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ALLIED DOCTRINE FOR GROUND-BASED AIR DEFENCE

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NORTH ATLANTIC TREATY ORGANIZATION

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NORTH ATLANTIC TREATY ORGANIZATION (NATO)

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NATO LETTER OF PROMULGATION

31 January 2018

1. The enclosed Allied Tactical Publication ATP-82, Edition A, Version 1, ALLIED DOCTRINE FOR GROUND-BASED AIR DEFENCE, which has been approved by the nations in the Military Committee Land Standardization Board (MCLSB), is promulgated herewith. The agreement of nations to use this publication is recorded in STANAG 2618.

2. ATP-82, Edition A, Version 1, is effective upon receipt.

3.

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

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Deputy Director NSO
Branch Head P&C

for

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Major General, LTUAF
Director, NATO Standardization Office

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RECORD OF RESERVATIONS

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

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RECORD OF SPECIFIC RESERVATIONS

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CHAPTER 1 INTRODUCTION

1. Introduction

For NATO Land Operations, Ground-Based Air Defence (GBAD)[1] resources are an integral part of the NATO Integrated Air and Missile Defence System (NATINAMDS) and an important deployable option for out-of-area operations. All policy, conceptual, operational, and tactical aspects for the use of GBAD forces in the way described in this document, are covered either directly in this standard or are referenced to appropriate existing NATO documents that are already sufficient.

1.1 Aim

In accordance with NATO's operational planning system (Ref. A), the aim of this standard is to provide tactical and operational guidance to National Military authorities, NATO Joint Force Commanders, and NATO Component Commanders, for the preparation and use of GBAD capabilities during Land Operations in response to operational requirements for Active Air Defence of NATO territorial assets and NATO forces deployed out-of-area. National approvals for the use of this standard are registered by ratification of Standardization Agreement (STANAG) 2618.

1.2 Situation

This standard provides operational level guidance for employment concepts and tasks that will enable Alliance forces to conduct successful, integrated GBAD Operations in SACEUR's defined Area(s) of Responsibility (AOR) (Ref. B). GBAD is the land-based capability option under the mission area of NATO Surface Based Air and Missile Defence (SBAMD)[2] (Ref. C) and is linked to other key capabilities in NATO that are undergoing changes. Figure 1 below[3], captures the related aspects of the House of NATINAMDS, recognizing that the details of the relationships depicted here, are still being refined. Together with MC 400/3 (3rd Revised/Final) MC Guidance on Military

[1] In the Integrated Air and Missile Defence (IAMD) Policy, which was approved by the North Atlantic Council (NAC) in March 2016 (Ref. C), GBAD is encompassed within the broader mission area of Surfaced Based Air and Missile Defence (SBAMD). To highlight the fact that Ed. A of this doctrine standard is addressing land-based capabilities that are directed specifically against aerial threats, the traditional acronym "GBAD" is retained for clarity (Ref. D).

[2] SBAMD consists of all defensive measures originating from the surface - land and maritime - designed to nullify or reduce the effectiveness of hostile air action (Ref. C).

[3] From the NATO IAMD Policy (Ref. C, para. 12.5), Active Air and Missile Defence (AMD) comprises the following mission areas:

a. airborne air defence;
b. surface based air and missile defence (including maritime and ground-based air defence, theatre ballistic missile defence and other missions having special emphasis in the IAMD Policy for NATINAMDS).

Implementation of NATO's Strategic Concept (Ref. F), the NATINAMDS Concept (Ref. E) is establishing the broader framework within which GBAD TF formations will operate.

GBAD is an important part of NATO's IAMD capability that is formed from national contributions. These national contributions must be integrated as an effective warfighting force. Initially, any capability that is formed from independent national contributions will not be homogeneous. It will be from a variety of sources, be of different generations, have differing technologies and will have different idiosyncrasies in terms of methods and modes of operations, as well as political constraints. It is important not to waste any contributed capability and to maximize effectiveness. There is therefore a need to orchestrate NATO operations to a standard pattern.

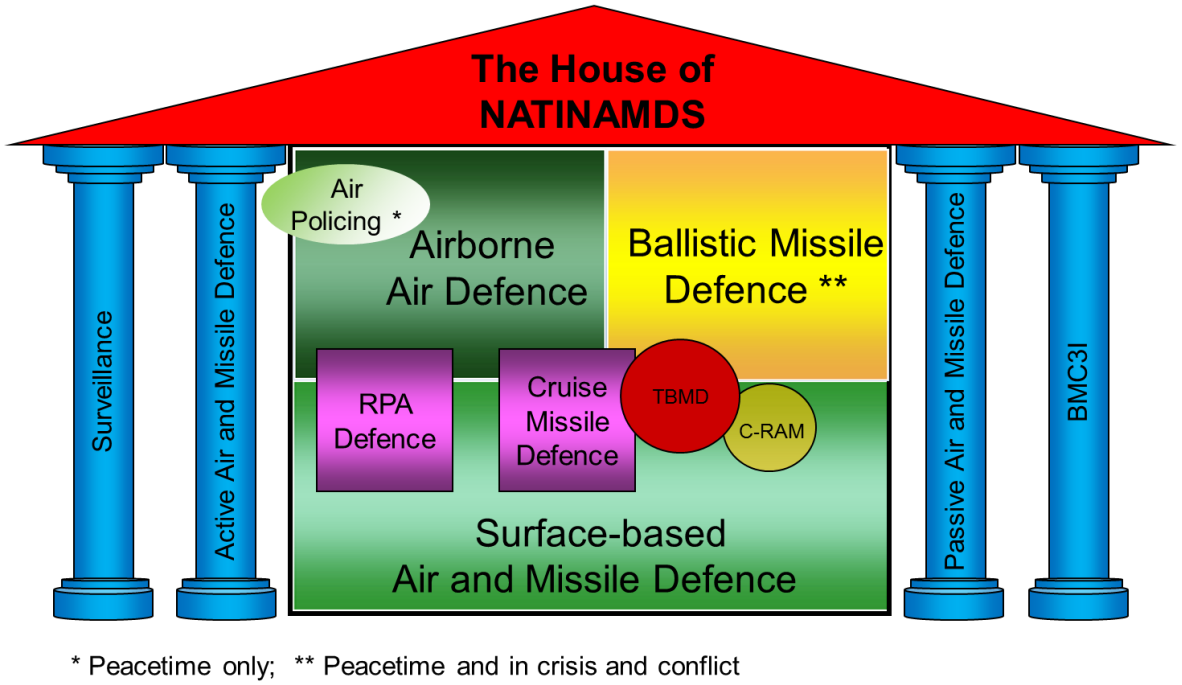

Figure 1. Air Defence Functional Areas in NATINAMDS

1.3 Document Purpose

This standard contains guidance aimed to achieve optimum GBAD capability through standardisation for NATO operations and provides guidance that will enable Alliance forces to conduct GBAD Operations in NATO-led Land Operations efficiently. This standard provides operational level guidance to make full use of the unique capabilities that a GBAD force will provide, under the overall purview of the IAMD Policy and NATINAMDS concept, while recognizing relationships to several other mission areas in NATO. GBAD operates under a hierarchy of documents in NATO, in the general categories of strategy, political guidance, policy, concepts, doctrine, and implementing defence plans. This hierarchy is depicted below in Table 1. For simplicity, this hierarchy favours the direct thread for Air Defence above a ground-based capability for

Defensive Counter-Air as Active Air Defence, within the broader context of IAMD and NATINAMDS under overarching NATO strategy and political guidance.

Table 1. Hierarchy of GBAD Documents in NATO

Publication	Remarks
PO(2010)0169, The Alliance's Strategic Concept, Active Engagement Modern Defence (NU), 19 November 2010 (Ref. G)	**GBAD, as a NATO capability comprised of national contributions, is derived from the NATO strategy for Active Air Defence of NATO forces during Land Operations.**
MC 0400/3 (3rd revised/Final), MC Guidance on Military Implementation of NATO's Strategic Concept, 30 June 2017 (Ref. F)	**Approved by the North Atlantic Council, MC 0400/3 provides guidance for the implementation of NATO's Strategic Concept**
PO(2015)0580, Political Guidance (NR), dated 16 October 2015 (Ref. H)	**Overarching NATO political guidance**
PO(2011)0141, Political Military Framework for Partner Involvement in NATO-led Operations, 13 April 2011 (Ref. I)	**High level political framework affecting Partner involvement in NATO-led operations**
MC 0586-Final, MC Policy for Allied Forces and their use for Operations, 9 August 2012 (Ref. J)	**High level policy governing the use of Allied forces in Operations**
C-M(2016)0014, NATO Integrated Air and Missile Defence Policy, 14 March 2016 (Ref. C)	**Overarching NATO policy on IAMD, including GBAD as part of SBAMD (para. 12.5.10)**
PO(2012)0161, Policy on NATO's Engagement with Third States on Ballistic Missile Defence, 16 April 2012, (Ref. K)	**Governing NATO policy affecting the involvement of partner nations in BMD operations, including GBAD forces in NATINAMDS**
PO(2017)0134(INV)-AS1, Concept for NATO Integrated Air and Missile Defence and NATO Integrated Air and Missile Defence System, 24 March 2017 (Ref. E)	**Replaced MC 0054/1, MC 0604, and MC 0613**
AJP-3(B), Allied Joint Doctrine for the Conduct of Operations, (Ref. L) **AJP-3.1(A), Allied Joint Doctrine for Maritime Operations, (Ref. M)** **AJP-3.2(A), Allied Joint Doctrine for Land Operations, (Ref. N)** **AJP-3.3(B), Allied Joint Doctrine for Air and Space Operations, (Ref. O)** **AJP-3.3.1(B), Allied Joint Doctrine for Counter-Air Operations, (Ref. P)** **AJP-3.3.5(B), Allied Joint Doctrine for Airspace Control, (Ref. Q)**	**The Joint doctrine publications in this group are critical to GBAD forces for direct use in Land Operations, coordinated participation in Air Operations, coordination with Maritime forces during littoral operations, and coordination with Missile Defence forces as defended assets.** **In particular, GBAD doctrine operates primarily under AJP-3.2, but has to be understood in the context of AJP-3.3.1.**

