NATO STANDARD

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NATO SPECIFICATIONS FOR IMAGE MAPS

Edition A Version 1

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NORTH ATLANTIC TREATY ORGANIZATION

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NORTH ATLANTIC TREATY ORGANIZATION (NATO)

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NATO LETTER OF PROMULGATION

18 December 2012

1. The enclosed Allied Geographic Publication AGeoP-10 Edition A Version 1, NATO SPECIFICATIONS FOR IMAGE MAPS, which has been approved by the nations in the [TA], is promulgated herewith. The agreement of nations to use this publication is recorded in STANAG 7169.

2. AGeoP-10 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.

Dr. Cihangir Aksit, TUR Civ
Director NATO Standardization Agency

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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 Database for the complete list of existing reservations.	

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RECORD OF SPECIFIC RESERVATIONS

[nation]	[detail of reservation]
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CHAPTER 1 GENERAL INFORMATION

1.1 AIM

The aim of this Allied Geospatial Publication is to sufficiently standardise Image Maps prepared for use by NATO armed forces, in both hard and soft copy products; to enable forces familiar with such image maps prepared by one member nation, to use those prepared by another member nation without additional training or extensive interpretation.

1.2 AGREEMENT

Participating nations agree that Image Maps will be produced, to the extent practicable, in accordance with the contents of Annex A. Nations agree to adhere to the minimum essential information content listed in Chapter 2 Annex A and Annex B. Hard copy image maps may be produced at a variety of scales and those produced at 1:25 000 scale and smaller, should adhere to the range of scales set out in STANAG 3677 IGEO. All hard copy image maps should be produced within the size constraints set out in STANAG 3666 IGEO. Image Maps over NATO territory shall use the national language(s) and English. Command requirements for languages are shown in MC 296 NATO Geospatial Policy and STANAG 3676 IGEO. Chief Geospatial Officer, SHAPE shall have final authority over which languages shall be used in case of difficulty.

1.3 IMPLEMENTATION OF THE AGREEMENT

This Allied Geospatial Publication is implemented when nations issue necessary instructions to adopt the specifications detailed in this document.

1.4 DEFINITIONS

GENERAL

1.4.1. The increased availability and quality of imagery is leading to a greater demand by NATO Forces for imagery products. This fact adds to the need for standardisation of the product formats.

1.4.2 NATO nations often produce Image Maps as a rapid response interim product, pending provision of new or revised standard operational mapping. Some nations are in the process of developing national standards for the production of Image Maps. NATO wishes to see these national standards developed in such a way that NATO forces can make use of Image Maps produced by any member nation without the need for retraining or extensive interpretation.

1.4.3 This Allied Geospatial Publication applies whether the final output is in paper (hard copy) or digital (soft copy) products.

1.4.4 The agreement covers depiction of detail on the map face as well as the contents of the marginalia and/or metadata associated with soft copy products but only in broad terms. Further details can be found in 0105 Related Documents.

1.4.5 Marginal information for hard copy products and soft copy products has been categorised as mandatory and optional. See Annex A and Annex B.

1.5 RELATED DOCUMENTS

1.5.1. STANAG 1059 JINT - LETTER CODES FOR GEOGRAPHICAL ENTITIES.

1.5.2. STANAG 2211 IGEO - GEODETIC DATUMS, PROJECTIONS, GRIDS AND GRID REFERENCES.

1.5.3. STANAG 3666 IGEO - MAXIMUM SIZES FOR MAPS, AERONAUTICAL CHARTS AND OTHER GEOGRAPHICAL PRODUCTS (EXCLUDING NAUTICAL CHARTS).

