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ALLIED JOINT DOCTRINE FOR GEOSPATIAL SUPPORT

Edition A Version 1

OCTOBER 2016

NORTH ATLANTIC TREATY ORGANIZATION

ALLIED JOINT PUBLICATION

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NORTH ATLANTIC TREATY ORGANIZATION (NATO)

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NATO LETTER OF PROMULGATION

6 October 2016

1. The enclosed Allied joint publication AJP-3.17, Edition A, Version 1, ALLIED JOINT DOCTRINE FOR GEOSPATIAL SUPPORT, 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 2599.

2. AJP-3.17, Edition A, Version 1, is effective upon receipt.

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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RESERVED FOR NATIONAL LETTER OF PROMULGATION

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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]
USA	The US expresses in the strongest possible terms the reservations that follow. The US noted many of these same reservations in both SDI and SD2 revisions, however it appears the custodian did not adjudicate any of the previous submissions. (1) Overall, The AJP in its current form does not meet the criterion of a level two AJP. Throughout most of the AJP, the content falls short of providing operational doctrine and instead prescribes policy, often restating content that can be found in other publications. The US noted many of these same reservations in both SD 1 and SD2 revisions, however it appears the custodian did not adjudicate any of the previous submissions. (2) The 'recognized environmental picture' reflected in para 2.6 is conceptual; it represents a future capability which is not established, proven or 'best practice' and therefore should not be in a doctrine document (IAW AJP-01). The US previously recommended removing this based on a fundamental disagreement with the principles of joint doctrine. This reservation will be lifted when this AJP is revised to reflect current practice. (3) There are numerous instances in this AJP that conflict with level one AJPs, particularly AJP-3. If confronted with conflicting guidance, the US will follow the doctrine in level one AJPs. This reservation will be lifted when this AJP is properly harmonized vertically and horizontally. (4) A number of terms introduced in this AJP do not conform to approved NATO terminology, or have been incorrectly introduced. The US recognizes only NATO approved terms. This reservation will be lifted when the correct NATO terms are cited and proper procedures followed for introducing new terms. (5) The US does not recognize Annex A, Geospatial Information Releasability Levels, as written. Annex A is in direct conflict with C-M(2002)49-COR10, Security Within The North Atlantic Treaty Organization. Releasability is based on security classification and need to know. The US recognizes the approved policy guidance. This reservation will be lifted when the Annex is either revised or removed.

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TABLE OF CONTENTS

CHAPTER 1 GEOSPATIAL SUPPORT OVERVIEW

Preface

Scope

This publication sets forth an overarching construct of the geospatial support principles and process to govern the geospatial support activities of the NATO Command Structure (NCS), NATO force structure (NFS), and NATO partner nations when planning, preparing, deploying, deployed on, or training for NATO operations.

Purpose

The AJP 3.17 ‘’Allied Joint Doctrine for Geospatial Support’’ addresses the lack of doctrine covering the area of geospatial support. Lessons learned from NATO Response Force (NRF) rotations and operations like Kosovo Force (KFOR), International Security Assistance Force (ISAF) and Resolute Support mission clearly highlight the need for an agreed framework for Geospatial Support to NATO and NATO Operations. There is a lack of documentation that prevents the MC Geospatial Policy from being translated into effective common operational principles.

Lessons learned from the deployment of NATO’s Core GIS[1] also underpin the urgent requirement for doctrine regarding the provision of geospatial support to virtually all military functions and capabilities.

1.1. Introduction

1. With current and future operations involving forces that are expected to perform a wide range of potentially simultaneous activities across the whole spectrum of conflict, from combat actions to humanitarian assistance, achievement of information superiority and therefore understanding the complex operating land, maritime and air environments is vital.

2. Consequently, as everything that happens has a geospatial and temporal context, it is vital that geospatial information (GI) is effectively collected, collated, managed, layered, de-conflicted and fused with other information, exploited/analyzed, and disseminated to meet the operational needs of commanders, staff and warfighters. Success of NATO operations is heavily dependent on the willingness of nations to provide GI and capabilities.

[1] The NATO Core Geographic Information System (GIS) is a core element within bilateral strategic commands (Bi-SC) Automated Information System (AIS) meant to deliver coherent digital geospatial services to all users, functions and their systems.

1.2. Responsibility

In order to deliver the support required throughout the operating environment, to all commands, (e.g. land, maritime, air, special operations forces, logistics), across all security environments and to all staff branches and functional areas (J1-9), geospatial staff provides accurate, comprehensive, consistent and timely Common Geospatial Framework (CGF)" as defined in MC 0545/1, Geospatial Information Supporting Nations Concept for NRF Deployments.

1.3. Intent

1. This publication sets forth an overarching construct of the geospatial support principles and process to govern the geospatial support activities of the NATO Command Structure (NCS), NATO force structure (NFS), and NATO partner nations when planning, preparing, deploying, deployed on, or training fsupior NATO operations.

2. Geospatial support is provided at strategic, operational and tactical levels during all phases of NATO's Crisis Management Process (NCMP).

3. Additionally, in line with NATO's contribution to a comprehensive approach to operations, it provides guidelines to gather any geospatial activities or support requirements of a host nation (HN), international organizations (IOs), non-governmental organizations (NGOs) or government agencies.

4. It provides military guidance for the exercise of authority with respect to geospatial support by commanders, either directly or through their respective chief geospatial officer (CGO). It is not the intent of this publication to restrict the authority of the commander from organizing the force and executing the mission in a manner he deems most appropriate. It provides military guidance to ensure unity of effort in the accomplishment of the overall objective.

CHAPTER 2 GEOSPATIAL ROLES AND RESPONSIBILITIES

2.1. Allied Command Operations (ACO)

1. Coordinate plans and direct geospatial support for NATO operations.

2. Manage reporting of significant GI collected on operations (e.g. map error reports) to relevant producers and takes other immediate action as necessary.

3. Coordinate draft GI requirements and related provision responsibilities, through working groups for NATO Geospatial Board (NGB) agreement, to satisfy NATO preparedness at the strategic level as well as current operations and plans. ACO supports NGB in identifying provision shortfalls and assessing consequent risks.

4. Support Allied Command Transformation (ACT) led capability development by identifying relevant deficiencies and providing advice.

5. Geospatial Staff provides integral geospatial support to all ACO headquarters. Principally, this covers NATO Core Geographic Information System (GIS) data management and support of functional area services (FAS) with geospatial production/-analysis services.

2.1.1. Supreme Headquarters Allied Powers Europe (SHAPE)

1. Identify, collate and communicate ACO-wide geospatial support requirements.

2. Identify, collate and communicate ACO geo-relevant deficiencies and provide them to ACT.

3. Ensure provision of minimum GI requirements to NATO.

4. Mandate, maintain and disseminate required geospatial lists (GEOLISTs) with designated and supplementary geospatial products to be used in NATO, unless delegated to joint force commands (JFCs)/-single service commands (SSCs).

5. Liaise with Nations, ACT, International Military Staff (IMS) and other organizations about ACO geospatial support unless delegated to JFCs.

6. SHAPE is the focal point for nations with regard to GI requests and provision in support of NATO planning and operations.

7. Coordinate subject matter advice for force generation.

8. Provide direct geospatial support and advice to SHAPE staff.

9. Provide direction, guidance and advice to subordinate headquarters (HQs).

10. Take command of assigned geospatial capabilities and delegate command as appropriate.

11. SHAPE is responsible for coordinating nations (CNs) and participating nations (PNs) processes.

12. SHAPE has operational control of the Geospatial Support Group (GSG).

2.1.2. Joint Force Command (JFC)

1. Mandate, maintain and disseminate the theater GEOLIST (with designated and supplementary products to be used in NATO led operations), ensure dissemination of GI (hardcopy and softcopy).

2. Negotiate reach back to NATO nations (NN) and other agencies, such as NATO Communications and Information (NCI) Agency, to support production and data collection that cannot be completed using in-theater resources.

3. Coordinate the timely introduction of resulting products to theater in formats and standards that are immediately exploitable by all deployed users (geospatial elements and wider systems).

4. Provide direct geospatial support and advice to local HQ staff.

2.1.3. Single Service Command (SSC)

1. Allied Air Command (AIRCOM)

a. Allied air command geospatial support focus may include support to targeting folders, mission planning, force protection and air navigation.

b. Geospatial staff manages all geospatial support requirements within the NATO commander´s area of responsibility (AOR).

c. Geospatial staff delivers geospatial technical support to air command HQ.

2. Allied Maritime Command (MARCOM)

a. Allied maritime command geospatial support focus may include support to planning and shared situational awareness (SA), supporting and managing the geospatial and maritime aspects of the rapid environmental assessment (REA) process. This includes gathering meteorological, oceanographic and hydrographic information for maritime purposes.

b. Provides nations (operating in the AOR) with essential GI (i.e. sea lanes, operating areas).

c. Geospatial staff manages all geospatial support requirements within maritime command HQ.

d. Geospatial staff delivers geospatial technical support to Maritime Command HQ.

3. Allied Land Command (LANDCOM)

a. Allied Land Command geospatial support focus may include supporting terrain analysis; ground maneuver execution; force protection and supporting shared SA.

b. Geospatial staff manages all geospatial support requirements within the land command.

c. Geospatial staff delivers geospatial technical support to land command HQ.

2.1.4. NATO Intelligence Fusion Center (NIFC)

1. The geospatial support focus within the NIFC will include the exploitation of high-resolution imagery (geo-referenced) as background information to generate specific intelligence products.

2. Integrate GI data and analysis complementing other intelligence discipline reporting and/or analysis in order to provide fused INT analysis to support NATO, HN or operating force(s) planning processes.

2.2. Allied Command Transformation (ACT)

2.2.1. HQ Supreme Allied Command Transformation (SACT)

1. Coordinate geospatial input to capability development in the context of the NATO defense planning process, noting relationships with joint intelligence surveillance and reconnaissance (JISR) and consultation, command and control (C3).

2. Coordinate and sponsor relevant research, development and experimentation in support of transformation.

3. Act as a focal point for coordinated geospatial capability requirements input to standardization and trials activities, including participation in Joint Geospatial Standards Working Group (JGSWG) activities.

4. Lead NATO specific geospatial individual education and training to meet Supreme Allied Commander Europe´s (SACEUR's) operational requirements and strategic priorities.

5. Act as a focal point for geospatial community engagement with industry.

6. Provide recommendations for relevant geospatial concepts and doctrine to respective commanders and the geospatial working groups.

7. Provide a deputy chairman and secretary to NGB.

8. Contribute to identify, collect and analyze geospatial lessons identified from operations and other Alliance military activities and implements lessons learned (LL) in all transformation efforts.

2.2.2. Joint Warfare Center (JWC)

1. Provide operational-level joint training in support of ongoing operations.

2. Conduct and support collective training of joint and combined staffs of the NCS/NFS for joint operations.

3. Assist the developmental and experimental work on geospatial aspects of ACT on new concepts, technologies, modeling and simulation.

4. Develop and maintain NATO exercise settings and scenarios.

5. Provide a project officer for the NATO Geospatial Orientation Course (NGOC).

2.2.3. Joint Analysis and Lessons Learned Center (JALLC)

The JALLC performs joint analysis of operations, training, exercises and experimentation. It supports the exchange and facilitates the development of LL capabilities.

2.2.4. Joint Forces Training Center (JFTC)

The JFTC supports training for NATO and partner forces to improve joint and combined tactical interoperability. The JFTC conducts joint training for tactical level command posts and staffs in support of tactical level commanders.

2.2.5. NATO Schools[2]

1. The NATO School Oberammergau (NSO) is a center for individual education and training. The NGOC is to provide a foundation for the policies, concepts, principles, current practices, and interoperability issues related to geospatial support within NATO.

2. The NATO Communications and Information Systems School (NCISS) Latina provides cost-effective highly developed formal individual GIS training to personnel from NATO and NNs.

2.3. NATO Communications and Information Agency (NCI Agency)

1. The NCI Agency geospatial staff provides scientific and technical support, through relevant research and development (R&D) and experimentation programs of work (coordinated by ACT), as mission support to all NATO geo-elements, required to achieve their mission objectives or goals.

2. Provide pre-deployment and in-theater training on geospatial systems.

3. Provide technical support to capability development on behalf of ACO and ACT.

4. Provide technical expertise and assistance concerning the formatting, transmission and supervision of data dissemination to end users of GI. The geospatial production capabilities of NCI Agency are usually tasked by the responsible geospatial staff in the NCS only for short-term production when this is cost effective.

5. NCI Agency is responsible for database management and maintenance of geospatial web services when there is no organic geospatial staff at a respective HQ.