Publication	Remarks
Standing Defence Plan (SDP) 11000 "PERSISTENT EFFORT", NATO Integrated Air and Missile Defence (IAMD), 23 January 2017 (Ref. R)	**The Standing Defence Plan (SDP) details all aspects of the use of NATO forces involved in territorial operations. This is the implementing plan for GBAD forces participating in the NATINAMDS.**
AIRCOM Support Plan (SUPLAN) 24600D "Constant Effort" (NC), 17 June 2016 (Ref. S)	
AIRCOM SUPLAN 24610M "COPPER CANYON" (NR), Airspace Control Plan, 30 August 2017 (Ref. T)	**SUPLAN 24610M describes the airspace control plan for crisis operations within AIRCOM's operating area, including GBAD**

1.4 Scope

GBAD operations encompass resources performing air defence functions in the land-based forces of NATO nations. GBAD forces operate in the Defensive Counter Air (DCA) role of NATO's Joint Air Power. They consist of a mix of systems with the following capability options: Counter Rockets, Artillery and Mortars (C-RAM)[4], Very Short Range Air Defence (VSHORAD), Short Range Air Defence (SHORAD), and Medium Range Surface-to-Air Missile (MRSAM). There are other critical mission areas relevant to NATO that are considered external to GBAD, such as Ballistic Missile Defence (BMD), Theatre Ballistic Missile Defence (TBMD), Maritime (littoral) Air Defence Operations (Ref. M, Ref. N), and Air Operations. These external mission areas are of critical interest to GBAD for support (defence) purposes or interoperability needs. It is the assumption of this GBAD concept, that the concept of employment for these other mission areas, including a fully integrated and interoperable AMD capability, will be described or referenced in separate documents (e.g., Concept for NATO IAMD and NATINAMDS (Ref. E)).

The target audience for this GBAD standard is intended to be the Nations, Joint Force Commanders and Component Commanders (with special emphasis on the Land and Air Commanders). In addition, the target audience includes national contributors for guidance concerning the GBAD mission area.

[4] The seven pillars of the C-RAM mission area in NATO are 1) PREVENT, 2) DETECT, 3) WARN, 4) INTERCEPT, 5) PROTECT, 6) ATTACK, and 7) COMMAND AND CONTROL. Although pillars 2, 3, 4, and 7 are considered to be a direct part of the GBAD mission area, a fully effective C-RAM capability must integrate all seven.

CHAPTER 2 ENVIRONMENT

2. Environment

The political and information environments in which GBAD forces will operate is referenced or described in this section.

2.1 Political Environment

The political environment is described in NATO's Strategic Concept "Active Engagement, Modern Defence" (Ref. G) and the extant Political Guidance (Ref. H, Ref. I).

2.2 Information Environment

This function contributes to Shared Situation Awareness (SSA) by providing Land Battlespace Air Picture data so as to achieve a correlated Recognized Air Picture (RAP) providing integrated and complete coverage over the Land Component Area of Interest (AOI) and by informing the appropriate command levels about the current and projected status and availability of all elements of the capability (including GBAD units operating in a manoeuvre support role), and to contribute Land Battlespace-specific data to the RAP.

The Information environment also includes Intelligence sources. Appropriate intelligence is required for mission planning and situational awareness during peacetime, crisis, and conflict. As tension develops, Commanders require specific information in order to assess the enemy order of battle and determine possible courses of action.

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CHAPTER 3 OBJECTIVES

3. Objectives

The NATO end state and objectives that are specific to GBAD forces are described in this section. For more information on the NATO end state, see SDP section 1.j (Ref. R).

3.1 NATO End State

The end state is to provide and maintain a GBAD capability consisting of forces that can function together in a unified way[5], be interoperable with one another, and be interoperable within the NATO C2 infrastructure. As NATO GBAD forces will in most cases be employed as part of the NATINAMDS, the guidelines and principles that are agreed for NATINAMDS should be used to the maximum extent possible to ensure the highest amount of interoperability of these forces. NATO considers the DOTMLPFI[6] approach to be an effective means of achieving a unified operational posture. It is acknowledged that although this document is an operational level document, there are occasions where details of strategic or tactical relevance are included for clarification. The methodology is identified in Ref. U and Ref. V and can be described as follows:

3.1.1 Doctrine.

Fundamental principles by which the military forces guide their actions in support of objectives. It is authoritative but requires judgment in application (Ref. W). In practical terms, doctrine is the way NATO faces the challenge. It involves the use of high-level philosophy, fundamental principles, Integrated Air and Missile Defence Concept, tactical practices, and Tactics, Techniques, and Procedures (TTP).

3.1.2 Organization.

Structure to accomplish GBAD mission; directly provide or support warfighting capabilities; includes manpower required to operate, sustain, and reconstitute warfighting capabilities.

3.1.3 Training.

Activities that develop, maintain or improve the operational readiness of individuals or units (Ref. W). Military training is based on doctrine and/or TTP to prepare forces and/or staffs, planners, operators and tactical staff executors to respond to strategic,

[5] The term “unified way” refers to the effective use of common doctrine, organization, training, material, leadership, personnel, facilities, and interoperability (DOTMLPFI).
[6] SDP section 3.d, footnote 30 (Ref. R).

operational and tactical requirements in the execution of their assigned missions. For training of tactical staff, planners, and operators, GBAD participation in NATO, Multinational, or National exercises with Air and Missile Defence interest is required. IAMD exercises, such as Joint Project Optic Windmill (JPOW) are recommended, however, exercises with specific GBAD objectives, such as Anaconda, or dedicated GBAD objectives, such as Tobruq Legacy, are highly recommended and should be organized and conducted on at least a biennial basis.

3.1.4 Material.

All material items which satisfy identified mission and training equipment needs, including related spares, repair parts, and support equipment, necessary to equip, operate, maintain, and support military activities. These material items are part of the capability requirements that support solution sets for GBAD interoperability.

3.1.5 Leadership Development.

NATO and GBAD leadership process to prepare to face the challenge. Professional military education for the Joint Command and staff officers in leadership positions within NATO forces; Education needed to provide the knowledge required to complement the training, experience, and self-improvement to produce the most professionally competent leaders possible.

3.1.6 Personnel.

The qualified personnel available to support capabilities within approved GBAD organizations (Peace Establishment and Crisis Establishment (PE/CE)).

3.1.7 Facilities.

Elements of existing infrastructure consisting of buildings, structures, utilities, pavement or land, infrastructure/ protect life, security.

3.1.8 Interoperability.

The ability to act together coherently, effectively and efficiently to achieve Allied tactical, operational and strategic objectives (Ref. W). Interoperability comprises procedural, technical and human interoperability and is essential for all operations in which GBAD will be involved (Ref. C). All issues, enabling systems and/or forces to operate effectively together, related to interoperability and connectivity of information systems and security domains necessary for automated real-time and non-realtime information exchange: Military Standardization Requirement (MSR), Information Exchange Gateway (IEG), Information Sharing Agreements, NATO Security Accreditation Directive, and Information Security (INFOSEC) (Ref. X).

3.2 NATO GBAD Objectives

NATO objectives for GBAD are as follows:

3.2.1 Develop a Robust GBAD Capability.

Strengthen the Alliance and Partnerships through the incremental development of a robust GBAD capability.

3.2.2 Provide Early Warning.

Provide tactical early warning of GBAD threats and approaching air targets.

3.2.3 Prevent Attack.

In accordance with NAC-approved rules of engagement (ROE), support the deterrence, disruption and prevention of imminent attacks.

3.2.4 Protect NATO and Partners.

Employ GBAD capability to contribute to the deterrence of aerial threats and nullify or reduce the effectiveness of hostile air action in order to protect populations, territory and forces.