1.5.4. STANAG 3676 IGEO - MARGINAL INFORMATION ON LAND MAPS, AERONAUTICAL CHARTS AND PHOTOMAPS.

1.5.5. STANAG 3677 IGEO - STANDARD SCALES FOR LAND MAPS AND AERONAUTICAL CHARTS.

1.5.6. STANAG 4545 JISRCG - NATO SECONDARY IMAGERY FORMAT (NSIF)

1.5.7. STANAG 7074 IGEO - DIGITAL GEOGRAPHIC INFORMATION EXCHANGE FORMAT (DIGEST)

1.5.8. STANAG 7099 IGEO - CONTROLLED IMAGE BASE (CIB)

1.5.9. STANAG 7136 IGEO – IDENTIFICATION OF LAND MAPS, AERONAUTICAL CHARTS, DIGITAL GEOGRAPHIC DATA SETS AND MEDIA CONTAINING DATASETS (EXCLUDING HYDROGRAPHIC PRODUCTS)

1.5.10. MIL-STD-2500A, B AND C - NATIONAL IMAGERY TRANSMISSION FORMAT (NITF 2.0 AND 2.1)

1.5.11. Spatiocarte Défense - FORMAT DÉFENSE DE SPATIOCARTES (VERSIONS 1.1 AND 2.0)

1.5.12. ISO 19115 (ISO TC 211 N1024) - GEOGRAPHIC INFORMATION – METADATA.

CHAPTER 2 SPECIFICATIONS FOR IMAGE MAPS

2.1 DEFINITION, FEATURES AND ATTRIBUTES OF IMAGE MAPS

Definition

2.1.1 Image Map. In photogrammetry, a map made from an image or image mosaic, usually overlaid with a grid or graticule and cartographically enhanced to aid interpretation. Note: it may be in hard or soft copy format and be capable of substituting a conventional map product.

From NATO Glossary of Terms and Definitions, AAP-6.

Features and attributes

Imagery

2.1.2 Image maps may be portrayed with the base image in monochrome or in colour when image sources allow. Images should be cloud-free whenever possible.

Geometric Correction

2.1.3 Imagery for image maps will have been ortho-rectified whenever feasible. Where this is not possible, the imagery will have been plane rectified.

Image Processing

2.1.4. It is not possible to lay down hard and fast rules for the processing of imagery as some products will have individual or bespoke requirements, however it is possible to state guidelines which are suitable for the majority of image products:

Optical Imagery

Monochrome Imagery

2.1.5 Users should generally follow accepted photographic image processing practice, and attempt to get a good spread of tonal values, and realistic level of contrast to make the imagery look as near to a good quality black and white landscape photograph as is practical. Images or selected parts of images may be processed with special filters such as mild Edge Enhancement Filters or Dodging Filters where appropriate.

Colour Imagery including Multi Spectral Imagery (MSI).

2.1.6 Image maps may be portrayed in either true colour, near true colour, or in false colour when there is a special reason for processing them in this way. When processing imagery in true colour or near true colour, producers should generally follow accepted photographic image processing practice and attempt to strike an appropriate balance between a wide range of tonal values, reasonable levels of contrast and a realistic colour. On occasions this may require a certain amount of image enhancement, re-colourisation/colour enrichment to get the image into a state in which it is acceptable as a product.

2.1.7 Image maps in false colour should clearly state that they are in false colour, to prevent users from misinterpreting them.

2.1.8 Image maps may be produced as Red Light Readable products when there is a military need for this type of representation. Red light readable image maps should be identified as such in the marginalia information or as part of the metadata associated with the product. This may not be required when the map is a Standard Series Topographic mapping product intentionally designed to provide such capability by the originator, or when that capability is already published as part of the Series description.

Radar Imagery

2.1.9 Radar products should be processed to have a wide range of tonal values and contrast. Action will normally have been taken to minimise speckle. Producers should endeavour to process the imagery so it will be easy for users to interpret. This is likely to mean that it has to be processed so that the finished image looks similar to optical imagery.

Images produced from other Specialist Data

2.1.10 Image maps which as part of the product also include images produced from miscellaneous specialist imagery sources, e.g. Oblique Rendered Digital Terrain Models (DTM), TIN Models etc. Users should attempt to present the imagery with a wide range of tonal values appropriate to the type of product being produced.

