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NATO METEOROLOGICAL SUPPORT MANUAL

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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

26 January 2016

1. The enclosed Allied METOC Publication AMETOCP-2, Edition A, Version 1, NATO METEOROLOGICAL SUPPORT MANUAL, 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 6013.

2. AMETOCP-2, Edition A, Version 1 is effective upon receipt and supersedes AWP-2 and AWP-1(C) which shall be destroyed in accordance with the local procedure for the destruction of documents.

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

Edvardas MAŽEIKIS
Major General, LTUAF
Director, NATO Standardization Office

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RECORD OF RESERVATIONS

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

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RECORD OF SPECIFIC RESERVATIONS

[nation]	[detail of reservation]
CZE	CZE has limited capabilities of METOC support in the oceanographic area. Pertinent tasks will be performed for abroad operations of NATO exercises only on request.
POL	National implementation requires an analysis of Polish normative documents regulating METOC support to the Polish Armed Forces and a potential need of changes to be introduced in these documents.
ROU	The Romanian Meteorological Centres designated to support NATO maritime, air and land operations cannot meet the requirements of delivering current and forecasted meteorological information concerning tactical meteorological indices, due the lack of mission specific Tactical Decision Aids (TDAs) software, consequently TDAs are not used.
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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b. AMETOCP-3, NATO Meteorological and Oceanographic Communications Manual
c. AWP-4(B), NATO Meteorological Codes Manual
d. AJP 3.11, Allied Doctrine for Meteorological and Oceanographic Support to Joint Forces

1.2 Background

1. AMETOCP-2(A) supersedes the current edition of AWP-2 and AWP-1(C). The purpose of AMETOCP-2(A) is to provide a ready reference for information concerning meteorological Support to Allied Forces.

2. Skilled advice on both actual and predicted meteorological parameters and their impact on operations enhance the quality of many military command, control, communications and intelligence (C^3I) decisions concerning the conduct and planning of such operations. Effectively applied, meteorological information complemented by other environmental information can be used down to the tactical level to improve the capability of operational units to carry out their missions and to improve their safety and the effectiveness of weapon and sensor systems which are sensitive to certain meteorological conditions. Meteorological information is also vital to the proper development of future weapon and support systems.

3. In order to obtain the greatest military advantage from the meteorological conditions, there is a requirement for accurate and timely advice to be readily available to all levels of command and control and all operational units that require it. This advice should be tailored to the specific requirements of the commanders' missions, the missions of operations centres controlling NATO forces, and of operational units' tasks, weapons and sensors. To ensure consistent situational awareness, it is important the same meteorological information is provided to all elements, hence the Integrated Meteorological and Oceanographic (IMETOC) principle of "One Operation, One Forecast". To better tailor this advice, a requirement also exists to feedback information on meteorological impact on operations, on both sides of the battlefield, to meteorological offices up the chain.

4. As the above principles also apply to an adversary, appropriate measures will have to be taken as laid down in Reference B.

5. For these principles to be applied there is a NATO requirement for:

a. An administrative organization to coordinate the necessary planning and organization of meteorological Support to Allied Forces in times of peace, crisis, and conflict.

b. An organization to leverage national capabilities through the IMETOC Support Lead Nation (LN) concept (Reference A) to ensure the provision of meteorological Support to Allied Forces in peace, crisis, and conflict.

6. NATO forces in the context of this manual comprise:

a. National operational units that have been assigned by their respective nations to support NATO operations in peacetime and in times of crisis and conflict.

b. NATO Commanders and their Staffs at NATO Headquarters (HQs).

c. Operations centres which control NATO maritime, air and land operations.

7. This document refers to meteorological Support to Allied Forces operating under Allied Command Operations (ACO) or Allied Command Transformation (ACT) in the case of Command Post Exercises (CPX) requiring METOC support.

1.3 Aim

1. This document is based on the policy and guidance in Reference A. The aim of the manual is to encourage the necessary standardization and interoperability among all constituent parts of the overall organization required to provide meteorological Support to Allied Forces. It is intended as a reference for NATO and national planning staff and for staff at weather centres providing meteorological support products to NATO forces. Where some parts hold detailed information, the document may also prove useful to expert staff operating at unit level.

2. This manual does not affect national plans and procedures for meteorological support to their own national forces. However, for national forces assigned to NATO as defined in Paragraph 6, it should be used as a basis and guideline for the development of national plans and procedures for the provision of meteorological support to those forces.

1.4 Contents

1. Chapter 2 introduces NATO meteorological planning and administration and Chapter 3 discusses the overall meteorological organization supporting NATO. Chapter 4 describes meteorological support to NATO HQs, and Chapters 5-7 provide details on

support to maritime, air, and land operations, respectively. Each of these chapters is divided into four sections:

a. Introduction, which describes relevant aspects of the NATO command and control structure.

b. Requirement, including tactical, operational and strategic level meteorological requirements, respectively.

c. Organization, which describes the relevant parts of the meteorological organization supporting NATO.

d. Implementation, which describes how the support will be provided.