2.4. Nations

1. Nations will provide support as outlined in MC 0296/2 NATO Geospatial Policy.

2. As force contributors, nations seek agreements with providing nations for release of GI when required for participation in NATO operations and other activities.

3. Nations ensure the provision of integral geospatial support to their own forces, coordinated with appropriate NATO commanders, to include the dissemination of NATO designated geospatial information (Des GI) and supplementary geospatial information (SGI).

4. Nations act as:

[2] Multinational center bound with NATO through a memorandum of understanding.

a. Coordinating and participating nations according to the Terms of Reference for coordinating and participating nations agreed by the NGB, to meet the agreed alliance GI requirements (Annex B).

b. The topographic and hydrographical information supporting nation (TISN and HISN) in accordance with MC 0545/1, NATO Geospatial Information Supporting Nations Concept for NRF Deployments.

c. Force providers for geospatial staff within the NFS for which they have assumed responsibility; they ensure the provision and dissemination of Des GI and SGI for the respective headquarters and to forces assigned to those commands.

d. Force contributors to ensure that their forces assigned to NATO use the GI designated and supplemented by the appropriate commanders.

2.5. Geospatial Support Group (GSG)

1. A GSG is a body formed of geospatial specialist staff from nations, operationally controlled by SHAPE, which delivers additional geospatial capability within a specific theater of operations, complementing and supporting the organic geospatial cells. These cells should be embedded within each organization and the higher HQs within a deployed force. A GSG can also deliver reach back support to an operation.

2. The GSG may be force generated through the combined joint statement of requirement (CJSOR) if a national or multinational capability is not available. For planning purposes a GSG comprises different capabilities (e.g. production, survey and analysis). It is to be tailored to meet the specific needs of a NATO operation; not all of the capabilities may be required.

2.6. NATO Joint Task Force (JTF) HQ

1. Ensure the provision of support to FAS in order to deliver the common operational picture, and maintain a recognized environmental picture (MC 0632 (Final) NATO REP Concept).

2. Provide direct geospatial support and advice to NATO Headquarters (NATO HQ) staff, including the supply of digital Des GI and SGI to FAS managers.

3. Provide direction, guidance, advice and dissemination of Des GI and SGI to subordinate HQs, command and control of theater geospatial elements.

4. Coordinate and prioritize the collection and collation of geospatial requirements for the theater and then staff these to JFC / command HQs for further action.
5. The production of bespoke GI products to support the HQ’s SA and decision-making process. Such products may involve geospatial analysis and interpretation.

2.7. NATO HQ - International Military Staff (IMS)

1. The responsibility for NATO geospatial policy issues lies with the NATO HQ International Military Staff, Intelligence Division (IMS/INT), supported by SHAPE geospatial staff. IMS/INT is responsible for the overall coordination, staffing and reporting of geospatial policy issues to nations and through the Military Committee (MC) as appropriate.

2. IMS/INT is responsible for the appointment of the chair of the NGB and for staffing MC level geospatial matters in NATO HQ.

2.8. NATO HQ - Situation Center (SITCEN)

1. Establish communication with the geospatial departments of IO (such as the United Nations) likely to be involved in the NATO area of interest (AOI), liaise with IO, with a view to providing releasable GI to HN in advance, flanking formations operations. Facilitate the geospatial information supporting nation (GISN) concept, SHAPE and JFC liaise with such organizations to assist in identifying requirements for GI sharing, as well as mutual assistance possibilities.

2. Provide the principal geospatial point of contact for other IO at the main headquarters level.

3. Provide geospatial support to NATO HQ staffs, as directed by the Secretary General and Director General International Military Staff and coordinated with ACO as appropriate.

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CHAPTER 3 GEOSPATIAL SUPPORT PRINCIPLES

3.1 Introduction

1. When collecting, delivering and exploiting GI, the overarching concept or principle that should be kept in mind is that all actors, military and non-military, should "operate off the same map" in order to achieve unity of effort.

2. Supporting this overarching principle, the support and tasks that may be provided are as follows:

a. Geospatial staff functions or tasks.

b. Provision of geospatial advice.

c. GI requirements & deficiencies management process.

d. Acquisition and collection of data.

e. Process / management of GI.

f. Exploitation of GI.

g. Quality control / quality assurance.

h. Dissemination / reproduction, distribution[3] of GI, products, services (including web-services).

3.2. Geospatial Staff Functions or Tasks

1. Operational geospatial support to NATO operations is controlled by geospatial specialists embedded within the NCS/NFS and specialist geospatial force elements provided by contributing nations, either as formed units or through the NATO force-generation mechanism. This support may be deployed forward (within the joint operations area (JOA)) or rear-based (often termed "operating at reach back").

2. At all levels in the operational chain of command an individual must be nominated to be the point of contact (POC) for geospatial matters. Where geospatial staff billets exist, this responsibility naturally rests with them. All geospatial POCs should be familiar with the geospatial support procedures employed within the operation.

[3] While the terms distribute and disseminate appear to have the same meaning, distribute generally refers to the handing out of hard media while disseminate refers to the publishing or serving of information and data.

3. Geospatial support will provide a commander and his staff advice on and access to geospatial capabilities and functions whether they are organic to that command or formation, at a senior or junior command / formation, deployed forward, as reach back, or within nations.

4. Geospatial support is provided throughout the operating environment and commands, e.g. land, maritime, air, special operating forces, logistics, across all security environments and to all staff branches and functional areas (J1-9[4]). Geospatial support is essential to command and control (C2), communication, intelligence, surveillance and reconnaissance (ISR), military engineering (MILENG) and is an enabler for information management and information exploitation (IM/IX). The staff will be employed where the commander deems appropriate. However, they are normally parented by J2, J3, operations support, or MILENG staff.

5. There must be a clear functional chain of command for the geospatial community. This will ensure standardization and consistency of support and underwrite the concept that all forces should “operate off the same map”.

6. For an operation, each headquarters is responsible for providing geospatial coordination, direction, guidance and advice in line with the relevant standing operating procedures (SOPs) and operation plans (OPLANs) within its JOA. Additionally, within its means, it will provide geospatial support to its immediate subordinates.

7. The NCS geospatial staff must be augmented with additional support to efficiently and effectively manage the flow of GI or provide sufficient geospatial support to NATO operations. This would be provided by a GSG or by a member nation, either force-generated or a standing body and either deployed forward or operating as reach back.[5]

8. Close cooperation between geospatial staff and CIS / FAS managers is essential. Advancement in communication and information systems (CIS) and related technology combined with initiatives to improve the scale and reach of geographic support via web services has led to C2, command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR) systems becoming more dependent on geospatial data, products and services provided via the available mission network.

[4] If the formation/command is not joint but from a single environment the support will obviously be provided to the appropriate maritime, land or air branch.

[5] There is currently no standing body within the NCS, or within a NATO nation dedicated to the NCS, to carry out this role. At the time of writing (2016) DEU is currently implementing a Multi-National GSG under the Smart Defense Initiative. Initial operational capability has been declared since 01 Jan 2015 to support the Resolute Support mission.

3.3. Provision of Geospatial Advice

1. Specialist geospatial advice must be provided from geospatial staff to commanders and their staff to ensure best use is made of geospatial data, products and capabilities. This advice will cover all lines of development (i.e. DOTMLPFI[6]) aspects of the geospatial capability provided. There is also a responsibility to ensure geospatial capabilities and requirements are reflected in concept of operations (CONOPS), OPLANs, and unit and formation SOPs or standing operating instructions. Specific advice may cover the following areas:

a. Doctrine. Advice on use of geospatial doctrine, policies and procedures.

b. Organization. Advice on how and where to employ geospatial staff and capabilities.

2. Geospatial information systems. Advice will be available on:

a. How geospatial systems should be deployed and employed; and the system support and infrastructure requirements to enable this.

b. Advice to commanders that geospatial systems should be integrated onto networks.

c. How they should be connected with and exploited by FAS (e.g. C2 and ISR systems), including the spatial data management, capabilities and limitations.

d. Geospatial representation of information. Advice will be available on types and uses of different coordinate systems, datum and projections.

e. The use and limitations of the different formats, standards, accuracy and quality of GI, data, products and services.

3.4. GI Requirements and Deficiencies Management Process

1. A rigorous requirements process is needed to ensure that all requirements are properly articulated in order to collate, validate and prioritize them.

2. Geospatial requirements can be considered under the following headings:

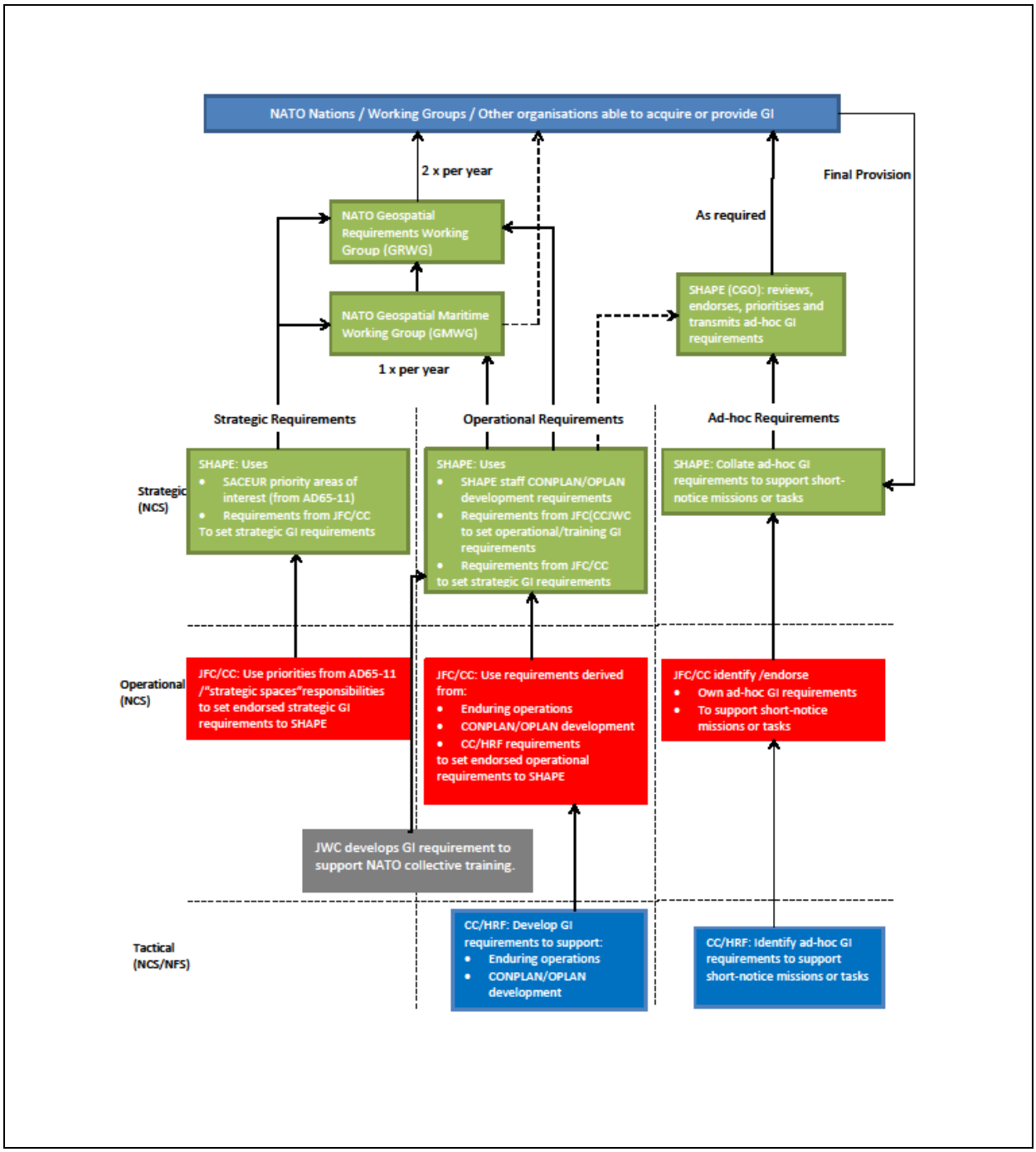
a. Strategic requirements arising from a proactive consideration of the GI needs to cover possible crises over SACEUR's prioritized areas of interest.

b. Operational requirements arising from a planned, imminent or ongoing NATO operation.

[6] doctrine, organization, training, material, leadership, personnel, facilities and interoperability

c. Ad-hoc requirements, short notice, reactive requirements in response to a need identified within the NCS/NFS.