Cosmetic Correction of Imagery

2.1.11 Imagery with inherent banding/striping should be de-striped where possible. Imagery should have radiometric and atmospheric correction carried out when appropriate.

2.1.12 The cosmetic correction of some detail, for example the replacement of a missing scan line with an average of the lines on either side, or retouching of

unwanted reseau marks is usually acceptable, however image maps will normally state that this has been part of the image processing that has been carried out.

Additional Cartographic Enhancements

2.1.13 Additional cartographic enhancement of detail will be tailored to the product, but the aim will normally be to keep the enhancements to reasonable level, and to be sparing. Producers should normally aim to make the product uncluttered and ensure minimal masking of the image detail.

2.1.14 Additional Enhancements are detailed at Annex A.

2.2 LAYOUT

Hard Copy Products

2.2.1. Pixel Orientation. Hard copy products will generally be orientated towards North.

2.2.2. Hard copy products will adhere to STANAG 3666 IGEO.

2.2.3. Hard copy image maps should normally be on the same sheet lines, and have the same orientation towards north, as the relevant Standard Series or native Topographic map that covers the same area and is at the same scale as the image map.

a. Maps which use Latitude and Longitude based sheet lines will under normal circumstances be oriented towards True North.

b. Maps which use Grid based sheet lines will generally be oriented towards Grid North.

2.2.4. Where no Standard Series Topographic mapping exists, producers should attempt to use the same sheet lines that would be used if standard series topographic mapping did exist over the area.

Soft Copy Products

2.2.5. Under most circumstances, pixels will be oriented at 0° or 90°. The image detail shown will point towards True North or Grid North as required by the product.

2.2.6. Image data will, as a preference, be Row Major and have square pixels although other pixel orientations, (Row Minor, Column Major etc.), and rectangular pixels are permissible, but should be avoided if possible.

2.2.7. Producers will generally reserve one pixel value to be used by users as a ‘void’, transparent or non-display value. This is to be used for areas that are not covered by image detail such as an area for which no imagery is available.

2.2.8. In the case of unsigned 8 to 16 bit continuous tone monochrome image data formats, and 24-bit 3 band colour images, or compressed variants of these basic image types, this value will normally be a pixel value of 0 (single band) or 0,0,0 for RGB (Red, Green, Blue).

2.2.9. When image products consist of 3 visible wavelength bands and image data is supplied in 1 file, the preferred order for the supply of bands will be RGB.

Marginalia Metadata and Image Positioning Data

2.2.10. Marginalia may be held either as raster data, replicating or similar to the marginalia of a hard copy product, or as metadata associated with the image product, or both. Annex A details hard copy and soft copy product marginalia, Annex B details metadata requirements for soft copy products.

2.2.11. The use of metadata to detail the content of, and provide positional information for soft copy products is encouraged. Metadata can be held either within the image file, (as with GeoTIFF images), or in a separate file or file structure (as with ISO 19115). The use of internationally recognised systems for the portrayal of detailed metadata is encouraged.

2.2.12. Image positioning data to position the image data within GIS packages may be held:

a. In a text file.
b. In separate binary file.
c. Embedded within the image header.

This information will be held in addition to other image metadata files.
Styles / Products

2.2.13. The term image map includes the following types of products:

Hard copy products	Maps, for which the base is principally a remotely sensed geometrically corrected image, which will normally have a grid or graticule and other cartographic enhancements.
Soft copy image maps	Soft copy versions of hard copy image map products which may or may not include the hard copy product's marginalia. These will normally be accompanied by suitable soft copy metadata.
Geographic (Latitude Longitude) based Imagery or Image map Tiles.	Non-Projected Imagery Tiles. These may have additional map data burnt into the imagery layer and/or have additional raster layers for map data or for additional imagery.
Projected Imagery or Image map Tiles.	Imagery or image map tiles on a recognised map projection. These may have additional map data burnt into the imagery and/or have additional raster layers for map data or for additional imagery.
Imagery or image tiles supplied with linked Vector Data.	Geographic or projected images or image tiles supplied with cartographic enhancements in the form of 2D or 3D vector data. The vectors may be attributed or non-attributed.