Chapter 8 discusses the types of meteorological data available, military requirements for meteorological data, and the collection, processing, and dissemination of meteorological data. Chapter 9 briefly describes meteorological support to Chemical, Biological, Radiological, and Nuclear (CBRN) operations. Chapter 10 provides an outline of routine reports.

2. Although this manual covers the whole spectrum of meteorological support to NATO, specific subjects are detailed in other manuals in the AWP- series. Meteorological Communication is discussed in Reference B, while Meteorological Codes are covered in Reference C. Reference D covers the joint aspects of meteorological support.

3. Meteorology is part of the overarching environmental support that also includes, in addition to others, oceanography, hydrography, geography, geology and biology. Although each discipline has its unique characteristics, individual support contributions to operations should be internally consistent and coordinated, using integrated structures, procedures, and products where required and feasible. This is especially true for meteorology and oceanography (METOC), which have many parameters in common. Therefore, in some areas meteorological and oceanographic support are considered one entity, in which case this manual will refer to METOC support.

4. The Staff Meteorological and Oceanographic Officer (SMETOCO) at the International Military Staff (IMS) along with the Chief METOC Officer (CMETOCO) at ACO are responsible for coordination of maintaining and amending this Manual on behalf of the Military Committee Working Group (METOC) (MCWG (METOC)).

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CHAPTER 2 NATO METEOROLOGICAL PLANNING AND ADMINISTRATION

2.1 References

a. MC 0594/1, MC Policy on Meteorological and Oceanographic (METOC) Support to Allied Forces
b. MC 133/4, NATO's Operational Planning
c. SH/J5/Plans/7630-063/05-105661, Promulgation of ACO Guidelines for Operational Planning (GOP), Revision 1
d. MC 324/2, The NATO Military Command Structure (NCS)
e. SHAPE 1220/SHOPJ/01, Bi-SC Functional Planning Guide on Environmental Support
f. AMETOCP-3, NATO Meteorological and Oceanographic Communications Manual
g. ACO Directive 80-34, METOC Services to ACO

2.2 Introduction

1. The provision of meteorological support requires international cooperation and coordination to ensure the essential exchange of data and products on a global scale. In peacetime, the World Meteorological Organization (WMO) and the International Civil Aviation Organization (ICAO) are the principle organizations responsible for the necessary planning and coordination to achieve these objectives. In most NATO and Partner nations, meteorological support to military forces involves extensive use of WMO and ICAO procedures and systems. In addition, it is NATO policy (Ref. A) that meteorological Support to Allied Forces will be provided, wherever possible, by national facilities. It is also NATO policy that national meteorological facilities will not be assigned to NATO, but remain under national command and control. Furthermore, the IMETOC principle “One Operation, One Forecast" applies. According to that principle, one designated nation, the IMETOC LN, shall provide meteorological support for one dedicated NATO operation and/or exercise. It can be assisted by one or more IMETOC Assisting Nations (ANs). The data and products delivered by the IMETOC LN are for use on strategic and operational level. At tactical level, they shall provide guidance and build the basis for derived products.

2. To ensure adequate meteorological support to planning, operations and exercises of NATO forces under all circumstances, it is necessary to plan and arrange for the coordinated use of national meteorological facilities as well as for additional or backup facilities for certain key functions during times of crises and conflict.

3. A vehicle to provide meteorological information to all users and levels will be the Recognised Environmental Picture (REP) once established. It will encompass a wide range of products as determined by the Operational Commander METOC staff lead. The REP will be part of the Common Operational Picture (COP) within NATO’s Command and Control Systems when established.

4. Two different types of planning for meteorological support can be distinguished:

   a. Generic planning, which aims to match support with the overall NATO mission, concepts, plans and procedures. This is a continuous process.

   b. Operational planning, which focuses on support to specific NATO operations and which is an integral part of the NATO Operational Planning Process (OPP, Refs. B and C). The OPP is conducted through two separate but related sub-processes:

      (1) Advance Planning, which provides planning tools, from which operational plans can be developed. The product of Advance Planning is the Contingency Operation Plan.

      (2) Implementation Planning, which involves the development of Operation Plans (OPLANs) or campaign plans, based on a Contingency Operation Plan if developed.

The OPP is applicable to strategic, operational, and tactical levels. Each planning process has five stages: Initiation, Orientation, Concept Development, Plan Development, and Plan Review. Depending on the scope of the operation, this type of planning should normally begin at the Strategic Command (SC) level with the SC staff officer establishing the broad requirements for the meteorological support and providing inputs into the Contingency Operation Plan or OPLAN. The staff officer at the designated Headquarters (HQ) or Component Command (CC) will detail the requirements arrangement in their command's Contingency Operation Plan/OPLAN. For small-scale operations, the majority of the required planning may be delegated to the CC or lower level.

2.3 Requirement

1. To perform the necessary planning, there is a requirement for a NATO meteorological organization to carry out the following functions:

   a. Identify and establish the requirements for meteorological Support to Allied Forces. This concerns generic support as well as support for specific operations or exercises. An important aspect here is to anticipate changes in requirements by monitoring the broader developments in NATO mission and concepts, and also changes in specific plans, assessing the need to adjust meteorological support and changing or developing support plans accordingly.

   b. Coordinate the production, promulgation and implementation of plans for Support to Allied Forces in operations or exercises. The goal will be to ensure the most efficient and effective use of national and NATO assets,

with focus on products, data collection, dissemination, support and to ensure the IMETOC principle.