Figure 1: A diagram showing the GI requirements flow is as follows:



3. Figure 1 illustrates the system and process for the capture and communication of NATO GI requirements. Central to this process is the Geospatial Requirements

Working Group (GRWG), which considers all GI requirements (Maritime, Land and Air).

4. Working groups are subordinate to the NGB, which meets annually to endorse the ways to meet NATO GI requirements.

5. Ad-hoc requirements, usually short-notice requirements, are not normally validated via the GRWG, rather by the request for geospatial information (RFGI). By definition such requirements are likely to arise once a crisis has started and an operation or potential operation is underway.

6. Requirements Specification. The current NATO system for specifying requirements is defined in MC 0296/2, NATO Geospatial Policy and uses a combination of coverage (i.e. geographic area) and type (i.e. hardcopy maps/charts, raster, vector, matrix, imagery) of the GI that is required and an associated level of information resolution.

7. Family of data/products concept. To effectively support operations, all of the data/products must be coherent so as to minimize confusion on the deployed commanders, staff and war fighters. This coherency is referred to as the family of data/products concept. It is a collective responsibility of producing organizations over a given operational area to ensure that this coherency occurs vertically and horizontally within the family of GI that is provided to support the operation. This should be achieved through the common employment of operationally effective standard specifications for GI production.

8. The JGSWG develops and coordinates standardization in GI and geospatial services. In particular, the NATO Geospatial Information Framework (NGIF) will enhance interoperability amongst NCS and NN by delivering a common geospatial data model and standardized product specifications for NATO operations. It will also enable the interoperability of NATO (and NN) C2 systems. Its geospatial information requirements team (GIRT) also supports the successful collection and identification of GI requirements.

9. The NATO geospatial deficiencies process[7]. The deficiencies management process is a way to manage the global geospatial support mission dynamically. It addresses DOTMLPFI. This process is a suitable way to manage the different capabilities as the standardization works in close link between the NGB, the JGSWG, the ACT R&D program of work, the development of new capabilities and the geospatial policy and doctrines amendments.

[7] A deficiency is deemed to be the inability to deliver an aspect of the CGF. It can be identified by any stakeholder in geospatial affairs at any time but the owner must be a member of the NATO military authority (NMA) geospatial staff. The process should identify, analyze and solve NATO geospatial deficiencies.

3.5. Acquisition and Collection of Data

1. Provision Responsibility:

a. NN are exclusively responsible for the production and provision of GI, for their own sovereign territory (land, air and maritime).

b. The fulfillment of NATO requirements for GI is dependent on the acceptance by Nations of their responsibilities for the production and provision of the required GI. Different processes exist separately, but are linked to:

(1) CN/PN process (Annex B).
(2) NATO REA process.
(3) GISN concept.
(4) Reach back / deployed GSG.

2. The CN/PN process is a mechanism where NN volunteer as CN to undertake responsibility for a region of NATO interest and to collect information about the GI available over that area and report this availability back to SHAPE. PNs support this process by reporting their GI production and holdings to the CNs as described in the terms of reference for the CN/PN process.

3. The CN/PN process is separate to, but linked with the geospatial information supporting nation (GISN) concept that is employed during NATO Response Force (NRF) operations.

4. For each NRF operation ACO will be supported by a TISN and HISN. The TISN and HISN will operate in a cycle mirroring that of the specific component command respectively.

5. SHAPE, and the operation, will be supported by a TISN and a HISN who may possess deployable as well as reach back/rear-based capabilities with corresponding roles and resources. On reach back GISNs will adopt traditional responsibilities for coordinating GI production and replication for expeditionary operations. However, the boundaries of this reach back support will be expanded to meet the needs of all expeditionary operations, whether NRF in nature or not, across NATO's operational area.

6. The CN/PN process can also be captured through the REA process.

7. It should be noted that acquisition of data might be a lengthy process, especially if data holdings are sparse in the AOI.[8]

[8] Often release of data/information is restricted by co-production agreements with nations who may not be members of NATO. Therefore, negotiations between relevant nations need to be undertaken.

8. SHAPE retains sole authority for liaison with NN. Direct liaison authorized (DIRLAUTH) may be granted to a JFC/SSC to engage with NN directly, once an operation is established.

9. Geospatial Information includes hard and softcopy versions and supporting documentation such as gazetteers, doctrine/policy, NATO standardization agreements (STANAGs), country handbooks, etc.

3.6. Process/Management of GI

1. Whether managed from a deployed or reach back facility, covering hardcopy and soft copy, the more significant processes involved in the management of GI are designation[9], supplementation and introduction to meet the operational requirements and ensure interoperability of forces along the operations.

a. Designation is the statement by the operational commander (normally a JFC/SSC and issued by the CGO in the JFC/SSC), that GI produced and/or provided by a nation, that meets a validated NATO requirement, is to be used by all forces having an operational interest in a particular area. It follows that designated information must be usable by all relevant co-operating entities. Nations are individually responsible for the provision of aeronautical and maritime navigational information to their own aeronautical and maritime assets (as covered in the International Convention for the Safety of Life at Sea), as NATO commanders cannot designate hydrographic and aeronautical information for navigational purposes. However they can designate or supplement any appropriate hydrographic and aeronautical information for any purposes (e.g. joint situational awareness) other than maritime navigation. Where full criteria for designation cannot be met, “substitute” products may be identified to meet the most essential requirements.

b. Supplementation is additional information identified as essential to interoperability or safety, for use in conjunction with designated products and is called “supplemented".[10]

c. Introduction is the procedure by which new or revised GI, controlled through designation/-supplementation, is formally brought into use simultaneously across a specified force, and its directing and supporting entities, to ensure the use of identical GI for battlespace reference.

2. The authority to classify GI as Des GI rests with SHAPE CGO but can be delegated to JFC/SSC CGO for specific operations and/or for specific AOR. The

[9] Designation is the process that is carried out by a HQ at Operation Headquarters (OHQ) level or above to authorize nationally produced GI for use on a NATO operation. The GI that undergoes designation is known as Designated GI (Des GI).

[10] Supplementary information includes many special products, often commissioned by commands, such as route maps, tribal maps, and minefield maps. Supplementary information often meets specific operational requirements with additional information not available on designated products.

designation authority extends to products which do not meet normal criteria or standards. The designation officer will be best placed to select the most appropriate GI for the particular mission or task taking into consideration the currency, accuracy and completeness of the GI.

3. GEOLIST: Designated and supplemented information is defined and controlled by the operational commander (Initially by SHAPE / JFC/ Land, Air, Maritime Command HQs) through a GEOLIST once they have planning authority, and reflected in relevant documents. Nations undertake to use this information for their forces assigned to NATO for all activities at strategic to tactical level to ensure interoperability with other forces and commands. While commanders at any level may specify additional information for specific tasks, the responsibility for stating that the resulting product (known as supplementary GI (SGI)) will meet stated requirements and is to be used by all forces lies with the CGO at the highest formation level at which the SGI will be used.

4. NATO strategic database (SDB): SHAPE is responsible for centrally maintaining on behalf of NCS the coherence and currency of all of the strategic level (i.e. GI Level 0 and 1[11]) softcopy GI that NCS requires. This Level 0 and Level 1 GI is grouped for ease of reference into a repository known as the SDB. SHAPE will update and maintain the SDB as new GI becomes available from PN's, providing copies (or updates) of the baseline (or subsets of the baseline) to its subordinate commands. The purpose of the SDB is to support strategic and initial operational- level planning within NCS. The content of this baseline is shown in the e-catalogue maintained by SHAPE and issued to the NCS geospatial staff.

5. NATO operational database (ODB): Each Operation Headquarters (OHQ) is responsible for maintaining on behalf of NCS the coherence and currency of the Level 2-5 softcopy GI. This level 2-5 GI is grouped for ease of reference into a single repository known as an ODB. There will be one ODB for each OHQ. OHQs will update and maintain their ODB as new GI becomes available from PN's, providing copies (or delta updates) of the baseline (or subsets of the baseline) to other HQs within the ACO operational chain of command as required.

6. Re-formatting of GI: Before a product can be designated it may require additional formatting and quality control to be completed prior to further distribution. This might include the integration of additional layers and/or additional marginalia. This involves all processes necessary to convert GI for general or specialist use or exploitation (e.g. transformation, re-projecting, re-formatting, and color-balancing). These conditioning works may include analogue or digital processes.

[11] GI levels 0-5 are laydown in MC 0296/2, Annex C, Table C-1.

7. GI management may be more specifically separated into hardcopy and soft copy management: All CGOs should ensure that an effective process is in place to cascade upwards and downwards. Softcopy GI management of Des GI and SGI in a GEOLIST should be centrally managed at the appropriate level for the operation.

3.7. Exploitation of GI

1. Geospatial Exploitation covers activities carried out by a user, or by specialist geospatial staff in direct support of operations, to select, de-conflict, combine, analyze, and present geospatial and geo-referenced information to meet a specified need that cannot be met by available products.

2. This activity primarily supports NATO staffs and can be performed in a deployed location, but can involve reach back and base facility support.

3. Much of the analysis output is required to provide products involving the visualization and portrayal of the information to aid battlespace management, SA and understanding.

3.8. Dissemination /Reproduction, Distribution of GI, Products, Services

1. Despite technological advances, provision of hard copy GI to the warfighter remains integral to mission success. Thus, the ability to reproduce and distribute hard copy GI will remain an essential task of the geospatial staff.

2. Deployed operations will require a capability that delivers, in bulk, data, information and products to a demanding timeline. This will be required for all types and phases of operations and will require the setting up, under control of the theater CGO, of map depots and distribution points across theater.

3. While control of hardcopy data, products and information is relatively straightforward, control of softcopy is not. In today's networked world it is easy for individuals to acquire, replicate and distribute digital data from numerous sources. This undermines the principle of "operating off the same map" leading to the danger of blue on blue, unwanted collateral damage and the resultant legal ramifications. It is imperative that commanders understand and enforce the importance of "operating off the same map".

4. It should be noted that management and dissemination of both hard and softcopy GI, data and products are resource intensive. Maps are required in their tens of thousands and need the logistic chain to account for this, while digital data is measured in terabytes, and CIS systems and CIS planners need to account for this.

5. Distribution channels for Des GI and SGI should be optimized and be centrally managed by the relevant CGO. In information networks GI shall be primarily provided

via web services in line with the NATO networks and Service Orientated Architecture (SOA) principles.

3.9. Overview of NCS and NFC responsibilities and relationships

The following four schematics aim to aid comprehension about the different roles, responsibilities and relationships within the NCS and NFS as the international community moves from a routine benign environment to a crisis situation.

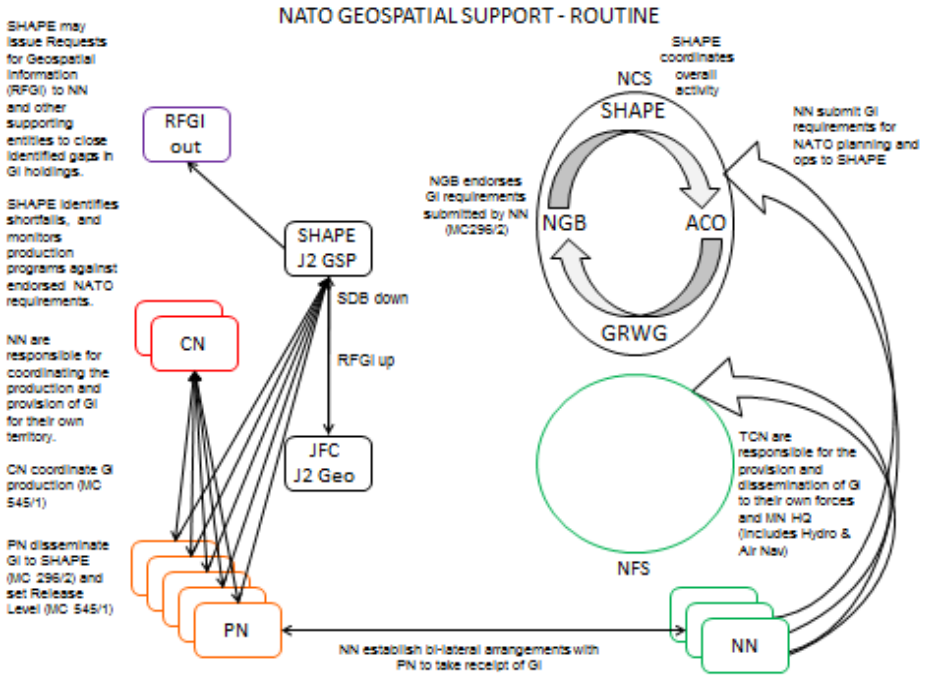


Figure 2: NATO geospatial support during routine situation.[12]

[12] NN = NATO nation, PN = participating nation, CN = coordinating nation, SDB = strategic digital geospatial information baseline, ODB = operational digital geospatial information baseline, CC = component command, GISN = geospatial information supporting nation, RFGI = request for geospatial information.