3.2.5 Prevent Fratricide.

In accordance with North Atlantic Council (NAC)-approved rules of engagement (ROE), employ the means necessary to assist with fratricide prevention and the protection of non-hostile aerial platforms.

3.2.6 Contribute to Recognized Air Picture.

Employ the means necessary to contribute to the development of a Recognized Air Picture (RAP).

3.2.7 Contribute to Airspace Management.

Contribute and adhere to effective Airspace Management.

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CHAPTER 4 POLITICAL CONSIDERATIONS

4. Political Considerations

In broad terms, this chapter covers political constraints and restraints, and the involvement of partner nations in GBAD forces.

4.1 Political Guidance

Through the Allied Command Operations (ACO) military chain of command, NATO-led forces will operate under the authority of, and be subject to the direction and political control of the NAC.

4.1.1 Political Constraints on GBAD Operations.

a. Operations will aim to avoid and minimize collateral damage.

b. Plans, procedures and measures will be open to possible support by or cooperation with International Organizations or Multinational coalitions in accordance with the Comprehensive Approach Action Plan.

c. Operations may include the participation of Partner and/or other non-NATO member nations, if approved by the NAC, in accordance with Political Military Framework for Partner Involvement in NATO-led Operations (Ref. I) and the Policy on NATO's Engagement with Third States on Ballistic Missile Defence (Ref. K).

4.1.2 Political Restraints on GBAD Operations

a. Political restraints on GBAD operations, as decided by the NAC, will be provided by SACEUR as stated in Ref. I.

b. Joint Force Commanders, the Land and Air Component Commanders, and Joint Force Air Component (JFAC) and subordinate commanders will be advised of all applicable political restraints in advance of a GBAD operation.

4.2 Contributions of Partner Nations

Taking into account national priorities and the political considerations explained above, it is the intent of this standard to involve Partner Nations and Non-NATO Operational Partners in GBAD operations. For additional information, see SDP paragraph 1.h.(5) "Friendly and Cooperating Actors" (Ref. R).

4.2.1 Contributions.

To the extent possible, Partner nations will be encouraged to contribute to the formation, equipping, training, education, and deployment of GBAD forces as per Ref. I.

4.2.2 Partner and Non-NATO.

Partner and Non-NATO nations recognized as operational partners will participate in strategy and decision-making from the planning to the execution phase of an operation.

CHAPTER 5 NATO GBAD TASKS

5. NATO GBAD Mission

GBAD tasks will be executed during Land Operations, either within the NATINAMDS area of interest or out-of-area. This chapter covers details of operating areas and mission planning.

5.1 Operating Areas

When directed by the NAC, SACEUR will conduct GBAD operations to deter, nullify or reduce the effectiveness of hostile air action in order to protect populations, territory and forces from air breathing threats. This will be done within the framework of NATINAMDS. The NAC may, on a case-by-case basis, direct GBAD forces to perform missions outside ACO's AOR.

5.2 Strategic Planning Direction/Design

This section covers strategic planning and describes operating areas. For more information, see SDP section 3.c (Ref. R).

5.2.1 Strategic Planning Assumptions.

National GBAD contributions, including units, subunits, Command and Control (C2) element(s), sensor(s), and weapon(s), or multinational GBAD Task Force (TF) organizations formed from these contributions, will be integrated into the NATO C2 structures and follow established NATO procedures.

5.2.2 Areas of Operations (AOO).

The general AOOs that are of interest to GBAD operations are described as follows:

a. **Area of Responsibility.** AOR is defined in AAP-06 as the geographical area assigned to the Supreme Allied Commander Europe (Ref. W). AORs of interest to GBAD forces will generally be located within NATO territorial space during Land Operations. AORs involving GBAD operations will be defined by SACEUR or by the affected Component Commander, as delegated. SACEUR may also task GBAD forces operating outside of this AOR (i.e., out-of-area operations), as agreed by the NAC.

b. **Area of Interest.** The AOI is a secondary area within which SACEUR may task GBAD forces to be employed. AOIs for GBAD are specific to a Commander who is planning or conducting an operation (Ref. G), and

are generally located in out-of-area locations. AOIs involving GBAD operations will be initially defined by SACEUR using NATO and national Intel inputs, until such time as the AOIs are agreed and approved by MC or the NAC.

c. **Joint Operational Area.** The JOA is a theatre-specific area of operations in which Joint GBAD forces will be employed. JOAs involving GBAD operations will be defined by SACEUR and approved by MC or NAC.

d. **Other Operational Areas.** Other operational areas will be formed and named according to operational need. In general, they will be areas of GBAD operations not otherwise covered in the above definitions for AOR, AOI, or JOA. Other operational areas involving GBAD operations will be defined by SACEUR and approved by the NAC.

e. **Theatre of Operations**. Theatre of operations is the area where an operation will take place. A theatre of operations may encompass areas of political interest as well as areas deemed to be of military importance (Ref. E).

CHAPTER 6 CONCEPT OF OPERATIONS

6. Concept of Operations

This chapter describes the composition and operational use of a GBAD TF.

6.1 Concept of Operations for GBAD

This section describes the operational context, challenges, and operating principles for GBAD operations.

6.1.1 Operational Context.

The basis of GBAD operations is to contribute to the DCA mission operating under the authority of the Air and Missile Defence Commander (AMDC) within the NATINAMDS. The Concept of Operations for this case is described in PO(2017)0134 (Ref. E).

A GBAD TF will be comprised of one or more national GBAD units, with variations allowed for formations, subunits, and components. More details on the recommended GBAD TF composition can be found in section 6.1.4.a below.

6.1.2 National Contributions.

Nations will vary in their ability to contribute to the formation of a multinational GBAD TF. Nevertheless, all capabilities must be able to operate in a unified way.

6.1.3 Operational Challenge.

The requirement for GBAD forces to operate and communicate effectively with NATO command and control relationships is paramount. At the NATO Summit in Warsaw 2016, Heads of State and Government underlined the importance of interoperability to the success of the Alliance. Although NATO nations should be allowed to use their own radios, networking solutions, internal reporting procedures, and messages, a more integrated means of conducting GBAD operations within the broader context of NATO GBAD Operations is desired and should be used. In so doing, the availability of means to connect national resources with dissimilar internal networks or reporting methods via gateways is recognized as a continuing need, as well as the possibility to more fully integrate NATO and national resources. Techniques, such as standardized means of executing unit level or component level interoperability with open architectures, will contribute to this intent.

6.1.4 Operating Principles.

NATO GBAD forces will be force generated for specific operations in a NATO approved environment and will be led either by a GBAD TF Commander (GTFC) appointed by the Lead Nation or led directly by a NATO authority, such as a Control Reporting Centre (CRC). The Lead Nation is responsible for commanding the GBAD TF, and providing common capabilities that may otherwise be lacking, such as communications networks, surveillance sensors, daily and standing tasks, mission execution orders, movement orders, food, fuel, and water.

a. **Force Contributions**. It is expected that contributing nations will participate in a multinational GBAD operation. The forces using these systems will be organized as a GBAD TF. National contributions to a GBAD TF will be task organized primarily in Units of Battalion (Bn)/Regiment (Rgt) size, however, Units may also be combined in order to form a GBAD TF Formation of Brigade (Bde)/Wing size. At any time, individual nations may opt to contribute one or more Subunits of Battery (Bty) size, or one or more components (weapons, sensors, C2 elements), rather than fully functional Units (or Formations), recognizing that all contributions are at national discretion. For reference purposes, Table 2 is provided below with a comparison of generic, Army, and Air Force GBAD organizational terms. Generic terms will be used in this paper when it is not necessary to refer to a specific service.

Generic	Army GBAD	Air Force GBAD
Formation	Brigade	Wing
Unit	Battalion or Regiment	Group
Subunit	Battery	Squadron

Table 2. Comparison of Organizational Terms

b. **Types of Forces**. GBAD forces will consist of a mix of systems operating within the following general engagement bands: C-RAM, Very Short Range Air Defence (VSHORAD), Short Range Air Defence (SHORAD), and Medium Range Surface-to-Air Missile (MRSAM). Although these bands can be roughly defined with operating ranges or altitudes, such definitions overlap and differ between nations.

Figure 3 below shows the relative positioning of GBAD engagement bands in the same airspace.

6.1.5 GBAD Operations.

GBAD forces will prepare for and conduct initial deployments to provide AD of the designated vital areas. If GBAD contributions are not being employed directly under a CRC, then one national Unit (or Formation), selected by the Lead nation, will form the nucleus of a multinational GBAD TF with its own organic Operations Centre, which is fully netted to NATINAMDS. Depending on the size and mission of the GBAD TF, a

GBAD surveillance and command network may also be formed to facilitate the availability of a common, local air picture for greater track accuracies and faster update rates. GBAD forces must be able to execute tactical road movements and to deploy rapidly over long distances by road, rail, sea, and air in response to shifting AD priorities. A GBAD TF normally provides 360-degree air cover; however, tactical factors may allow weighted coverage. After Transfer of Authority (TOA), Weapon Engagement Zones (WEZ) can be established for the weapon systems that comprise the GBAD TF.