2. The provision of Meteorological Support to Allied Forces is driven by the operational requirement, which is the package of meteorological data and products needed to support operational commanders in specific NATO operations, at NATO HQs and CCs. This operational requirement is strongly related to the tactical requirement, i.e. the specific sets of meteorological information needed to support each type of mission. This requirement may vary with different weapon systems, sensors and platforms. From the operational and tactical requirements, the specific meteorological requirement can be derived, which constitutes the suite of data and/or products needed to carry out the NATO support mission.

3. This document defines tactical requirements, given as a mean assessment. It also describes the operational requirements for support to NATO HQs and CCs.

4. As for support to specific NATO operations, such requirements must be identified by reference to the appropriate NATO OPLAN and to the appropriate chapter(s) of this document to establish the specific requirements of those forces. As NATO forces may be tasked for anywhere within the NATO Area of Responsibility (AOR), the operational requirement may concern provision of meteorological data and products for any region on the globe.

5. Meteorological Support to forces operating in, or from, their own national territory will normally be provided by their own national meteorological organization in accordance with national plans and procedures. However, coordination with the NATO meteorological organization will be required for plans to provide the necessary IMETOC LN data and products to the national weather centres in times of crisis and conflict or other NATO-led activities such as NATO exercises, for arrangements for back-up capabilities in case of major outages. Additional advice is given in Reference F.

6. The IMETOC Support (Reference A) is an important tool to ensure the “One Operation, One Forecast” principle is applied. Based on national assets and through a process of international coordination under SHAPE METOC staff lead, nations will make national centres available for IMETOC contributions that would become a significant source for the REP (when established). A LN will be responsible for production and coordination of IMETOC contributions for a given NATO operation or exercise, calling upon other nations to assist with capabilities that are not available from the LN, if required. The duration of a national commitment is not to be restricted to a minimum or maximum period. An incoming LN should be trained in all activities required for overtaking the role as IMETOC LN. Annex B. describes responsibilities of the LN.

7. IMETOC LN will provide a set of agreed data and products and the proper IMETOC Support Plan (ISP), attached to a Technical Arrangement (TA) which would be prepared and published. Annex C provides Generic TAs and ISPs for nations as a basis for development of their TAs and ISPs.

8. Nations will comply with the IMETOC principles and arrangements.

2.4 Organization

1. The meteorological support coordination structure, as shown in Figure C-1 of Annex C to Reference G together with the organic Peacetime Establishment (PE) post affiliated with the corresponding HQs, is an integral part of the overall NATO Military Command Structure (Reference D). It comprises:

a. The Military Committee Working Group METOC (MCWG(METOC)) which reports directly to the Military Committee (MC), and the subordinate Military Meteorology Panel(MILMET).

b. The NATO Command Meteorological Committees.

c. The Staff Meteorological Officer (SMO) on the staffs of some NATO Commanders.

d. The Allied Command Operations (ACO) METOC Conference (AMC) and its ACO METOC Information Exchange Working Group (ACOMEX).

2. Most meteorological groups and committees have extended structures to allow for participation of Partner Nations.

3. The MCWG(METOC), MILMET and AMC are composed of professional METOC representatives of all nations represented on the Military Committee (MC) and include members from the Strategic Commands (SCs).

4. Meteorological personnel are appointed to the staffs of the Strategic Commands, to the staffs of the Joint Force Commanders (JFCs), and to Component Commands as is considered necessary. NATO Command SMOs will be one of the following:

a. A national officer detached for a fixed tour of international duty on a NATO staff with responsibility for meteorological matters (and sometimes other matters).

b. As above, with the national officer being dual-hatted with national and NATO appointments on (in most cases co-located) national and NATO staffs.

5. SMOs may have a title other than Staff Meteorological Officer because the position incorporates collateral or related duties, e.g. Staff Geospatial Meteorological and Oceanographic (GEO METOC) Officer, or is related to his/her position in the HQ's staff structure, e.g. Chief Meteorological Officer. Throughout this document, the generic title of SMO will be used.

6. Organization of meteorological support in ACO and ACT is under the overall direction of the SC SMOs, i.e. SHAPE CMO and SACT SMO, respectively.

2.5 Implementation

1. **Groups and Committees**

The Terms of References (TORs) of the MCWG (METOC), MILMET are given in Reference A. The TORs of Command Meteorological Committees are given in Reference G. Although each has its specific mission, the overall aim of these groups and committees is to develop requirements, plans, and procedures for meteorological support to NATO. An important aspect in the groups' work is to promote coordination and liaison between national meteorological organizations and NCS/NFS to support NATO-led activities and to encourage research and development to improve the capability and quality of meteorological support to Allied Forces. The work between these groups is coordinated to ensure the overall objectives are met. On specific issues, groups will liaise with other NATO groups and agencies on matters of common interest.

2. To facilitate the flow of information between the various groups, meetings are held in a meeting cycle as defined in their respective TORs (cp. References A and G).