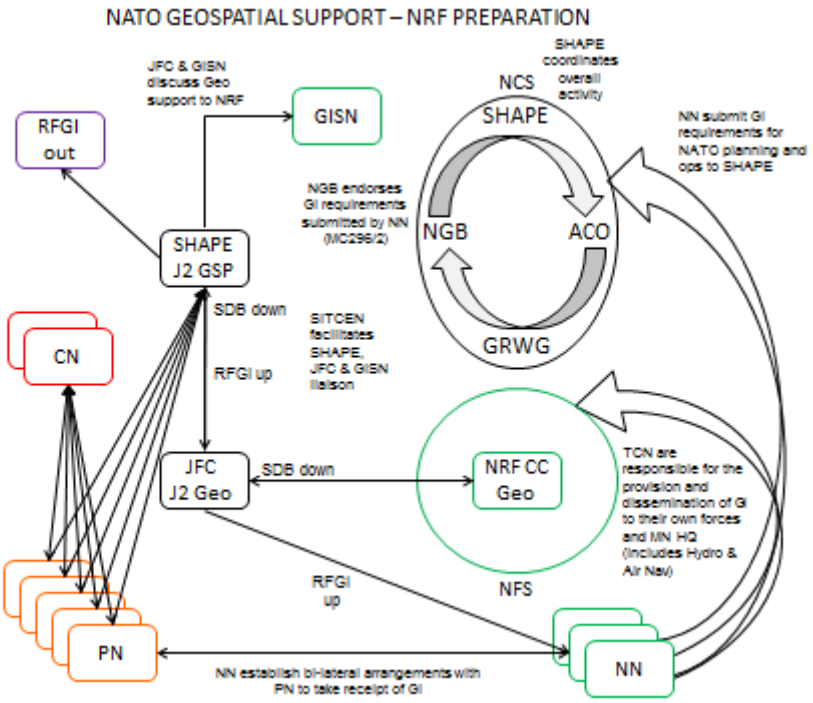


Figure 3: NATO geospatial support during NRF preparation.

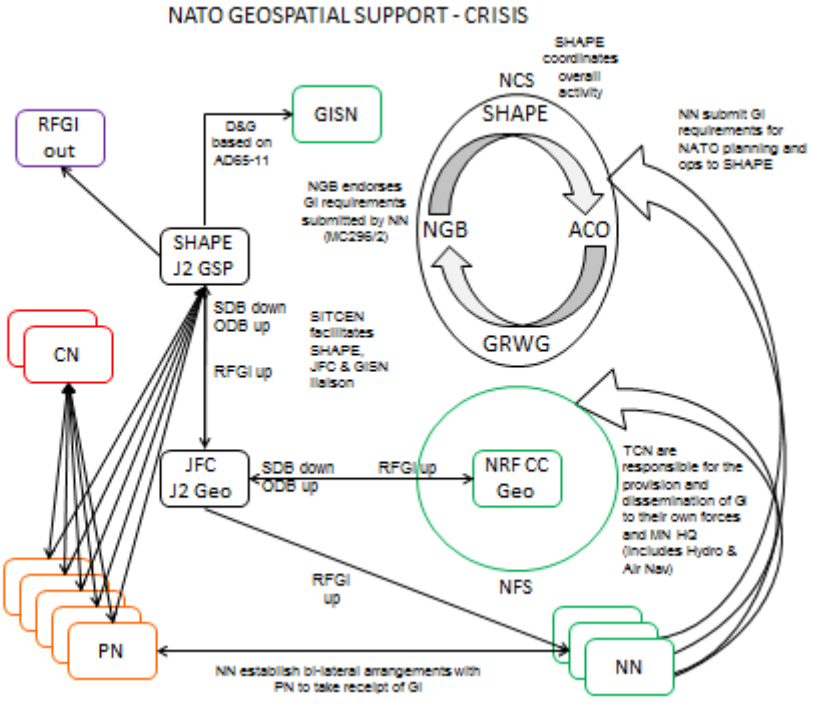


Figure 4: NATO geospatial support during crisis.

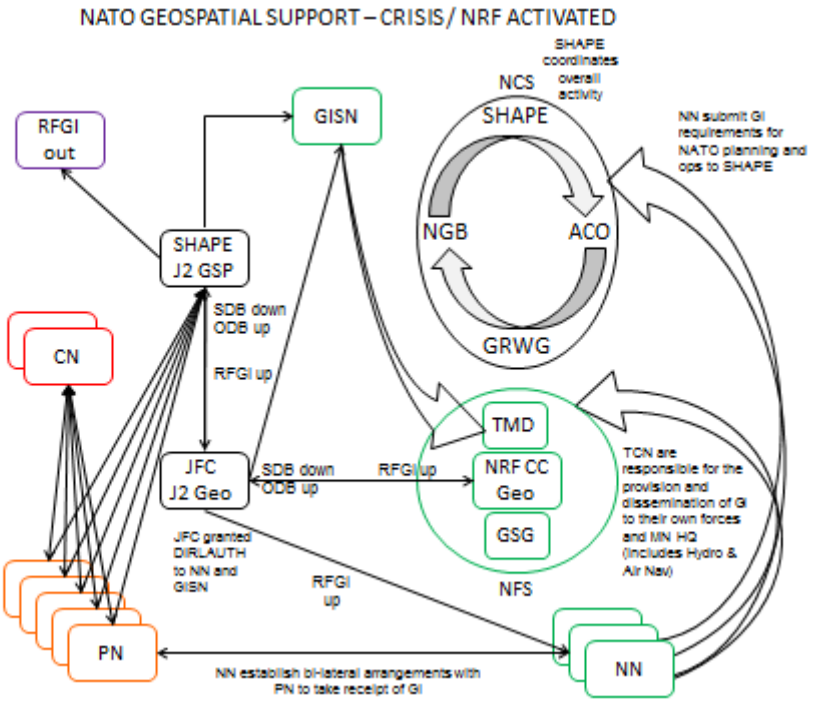


Figure 5: NATO geospatial support in crisis & NRF being activated.

CHAPTER 4 GEOSPATIAL SUPPORT TO NATO OPERATIONS

4.1 Introduction

1. This chapter details the principles, mechanisms, procedures and tasks required to deliver efficient and effective geospatial support to all types of NATO operations.

2. This chapter uses the definitions from the NCMP and the NATO Terminology Database (NATOTerm) to define discrete phases of a NATO operation. Types of likely NATO operations are defined NATOTerm and the Bilateral Strategic Commands (Bi-SC) Conceptual Framework for Alliance Operations - dated 11 Jun 2013 (as amended on 18 July 2013).

3. There are five joint core activities at the operational level which assist a NATO joint force commander in both planning and execution. The five functions are: shape, engage, exploit, protect and sustain. These functions help the commander visualize how major operations, battles and engagements relate to one another within the overall campaign. They should not be viewed as sequential or separate and distinct phases. The key is to maintain a clear focus on success, balancing the need to be bold and decisive within the constraints and restraints of modern operations. These functions also enable a JFC to develop an intent and CONOPS that considers subordinate commands and supporting forces in context to each other in time, space and purpose[13].

4.2. Key Operational Principles

4.2.1. Types of NATO Operations

1. Types of operations. There are two main categories of types of operations:

a. Combat. Combat operations serve the direct defense of NATO against an aggressor. For this mission, NATO geospatial policy dictates that the HN takes responsibility for provision of GI to the NCS and supporting NATO forces (less the NRF which is provisioned by the GISN).

b. Crisis Response Operations. Crisis response operations include multifunctional operations, which contribute to conflict prevention and resolution, humanitarian purposes or crisis management in pursuit of declared Alliance objectives. Depending on the situation, these operations may be as demanding and intense as combat operations. For these missions the NCS will rely on the GI management process (Chapter 3) to support alliance planning and decision making. Any expeditionary operation under these missions needs an associated lead-nation for the management provision of GI and geospatial support to the deployed force.

[13] AJP-5 Allied Joint Doctrine for the planning of Operations

2. For all types of operation, effective geospatial support and delivery of a comprehensive CGF will rely on:

a. The timely provision of accurate and relevant GI.

b. The presence of properly trained and equipped geospatial staff (within the NCS/NFS and NATO coalition), who are enabled and mandated to deliver the CGF to NATO HQs and deployed forces.

c. Force elements (NATO and non-NATO) willing and able to achieve geospatial interoperability with NCS/NFS and with each other.

4.2.2. Stages of an Operation

1. Geospatial support to NATO operations is defined in terms of three geospatial doctrinal stages, defined for the purpose of this doctrine: (1) Readiness for operations, (2) Planning for operations, (3) Execution of operations. These stages relate to the six phases of the NATO Crisis Management Process (NCMP)[14]. – defined as follows:

NCMP phases	Geospatial doctrinal stage	Key NCMP stage outputs / North Atlantic Council (NAC) decisions	Remarks / [Indicative transition time]
1. Indications and warnings	Readiness for operations	**After stage 1**. Further action. Request full assessment	**[Years /Months]** Geospatial Liaison pre-authorized at this point
2. Assessment	Planning for operations	**After stage 3**. Issue NAC initiation directive (NID) **After stage 4**. Issue NAC execution directive (NED)	**[Months/Weeks/Days]** No detailed planning / liaison allowed before NID, unless pre-authorized.
3. Response options development			
4. Planning			
5. Execution	Execution of operations	**During Stage 5:** Periodic mission review	**[Weeks/Days]** Liaison Authorized
6. Transition			

2. It is important to note that geospatial support, especially the creation and acquisition of relevant GI is a long-term process, normally measured in years and months, rather than the weeks and days. It is therefore vital that the GI requirements and geospatial support arrangements are discussed, agreed and reviewed regularly as part of the standing process mandated by NATO policy.

3. In practice this means that much activity by NCS geospatial staff and engagement with NN with regard to an emerging crisis must take place in advance of a formal NAC Initiation Directive (NID). In recognition of this certain geospatial Crisis Response Measures are ‘pre-authorized’ and can be carried out (subject to SACEUR discretion) prior to a NAC decision to proceed from Stage 1 to Stage 2 of the NCMP.

[14] Defined in NATO Crisis Response System Manual (NCRSM) 2014, NAC.

4.3. Readiness for Operations

In the months, even years, that precede and intersperse NATO operations, Geospatial Readiness is defined as a combination of:

a. Effective management of GI. The CN/PN process assists in identifying current holdings and any shortfalls. Annex B provides the ToR for the CN/PN process.

b. Efficient geospatial support to all NCS/NFS staff domains and across commands within the NCS.

c. Persistent efforts to improve NATO geospatial interoperability within the NCS/NFS and between the NATO military authority (NMA) and NN.

4.4. Planning for Operations

In the weeks and (possibly) months between a NAC 'Request for full assessment' and a North Atlantic Council execution directive (NED), Geospatial Readiness is defined as a combination of:

a. Focused management of GI over the AOI.

b. Efficient geospatial support to all aspects of NCS operations planning.

c. Understanding, enabling and improving geospatial interoperability within the emerging NATO force.

4.4.1. Geospatial Information Management during Planning for Operations

1. Review of GI availability over the AOI. Triggered by the NAC decision to request a full assessment (Section 4.2.2, above). Using the mechanisms described in Chapter 3, ACO (SHAPE, JFCs and SSCs), will review the GI in the SDB. Through analysis of indicated tasks and available geospatial data over the area of interest, the operational-level HQ geospatial staff will start to develop an ODB. The JFCs will undertake a gap analysis in order to highlight needs against the different levels of data (1-5) that are determined as being required for the operations under consideration. Based on the operational assessment by the JFCs, SHAPE will then initiate the mechanisms described in Chapter 3 to address any emerging GI shortfalls or format issues.

2. Review of GI release-levels. NCS geospatial staff review the release-levels, as shown in Annex A, that have been attributed to the GI provided by NN and engage (as required) with NN to manage any issues arising.

3. Coordinating Nations. ACO SHAPE will engage with the relevant CNs (if applicable) that cover the area of interest and request an analysis of the data available

and an initial quality assessment. SHAPE may determine a need to invoke early provision of data once the NATO Initiation Directive has been signed. Data will then be provided through SHAPE from PN's to the operational level. The early provision of data is an essential and critical geospatial planning task.

4. Funding for GI purchase and conditioning. The NCS will consider the requirement to request NATO Common Funding (crisis urgent requirement) to meet any evident gaps in GI cover or emerging issues in GI formatting.