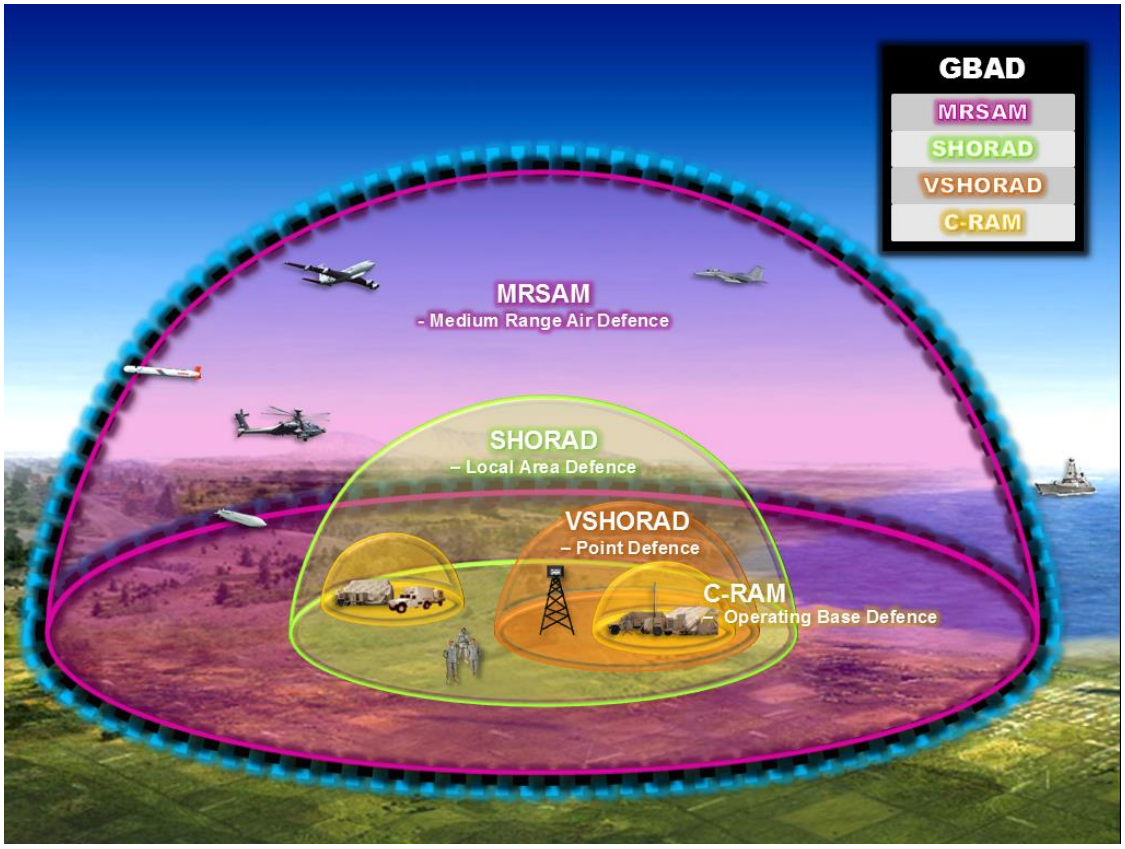

Figure 2. Comparison of GBAD Engagement Bands

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CHAPTER 7 EXECUTION

7. Execution

Chapter 7 explains mission execution, objectives, and threat elements that apply to the Air Commander for consideration of the use of GBAD forces.

7.1 Mission and Objectives for the Air Commander

The Component Commander's mission and intent are explained in this section.

7.1.1 Component Commander’s Mission.

The mission of GBAD contributes to deterrence, surveillance, or protection of forces and High Value Assets (HVA) from aerial attack, tactical missile attack and surveillance. GBAD contributes unique capabilities to both theatre counter-air, cruise missile defence, and C-RAM operations. The theatre objectives of GBAD are to preserve combat power, gain the initiative, and support offensive operations. GBAD systems are capable of sustaining these missions for longer periods of time, requiring less infrastructure and fewer resources than alternative systems, e.g., fighters and air infrastructure.

7.1.2 Component Commander’s Intent.

Air Component Commander’s intent is to ensure any attacks through the airspace medium are met with sufficient force to prevent unacceptable damage to NATO’s vital assets.

7.2 Threat Elements

Both threats and friendly platforms (Fixed Wing, Rotary Wing, Unmanned Aerial Vehicles (UAVs), Remotely Piloted Aircraft (RPA), etc.) will operate in the same airspace. All need to be identified and tracked for mission tasking and fratricide avoidance purposes.

7.2.1 Threats Relevant to GBAD Forces.

Taking considerations of friendly air surveillance into account, GBAD forces will be constituted to defeat a large number of aerial threats, including but not limited to the threats that are listed below. These are not presented in priority order. Specific operations will use different priorities according to theatre requirements:

a. Rockets, Artillery, Mortars (RAM)

b. Cruise Missiles (CM)
c. UAV/RPA[7], including Low, Slow, and Small (LSS)[8] threats
d. Fixed Wing (FW)
e. Rotary Wing (RW)
f. Air-to-Ground Missiles (AGM)
g. Precision Guided Munitions (PGM)[9]
h. Lighter than Air Platforms[10]

Threat assessments are made in cooperation with participating nations prior to a NATO military operation. At that time, specific threats are identified. This is normally documented in the Operations Order (OPORDER).

[7] UAV – includes both lethal and non-lethal UAVs. UAV and RPA are essentially the same threat (Ref. D), but some UAVs follow a predetermined flight path without any remote pilot (Ref. W).
[8] LSS – Class I (< 150 kg) micro, mini, and small UAVs (Ref. Y, Table 3-5-1).
[9] PGM – Includes but is not limited to Television (TV) guided, laser guided, Global Positioning System (GPS) guided, or loiter munitions. In general, these are gravity guided munitions that take advantage of additional guidance means for improved trajectories.
[10] Lighter than Air Platforms are free-flight or tethered dirigibles or balloons that generally have a surveillance or communication relay mission.

CHAPTER 8 GBAD TF REQUIREMENTS

8. GBAD TF Requirements

The basic requirements for NATO GBAD forces working under the NATINAMDS are described in the NATO Minimum Capability Requirements (MCR) and implemented through the NDPP process (Ref. NN). Specific requirements for GBAD forces working outside of the NATINAMDS environment should be harmonized with them as much as possible.

8.1 Operational Requirements for a GBAD TF.

The main operational requirements on GBAD forces concern manning, equipment, and a liaison element. Details on these categories follow. All of the following categories are based on ACO Force Standards.

8.1.1 Manning.

GBAD forces must be:

a. fully manned with trained personnel in line with national regulation,

b. able to conduct sustained operations.

8.1.2 Equipment.

GBAD Forces must be properly equipped and capable of meeting ACO Force Standards, Defence Planning and Consultation System (DPCS), or a Combined Joint Statement of Requirements (CJSOR). Applying to both peacetime and crisis, GBAD forces must meet ACO standards for preparedness and readiness for protection of manoeuvre forces and high value assets.

8.1.3 Liaison Element.

a. **GBAD in manoeuvre force protection roles.** If GBAD Forces are tasked to protect a manoeuvre force, a unit-level liaison element must be provided with appropriate communications to the supported manoeuvre force HQ to maintain seamless interoperability.

b. **GBAD in point defence or fixed site protection roles.** For fixed site protection, the GBAD forces must provide a liaison element to the site Commander.

c. **GBAD in theatres with Air Operations.** If GBAD is tasked to operate in a theatre where allied air bases are deployed and air operations with special emphasis on Air Power Contribution to Land Operations are being executed, a liaison element to the appropriate “Air Execution” – level must be provided for deconfliction (Air – Surface Integration).

8.2 NATO Interoperability Requirements

Interoperability requirements for GBAD forces in NATO involve C2 and coordination responsibilities, as described in this section.

8.2.1 NATO C2 Interoperability.

a. **NATINAMDS.** Each GBAD TF assigned a NATO territorial or out-of-area defence mission, should be capable of being fully integrated into NATINAMDS at all levels of command. The responsibility for ensuring full integration with NATINAMDS belongs to the lead nation of the GBAD TF. For more information on NATINAMDS, see Ref. E.

b. **ATC.** Units in Airbase defence role must be capable of exchanging information with the local Air Traffic Control (ATC) and the Base Operations Centre, reflecting real time relevant air traffic-data, including abnormalities such as defector aircraft.

c. **Defence of BMD/TBMD Resources.** A GBAD TF may be given a mission to protect high value BMD or TBMD resources from aerial threats and to support local surveillance needs. The GBAD TF must be interoperable with defended BMD or TBMD resources, using the means specified in Annex B, as well as NATO tasking authorities.

d. **Provision of capabilities.** Pending agreement on Allied responsibility for a specific operation, the provision of sensor, military communications and similar control facilities, as well as the funding and manning of these facilities, will be provided by contributing nations, and performed in coordination with the lead nation and GBAD TF Commander, as appropriate. As new equipment is introduced, great care must be exercised to ensure that they are in line with the requirements of the overall system now in existence, under development or planned. GBAD TF connections with the Deployable Air Command and Control Centre (DACCC) will be manned primarily by the Nation in whose territory they are located unless circumstances dictate otherwise, and then only after approval of the Nations concerned. It must also be ensured these C2 entities are adequately equipped to assume all their dedicated functions if the situation requires (e.g. sustained “Designated Air Control Centre – Recognized Air Picture Production Centre – Sensor Fusion Post (ARS)” in case of a Combined Air Operations Centre (CAOC) outage).