3. **NATO SMO**

A NATO SMO's principal duty is to deliver adequate meteorological support to his commander and staff. This involves determining specific requirements and arranging for the provision of meteorological support and, in addition, the coordination of meteorological support requirements for subordinate units without a SMO and affiliated operation centers.

4. An important aspect of this work concerns operational planning of meteorological support to forces allocated for NATO OPLANs originated by his commander and subordinate commanders. Reference E provides guidance and details on establishing operational requirements and their translation into specific arrangements for Geospatial and METOC support. The METOC part of Reference E includes the template for writing the appropriate part of Annex T to the OPLAN/Contingency Operation Plan. Joint Planning Guides (JPGs) may provide additional guidance.

5. Operational Planning requires teamwork of staff at all levels of Command. For meteorology, this involves close coordination and collaboration between SMOs at SC and HQ level, where applicable down to the SMO of a Combined METOC Unit (CMU) at a deployed HQ. A more detailed description of specific responsibilities for SMOs involved in operational planning and conduct of meteorological support at various command levels is listed in Annex A and further detailed in Reference G.

6. SMOs have further responsibilities beyond operational planning, which relate to the overall planning and management of provision of support, such as:

a. To coordinate the work with other environmental disciplines especially focusing on saving resources and streamlining structures and procedures.

b. To coordinate implementation within the command area of NATO meteorological plans in times of crisis and conflict, including meteorological measures contained in the NATO Crisis Response System (NCRS).

c. To monitor developments in NATO operational policies, concepts and plans, to assess the impact of any developments on the requirements for meteorological support within the command area and to initiate appropriate action.

d. To assess the requirements for, arrange procurement of, and monitor operation of equipment and facilities provided by NATO for the provision of meteorological support in the command area.

e. To plan and coordinate meteorological aspects of NATO exercises for which his commander is the officer scheduling the exercise (OSE) or officer conducting the exercise (OCE).

f. To coordinate the work of SMOs of subordinate commanders, providing direction and guidance, when necessary.

g. To liaise with national authorities, through MCWG(METOC), and with other NATO commands to coordinate plans and procedures and to arrange for provision of meteorological services from the IMETOC LN to meet specific requirements of the command.

h. To coordinate, in collaboration with identified METOC Points of Contact (POC) and Host Nation (HN) METOC cells, for the provision of operational METOC support to subordinate units without a SMO and affiliated operation centers and the provision of local area meteorological support. Support will be in accordance with IMETOC Support Principles and documented, case by case, in specific arrangements in OPLANs, EXPLANs, and HN support agreements / arrangements.

7. **Promulgation**. Plans and procedures are promulgated to the NATO meteorological support organization primarily by Reference A, by the Allied METOC Publication series and by NATO Command meteorological directives, guides, and manuals. Other means of promulgation include NATO operational planning documents and national publications.

8. **Feedback.** In the short term, the following items shall be added to the reporting requirements of SITREPs, which are required by reference A:

a. Are IMETOC requirements in theatre working properly?

b. Are data and products delivered by IMETOC LN covering all requirements for METOC support?

c. Is the transmission of data and products working properly?

9. The SITREPs from NATO-assigned METOC units shall be transmitted at least once per month per email through the chain of command to SHAPE. During its transmission, they shall be sent to the next higher Command not later than 2 weeks after reception. The first of these Commands which has the capability to solve any problem contained in the SITREP shall coordinate the solution with all commands to which they are subordinated on the chain of command. After elaborating and coordinating the solution, that particular Command shall provide feedback to the respective NATO-assigned units within 2 weeks. The feedback shall include the following information:

a. Solution for the problem addressed;

b. Name of the entity, including POC, who is responsible for solving the problem;

c. Deadline for implementing the solution to the problem.

If even SHAPE cannot solve the problem, SHAPE shall notify the respective NATO-assigned unit and all involved NATO Commands within 2 weeks after receiving the SITREP accordingly.

10. For NATO exercises, SITREPs shall be disseminated from the ACO Command conducting the exercise and from the IMETOC LN to SHAPE six weeks after the end of the exercise. To facilitate this METOC specific feedback a corresponding template should be used according to Reference G.

11. Nations encourage METOC personnel supporting NATO operations and exercises to document/notify NATO METOC entities of problems with IMETOC support via SITREPs.

12. A complete quality management system will be established within two years after declaration of IMETOC Full Operational Capability by ACO Chief METOC Officer. Before, Quality Management will be limited to SITREPSs from theatre (cf. 7 – 9) and site visits as stipulated in Reference G, Art 3-7c).

13. Training: In order to ensure proper familiarisation with IMETOC support, NATO provides the following opportunities for training to METOC personnel:

a. A METOC Seminar for all METOC personnel identified to deploy in support of a NATO operation, the NATO Operations METOC Pre-deployment Seminar (NOMPS).

b. A METOC Course at NATO School Oberammergau, the NATO METOC Orientation Course (NMOC): All METOC personnel assigned to NATO, and METOC personnel not assigned to NATO but who will have interaction with NATO METOC should attend NMOC.

c. Improvement of and training on NATO forecasting and observing systems: SHAPE shall pursue the improvement of NATO METOC systems, acquire training for NATO METOC personnel on these systems, and ensure their inclusion in NOMPS.