Allied Products

2.2.14. Ortho-Rectified imagery products – For example, CIB (STANAG 7099 IGEO).

2.3 CO-ORDINATE REFERENCE SYSTEMS

Hard Copy Products

2.3.1. Image maps will be supplied on recognised map projections; ellipsoid and datum as laid out in STANAG 2211 IGEO.

Soft Copy Products

2.3.2. Soft copy products that are direct reproduction of hard copy products will normally be supplied either on:

a. The same Projection Ellipsoid and Datum as the original product.

or

b. As unprojected data (sometimes referred to as Geographic, Latitude and Longitude).

2.3.3. Soft copy image maps and tiles will either be on a recognised Map Projection, Ellipsoid and Datum as laid out in STANAG 2211 IGEO or as unprojected data.

Image and Metadata Formats

2.3.4. This document does not seek to stipulate image raster formats or metadata formats. However, users are requested to consider the use of widely accepted commercial image formats or recognised geographic derivatives of these whenever practical.

2.3.5. Metadata for digital products can be held either in the header of the image file when the image format allows this, and/or in a separate metadata file that accompanies the data. The use of accepted commercial metadata formats and ISO standards Systems such as ISO 19115 for Metadata is encouraged when appropriate.

ANNEX A IMAGE MAPS CONTENT

Mandatory Components

1.

HARD COPY PRODUCTS	SOFT COPY PRODUCTS
Imagery **Colour or Monochrome**	Imagery **Colour or Monochrome. This may be one layer (band) of imagery or several bands.**
Grid/Graticule. This will normally be done to full Military Standards. (STANAG 2211 IGEO).	**Geographic Referencing Information** to allow the image to display in the right place in the real world. This will normally be provided by the header information associated with the file or the metadata. The product may however still include a traditional grid or graticule.
Marginalia. Normally to full military Standard. (STANAG 3676 IGEO). To include as a minimum: Scale Bar Scale Statement [Representative Fraction (RF)] Series Designation, Sheet No, and Edition. Producer/Publication Note Sheet Title Geodetic Information Grid Data Geographical Co-ordinates of Sheet Corners Information about the imagery used	Marginalia and/or Metadata **Marginalia optionally held as raster data will be similar to that provided for hard copy products.** **Mandatory and optional metadata for image maps is described in Annex B.**
Description of Imagery Imagery Dates (Reference to imagery dates will be omitted when it is impossible to provide them.)	**Description of Imagery** Imagery Dates (Reference to imagery dates will be omitted when it is impossible to provide them.)

Optional Components/Enhancement

2. Cartographic features may be:

a. Held in an additional raster layer or layers.
b. Held in the same layer or burnt into the remotely sensed imagery.
c. Held as 2D or 3D vector data.

3. When deciding what enhancements to put onto an image map, producers should consider whether enhancement of a feature or class of features adds anything to the product. For example: If a large scale image map has a very obvious motorway crossing it, it may be perfectly acceptable to only place type along the side of the feature giving the road number, rather than obliterating the feature with a thick symbolised line. Similarly, for a large scale image map of a Built up Area, where it is decided that roads will be highlighted, it may only be necessary to highlight the 'Through Routes' rather than highlighting all of the roads.

4. Some of the landform features mentioned in the lists below are often obvious on image maps and may not need any additional enhancement.