8.2.2 Coordination of Requirements.

The C2 structure and subsequent apportionment of responsibilities provides the framework for any military operation (Ref. F, Ref. Z, Ref. AA). The structure of ACO is shown in Figure 3. Commanders at each level have the inherent responsibility for the planning and execution of GBAD as directed.

a. **Strategic Commander.** SACEUR is responsible for the overall planning, direction, command and conduct of all Alliance military operations and activities, as directed by the NAC. These responsibilities include the coordination of multinational support, the designation and reinforcement of supported and supporting commanders and also the provision of guidelines for training and evaluating military capabilities. Resources will have to be dedicated to the mission. Because of the scarcity of suitable assets and capabilities, it will be of strategic importance to properly prioritize them, based on threat assessment and Intelligence Preparation of the Battlespace (IPB). SACEUR is responsible for the designation of the AMDC to direct and conduct the Air Defence mission at the appropriate level. This may include Ballistic Missile Defence, Active Air Defence and GBAD. SACEUR orders the GBAD force generation process, approves operational defence designs, delegates Engagement Authority where the capability exists within the limits of ROE to the AMDC as the situation requires, and generates and disseminates strategic intelligence in order to initiate or raise readiness states.

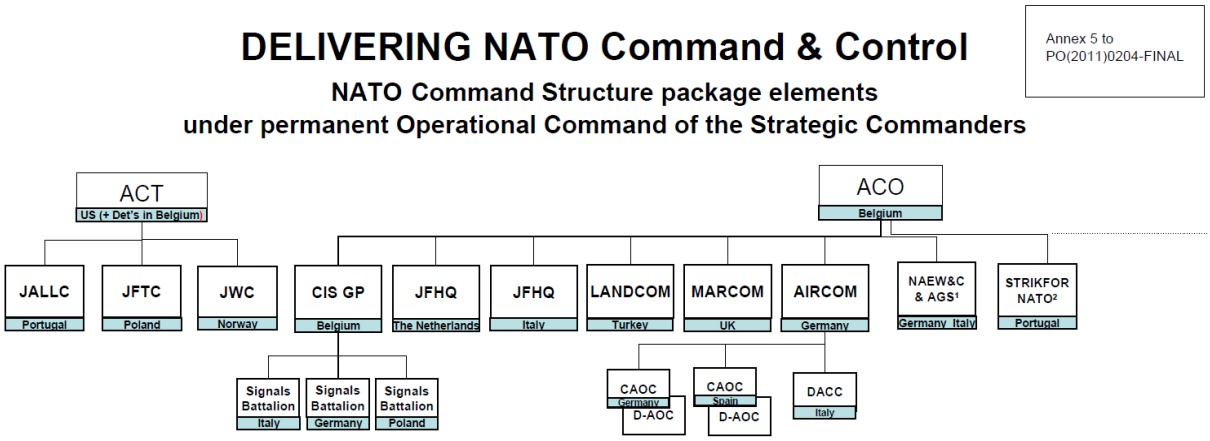

Figure 3. NATO Military Command Structure

b. **Joint Force Commander.** The JFC is to support planning for the development and sustainment of SACEUR's overall GBAD effort and to be prepared to conduct Joint Operational Planning to support Consequence Management response as directed by SACEUR, in coordination with Supreme Headquarters Allied Powers Europe

(SHAPE), Senior Emergency Civil Planning Committee, and National military and civil elements. The JFC has to be prepared to command a Joint Operation in a post-attack environment and to employ GBAD capabilities in Non-Article 5 Crisis Response Operations (NA5CRO). JFC should develop the Joint Prioritized Defended Asset List (JPDAL) as required / tasked and provide advice on and participate in a robust joint training and exercise programme to ensure GBAD mission effectiveness. The JFC must ensure that adequate subject matter expertise and manpower exist in the area of GBAD and within the peacetime establishment of his command. When properly equipped, this manpower will provide the commander with the requisite capability and situational awareness to effectively execute his responsibilities, as directed by SACEUR.

c. **Commander Air Component.** COM AIRCOM is normally the AMDC, however, in certain operations, the function of AMDC may be delegated. Once designated by SACEUR, the AMDC will be responsible for the planning and execution of all GBAD Operations. AMDC is to: conduct IPB, develop the GBAD Defence Design, generate Pre-Planned Response measures for the GBAD mission area, implement approved Defence Design and ROE, be prepared to assume Engagement Authority if delegated by SACEUR and further delegate to appropriate effector level, order Readiness States (RS) for assigned GBAD forces, operate Battle Management Command, Control, Communications and Intelligence (BMC3I) systems. The AMDC has to coordinate with national/ Non-GBAD forces to support the GBAD mission if applicable, define deployment requirements, to provide early warning of attack and to advise on participation in a robust training and exercise programme to ensure GBAD mission effectiveness. The designated AMDC has overall coordinating authority for planning and executing all TBMD and GBAD operations in cooperation with other Component Commanders, including a Combined Joint Special Operations Task Force (CJSOTF), and with the forces of partner nations as appropriate. JFAC assumes the appropriate level of command and control necessary to complete the mission as directed by the AMDC for TBMD and GBAD operations.

d. **Commander Land Component.** The Commander Land Component may be assigned one or more Sector Commanders, which may include a GTFC (especially if he has GBAD assets organic to his component) (Ref. O, article 2.2.2.2; Ref. W). C2 responsibilities must be well understood, particularly if intensive manoeuvre warfare is likely and the Land Component Commander's GBAD assets may move into or be spread across several sectors. COM LANDCOM, based on operational need, will also perform the following GBAD functions:

(1) **Direction Functions**

(a) Delegating, as appropriate, specified functions to local units,

(b) Establishing air surveillance zones for local units,

(c) Broadcasting the air picture to local units on a local AD coordination net.

(2) **Coordination Functions**

(a) Correlating and evaluating reports from local units and, where appropriate, relaying this information to his superior AMDC on the relevant AD coordination net;

(b) Issuing local AD threat warnings. If the local threat warrants a higher warning than that which is in effect beyond his allocated area, the GTFC is to keep his superior AMDC informed;

(c) Passing pertinent information to assigned units regarding weapon engagement zones, weapon control orders and safety sectors, and targets which have been designated to sector/force AD weapon systems.

(3) **Control Function.** Controlling the local AD coordination net.

e. **Supporting Relationships.** The Supporting Maritime/ Land Commander is responsible for: supporting AMDC planning with respect to employment of (maritime and land) forces for the development and sustainment of the overall MD mission, deploying TBMD units, coordinating the deployment (pending strategic Indications and Warnings (I&W) with the AMDC responsible for TBMD, planning for and contributing to the execution of Intelligence, Surveillance and Reconnaissance (ISR), monitoring Shared Early Warning (SEW) information and warning/ informing/ advising (maritime and land) units with regard to Force Protection and Consequence Management, preparing to provide or support deployed BMC3I for TBMD in NA5CRO (deployed forces out of region), and providing advice on participation in a robust joint training and exercise programme to ensure GBAD mission effectiveness.

f. **GBAD TF Commander.** The AMDC will assign tasks and specify the level of control for the GTFC based on the assets that have been made available. On behalf of all contributing units to a GBAD TF, the GTFC will be the main Joint advisor to the AMDC regarding operations within the scope of his own GBAD TF mission, specifically with regard to planning aspects. When required, a liaison element from each GBAD TF Headquarters (HQ) will participate in the JFC's Joint Defended Asset

Working Group (JDAWG) during initiation and update of the JPDAL (Ref. O). The GTFC must ascertain the level of capability of the TF as soon as he is aware of his order of battle (ORBAT). This assessment must go beyond the performance quoted by manufacturers. It should entail an understanding of the levels of readiness, serviceability, training, sustainability, persistence and the degree of integration attainable across the grouping by each force element. Once this assessment has been conducted, the GTFC is in a position to declare the level of capability his TF possesses to the AMDC[11]. The assessment must also mutually confirm what is understood by the declared command status for each element, including any political caveats applied by the governments of contributing nations. This will contribute to the development of the AMDC's plan and delegations matrix. On this basis the AMDC will then assign tasks and the level of control to the GTFC. The use of Tactical Battle-Management Functions (TBMF) could be one such dynamic mechanism to achieve the latter. If the operations area is large, there may be a requirement for the AMDC to create separate areas in accordance with Ref. P.