14. METOC personnel deployed in theatre shall be enabled to effectively utilize IMETOC in support of NATO operations: For NATO METOC forecasters in theatre, Standing Operation Procedures for the use of IMETOC shall be implemented, and a minimum three-day training window should be established for the handover of incumbent duties to the replacement.

15. Nations shall ensure that METOC personnel:

a. Assigned to support NATO operations and exercises are given the opportunity to attend NMOC. If this is not feasible, another arrangement should be resolved between SHAPE and the individual's Nation.

b. Identified to deploy in support of NATO operations are given the opportunity to attend NOMPS.

16. In order to fulfil IMETOC Principles the IMETOC LN has to prepare an IMETOC Support Plan according to the guidelines depicted in Annexes C and D of Chapter 2.

17. When IMETOC Support Plan requirements change the procedure depicted in Annex E applies.

Annexes:

A. SMO Responsibilities for Operational Planning of Meteorological Support
B. IMETOC LN Responsibilities

C. Template for the Integrated Meteorology and Oceanography (IMETOC) Technical Arrangement (TA)
D. Guideline for Initiating & Implementing IMETOC Support for a Mission or Operation
E. Guidance for Determining the IMETOC Lead Nation
F. IMETOC Support Plan Requirement changes

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ANNEX A SMO RESPONSIBILITIES FOR OPERATIONAL PLANNING OF METEOROLOGICAL SUPPORT

1. GENERAL

Planning and conduct of operations in most cases involves different commands, from the strategic level down to operational/tactical level. In order to provide coherent and consistent meteorological support to an operation, the SMOs at the various levels of command involved need to work as a team, although each will have his specific responsibilities. In most planning, key players are the SMOs at SC and HQ level as well as the SMO of a deployed HQ's Combined Meteorological Unit (CMU). To facilitate their cooperation in planning meteorological support, main responsibilities of these officials are listed below.

2. RESPONSIBILITIES

a. SMO at SC level:

(1) Work with SC operations and planning staffs in order to maintain awareness of and anticipate requirements for METOC support.

(2) Liaise closely with the SMOs of other commands involved to keep them abreast of the operational requirements and to determine a concept of METOC support, including the manning levels, equipment and communications requirements.

(3) With the SMO of the designated HQC/CC, decide on and coordinate REA implementation and arrange product availability (especially climatological information) for the planning staffs.

(4) Draft the SC OPLAN annex for METOC support and coordinate with the OSE and the assigned IMETOC Support LN.

(5) Assist the designated HQ SMO/SMOCO with drafting his METOC annex for his command's more detailed OPLAN.

(6) Through the SC manpower and personnel branch, establish and coordinate the manning requirements for the NATO CMU with the nations involved if required.

(7) Provide METOC support information and briefings at the SC as required.

(8) Keep nations and commands updated by frequent information

briefs (Newsletters, SITREPs, conferences, etc.).

c. SMO at HQ/CC level:

(1) Liaise closely with the SC CMETO/CMETOCO in drafting the METOC support annex to the HQ/CC OPLAN in accordance with and guided by the SC OPLAN.

(2) Work with HQ staff in developing METOC support requirements.

(3) Work out details regarding in-theatre METOC support:

(a) of required data, information and products from the LN.

(b) in-theatre METOC support products, including briefings and special products, equipment of CMU.

(4) Communication for distribution of products and in-theatre METOC support.

(5) Additional observational requirements including upper air sounding capabilities, climatological analyses and other REA products.

(6) CMU domestic arrangements (housing etc).

(7) Document specific roles and contributions of participating commands and nations in Operations Orders (OPORDS), as appropriate. When required, release support details or additions via Letters of Instruction (LOI).

(8) Liaise closely with the Nations providing resources (including participating Cooperation Partners) on augmentees, equipment, and communications.

(9) Provide METOC support information and briefings at HQ as required and work out a routine coordination mechanism with SC Chief METOC Officer.

(10) Provide After Action Report (AAR) to SC Chief METOC Officer.

d. SMO CMU:

(1) Provide daily METOC support to in-theatre HQ and deployed units; or in case of deployed METOC staff, coordinate routine forecast products based on IMETOC LN data and products.

(2) Report to HQ SMO via a Situation Report (SITREP) or METOC Report (METOCREP) regularly on adequacy of manning, equipment and communications in CMU identify and report any shortfalls.

Further details on the responsibilities of Subject Matter Experts (SMEs) at the various levels of the NCS are listed in the ACO Directive AD 80-34 “METOC Services for ACO”.

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ANNEX B IMETOC LN RESPONSIBILITIES

GENERAL

An IMETOC LN has to provide comprehensive and relevant IMETOC support for NATO missions, operations, exercises and other events, consisting of coherent, consistent, accurate and timely METOC data and products. It shall deliver all of the data and products required. To do this, it can be assisted by Assisting Nation(s) [AN(s)].