5. Additional Inputs. Geospatial Information for use during the planning process will also be made available from the NATO Intelligence Fusion Centre (NIFC), internally from the entire J1-J9 structure from tactical to strategic level and support from the nations. As this information will become part of the CGO, NIFC has to ensure that only the designated GI authorized for operation is used.

6. GI Production. As a result of the analysis of available data it may be determined that the gaps require immediate attention and/or RFGI satisfaction. In this case SHAPE will contact nations, the PN or TISN/HISN, to generate production requests to rapidly fill GI gaps. Maritime information will also be captured by the REA process.

7. NRF. During the planning phase consideration of the use of the NRF will be made. If this option is viewed as the most likely and is reflected in planning and subsequently the NID activation of the NRF TISN / HISN concept will be undertaken by SHAPE. Close liaison with the nominated JFC operational-level HQ will occur and the relevant processes activated to begin the process of data provision not just to the planning HQs but to the wider NRF force. The level of coordination, consultation, liaison and control of data cannot be underestimated should the NRF be utilized.

8. GI Designation. As defined in Chapter 3, the NCS (led initially by SHAPE), will start to develop a list of designated geospatial information (Des GI) for the operation under NCS consideration.

9. GI Densification. It is the process to enrich GI holdings by acquiring more detailed information down to the operational / tactical level. Once the NAC authorizes the NED the NCS will most likely need to densify its vector and imagery data resulting in an improved level of detail aiming to provide level 5 coverage. Both the NCS (operational and/or strategic) or the GISN (TISN and/or HISN) could lead this process and route their RFGIs through SHAPE to the nations.

10. GI Dissemination. In accordance with the process detailed in Chapter 3, the NCS (during the planning stage) will seek a GISN (TISN and/or HISN) to support the emerging operation.

4.4.2. Geospatial Input to Comprehensive Operations Planning

1. At the operational-level geospatial staff and technicians contribute to all six phases, shown in detail below. The geospatial contribution plays a large part in the definition and analysis of the operating environment. Through a joint approach to supporting the Comprehensive operations planning with geospatial information, modeling the environment in 4 dimensions (3 spatial and time), the provision of products and services, especially the later, the operational orientation of the J5 planning staff is achieved. This allows the staff to have a single common picture and to begin to 'operate off the same map". The contribution from ACO geospatial staff is through the relevant Joint Operations Planning Group (JOPG), which at JFC level has a dedicated staff officer providing inputs as a subject matter expert (SME). The technical outputs used to support each step are often mission tailored to the type of operation, the scale of the operation and the required output at each stage. Any output is clearly dependent upon the quality of the data utilized in the generation of products and services.

a. Phase 1 – Indications and Warnings. The major geospatial input is to the initial SA briefing. This utilizes geospatial knowledge, advice and the use of comprehensive, all source data. Factors considered, although not exclusive, include; country overviews, AOIs, terrain analysis, vegetation, infrastructure, energy, transportation, human environment, bathymetry, sedimentology analysis, geology, etc.

b. Phase 2 – Assessment. An operational appreciation of SACEUR's strategic assessment. The geospatial consideration of this assessment and the utilization of any relevant data, including Political, Military, Economic, Social, Information, Infrastructure and health analysis information for incorporation into geospatial products and services.

c. Phase 3 – Response Options Development. The geospatial team plays a large part in the definition and analysis of the operating environment. Through the provision of products and services, especially the later, the operational orientation of the J5 planning staff is achieved.

d. Phase 4 – CONOPS Development Planning. The assistance provided by geospatial technicians and staff in the provision of specific outputs, allows visualization of the potential Courses of Action and elements of the CONOPS. Encouragement for the use of a designated geospatial data in web applications, onto which options are added as 'layers' has been a successful way of displaying information to decision makers.

e. Phase 4 – OPLAN Development Planning. By having a geospatial SME/ representative within the JOPG, continuity is achieved. An understanding by the SME of the direction and guidance, the way in which the plan has evolved and the assumptions made in the plan development is crucial. A dedicated staff officer will generate a draft Appendix 1 to Annex T, Geospatial Support to the OPLAN. Internal

geospatial, J2 and J5 staffing ensures a strong product is generated for submission to the strategic HQ at SHAPE within the OPLAN itself.

f. Phase 5 – Execution. The geospatial staff supports the NAC directives and its effects across the spectrum of a crisis, covering military events, civil development, and environmental issues. Phase 5 also includes a periodic review of the OPLAN.

g. Phase 6 – Transition. The geospatial staff assists in the visualization of disengagement options. Web-based services allow these options to be visualized as another options 'layer'.

4.4.3. Geospatial Interoperability during Planning for Operations

FAS support. The information exchange requirements for the GISs are produced by the operational community, and will be collected in the early stages of CIS planning and coordinated with SHAPE CIS&CD J6 Division, NATO Communication and Information Systems Group (NCISG) and NCI Agency. In addition, the FAS are identified by operational command per ACO DIRECTIVE 080-095, and are expressed and defined in a matrix and associated diagrams. A communication and information systems services matrix (CISSM) is established by Operational Command, and is coordinated and compiled amongst all NATO supported participant units. The CISSM is submitted to SHAPE for validation and approval. A strategic CIS planning group will consolidate all associated products and support actions into a CIS Support Plan and forward to NCISG and NATO Communications and Information (NCI) Agency for execution.

4.5. Execution of Operations

This section outlines the main types of geospatial tasks, activities and procedures undertaken in support of NATO operations during the execution phase for deployed and non-deployed geospatial assets and resources. The varied nature of any operation makes it impractical to produce a specific list of geospatial tasks that would be undertaken during each phase of an operation and therefore focuses on the generic aspects of geospatial support common to most operational scenarios:

a. Definition of geospatial activities, order of battle and C2.

b. Continuous engagement with nations to ensure GI availability.

c. GI Management, including designation and supplementation of GI and the identification of new requirements.

d. GI Exploitation to support NATO operations.

e. Promote geospatial interoperability.

f. Geospatial support to Phase 6.

4.5.1. Definition of Geospatial Activities and C2

1. The exact geospatial support activities required to meet operational needs vary between different types of mission and JOA. The type, spectrum and level(s) of geospatial support required will be in accordance with the roles described in Chapter 3, but will also be influenced by the following factors:

a. The nature of the operation being undertaken.

b. The size of the operational force.

c. The equipment and technology employed by the force.

d. The availability, coverage, currency and content of GI over the JOA.

2. The focus for geospatial staff support at the operational level is the CGO. Normally an OF-4, the CGO plays a key role in ensuring that the appropriate level of geospatial support is delivered to the mission. Given the role and deployable nature of the JFC HQs the CGO will be the joint task force (JTF) senior geospatial staff officer (GSO) in theater. CGO JTF HQ will head the geospatial cell in JTF HQ and may deploy in advance with the initial command element (ICE) where appropriate.

3. Each SSC HQ will also be required to identify a CGO who will act as the officer of primary responsibility for all geospatial matters within their COM's AOR. The main responsibilities and tasks of the CGO are as follows:

a. Develop and maintain a generic geospatial Appendix to the JTF OPLAN.

b. Oversee all aspects of geospatial support to the mission.

c. Apply DIRLAUTH, where delegated, to enhance in-theater geospatial capability and resources.

d. Maintenance of the GEOLIST.

e. Designation of GI.

f. Chairs an operational geospatial conference.

4. SHAPE and the operation should be supported by a GSG operating at reach back. The GSG would be under operational control by SHAPE, who may delegate command to a lower level.

4.5.2. GI Management during Operations

1. The management of GI during an operation will follow the procedures explained in Chapter 3, with emphasis on the following aspects:

a. SHAPE, and the operation, will be supported by GISNs (TISN and HISN, as required) who may possess deployable as well as reach back/rear-based capabilities with corresponding roles and resources.

b. On reach back the lead nation will adopt traditional responsibilities for coordinating GI production and replication for expeditionary operations, however, the boundaries of this reach back support will be expanded to meet the needs of all expeditionary operations, whether NRF in nature or not, across NATO's area of operations.

c. Deployed geospatial assets may include the JTF and SSC geospatial support cells as well as SSC geographic and hydrographic units and embedded geospatial teams and individuals throughout the NFS. Capabilities can range from national geospatial products and service capabilities, to portable GIS desktop systems at embedded geospatial posts.

2. Designation of Geospatial Products.

a. SHAPE CGO will issue a mandated list of Des GI for use by each operation, as described in Chapter 2.

b. The authority to classify GI as Des GI rests with SHAPE CGO but can be delegated to JFC/SSC CGO for specific operations and/or for specific AOR. The designation authority extends to products which do not meet normal criteria or standards.

c. CGOs will have the authority to mandate SGI for use within an operation.

4.5.3. GI Exploitation to Support Operations

1. The delivery of geospatial data, products and services (at all levels of an operation), can be separated into two functions as follows:

a. Configure geospatial data to ensure it is:

(1) Complete and current. Where gaps or obsolete GI are identified they are prioritized for production or update, including the ordering of REA activities in theatre.

(2) Fit for use in both hard and softcopy format, as appropriate.

(3) Configured and formatted for use across mission CIS networks and mission application program interfaces.

(4) Quality assured (including version control).

(5) Backed-up or archived and can be restored in full.

b. Exploit geospatial data to provide:

(1) Geospatial and temporal analysis.

(2) Situational and battlespace awareness.

(3) Topographic, hydrographic and cartographic services (such as routing, slope analysis, line of sight analysis).

2. These tasks are executed by specialist geospatial staff embedded within the NCS/NFS and supported by specialist geospatial staff force generated (by nations) for the mission, either as part of the GISN, a GSG or the deployed force.

4.5.4. Geospatial Interoperability

1. Successful geospatial support to NATO will require interoperability between the NCS/NFS and Nations to ensure the rapid and accurate transfer of GI (both horizontally and vertically) between the NCS/NFS and nations.

2. Increasing reliance on CIS means that NATO FAS are critically dependent on geospatial data, products and services provided via the mission network.

3. Appropriate CIS support and resources are now crucial to enable geospatial staff to deliver capability in the form of required data, products and services to the mission.

4. A high level of geospatial staff, GIS and CIS competency and training at the strategic, operational and tactical levels is required.

5. Nations are encouraged to ensure their force elements deploy with appropriate hardware, software, and storage and network connectivity to connect to the OHQ, NFS and NATO FAS via the deployed mission CIS network.

4.5.5. Geospatial Support to Mission Transition

1. The geospatial input to an OPLAN is mandatory and periodic mission review will highlight the roles, responsibilities, capabilities and corresponding resources required to support the enduring geospatial mission. In consultation with SHAPE, this will be prepared by CGO and endorsed by OHQ commander. This will include details on the following:

a. Release iaw the agreed GI release levels (Annex A) and gifting (free of charge) of GI to local government. If no release is possible, remaining GI will be destroyed.

b. OHQ will request SHAPE to obtain permission from nations to gifting and release.

c. SHAPE, through the GRWG, will encourage development of bilateral agreements between PN's and HN in order to achieve a common release matrix.

d. Obtaining data from nations at the lowest possible release level and detailed working knowledge of bi-lateral agreements will help facilitate any gifting and release intentions.

2. A desired end-state for most operations (and a key support to the development of a civil society) is the mentoring and advising the HN to generate appropriate residual geospatial capability (military and civil). This will require detailed planning (led by the deployed geospatial staff), be included in the wider transition plan and obtain the support of the nations involved in the operation.

CHAPTER 5 GEOSPATIAL SUPPORT TO FUNCTIONAL AREA SERVICES

5.1 Introduction

1. GI is the foundation for all military activities and capabilities, and therefore all military activities (air, land and sea) require geospatial support. This holds especially true for modern information technology (IT)-systems (C2/ C3) supporting FAS in executing their specific tasks. While the functionality of these FASs is tailored towards the specific need of the specific community of interest (COI) GI plays an essential role within most of these systems.

2. Therefore the overarching principle of “operating off the same map” must be ensured through geospatial support to FASs. This means providing FASs with the required GI in order to allow specific functional areas to be provided with an understanding of the battlespace with a common, quality assured and coherent geospatial foundation. The ability to digitally combine GI with other information is fundamental to modern FASs, so that spatial situations can be visualized, analyzed, and communicated in relation to the battlespace. As one significant example, the REP concept describes a joint approach to supporting the common operational picture with a combination of certain elements of meteorological, oceanographic (METOC) and geospatial information.