[11] This declaration may be accomplished by OWNSITREP, unit SAWREP, voice, courier, or other means as required.

CHAPTER 9 RULES OF ENGAGEMENT

9. Rules of Engagement

Rules of engagement (ROE) concern the use of force, self-defence, targeting, firing doctrine, and force protection. NATO doctrine for ROE, and general guidance in relation to ROE, is set out in MC 0362/1 "NATO Rules of Engagement" (Ref. BB). Specific ROE for missions outside of NATINAMDS will have to be decided and agreed by the NAC on a case-by-case basis.

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CHAPTER 10 AIRSPACE MANAGEMENT

10. Airspace Management

Airspace Management is a Joint issue which concerns coordination of activity that must occur in the common airspace. This issue affects the GBAD TF, as well as forces performing TBMD, Air Operations (e.g., Close Air Support), and Land Operations (e.g., Logistics, Medical, Special Forces, and Indirect Fire Systems (IFS)). Further guidance for Airspace Management is provided in SUPLAN D (Ref. S), SUPLAN M (Ref. T), and AJP-3.3.5 (Ref. Q). In out-of-area operations, where Air Space Management procedures are not clear, GBAD TF will adjust to specific circumstances with adherence to the aforementioned sources to the degree possible.

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CHAPTER 11 COMMUNICATIONS AND INFORMATION

11. Communications and Information

This chapter identifies the need for a mission network and a planning network, as well as integration of national contributions, when needed.

11.1 Mission Network.

Integration of dissimilar GBAD forces requires a commonly managed surveillance network, commonly managed communications network(s), and commonly managed servers, all of which are not normally available. It is desired that these functions be provided by NATO, however, if not, then the Lead Nation, acting through and in support of the GTFC, is responsible for providing the communications infrastructure needed to perform the mission.

11.2 Planning Network.

NATO and national GBAD, Air Operations (AO), BMD, and TBMD forces are separately resourced and organized, but can have overlapping missions. A more complete means of integrating these forces for mission purposes, coordination, and mutual protection is needed. When directly tasked by NATO, the GBAD TF Commander will connect into the point of presence that has been designated by the NATO Commander for interoperability to the NATO General Purpose Communications System (NGCS) at the Air Command and Control System (ACCS) level. Without connections like this, the GBAD TF Commander must receive planning and tasking information manually (i.e., fax, courier, voice, paper). When operating independently of NATO, the GBAD TF Commander must provide a connection means into forces performing AO, BMD, TBMD functions, as required.

11.3 Integration and National Contributions.

Not all nations operating in the NATO environment are able to maintain a complete Air Defence package, including Command and Control (C2) nodes, sensor networks, and weapons platforms, suggesting the need for a high level of integration across national boundaries when gateway solutions are inadequate. The utility of national contributing abilities will be directly related to the degree of interoperability (Annex B) that is able to be achieved.

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ANNEX A NATO CRISIS RESPONSE MEASURES (CRM)

NATO CRM are described in the extant NATO Crisis Response System Manual (NCRSM) (Ref. CC). An example of a CRM Implementation Plan depicting the measure "Use of GBAD Units by NATO" is provided below:

1. USE OF GBAD UNITS BY NATO:

ABC	**ABC**
Implementation of Plans for the Use of GBAD Units by NATO Forces	
AIM: To co-ordinate and implement plans for the use of GBAD Units by NATO forces.	
REMARK: The situation will dictate the need to deploy NATO forces to pre-designated units.	
RELEASABILITY:	This measure is NOT releasable to non-NATO nations.
AUTHORISATION REQUIREMENT:	In accordance with Chapter X of the NCRS manual.
RELEVANT ACTIONS: (example) **1. NATIONAL AUTHORITIES:** a. Take actions to correct deficiencies found and report on the status of GBAD unit preparedness to SHAPE and other appropriate NATO commanders. b. Execute plans to ensure that NATO airfields are operationally usable and sustainable. **2. SACEUR is to direct appropriate action for AMDC:** a. Co-ordinate preparations for pre-stocking, manning, maintenance and repair of all NATO GBAD units located within their command area. b. Report deficiencies in GBAD units preparedness to SHAPE as necessary.	

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ANNEX B INTEROPERABILITY CONCEPT

1. **Introduction.** The preferred interoperability concept for NATO GBAD operations will seek the highest level(s) of interoperability practical for engagement and force operations. Interoperability levels are identified as degrees of interoperability in the NATO C3 Systems Interoperability Directive, and are summarized:

    a. **Degree 0** – Isolated Interoperability in a Manual Environment. The key feature of Degree 0 is human intervention to provide interoperability where systems are isolated from each other.

    b. **Degree 1** – Connected Interoperability in a Peer-to-Peer Environment. The key feature of Degree 1 is physical connectivity providing direct interaction between systems.

    c. **Degree 2** – Functional Interoperability in a Distributed Environment. The key feature of Degree 2 is the ability of independent applications to exchange and use independent data components in a direct or distributed manner among systems.

    d. **Degree 3** – Domain Interoperability in an Integrated Environment. The key feature of Degree 3 is a domain perspective that includes domain data models and procedures where data is shared among the independent applications which may begin to work together in an integrated fashion.

    e. **Degree 4** – Enterprise Interoperability in a Universal Environment. The key feature of Degree 4 is a top-level perspective that includes enterprise data models and procedures, where data is seamlessly shared among the applications that work together across domains in a universal access environment.

2. **Contributing to GBAD.** Nations will generally seek Degrees 2 or 3, especially for engagement operations where events need to occur in short time spans (seconds, milliseconds). Degrees 0 or 1 are difficult interoperability levels to use for engagement operations, where guaranteed channel access and guaranteed speed of service are hard requirements. For force operations data exchanges with longer time spans (minutes, hours), guaranteed speed of service is not a hard requirement. Guaranteed delivery is a requirement, but with the slower time spans, there is more flexibility to operate in a switched network, with variable delays. In these cases, although Degrees 2 or 3 are advised and achievable within limits, Degrees 0 or 1 can be acceptable alternatives.

3. **Aim**. The ultimate objective to achieve Degree 4 interoperability, wherever this is possible and practical, but such a goal requires a high level of integration and

coordination on a universal or enterprise scale. It may be possible, for example, to build towards Degree 4 after the efforts of two or three nations have paved the way. Given the similarities between the AO, Theatre Missile Defence (TMD), and GBAD mission areas, Degree 4 would be a worthwhile long range objective for a broad community of users such as these, with related interests. Until such time as Degree 4 can be implemented on a universal scale, Degree 3 (Domain Level) would be sufficient.

4. **GBAD Operations within the NATINAMDS Architecture.** A GBAD TF operating within the NATO territorial landmass under NATO authority or in support of NATO, must be capable of operating effectively within the NATINAMDS architecture. Details are provided in Ref. E. In addition, there are specific roles that have been established for the NATINAMDS and the Air Defence Commander when working with NATINAMDS. They can be generally explained as follows:

   a. **NATINAMDS.** The role of NATO Air Defence (AD) in peacetime, crisis or times of conflict, is to provide a continuous responsive posture that contributes to the desired level of control of the air for NATO to conduct the full range of its missions at the right time without prohibitive interference. To advance this cause, the NATO Integrated Air Defence System (NATINADS) has been a cornerstone of the defensive posture of the Alliance since its inception in 1961 and it has contributed to NATO's core tasks of Collective Defence, Crisis Management and Cooperative Security. This historic role will be continued by the NATINAMDS.

   b. **AMDCs.** Concerning requirements for working within NATINAMDS, National AMDCs are responsible for:

      (1) determining, in coordination with SACEUR, the air defence units and facilities which will be assigned to SACEUR. The provision of national force contributions will follow the already established procedures (i.e. SACEUR will continue to make his recommendations to the Military Committee (MC)), but the decision on the size and composition of the forces to be provided and their equipment will remain a national responsibility;

      (2) determining, upon recommendation of AMDC, the air defence units organic to assigned land forces which would be deployed and operational in peacetime;

      (3) the logistic support of the units;

      (4) the administration and discipline of personnel assigned to multinational organization;

      (5) the local protection of certain multinational installations and facilities located within the country concerned;

(6) the adequate education and training to include NATO-led training and exercises, of personnel in preparation of their employment in IAMD related functions.

5. **Interoperability Means.** The following paragraphs discuss, for further consideration, interoperability from three perspectives: 1) Engagement Operations, 2) Force Operations, and 3) Future Standards. In each of these discussions, a voice coordination means to support the primary mission and planning networks is assumed and is an important requirement for interoperability, but is not otherwise detailed.

   a. **Engagement Operations**. In general, engagement operations are the realtime reporting activities, such as surveillance or engagement control, that directly support GBAD engagements.