RESPONSIBILITIES

1. Before take-over IMETOC LN:

    a. Exercises its METOC communications and procedures;

    b. Liaises with AN in case it cannot meet all requirements or the potential AN(s) can deliver data and products of significantly better accuracy;

    c. Drafts the ISP and coordinates it with OSE/SME of the leading HQ and SHAPE;

    d. Ensures that all IMETOC data and products required by the ISP, including that from AN(s), are available for NATO-led activities in accordance with the IMETOC principles (Reference A);

    e. Liaises with preceding LN in order to initiate adequate hand-over, if applicable.

2. After take-over IMETOC LN:

    a. Organises, coordinates and provides IMETOC data (incl. numerical weather prediction output) and products as outlined in the ACOMEX Handbook;

    b. Co-ordinates and makes all arrangements required with AN(s) for provision of the data, products or services.

3. Before hand-over IMETOC LN:

    a. Supports and mentors the incoming IMETOC LN by transferring at least the following items:
        (1) points of contacts
        (2) current and planned initiatives
        (3) documents (e.g. local procedures)
        (4) Lessons Identified (LI)

b. Provides incoming IMETOC LN with all provisions, documents and Lessons Learned (LL) available.

4. After hand-over the IMETOC LN:

Coordinates with the SME of the leading HQ for the NATO-led activity on the LI/LL, SitReps, etc. wrt METOC relevant issues to constantly improve IMETOC LN data and products.

ANNEX C TEMPLATE FOR THE INTEGRATED METEOROLOGY AND OCEANOGRAPHY (IMETOC) TECHNICAL ARRANGEMENT (TA)

TECHNICAL ARRANGEMENT (TA) BETWEEN

COUNTRY NAME (ABBREVIATION)

AND

THE SUPREME HEADQUARTERS ALLIED POWERS EUROPE (SHAPE)

REGARDING THE PROVISION OF INTEGRATED METEOROLOGY AND OCEANOGRAPHY (IMETOC) SUPPORT FOR OPERATION NAME

REFERENCES:

A. MC-0594/1, Military Committee Policy on Meteorological and Oceanographic (METOC) Support to Allied Forces, 02 Apr 2014
B. SH/OPI/J3/SPOPS/XX/XX, Announcement of Integrated Meteorological and Oceanographic Lead Nation for Operation Name, dated XXXXXX 20XX.
C. ACO Directive (AD) 80-34, Meteorological and Oceanographic Services for Allied Command Operations, 20 Jun 2014

1. Purpose

a. This Technical Arrangement (TA) arranges the execution of Meteorological and Oceanographic (METOC) support provided by Country Abbreviation to Operation Name (Operation Abbreviation[1]) within the framework of Integrated Meteorology and Oceanography Support (IMETOC) Principles (Reference A).

b. Country Abbreviation is the nominated IMETOC Lead Nation (LN) for Operation Abbreviation (IMETOC LN (Operation Abbreviation)) (Reference B) (For NRF, add: “durring the period 01 January 20XX to 31 December 20XX (NRF cycle year 20XX)”).

c. The IMETOC Support Plan (ISP) for Operation Abbreviation at Annex A details the arrangements between NATO and Country Abbreviation for the provision IMETOC Operation Abbreviation support. (For NRF, add: “This TA covers METOC support provision only during NRF cycle 20XX, when Headquarters Allied Joint Force Command Naples/Brunssum has the Operational-Level lead).

[1] If the operation has an abbreviation, it is defined here and used throughout the remainder of the document.

2. Scope

a. The ISP for Operation Abbreviation at Annex A covers the full scope of IMETOC support to be provided by Country Abbreviation as IMETOC LN (Operation Abbreviation) for Operation Abbreviation Operations (For NRF, add: "(in the avent of NRF activitation)") and Exercises.

b. (For NRF, start 2.b. with sentence: "In addition to NRF-related exercises, Country Abbreviation as IMETOC LN (NRF) will also support selected non-NRF related events within NRF cycle 20XX.") Operation Abbreviation (For NRF, delete "Operation Abbreviation" and start sentence with "Exercises".) exercises likely to require METOC support are identified by SHAPE in the Military Training and Exercise Program METOC Letter, issued annually (Reference C).

c. The ISP for Operation Abbreviation is subject to change, and can be amended without re-signing the TA, as operationally required and mutually agreed by both parties, and to guarentee the optimum METOC support to Operation Abbreviation.

3. Language. All information exchange between participants will be in the English language.

4. Duration

a. This TA covers the responsibility of Country Abbreviation as IMETOC LN (Operation Abbreviation) for the durration of the Country Abbreviation commitment (For NRF, delete "the Country Abbreviation commitment" and replace with "NRF cycle 20XX, terminating on 31 December 20XX"). The Country Abbreviation commitment as IMETOC LN (Operation Abbreviation) will last indefinitely unless termination is announced to SHAPE with at least 13 months notice. (For NRF, delete the proceeding sentence.)

b. The Country Abbreviation commitment as IMETOC LN (Operation Abbreviation) will be evaluated on a yearly-basis at the beginning of every calendar year[2]. (For NRF, replace proceeding sentence with: "Country Abbreviation will coordinate with SHAPE on the handover of IMETOC LN (NRF) responsibilities to the named IMETOC LN (NRF) for NRF cycle 20XX in the advance of the end of cycle 20XX").