3. The NATO geospatial policy mandates geospatial support to FASs to fully integrate into the Bi-SC automated information system (AIS) architecture and NATO networks. Due to the central role of GI to any COI, the Bi-SC AIS implemented the NATO geospatial core capability as Bi-SC AIS Core Service within the Bi-SC AIS architecture.

4. In information networks GI shall be provided to the FASs via web services in line with the NATO networks and service orientated architecture (SOA) principles. In case a legacy FAS is not capable of fully integrating into the information network yet, these FASs will also be supported with GI offline.

5. As part of the delivery and management of a common CGF geospatial support to FASs has the following objectives:

a. Exploit appropriate spatial data sources and sensors in a manner compliant with NATO networks.

b. Provide GI in a timely fashion that meets the needs of NATO led operations.

c. Enable management of all spatial data and services in the context of geospatial support to FASs.

d. Enable fusion and subsequent analysis of GI with all other elements of information.

6. The doctrinal elements of geospatial support to FASs, taking into account the following geospatial Allied joint publication (AJP) Principles, are described as follows:

a. Interoperability: Through standardization, designation authority and procedures (designation, seamlessness, provision, responsibility).

b. Burden sharing and exchange: nations as providers, nations as recipients, NATO HQs and agencies.

c. Information Management.

d. Customer Focus: GI liability, geospatial information systems, geospatial services.

e. Geospatial support to FASs will be delivered from a services point of view in a web services based information network.

5.2. Geospatial Information Provision to FASs via Web Services

1. This section describes how FASs will be supported with GI and services by the geospatial COI within the BI-SC AIS and information network based on the NATO networks concepts. The following activities need to be implemented in each command to achieve the overarching principle of “operating off the same map” in the context of geospatial support to FASs:

a. Geospatial web services shall fully integrate into the NATO IT-infrastructure and architecture, support the NATO networks concepts and maximize interoperability with NATO and national FASs.

b. Geospatial web services provided will follow the “one-to-many” relationship (e.g. the data is “published once as web service but used many times”). Sharing of services and services contents will enable vertical as well as horizontal sharing amongst commands as well as nations.

(1) If network capacity and operational requirements allow for usage of geospatial web services over the wide-area network (WAN) services they will be shared amongst commands maximizing the “one-to-many” paradigm. Coordination for web services shared through the WAN lies with SHAPE geospatial staff.

(2) In case the same geospatial web services are required in multiple commands SHAPE geospatial staff coordinates information content and hosting responsibility (e.g. Des GI and Des GI web services through

SHAPE). The distribution mechanism will allow for distributing data as well as web service configuration/definition.

(3) A catalogue of available common web services available to all commands is to be created and maintained by SHAPE geospatial staff.

(4) Where applicable, nations will be encouraged to not only provide GI but in addition also geospatial web services configuration/definition to NATO.

2. A current list of FASs in use within the command and subordinate commands, including NATO geospatial core capability (i.e. currently NATO Core GIS), interoperability capabilities as well as deficiencies, needs to be maintained within each command.

3. FAS geospatial requirements (information requirements) need to be assessed, documented and coordinated between geospatial staff and the respective customers.

4. The status of support to FASs in the command and subordinate commands regarding NATO networks and SOA principles (web services) as well as other means needs to be documented and reported to the higher command on a regular basis.

5. Geospatial services available and accessible within the command as well as usage by FASs needs to be documented and published (e.g. through a web-based geospatial portal) within the commands. Classification restrictions and the need-to-know principle must be observed.

6. Briefing and training of FAS managers within commands on available web services, information content, potential changes and downtime of geospatial web services need to be arranged at least on a regular basis by the geospatial staff.

7. Distribution statistics of hardcopy paper maps and usage statistics of geospatial web services need to be captured (method to be defined in different document, e.g. BI-SC Directive) within the commands and reported to SHAPE geospatial staff - SHAPE geospatial staff to report statistics during NGB.

8. FAS support in operations:

a. NATO FASs in NATO HQs by NATO geospatial core capability.

b. National FASs on the NATO or mission network by NATO geospatial core capability.

c. NATO FASs on the NATO or mission network by national geospatial core capability.

9. A mechanism is to be established to support FAS with geospatial web services when there is no geospatial core service available on the network and cannot be accessed via the WAN.

10. Cost effective ready to use, preconfigured web services to be developed and maintained.

5.3. Geospatial Information Web Services

1. Geospatial information web services will contain GI under the control and responsibility of the respective CGO such as Des GI and SGI containing all types of GI.

2. Additional GI will be provided upon request by the users to geospatial staff, if it can be made available.

3. For each command a current catalog of available services for base GI such as imagery, topographic maps, hydrographic and aeronautical charts, raster and vector products, feature and coverage services must be maintained and published. These catalogs will enable geospatial staff to manage not only the GI but also the geospatial web services. Users of these geospatial web services, including FAS managers, will be able to facilitate this information by being informed about available geospatial web services and their content.

4. Likewise with respect to GI management, similar procedures must be established to handle:

a. Dissemination

b. Designation

c. Classification

d. Releasability / Disclosure / Copyright / Restraints

e. Web services containing GI

5.4. Geospatial Analysis Web Services

1. Geospatial staff is able to provide geospatial analytical web services for integration and usage by FASs. Amongst others, typical analysis products include network, surface and visibility analysis or site selection.

2. The geospatial analytical web services will be executed based on user requirements on analytical models predefined by geospatial staff.

3. Examples of geospatial analytical tasks include:

a. Terrain and environmental overlays.

b. Support to the joint intelligence preparation of the operating environment through infrastructure and network overlays.

c. Mobility and counter-mobility and maneuver assessments, e.g. cross-country movement/mobility.

d. Network analysis, e.g. logistical routes, sea lanes of communication.

e. Surface analysis, e.g. urban models.

f. Visibility analysis, e.g. dead ground studies, views shed, line of sight.

g. Site selection (based upon multiple criteria analysis), e.g. helicopter landing sites, beach survey reports, harbor areas, refugee campsites.

h. Trend analysis, e.g. analysis of improvised explosive device incident clusters.

i. Change detection, correlation.

4. The results of the geospatial analytical web services need to be easy to understand for non-geospatial experts (e.g. traffic light charts) with the option to drill down into the traffic light charts if required, to obtain additional information e.g. why a certain area has been classified as red.

5. These geospatial analytical web services will bring new challenges with them as they can be directly used by the consumers without any direct consultation of expert geospatial staff. Therefore, the users need to be made aware of the accuracy, resolution, interpretation of the results and the associated limitations and risks. Geospatial staff must mitigate these risks by:

a. Training the users in the commands.

b. Run awareness campaigns in the commands.

c. Ensure the geospatial analytical web services are easy to understand and the models and results are well documented.

d. Advise and train users on the usage of these geospatial analytical web services and the interpretation of the results.

e. Advise and train potential users whether and how geospatial analytical web services will support their tasks.

5.5. Publishing FASs Specific Geospatially Referenced Information

1. The NATO geospatial core capability provides a powerful platform with standardized interfaces not to only serve GI, but also to serve any other kind of geospatially referenced information captured and maintained by other branches. A process for information exchange should be required.

2. Platform as a Service: The NATO geospatial core capability will be used as a platform to also serve geospatially referenced information not under the responsibility of geospatial staff FASs.

5.6. Geospatial Advice for Development and Employment of FASs

To ensure GI is provided in a timely fashion and meeting the FASs requirements geospatial staff needs to be involved from the early stages of every FAS development as well as during the employment of FAS. Hence geospatial advice needs to be provided on a regular basis by:

a. Taking an active role during requirements capture (data, standards, services, technology), implementation and validation of new or further developing FASs.

b. Ensure that the minimum military requirement assessment for other FASs would encompass consideration of the NATO geospatial core capability to supply GI to these FASs.

c. Advise FAS managers on the usage of GI e.g. Des GI for NATO use (training and operations). Ensure they understand Des GI is only available from a geospatial database managed by a geospatial specialist.

5.7. Geospatial FAS Support Framework

This section describes how to establish the framework required for delivering the geospatial services. Only doctrinal elements specific to FAS support which are not contained in other chapters are described below.

5.7.1. GIS Hardware and Software

To enable geospatial staff to support FASs in a timely and efficient manner while meeting the FASs requirements, a NATO geospatial core capability needs to be provided. This chapter describes the doctrinal elements for the hardware (HW) and software (SW) of this capability:

a. Specialized GIS software and hardware for geospatial staff needs to be available to facilitate the geospatial tasks.

b. The current NATO Core GIS Service shall be available at each NATO command including NATO lead operations.

c. NATO geospatial core capabilities also need to be available in deployable modes to support operations and exercises. To meet deployment and reaction time requirements, deployable scalable equipment (HW and SW) to support operations and exercises must have the same capabilities as the equipment held in static commands and needs to be readily available.

d. To facilitate easy integration of the NATO geospatial core capability, a GIS component-based framework (CBF) needs to be provided to FASs. Besides standardized GIS software components to integrate GIS functionality into FASs, including software components enabling easy connection to the NATO geospatial core capability web services, the framework can also include other elements maximizing reuse of the CBF by FASs.

5.7.2. Standards

1. Standards are a key to NATO networks and information networks established within and by the Bi-SC AIS. In the context of geospatial support to FAS the following elements need to be addressed through FAS requirements focused standards. All standards need to be customer focused, i.e. ease of use and integration by FASs as well as reduced complexity shall be principles for geospatial standardization.

a. Geospatial web services standards to connect to the NATO geospatial core service.

b. GI standards for the core services provided GI.

c. Standards for cataloging geospatial web services (human readable as well as machine readable).

d. GI and web services configuration and definition (e.g. portrayal) standards for sharing and ingestion of GI and web services into the NATO geospatial core capability, e.g. provided by nations.

2. Overall geospatial interoperability needs to be actively promoted into FASs and nations will follow these standards in order to ensure geospatial interoperability (e.g. mission network) in case of multinational operations.

3. The JGSWG is the designated working group to provide the above-mentioned standards including specifications for web services through the established NGIF as required by the GRWG.

5.7.3. Quality Control and Quality Assurance

1. Quality control (QC) and quality assurance (QA) is inherent in any geospatial task as described in Chapter 3 and has been successfully conducted over the years by geospatial staff in NATO commands and operations. The same principles apply to geospatial support to FASs.

2. Therefore a process for QC and QA:

a. for GI web services needs to be established and applied to any published GI web service.

b. focusing on analysis web needs to be established including a method on how to QC and QA the analysis models driving the analysis web services.

c. principles shall also be applied to services.

5.7.4. Service Level Agreements (SLAs)

To ensure coherent availability of the provided geospatial web services within and across commands, SLAs need to be put in place to enable geospatial staff to provide a high quality of service to the customers and enable FASs to take into account the availability of the NATO geospatial core capability during development, implementation and employment.

5.7.5. Geospatial Staff

Geospatial staff is a key element of the geospatial FAS support framework.

a. The NATO geospatial core services can only be managed if operated by trained geospatial staff within the commands.

b. The roles, responsibilities and skill set for personnel operating NATO geospatial core services need to be clearly described. Geospatial staff operating the NATO geospatial core services needs to have the defined skill set and dedicated specialist training to be able to fully meet the challenges of providing geospatial support to FASs.

c. Due to the various players (e.g. ACO, ACT, geospatial staff, CIS staff, FAS managers, FAS project managers etc.) at different levels involved in the implementation and employment of a NATO geospatial core capability, the NATO geospatial core capability needs to be actively and consistently managed. This could be achieved by a NATO geospatial core capability management board chaired by a NATO geospatial core capability “product manager” at SHAPE level.

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CHAPTER 6 EDUCATION and TRAINING

6.1. Introduction

1. Training is a cornerstone for the provision of effective geospatial support. Geospatial training in NATO is to be conducted in accordance with MC and Bi-SC policy and direction. Current training policy for the geospatial discipline is contained within MC 0458/3, NATO Education, Training, Exercises and Evaluation Policy and MC 0619 NATO, Intelligence Education and Training Plan. Direction is provided by Bi-SC Directive 075-002, Education and Training and Bi-SC Directive 075-003, Collective Training and Exercise Directive.

2. This chapter aims to identify how geospatial training is managed and delivered to ensure that the geospatial support provided meets NATO needs.

6.2. Management of Geospatial Support Training

1. The GRWG is the nominated forum within which geospatial training matters are to be discussed, any proposals for change arising from the GRWG are forwarded for endorsement to the NGB.

2. The process identifies the training needed in the following areas:

a. National training. The geospatial discipline requires extensive individual training in GIS, cartography and related areas. NATO does not have the resources to provide this training and as such it is a national responsibility to prepare personnel for specialist geospatial posts. Individual post job descriptions identify the competencies appropriate to each post.

b. Individual NATO specific training. For geospatial training it is appropriate to break individual training into two areas as follows:

(1) Geospatial specialists. NATO specific training to provide the knowledge, skills and competencies required to fill a geospatial post.