5. Features listed for enhancement may include but are not limited to:

HARD COPY PRODUCTS	SOFT COPY PRODUCTS
Marginalia To full military standards (STANAG 3676 IGEO), including: Legend Boundary Disclaimer Classification and Release Information Location Diagram Index to Adjoining Sheets Accuracy/Data Quality Statement	**Marginalia** Raster marginalia to full military standards and/or metadata as described in Chapter 2 including: Legend Information Boundary Disclaimer Classification and Release Information Location Information Accuracy/Data Quality Statement
Description of Imagery Sensor Imagery bands presented Type of Rectification Special processing	**Description of Imagery** Sensor Imagery bands presented Type of Rectification Special processing
Stock Number and Barcodes Raster data for the stock number and	**Stock Number and Barcodes** Raster data for the stock number and

barcodes may be held as part of the raster marginalia.	barcodes may be held as part of the raster marginalia.
Drainage: Rivers Ditches Canals Lakes Reservoirs Locks Dams	**Drainage**: Rivers Ditches Canals Lakes Reservoirs Locks Dams
Air Information Powerlines Obstructions Airfields Airspaces, etc	**Air Information** Powerlines Obstructions Airfields Airspaces, etc
Hypsography: Spot Heights Contours Cliffs	**Hypsography:** Spot Heights Contours Cliffs

Names and Annotations Geographic Feature Names and Annotations	**Names and Annotations** Geographic Feature Names and Annotations
Culture Roads Railways Features or the outlines of areas of military interest: Military Installations or Other Utilities Minefields, etc BUA (Built Up Area). [Normally obvious on image maps without any additional enhancement] Buildings Bridges Tunnels	**Culture** Roads Railways Features or the outlines of areas of military interest: Military Installations or Other Utilities Minefields, etc BUA (Built Up Area). [Normally obvious on image maps without any additional enhancement]. Buildings Bridges Tunnels
Administrative Features Administrative Boundaries Demilitarised Zones	**Administrative Features** Administrative Boundaries Demilitarised Zones
Landform Features Marsh/Swamp LSI (Land Subject to Inundation) Woodland, Mangrove etc	**Landform Features** Marsh/Swamp LSI (Land Subject to Inundation) Woodland, Mangrove etc
Legend Information Legend information, as appropriate, (See STANAG 3676).	**Legend Information** Raster legend information replicating or similar to the legend information for a similar hard copy product. This may be held in the same file as the image or as a separate file or product. Vector datasets may be used to hold legend data in vector formats.

ANNEX B SOFTCOPY IMAGE MAP MANDATORY DATA/METADATA

Mandatory Metadata

1. Metadata for soft copy products should include as a minimum the data that is set out below, however in practice many metadata standards will allow the inclusion of considerably more data than is indicated here. Users are encouraged to use these and populate additional metadata fields as required

2. Positional Information. Data to geographically reference the image in the right place in the real world. Data may be based on latitudes and longitudes, or map projection information, depending on the geodetic parameters of the image map.

3. Essential Information about the image. To include:

FIELD	COMMENTS
File Format	
Data Format	
Number of Pixels per line	
Number of Lines	
Tile Structure and Dimensions	Where applicable
Number of bands in each file and layout of bands	i.e. BSQ, BIL, etc
Orientation of Raster Data	i.e. Row major, Column Major, etc.
Date and time of day for image capture and other relevant dates. (Reference to imagery dates will be omitted when it is impossible to provide them)	Air Information date, etc
Geodetic Data	To include: Projection Ellipsoid Datum Units of measurement Bespoke geodetic parameters for non-standard/variable projections, for example: Origins, and False Origins, Scale factors, Axis Flattening etc.
Security data	

Optional Metadata

4. Population of dpi Statement (Dots per Inch). For products with a nominal scale that are held in a widely accepted commercial image format, it is highly desirable that a valid dpi or resolution statement is populated in the header where this is possible. This is to allow the plotting of the image at the nominal scale, using standard non-GIS commercial graphics software. For example, this would apply to a soft copy version of hard copy image map originally at a scale of 1:50,000.

5. Optional metadata about the imagery and other detail may include, but is not limited to:

FIELD	COMMENTS
Dataset Title	
Abstract	
Copyright Information	
Producer and other Production Information	
Image Licensing Statements	
Warnings	
Disclaimers	
Data Quality Information	
Keywords	
Additional Geodetic Information	
Series Information	
Stock Number Data	
Radiometric Information	
Cloud Cover, Mist, other Adverse Areas.	
Processing Information	
Accuracy Statement(s)	

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