5. Settlement of disputes. Any disagreements between participants regarding the interpretation or application of this arrangement and its Annex will be resolved by

[2] A Nation's commitment is situation dependent. For example, the commitment of a Nation as IMETOC LN for NRF is always one (1) year. However, the commitment of a Nation as IMETOC LN for an operation may be defined as "indefinite" by the Nation; in other words, for the duration of that operation. Therefore, 4.b. in this template TA is subject to modification.

negotiations and without recourse to any national or international tribunal or third party for settlement.

6. Final provisions. This TA includes the ISP for Operation Abbreviation at Annex A, including the catalogue of required IMETOC Operation Abbreviation data and products.

Two copies, both in English

FOR THE COUNTRY NAME APPROPRIATE AUTHORITY[3]	FOR THE SUPREME HEADQUARTERS ALLIED POWERS EUROPE
SIGNATURE	
Signature	*Signature*
Signature Block XXXXXXXX XXXXXXXX	SHAPE COS Signature Block XXXXXXXX Chief of Staff SHAPE
Date	*Date*

TEMPLATE FOR THE INTEGRATED METEOROLOGY AND OCEANOGRAPHY (IMETOC) SUPPORT PLAN (ISP) MAIN BODY

INTEGRATED METEOROLOGY AND OCEANOGRAPHY (IMETOC) SUPPORT PLAN FOR OPERATION NAME

PROVIDED BY
THE IMETOC LEAD NATION (LN) COUNTRY NAME (COUNTRY ABBREVIATION)
AND AGREED WITH
THE SUPREME HEADQUARTERS ALLIED POWERS EUROPE (SHAPE)

REGARDING THE PROVISIONS OF METEOROLOGICAL AND OCEANOGRAPHIC (METOC) SUPPORT TO OPERATION NAME
REFERENCE: MC-0594/1, Military Committee Policy on Meteorological and Oceanographic (METOC) Support to Allied Forces, dated 2 Apr 2014

[3] The "Appropriate Signature Authority" should be at a level having the authority to sign a Nation to a military operations support agreement with SHAPE. TA's can be signed by the SHAPE NMR of the respective Nation.

1. Introduction

a. The Integrated Meteorology and Oceanography (IMETOC) Support Plan for Operation Name (Operation Abbreviation[4]) details the arrangements between NATO and the nominated IMETOC Lead Nation (LN) (Operation Abbreviation) Country Abbreviation regarding the provision of Meteorological and Oceanographic (METOC) support to Operation Abbreviation, supported by the IMETOC Assisting Nation (AN)[5] Country Name (Country Abbreviation). It also defines the data and products required for the provision of METOC support to Operation Abbreviation, which are listed in Annex A.

b. IMETOC Operation Abbreviation data and products are for use at Headquarters (HQ) Command Name (Command Abbreviation). The data and products will be used as guidance and for generating customer and mission-tailored METOC support.

c. In accordance with the IMETOC Concept (Reference A), IMETOC support will be practical and robust (e.g. coherent, comprehensive, consistent, accurate, relevant, timely, and standardized) in order to address all levels of required support, to include direct support to the Strategic and Operational levels, and guidance support to the Tactical level.

2. Support Outline

a. The IMETOC LN (Operation Abbreviation) and AN will provide METOC data and products as specified at Annex A, "Catalogue of IMETOC Data and Products in Support of Operation Name".

b. All products will be in the English language.

c. Additional support may be requested by NATO at any time. The IMETOC LN (Operation Abbreviation) will provide the additional data and products as soon as reasonably possible, or – in coordination with SHAPE – their provision by the current AN or by seeking an additional AN. The IMETOC LN (Operation Abbreviation) will inform the ACO Chief METOC Officer (SHAPE) and the HQ Command Abbreviation METOC Officer[6] if the additional support cannot be provided as requested.

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[4] If the operation has an abbreviation, it is defined here and used throughout the remainder of the document.

[5] Include content only if there is an AN. Note: This ISP template is written to include an AN.

[6] If the HQ's PE has more than one (1) SMO, then ISP contents should indicate the POC is the CMO of the HQ throughout the document; e.g. replace "HQ Command Abbreviation METOC Officer" with "HQ JFCNP Chief METOC Officer".

d. If the workload of the IMETOC LN (Operation Abbreviation) becomes excessive (e.g. if change in NATO Operation Abbreviation posture requires rapid amendments to the agreed-to product suite as specified in Annex A), the IMETOC LN (Operation Abbreviation) will inform ACO Chief METOC Officer (SHAPE) and HQ Command Abbreviation METOC Officer. SHAPE, in coordination with HQ Command Abbreviation, will set priorities.

e. The IMETOC LN (Operation Abbreviation) will notify HQ Command Abbreviation METOC Officer at least six (6) months in advance of any planned product or data changes that could impact dissemination to and / or use by NATO (i.e. changes that will cause NATO METOC product / data format requirements as specified in Annex A to no-longer be met). HQ Command Abbreviation METOC Officer will inform ACO Chief METOC Officer (SHAPE), accordingly. The IMETOC LN (Operation Abbreviation), HQ Command Abbreviation, and SHAPE will coordinate on the solution(s).