(2) HQ staff. Geospatial awareness training/education to provide the knowledge required to understand the benefits that geospatial support can provide to each staff function.

c. Collective training. The practical application of geospatial doctrine, procedures and plans to enhance geospatial functional capability and readiness across the joint and single service staff.

3. In addition to the process outlined above there will be a need to develop bespoke training packages for NATO missions. This mission specific training will be developed as required and could encompass national training and NATO specific individual and collective training.

6.3. Delivery of Geospatial Support Training

6.3.1. Collective Training

1. Collective training enables HQs to maintain functional readiness and prepares staffs for their role in real the operational environment and in NATO certification exercises. Academics, key leader training, battle staff training and operational battle rhythm events are training opportunities that should be leveraged to enhance geospatial support to the commander. Training objectives with task, condition and standards are fundamental to guide the management and execution of collective training events, to include exercises.

2. NATO exercises can be used to certify and validate NATO HQs to carry out specific functions. For example; the TRIDENT JUNCTURE series of exercises are designed to assess a JFC in the role of the lead operational HQ for a NATO NRF deployment, these exercises take place in the year preceding the JFC taking up the role. Successful completion of the exercise will certify the JFC to carry out the NRF role. Embedded geospatial sections within a NATO HQ are not generally certified in their role but as part of the HQ they support.

3. Collective training is conducted at all levels of NATO command, (strategic, operational and tactical). NATO direction on planning, executing and assessing collective training and exercises for NCS and NFS is contained in Bi-SC Directive 075-003 Collective Training and Exercise Directive. This section focuses on the geospatial support required at each stage of the process.

4. The exercise process is broken down into stages. Geospatial support is an integral part of each of these stages and details can be found in Annex C.

6.3.2. Individual Training

1. There is extensive individual training required to ensure personnel are competent to operate within the geospatial discipline. NATO cannot meet these training requirements and it is a national responsibility to train individuals to the required standards. The competencies associated with NATO geospatial posts are published in AIntP-11 STANAG 2555, NATO Intelligence Training, and individual post job descriptions identify appropriate competencies.

2. NATO is responsible for delivering NATO specific individual competencies to ensure individuals are able to operate within the NATO environment. NATO geospatial courses available to meet this requirement are as follows:

a. NGOC. Delivered at the NATO School in Oberammergau, Germany. JWC and SHAPE are co-officers of primary responsibilities (OPRs) with the JWC GSO generally taking the lead. The aim is to provide a foundation in the policies, concepts, principles, current practices and interoperability issues related to geospatial support within NATO. The course is open to all personnel with a NATO geospatial or national geospatial role which liaises with NATO. Details of the courses can be found on the NATO School web page available on the NATO unclassified network.

b. Core GIS Training. Core GIS is a NATO fielded system and therefore it is a NATO responsibility to provide training on the system. Training is delivered through the NATO Communication Information Systems School at Latina, Italy. Courses are run by NCI Agency, with SHAPE providing direction. Three courses cover varying levels of competency and provide training in the operation of the GIS system and the associated server. Details of the courses can be found on the NCIS School web page available on the NATO unclassified network.

c. Non-Specialist Training. Geospatial services are provided to the majority of staff branches in NATO HQs. Unless a geospatial orientation brief is set up and delivered as part of appropriate staff courses, it is very much a geospatial section task to promote and advertise geospatial capabilities to the staff in a HQ. While NATO collective training can provide opportunities to establish, enhance and demonstrate NATO's geospatial contingent capabilities and to liaise with all other staff branches it is not an effective training medium.

6.3.3. Mission Specific Training

1. Current operations are identified in MC 0458/3, NATO Education, Training, Exercises and Education Policy, as the highest priority with regard to support from NATO's training resources.

2. NATO is responsible for providing mission specific training to the NCS deploying on operations. Nations are responsible for the training of their own troops.

3. From a geospatial perspective it is important to consider mission specific training for all deployed geospatial personnel. The training required will vary depending on the mission but the following should be considered:

a. Geospatial specific individual pre-deployment training, it is expected the minimum would be the NGOC as well as the NCIS courses if individuals are to use Core GIS.

b. Requirements for the training of individual augmentees to a geospatial section in a deployed NATO force.

c. Requirements for any geospatial collective training with particular focus on interoperability between the deployed forces and participation in any mission rehearsal exercises

ANNEX A GEOSPATIAL INFORMATION RELEASABILITY LEVELS

Level A: NATO planning
- NATO HQ
- NCS
- NIFC
- STRIKFORNATO
- NATIONS training for or on the current NRF cycle
- NATO agencies[1]
- NATO training establishments[2]

Level B1:
- Level A
- NATO force structure[3] (NFS)
- NATO crisis establishment
- NATO combined joint statement of requirement (CJSOR)
- NNs[4]

Level B2:
- Level B1
- Non NATO nations (NNN)[5]
- NATO contractors[6]
- Non NATO multinational forces (NNMF)[7]

Level C: Where there is a NATO agreed requirement to operate alongside other organizations[8]

Level D: Trusted IO/NGO (list to be agreed by producing nations for a specific operation)

Level E: Public release[9]

Level Z: Produced but not released

_____

1 Undertaking tasks in support of NCS or preparing, planning deploying, supporting, executing, recovering from NATO led operations.
2 Delivering training to personnel from NCS and NATO nations, but no release to students.
3 Undertaking tasks in support of NCS or preparing, planning, deploying, supporting, executing, recovering from NATO led operations.
4 Undertaking tasks in support of NCS or preparing, planning, deploying, supporting, executing, recovering from NATO led operations.
5 Planning deploying, supporting, executing, recovering from NATO led operations.
6 Planning deploying, supporting, executing, recovering from NATO led operations.
7 Planning deploying, supporting, executing, recovering from NATO led operations.
8 Level C implies that Levels A, B1 and B2 have been granted. Level needs agreement by the producing Nation for every specific operation.
9 Available to everyone without the need for any further permission by the producing Nation.

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ANNEX B TOR FOR COORDINATING AND PARTICIPATING NATIONS

TERMS OF REFERENCE FOR COORDINATING AND PARTICIPATING NATIONS

INTRODUCTION

1. NATO's Geospatial Information Requirement Matrix[1] aims to ensure the pre-identification of GI availability so that GI can be rapidly acquired in support of NATO. The matrix identifies Level 0-5 GI requirements necessary to enable NATO planning over geographic areas of interest. Nations may volunteer to act as coordinating or participating nations to assist NATO in its understanding of GI availability at each level over agreed geographic areas. This does not imply production responsibilities on the part of the coordinating or participating nations, however where coordinating and participating nations agree to produce, this mechanism will provide a framework for coordination. Provision of the GI to NATO will be handled via bilateral arrangements, and is not addressed by this mechanism.

SCOPE

2. This document applies to land and air information, with the exception of airspace management information, which is controlled by the airspace management community. Geospatial maritime information is captured through the REA Category (CAT) 1 process, and via programs such as the AML co-production program, which is coordinated by the GMWG.

AIM

3. The aim is to provide guidance to coordinating and participating nations for the assessment of available (GI) to fulfil NATO's geospatial information requirements and to provide a basis for crisis support readiness.[2]

DEFINITIONS

4. Throughout this document the following definitions will apply:

a. Coordinating Nation. A nation that agrees to assess and report on available[3] geospatial information as specified in the NATO Geospatial Information Requirement Matrix for NATO use over a specific geographic area. This area will be agreed between the Nation and SHAPE OPI INT Geo.

1 See Enclosure to IMSTAM (GE0)-0003-2010, NATO and NATO/PfP Geospatial Conferences 2010 - Minutes
2 For the purposes of pre-crisis planning and prudent thinking with regard to potential information requirements.
3 Availability in this context refers to geospatial information that is currently held by NATO nations or may be procured from other sources, such as commercial, multinational organizations and programs, or non-NN.

b. Participating nation. A nation that volunteers to support a coordinating nation in an agreed geographic area or areas.

c. NATO's Geospatial Information Requirements. As described in para17a, b, c "Agreed Geospatial Information Requirements" (NATO Geospatial Policy MC 0296/2)

ROLES AND RESPONSIBILITIES

5. SHAPE responsibilities:

a. To solicit, via the NGB, participation of nations as coordinating or participating nations in support of NATO requirements.

b. To maintain the list of coordinating and participating nations, and their agreed geographic areas of responsibility.

c. To collate the assessments of the Coordinating Nations.

d. In times of crisis, request increased reporting frequency over crisis areas.

6. Coordinating nation responsibilities:

a. In conjunction with SHAPE, to identify candidate participating nations for the agreed geographic area.

b. To coordinate a seamless assessment of available geospatial information over the nation's agreed area or areas, avoiding duplication of effort.

c. To include in the assessment planned production by the coordinating or participating nations over the agreed area, mitigating production duplication where possible.

d. To agree with other coordinating nations the geographic extent of responsibility for adjacent areas.

e. Where possible, to make an assessment of the suitability of the available geospatial information.

f. To collate the information and report to SHAPE, using the guidelines in this document.

g. To act as the single point of contact for SHAPE concerning the assessment of the agreed geographic area.

Participating nation responsibilities:

7. Under the direction of the Coordinating Nation, participating nations are responsible for assisting with the assessment process of the agreed geographic area. This includes reporting on plans to produce in the geographic area.

REPORTING

8. The coordinating nation will report to SHAPE on their geographic area annually, which SHAPE will collate in a NATO Restricted geospatial e-catalogue.

a. Initially, reporting will be done in an electronic format which includes an index and metadata, in any format (ideally shape files).

b. The ultimate goal is to report using a standard agreed format.

9. In times of crisis, coordinating nations will report on a more frequent basis as indicated by SHAPE, in order to support prudent planning, for example to inform the GISN of GI availability in crisis areas.

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ANNEX C GEOSPATIAL SUPPORT DURING EXERCISE

1. Stage 1 – Concept and specification development. The purpose of stage 1 of the exercise process is to determine the overall exercise requirement, establish the aim and overarching objectives and develop a viable exercise concept for achieving them. Geospatial support to this stage should include the following:

a. Advise the exercise planning group to influence the selection of the exercise 'play box', specifically:

(1) Consideration of the use of real world or scenario geography for the exercise. For the TRIDENT series of exercises JWC will develop scenario geography for each exercise as directed by ACT. For all other NATO exercises scenario geography packages are available from JWC. The use of real world geography is preferable to scenario geography however political sensitivities often prevent the use of real world geography.

(2) Identify the available GI through investigation with SHAPE and JWC. Some areas of the real world only have sparse covering of GI. A selection of these areas could limit the objectives of an exercise.

(3) The releasability of available GI to all exercise participants should be considered as part of the exercise 'play box' selection process. This is particularly important if it is intended to have Non-NATO nations participating in the exercise.

b. Contribute to the development of the exercise specifications (EXSPEC), specifically:

(1) Production of a map overview product depicting the theatre of operations to support the geo-strategic narrative.

(2) Ensure any budget requirements for geospatial support to the exercise are captured and included in the EXSPEC.

c. Carry out any other map production that will assist with situational awareness of the exercise planning group and the development of the exercise concept.

d. It is not always the case that exercise planning staff will consider consulting geospatial staff during this stage of the exercise. It is essential that geospatial staff is included to ensure the selected geography for the exercise is available and appropriate to the aim of the exercise.

2. Stage 2 – Planning and product development. The purpose of this stage of the exercise process is to determine specific planning requirements and to draft, coordinate and promulgate the exercise plan (EXPLAN) as well as all the required documents related to scenario and exercise play. In short, to provide all the information that enables the exercise to be executed successfully. Geospatial support to this stage should include the following:

a. Develop geospatial training objectives and include them in the EXPLAN. Supporting the exercise planning process and execution will test the geospatial staff in a wide range of activities and it is expected that geo will contribute to generic training objectives such as “support understanding of the operating environment to enable planning, operations and decision making”. However, an exercise will seldom test such training requirements as hard copy GI distribution or the CN/PN process. Any geospatial specific training objectives that are required to be tested on an exercise should be added to the training objectives for publication in Annex D to the EXPLAN.

b. Provide input to the EXPLAN. The EXPLAN provides detailed instructions on how the exercise will be managed. Operations planning products, such as OPLANs are issued in accordance with operational procedures and are not part of the EXPLAN. The geospatial element of the EXPLAN is Annex X which is entitled geospatial support instructions. The structure of Annex X may vary depending on the exercise, a suggested outline layout is as follows:

(1) Introduction. Describing the purpose of the Annex and any appropriate details regarding the exercise.