      (1) **Connection Means**. Given that GBAD as a mission area clearly has Joint interest, it is critical to maintain interoperability with Air Operations, BMD, TBMD, and Maritime (littoral) forces for the realtime tracking of aerial threats and friendly aircraft. The preferred means for this is Link 16 via the Multifunctional Information Distribution Systems (MIDS). MIDS-based Link 16 is the preferred NATO means for air-to-air and air-to-ground interoperability in the general mission area of Air Defence (including GBAD) and Missile Defence (i.e., BMD and TBMD). However, although Link 16 is also preferred for ground-to-ground means, the use of MIDS-based Link 16 is a more difficult and expensive choice for Land Based units, who need guaranteed channel access, higher track qualities, and when operating on isolated networks, faster update rates[12].

      (2) **Connection Issues.** There is already tight competition for time slots on Link 16 networks. Moreover, the connection ranges are much smaller in ground clutter, since MIDS operates in the lower Ultra High Frequency (UHF) range. Ground-to-ground MIDS thus requires close positioning of ground units, or the use of relays which comes with its own timeslot penalty. There are ways to mitigate these issues directly. The chief way is to employ Joint Range Extension Application Protocol (JREAP) for ground-to-ground data exchange requirements involving the Link 16 message standard. JREAP was designed for long range extension of MIDS networks, as can be seen in STANAG 5518/Allied Tactical Data Link Publication (ATDLP)-5.18 (Ref. EE). The three Appendices to this standard show how to exchange Link 16 messages on different types of networks, such as satellite, HF, or Transport Control Protocol /Internet Protocol (TCP/IP) over Local Area Network (LAN). Virtually all GBAD

[12] Faster update rates (up to 1 second) are required when tracking or engaging targets in the low level area (Ref. DD, Annex A, para. 4).

systems of recent vintage have built-in TCP/IP over Ethernet already packaged for a tactical application. For all these reasons, JREAP-C is directly applicable to a GBAD user, for ground-to-ground networks where the use of, and access to, MIDS/Link 16 is problematic. In such cases, faster update rates can be employed without adversely impacting Link 16 networks.

(3) **Alternate Connection Means.** There are also several other standards currently in use, which show promise as alternatives for specific applications or when MIDS/Link 16 is not available, especially if older systems will need to connect into GBAD terrestrial networks. The Low Level Air Picture Interface (LLAPI) is now standardized in STANAG 4312 Part II, (Ref. DD) and is available in the SHORAD C2 systems of several NATO nations. LLAPI is an effective means for exchanging a simplified (local) air picture inexpensively between adjacent allied units that are operating in an informing relationship, and isolated from MIDS/Link 16 (Ref. DD para. 9, pg. 3). Link 1, Link 11 and Link 11B are Joint tactical data links currently in use. Each is defined in a NATO ATDLP. Recognizing that LLAPI and Link 1 do not include C2 functions, these data links can be helpful for engagement operations in general, especially where MIDS/Link 16 options are not available to one or more users.

(4) **Reporting Means**. Taking the Link 16 specification (STANAG 5516/ATDLP-5.16) (Ref. FF) as the requirements guide, the primary technical functions that are of interest to GBAD applications are Air Surveillance, Weapons Unit, and Command. Beyond these, there are also mandatory functions or messages in both STANAG 5516/ATDLP-5.16 and STANAG 5518/ATDLP-5.18 that are required for data link operations. The technical and mandatory functions both have specific requirements for message exchange, which are a matter of record and are not detailed here. For more details on information exchange requirements and messaging, the reader is invited to consult ATDLP-5.16 (Ref. FF), ATDLP-5.18 (Ref. EE), and the “Final Report of NIAG SG.124 Study on Ground Based Air Defence (GBAD) Integration and Interoperability with NATO Deployable Assets” (Ref. Y).

b. **Force Operations**. In general, force operations are the non-realtime reporting activities that support the force. Examples include coverage missions/reports, air control/air tasking orders, movements, and situation/ status reporting. If these reporting activities can be automated, this is preferable, but not all systems will have the capability to process the required messages. In those cases, manual means can be employed, such as fax, courier, voice, or email attachments.

(1) **Connection Means**. The best expectation for a non-realtime connection means appears to be a secure, IP-based tactical network. Within the NATO infrastructure, this is called the NGCS, and it supports systems at the NATO tactical level and above. For fixed site connections, landline into the national system is recommended. For deployed systems, the connections will be temporary landlines wherever possible, otherwise, secure satellite communications may be needed. This suggests the need for a gateway or boundary protection device, such as that which is recommended in Chapter 7 of the "NATO C3 System Interoperability Directive" (Ref. GG). National, secure, IP-based networks should be used wherever possible, with a NATO-to-National gateway situated in a centrally located secure facility, or a deployable NATO Point-of-Presence (PoP) under the protection of a secure physical perimeter. The PoP would support connectivity into the NGCS (on the NATO side), or into the secure network infrastructure on the national side.

(2) **Reporting Means**. The primary messaging standard that supports the force operations function at the tactical level is the group of messages that is collectively referred to as Message Text Formats (MTF). NATO MTF standards are defined in two standards pairs: STANAG 5500/ADatP-3(A) (Ref. HH, Ref. II) and STANAG 7149/Allied Procedural Publication (APP)-11(C) (Ref. JJ, Ref. KK). Development of specific operational and interoperability guidelines for the use of APP-11/ADatP-3 MTFs by GBAD forces to support force operations at the tactical level is an issue that requires validation by the GBAD TF Commander prior to deployment. Recent ADatP-3 baselines contain a version of the specification that has been converted into an eXtensible Markup Language (XML) schema. This is referred to as XML-MTF. The messages in these standards are organized according to communities of interest by a sponsoring NATO organization (e.g., Land Operations Working Group (LOWG), Air Operations Working Group (AOWG), etc.). Information exchange requirements (IER) for the GBAD community were defined for SHORAD in STANAG 4312 Part I (Ref. LL). The SHORAD IERs were then converted into MTFs and have been promulgated in ADatP-3, since Version 10. IERs unique to systems operating in MRSAM engagement band were never developed for NATO standardization, yet it is still possible to employ ADatP-3 for a GBAD task, by using the MTFs that have crossover functionality. Development of specific operational and interoperability guidelines for the use of APP-11/ADatP-3 MTFs by GBAD forces to support force operations at the tactical level is an issue that

requires validation by the GBAD TF Commander prior to deployment.

c. **Future Standards**. For future engagement operations standards, adherence to the NATO Bi-Strategic Commanders (Bi-SC) Data Link Management Strategy (DLMS) is recommended. NATO has established the DLMS (Ref. MM), which, amongst other things, aims to:

(1) establish a common message format,

(2) reduce interfaces between TDLs, and

(3) improve automated management of the links to reduce duplication of information being passed.

For future force operations standards, with the expanded availability of web services for tactical use, it is likely that XML schema standards may be employed with enhanced web service mechanisms, such as brokered publish and subscribe. In order to use these emerging, net-enabled capabilities to their full extent, they should be integrated into the preferred existing standard, which is APP-11 (Ref. JJ, Ref. KK). To provide the desired interoperability, only one NATO standard should be developed and maintained for future data exchange. Recognizing that APP-11 is currently in use as a NATO standard, it is preferred for growth capability to implement future requirements.

ANNEX C ACRONYMS

Acronym	Expansion
AAP	Allied Administrative Publication
ACCS	Air Command and Control System
ACO	Allied Command Operations
AD	Air Defence
ADatP-3	Allied Data Processing Publication - 3
AGM	Air-to-Ground Missiles
AIRCOM	Air Command
AJP	Allied Joint Publication
AMD	Air and Missile Defence
AMDC	Air and Missile Defence Commander
AO	Air Operations
AOI	Area of Interest
AOO	Area of Operations
AOR	Area of Responsibility
AOWG	Air Operations Working Group
APP	Allied Procedural Publication
ARS	**A**ir Control Centre, **R**ecognized Air Picture Production Centre, **S**ensor Fusion Post
ATC	Air Traffic Control
ATDLP	Allied Tactical Data Link Publication
ATP	Allied Tactical Publication
Bi-SC	Bi-Strategic Commanders
BMD	Ballistic Missile Defence
BMC3I	Battle Management, Command, Control, Communications and Intelligence
Bde	Brigade
Bn	Battalion
Bty	Battery
C2	Command and Control
C3	Command, Control and Communications
CAOC	Combined Air Operations Centre
CJSOR	Combined Joint Statement of Requirements

