mil / millième
Unit of angle measurement such that 6400 mils is a full circle.
[1 mil is 0.000981748 radians, so it approximates to 1 milliradian.]

Secular variation / variation séculaire
The rate of change in the Earth's magnetic field. Used to compute the annual change in magnetic declination.

World Magnetic Model / Modèle magnétique mondial
WMM
A model for computing magnetic data for a set period starting with a particular epoch. The most rigorous form consists of formulae and spherical-harmonic coefficients from which declinations and other components can be computed.

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