(2) GI availability. Details the authority for the provision of exercise GI, what GI is available (usually refers to GEOLIST in the OPLAN) and how the availability of GI is linked to the operational process detailed in chapter 4 of this publication.

(3) GI provision. Details how and when GI will be disseminated to support the exercise planning process. Provides geospatial POC information for each supporting element within the exercise. Details how GI provision and introduction will be managed during the execution phase of the exercise, including web service provision and any geo viewer capability being used on the exercise.

(4) Responsibilities. Outlines responsibilities for geospatial support before, during and after the execution phase of the exercise.

(5) The Annex may also contain any other pertinent geospatial related instructions that will help orientate the exercise participants to the exercises geospatial support situation.

(6) Historic examples of Annex X used in previous exercises are held by JWC.

(7) There are a number of other Annexes to the EXPLAN which would benefit from geospatial input/liaison including Annex V which covers the use of FASs within the exercise and Annex W which contains instructions for the REA.

c. Contribute to the development of scenario materials. This will involve the collation of all the GI required to support the exercise as well as providing geospatial support to scenario documentation development and the main events list and main incidents list (MEL/MIL) development. The work required to support this activity will vary depending on the exercise but is likely to include the following:

(1) Collate and amend, as required, the GI to support the exercise. How this is done very much depends upon the level of exercise. Just as there is only one GI designating authority for operations the key for exercises is have one authority for the introduction of GI to the exercise. This role should sit with the geospatial section working to either the officer conducting the exercise or the officer directing the exercise, (both of these roles will have been outlined in the EXSPEC created at Stage 1 of the exercise process).

(2) Writing of Appendix 1 to Annex T to the OPLAN as detailed in Chapter 4 of this document. For exercises the OPLAN outlines the plan within the scenario, as if it were actually going to take place. The EXPLAN, also created in this stage of the exercise process, provides the plan for what is actually going to take place. For example the OPLAN will detail the deployment of the force to the conflict area, (possibly SOROTAN/SKOLKAN), while the EXPLAN will detail the actual deployment of personnel to the nominated exercise area. From a geospatial perspective it is important that the Annex T to the OPLAN is consistent with Annex X of the EXPLAN, especially in regard to the dissemination, designation and introduction of GI.

(3) Designate the GI to be used on the exercise and publish in the GEOLIST as part of Annex T to the OPLAN. Carry out any GI production required and distribute completed dataset to subordinate formations as appropriate, (distribution details should be in Annex X to the EXPLAN). The dataset should contain raster, vector and elevation data and could also contain cached data, web services and any other appropriate GI.

(4) Liaise closely with scenario writers to ensure that GI is consistent with the other documentation being created/used in support of the exercise. Scenario writers will produce country briefs and other documentation designed to mirror ACO operational processes and

procedures; it is essential that the GI and the scenario material are consistent.

(5) Provide geospatial support to the exercise core planning team.

(6) Provide geospatial support to the MEL/MIL storylines. The MEL/MIL builds story lines designed to trigger certain decisions and activities in order to assess the training audience against the exercise training objectives and is used by exercise control (EXCON) to control the exercise. It is recommended that a geospatial SME is included within the MEL/MIL scripting team. There are a number of geospatial activities associated with the MEL/MIL.

(7) If the geospatial personnel are to be exercised than dedicated MEL/MIL incidents should be designed to test their skills. This will always be the case if geospatial specific training objectives have been included in the EXPLAN. All geospatial incidents should be consistent with the story lines within the MEL/MIL.

(8) The development of story lines, events and incidents requires geospatial support. Hard copy mapping, both to provide detail and an overview of the area of operations, and mapping services to the functional services, usually joint exercise management module, being use to manage the MEL/MIL are essential. A geospatial SME should also be available to offer advice, especially in regard to the use of coordinate systems for the reporting of positions within injects.

(9) The MEL/MIL scripting team will require a brief on the available GI for the exercise and the means by which they can access the data.

(10) The development of story lines may identify a requirement to change the GI to support incidents/events, for example the story line may require a road to be upgraded or a new feature to be created. The geospatial SME should capture these changes and ensure they are incorporated into the final release of the exercise GI. The GI dissemination plan published in the EXPLAN should reflect this requirement for a GI release after MEL/MIL scripting has been completed.

(11) Ideally the geospatial SME that supports the MEL/MIL scripting team will be available to support EXCON during the execution phase of the exercise. The SME should not be provided by the training audience geospatial section.

(12) Provide situational awareness and ground briefs to the exercise planning conferences as required.

3. Stage 3 - Operational conduct. This stage sees the training audience coming together to undergo training. The training involves working with the scenario to plan and execute operations that will resolve the crisis described in the scenario. The stage consists of a number of phases as follows:

a. Phase I – Foundation training. Broken down into four sub-phases internal training, Academic seminar, key leader training and battle staff training. The geospatial role within these phases is to provide situational awareness and ground briefs as required and to be trained and rehearse their role as part of the HQ staff.

b. Phase II – Crisis response planning. The HQ staff plan for the operation based on the scenario material; preparing options and developing both CONOPS and the OPLAN. The geospatial support to this phase will be wide ranging and should reflect the support required when planning real operations, as detailed in chapter 4.

c. Phase III – Execution. The phase during which the exercise is run. Can be broken down into two sub-phases, IIIA force activation, deployment, reception, staging, onward movement and integration and IIIB exercise execution. Geospatial support to this phase can be detailed as follows:

(1) Provision of the full range of geospatial support to HQ staff and the management of all geospatial business as detailed in the exercise OPLAN.

(2) Support to EXCON, providing both general geospatial support to EXCON and geospatial SME support to the exercise injects through the MEL/MIL.

d. Phase IV – Assessment. Assessment will occur throughout the stages in order to enable the training associated with the exercise. Within the geospatial discipline, assessment will also take place regularly and changes to procedures may be adopted as a result. During the execution phase of the exercise the Training Audience should expect feedback and assessment from the geospatial SME in EXCON for any geospatial responses required to MEL/MIL injects and to their adherence to the OPLAN, (submission of reports, transfer of GI etc.).

4. Stage 4 – Analysis and Reporting. There is relatively little Geo staff input into Stage 4. As with other Staff areas all exercise participants will submit lessons identified during the exercise. Lessons identified associated with the geospatial discipline should be copied to the COI geospatial lessons identified site hosted by JALLC on the NATO Secret network at the following link, http://nllp.jallc.nato.int/cmnt/geocoi.

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PART I - Acronyms and Abbreviations

ACO	Allied Command Operations
ACT	Allied Command Transformation
AIS	automated information system
AJP	Allied joint publication
AOI	area of interest
AOR	area of responsibility
Bi-SC	of the two Strategic Commands
C2	command and control
C3	consultation, command and control
CBF	component-based framework
CGF	Common Geospatial Framework
CGO	chief geospatial officer
CIS	communication and information systems
CISSM	communication and information systems services matrix
CJSOR	combined joint statement of requirement
CN	coordinating nation
COI	community of interest
CONOPS	concept of operations
Des GI	designated geospatial information
DIRLAUTH	direct liaison authorized
DOTMLPFI	doctrine, organization, training, material, leadership and education, personnel, facilities and interoperability
EXCON	exercise control
EXPLAN	exercise plan
EXSPEC	exercise specifications
FAS	functional area services
GEOLIST	geospatial list
GI	geospatial information
GIS	geographic information system
GISN	geospatial information supporting nation
GMWG	Geospatial Maritime Working Group

GRWG	Geospatial Requirements Working Group
GSG	Geographic Support Group
GSO	geospatial staff officer
HISN	hydrographical information supporting nation
HN	host nation
HQ	headquarters
HQ SACT	Headquarters Supreme Allied Commander Transformation
IMS	International Military Staff
IO	international organization
ISR	intelligence, surveillance and reconnaissance
JALLC	Joint Analysis and Lessons Learned Centre
JFC	joint force command
JFTC	Joint Force Training Centre
JGSWG	Joint Geospatial Standards Working Group
JOA	joint operations area
JOPG	Joint Operations Planning Group
JTF	joint task force
JWC	Joint Warfare Centre
LL	lessons learned
MC	Military Committee
METOC	meteorological and oceanographic
MEL	main events list
MIL	main incidents list
MILENG	military engineering
NAC	North Atlantic Council
NATO HQ	NATO Headquarters
NCI Agency	NATO Communications and Information Agency
NCISG	NATO Communication and Information Systems Group
NCMP	NATO Crisis Management Process
NCRSM	NATO Crisis Response System Manual
NCS	NATO Command Structure
NED	North Atlantic Council execution directive
NFS	NATO force structure
NGB	NATO Geospatial Board
NCISS	NATO Communications and Information Systems School (Latina)
NGO	non-governmental organization
NGOC	NATO Geospatial Orientation Course
NGIF	NATO Geospatial Information Framework
NID	North Atlantic Council initiation directive
NIFC	NATO Intelligence Fusion Centre

NN	NATO nation
NMA	NATO military authority
NRF	NATO Response Force
NSO	NATO School Oberammergau
OHQ	operation headquarter
ODB	operational digital geospatial information baseline
OPLAN	operation plan
PN	participating nation
POC	point of contact
QC	quality control
QA	quality assurance
REA	rapid environmental assessment
RFGI	request for geospatial information
SA	situational awareness
SACEUR	Supreme Allied Commander Europe
SDB	strategic digital geospatial information baseline
SGI	supplementary geospatial information
SHAPE	Supreme Headquarters Allied Powers Europe
SITCEN	Situation Centre
SLA	service level agreement
SME	subject matter expert
SOP	standing operating procedures
SSC	single service command
STANAG	standardization agreement
TISN	topographic information supporting nation
TNA	training needs analysis
TRA	training requirements analysis
WAN	wide-area network

PART II - Terms and Definitions

geospatial
Of or related to any entity whose position is referenced to the Earth (NATOTerm – NATO Agreed).

geospatial information (GI)
Facts about the earth referenced by geographic position and arranged in a coherent structure. Note: This includes products, data, publications and materials based on topographic, aeronautical, hydrographic, planimetric, relief, thematic, geodetic and geophysical information, including geo-referenced imagery. These will be available in either analogue or digital formats (proposed definition with NSO for approval, see TTF 2015-0068).

geospatial staff
Personnel, units, organizations and agencies within the NATO Military Authorities, nations and the NATO Force Structure that provide geospatial information and geospatial support (proposed definition with NSO for approval, see TTF 2016-0512).

geospatial intelligence
Intelligence derived from the combination of geospatial information, including imagery, with other intelligence data to describe, assess and visually depict geographically referenced activities and features on the earth (NATOTerm – NATO Agreed).

geospatial support
Those activities necessary to meet the recognized need for geospatial information and its subsequent analysis and interpretation. Note: These activities include, but are not limited to staff planning and direction, geospatial information management procedures (Designation, Supplementation and Introduction), database management, map supply, acquisition and exchange, survey, production, reproduction, provision, analysis, fusion and presentation, training, geospatial support certification, and geospatial advice (MC 0296/2; proposed definition with NSO for approval, see TTF 2015-0067).

designated geospatial Information (Des GI). Geospatial information conforming to a NATO standard and authorized by SACEUR for use in NATO operations. (proposed definition with NSO for approval, see TTF 2016-0509).

supplementary geospatial information (SGI)
Additional geospatial information identified as essential for operations but not meeting all criteria to be treated as designated geospatial information. (proposed definition with NSO for approval, see TTF 2016-0516).

Common Geospatial Framework (CGF)
The framework that describes the policy, procedures, standards, geospatial information, products and services to be implemented for NATO led operations (NATOTerm – NATO Agreed).

imagery
Collectively, the representations of objects reproduced electronically or by optical means on film, electronic display devices, or other media (NATOTerm – NATO Agreed).

intelligence
The product resulting from the directed collection and processing of information regarding the environment and the capabilities and intentions of actors, in order to identify threats and offer opportunities for exploitation by decision-makers (NATOTerm – NATO Agreed).

rapid environmental assessment (REA)
A contribution to the common understanding of the operational environment by collecting, processing and disseminating METOC and geospatial data and products to forces in near-real-time, in order to improve operational effectiveness through enhanced situational awareness and decision making (Acronym NATOTerm – NATO Agreed, proposed definition with NSO for approval, see TTF 2016-0515).

recognized environmental picture (REP)
A complete and seamless depiction of geospatial, oceanographic and meteorological information designated for the planning and conduct of joint operations in a specific area at a specific time and which supports the unity of effort throughout the battlespace (NATOTerm – NATO Agreed).

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