Acronym	Expansion
CJSOTF	Combined Joint Special Operations Task force
CM	Cruise Missile
COM	Commander
CRC	Control and Reporting Centre
CRM	Crisis Response Measures
C-RAM	Counter Rockets, Artillery, and Mortars
DACCC	Deployable Air Command and Control Centre
DCA	Defensive Counter Air
DLMS	Data Link Management Strategy
DOTMLPFI	Doctrine, Organization, Training, Material, Leadership, Personnel, Facilities, and Interoperability
DPCS	Defence Planning and Consultation System
FW	Fixed Wing
GBAD	Ground-Based Air Defence
GPS	Global Positioning System
GTFC	GBAD Task Force Commander
HF	High Frequency
HQ	Headquarters
HVA	High Value Asset
I&W	Indications and Warnings
IAMD	Integrated Air Missile Defence
IEG	Information Exchange Gateway
IER	Information Exchange Requirement
IFS	Indirect Fire Systems
INFOSEC	Information Security
IP	Internet Protocol
IPB	Intelligence Preparation of the Battlespace
ISR	Intelligence, Surveillance and Reconnaissance
JDAWG	Joint Defended Asset Working Group
JFAC	Joint Force Air Component
JFC	Joint Force Commander
JOA	Joint Operational Area
JPDAL	Joint Prioritized Defended Asset List
JPOW	Joint Project Optic Windmill
JREAP	Joint Range Extension Application Protocol
LAN	Local Area Network

Acronym	Expansion
LANDCOM	Land Component
LLAPI	Low Level Air Picture Interface
LOWG	Land Operations Working Group
LSS	Low, Slow and Small
LTUAF	Lithuanian Air Force
MC	Military Committee
MCLSB	Military Committee Land Standardization Board
MCR	Minimum Capability Requirements
MD	Missile Defence
MIDS	Multifunctional Information Distribution System
MRSAM	Medium Range Surface-to-Air Missile
MSR	Military Standardization Requirement
MTF	Message Text Format
NA5CRO	Non-Article 5 Crisis Response Operation
NAC	North Atlantic Council
NATINADS	NATO Integrated Air Defence System
NATINAMD	NATO Integrated Air and Missile Defence
NATINAMDS	NATO Integrated Air Defence System
NATO	North Atlantic Treaty Organization
NCRS	NATO Crisis Response System
NCRSM	NCRS Manual
NGCS	NATO General Purpose Communications System
NR	NATO RESTRICTED
NS	NATO SECRET
NU	NATO UNCLASSIFIED
NSO	NATO Standardization Office
OPCON	Operational Control
OPORDER	Operations Order
ORBAT	Order of Battle
OWNSITREP	Own Land Forces Situation Report
PE/CE	Peace Establishment and Crisis Establishment
PGM	Precision Guided Munitions
PoP	Point of Presence
RAM	Rocket, Artillery, and Mortar
RAP	Recognized Air Picture
Rgt	Regiment

Acronym	Expansion
ROE	Rules of Engagement
RPA	Remotely Piloted Aircraft
RS	Readiness State
RW	Rotary Wing
SACEUR	Supreme Allied Commander Europe
SAWREP	Surface-to-Air Weapon Unit Status and Availability Report
SBAMD	Surface Based Air and Missile Defence
SDP	Standing Defence Plan
SEW	Shared Early Warning
SHAPE	Supreme Headquarters Allied Powers Europe
SHORAD	Short Range Air Defence
SSA	Shared Situation Awareness
STANAG	Standardization Agreement
SUPLAN	Support Plan
TBMD	Theatre Ballistic Missile Defence
TBMF	Tactical Battle Management Functions
TCP/IP	Transport Control Protocol/Internet Protocol
TDL	Tactical Data Link
TF	Task Force
TMD	Theatre Missile Defence
TOA	Transfer of Authority
TTP	Tactics, Techniques, and Procedures
TV	Television
UAV	Unmanned Aerial Vehicle
UHF	Ultra-high Frequency
VSHORAD	Very Short Range Air Defence
WEZ	Weapon Engagement Zone
XML	eXtensible Markup Language

ANNEX D REFERENCES

A. MC 0133/4-Final, NATO's Operations Planning, 7 January 2011

B. MC 0053/3, (Final) (Revised) Terms of Reference for the Supreme Allied Commander Europe (NR), 1 October 2014

C. C-M(2016)0014, NATO Integrated Air and Missile Defence Policy, 14 March 2016

D. AAP-15(2016), NATO Glossary of Abbreviations Used in NATO Documents and Publications, 24 May 2016

E. PO(2017)0134(INV)-AS1, Concept for NATO Integrated Air and Missile Defence and NATO Integrated Air and Missile Defence System, 24 March 2017

F. MC 0400/3 (3rd revised/Final), MC Guidance for the Military Implementation of NATO's Strategic Concept, IMS Control Nr: 017003305, 30 June 2017

G. PO(2010)0169, The Alliance's Strategic Concept, Active Engagement Modern Defence (NU), 19 November 2010

H. PO(2015)0580, Political Guidance (NR), 16 October 2015

I. PO(2011)0141, Political Military Framework for Partner Involvement in NATO-led Operations, 13 April 2011

J. MC 0586-Final, MC Policy for Allied Forces and their use for Operations, 9 August 2012

K. PO(2012)0161, Policy on NATO's Engagement with Third States on Ballistic Missile Defence, 16 April 2012

L. AJP-3(B), Allied Joint Doctrine for the Conduct of Operations

M. AJP-3.1(A), Allied Joint Doctrine for Maritime Operations

N. AJP-3.2(A), Allied Joint Doctrine for Land Operations

O. AJP-3.3(B), Allied Joint Doctrine for Air and Space Operations

P. AJP-3.3.1(B), Allied Joint Doctrine for Counter-Air Operations

Q. AJP-3.3.5(B), Allied Joint Doctrine for Airspace Control

R. PO(2017)0019(INV), Update of SACEUR's Standing Defence Plan PERSISTENT EFFORT 11000 for NATO's Integrated Air and Missile Defence (IAMD), 23 January 2017

S. AIRCOM SUPLAN 24600D "Constant Effort" (NC), 17 June 2016

T. AIRCOM SUPLAN 24610M "COPPER CANYON" (NR), Airspace Control Plan, 30 August 2017

U. AC/322-D(2007)0048, NATO Architecture Framework, Annex 1, Version 3 (NU), November 2007

V. Joint Capabilities Integration Development System (JCIDS) instruction 3170.01I, 23 January 2015

W. AAP-6, NATO Glossary of Terms and Definitions (NU)

X. AC/322-D/0048, NATO INFOSEC Technical and Implementation Directive on Computer and Local Area Network (LAN) Security, 29 April 2002

Y. "Final Report of NIAG SG.124 Study on Ground Based Air Defence (GBAD) Integration and Interoperability with NATO Deployable Assets", NIAG-D(2009)0013, 29 July 2009

Z. PO(2011)0204-FINAL, New NATO Command Structure - Including its Geographic Footprint, 8 June 2011

AA. MC 0324/3, The NATO Military Command Structure, 30 January 2013

BB. MC 0362/1, NATO Rules of Engagement, 23 July 2003

CC. AC/237-D(2009)0001, NATO Crisis Response System Manual (NCRSM), 21 April 2009

DD. Standardization Agreement (STANAG) 4312 Part II, Interoperability of Low-Level Ground-Based Air Defence Surveillance, Command and Control Systems, Part II: Common Interface Requirements and Bit-Oriented Messages Agreement, NSA-0541(2012)LMC/4312, 19 April 2012

EE. STANAG 5518/ATDLP-5.18, Interoperability Standard for Joint Range Extension Application Protocol (JREAP)

FF. STANAG 5516/ATDLP-5.16[13], Tactical Data Exchange – Link 16

GG. AC/322-D(2004)0040, "NATO C3 System Interoperability Directive", 13 September 2004

HH. STANAG 5500, Concept of NATO Message Text Formatting System (CONFORMETS) - ADatP-3(A), NSA/1144(2010)C3/5500

II. ADatP-3(A), Change 1, ADatP-3(A) NATO Message Text Formatting System (FORMETS) Concept of FORMETS (CONFORMETS)

JJ. STANAG 7149, NATO Message Catalogue – APP-11(C) Change 1, NSA(Joint)1033(2010)IERH/7149

KK. APP-11(C) Change 1[14], APP-11(C) NATO Message Catalogue

[13] For tactical data link (TDL) standards, such as STANAG 5516/ATDLP-5.16 or STANAG 5518/ATDLP-5.18, the latest technical baseline that is approved by the TDL Capability Team, is recommended for GBAD implementation, test, and operational use, while awaiting promulgation.
[14] APP-11(C) Change 1 (1) has been superseded by APP-11(D)(1), however, a major investment has been made in NATO on APP-11(C)(1) with respect to Theatre Ballistic Missile Defence planning and tasking. This has a related impact on GBAD weapon system requirements. For this reason, APP-

LL. STANAG 4312 Part I, Interoperability of Low-Level Ground-Based Air Defence Surveillance, Command and Control Systems, Part I: Information Exchange Requirements (IERs) for developing common character-oriented Message Text Formats (MTFs), NSA-0545(2012)LMC/4312, 19 April 2012

MM. SH/OPI/J3/SPOPS/C2/16-314654, Bi-SC Data Link Management Strategy (DLMS), 27 September 2016

NN. 1500/SHCPPCAM/FCR/281528, NATO Minimum Capability Requirements 2011, 20 December 2011

11(C)(1) is preferred in this standard as the current implementation target for Message Text Formats. This situation will be reviewed for the Ed. B update to ATP-82(A).

ATP-82 (A)(1)