3. Coordination

a. HQ Command Abbreviation METOC Officer will coordinate the overall Operational-level METOC support for Operation Abbreviation. These arrangements and requirements will be laid down in relevant operations plans. When preparing details, HQ Command Abbreviation METOC Officer will consult the IMETOC LN (Operation Abbreviation).

b. The Point of Contact (POC) at HQ Command Abbreviation responsible for overseeing and coordinating IMETOC Operation Abbreviation support requirements:

HQ Command Abbreviation METOC Officer:
Phone (comm): +XX XXXX XXXX
E-mail (unclass): XXXXXXXXXX[7]

In the absence of the HQ Command Abbreviation METOC Officer, contact should be made directly with:

ACO Chief METOC Officer (SHAPE):
Phone (comm): +32 65 44 6221
Fax (comm): +32 65 446246
E-mail (unclass): metoc@shape.nato.int

c. The Country Abbreviation POC responsible for overseeing and coordinating the overall IMETOC LN (Operation Abbreviation) support provision:

POC Duty Title

[7] E-mail addresses in an ISP should be organizational, rather than personal, e-mail address.

POC Duty Section
Phone (comm): +XX XXXX XXXX
Fax (comm): +XX XXXX XXXX
E-mail (unclass): XXXXXXXXXXX

d. The POC at the Name Of Country's Centre responsible for overseeing and coordinating Country Abbreviation IMETOC LN (Operation Abbreviation) data and products[8]:

POC Duty Title
POC Duty Section
Phone (comm): +XX XXXX XXXX
Fax (comm): +XX XXXX XXXX
E-mail (unclass): XXXXXXXXXXX

4. Dissemination[9]

a. IMETOC LN (Operation Abbreviation) data and products will be sent automatically by the Country Abbreviation to the NATO METOC Data Hub (NMDH) at Bundeswehr Geo-Information Centre (BGIC), DEU, and stored on the NATO METOC Data Server (NMDS).

b. IMETOC AN (Operation Abbreviation) data and products will be sent automatically by Country Abbreviation to the NMDH at BGIC and stored on the NMDS.

c. IMETOC Operation Abbreviation data and products will be disseminated through the NMDH at BGIC by means of Allied Command Operations METOC Data Exchange (ACOMEX) circuitry.

d. IMETOC Operation Abbreviation data and products will also be made available on the NATO Secret Wide Area Network (NS) web portal; http://namis.ncia.nato.int:8080/.

e. IMETOC Operation Abbreviation data and products will also be made available on the password-protected website hosted by BGIC public Internet; https://www.nmds-bgio.de. Access to the website will be provided by the site's owner, upon user request. See (4. f) below for contact details.

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[8] If more than one (1) National Centre will be providing IMETOC LN data and products, then this Centre's contact information will be provided as 3.e., etc.

[9] "Dissemination" items (4.a. – f.) included in this template ISP are mandatory. Additions, such as if the IMETOC LN will make data and products available via its National website, or if data and products will be made available via another web portal (e.g. a Command's NATO Secret Wide Area Network web portal), will be included using similar material.

f. BGIC NMDH POC:

Phone (comm): +49 (0)2251 953 5949
Fax (comm): +49 (0)2251 953 5984
E-mail (unclass): bgiocomcen@bundeswehr.org

ANNEX A: Catalogue of IMETOC Data and Products in Support of Operation Name

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ANNEX A TO
IMETOC SUPPORT PLAN FOR
NAME OF OPERATION
DATED XXXXXXXX

CATALOGUE OF IMETOC DATA AND PRODUCTS IN SUPPORT OF OPERATION NAME

[Template for the Integrated Meteorology and Oceanography (IMETOC) Support Plan (ISP) Catalogue of IMETOC Data and Products]

Data and Products	Model Type or Data Source	NW Scale (Global / Meso)	NWP Resolution / Grid Spacing (km / deg)	Production Frequency	Time(s) Available (UTC)	Originator	File Type
1. Significant Weather / FITL / Hazards[10]							
Cloud Tops	DCF			00 to 120 hours, at 3hr increments	00, 06, 12, and 18Z	IMETOC LN	.JPG
…..							
Upper Level Turbulence		Global		00 to 120 hours, at 3hr increments	00, 06, 12, and 18Z	IMETOC LN	.GIF
…..							

[10] This Annex contains the standard 12 “product or data descriptors”, with corresponding examples, on which every ISP catalogue should be built: Amended this example catalogue appropriately in order to meet the specific support requirements of the operation being supported.

Surface Analysis				12 to 48 hours, at 12hr increments	00, 06, 12, and 18Z	IMETOC LN	.GIF
Joint Operational Area Forecast				12 to 48 hours, at 12hr increments	00, 06, 12, and 18Z	IMETOC LN	.GIF
Unified Weather Forecast				Every 24 hrs	17Z, Valid +48, 72, 96, 120 hrs	IMETOC LN	.GIF
…..							
2. METSAT							
MET-10 VIS	METEOSAT			Hourly	Hourly	IMETOC LN	.JPG
…..							
3. Atmospheric Forecast Model							
Surface	UM	Global		00 to 120 hours, at 3hr increments	00, 06, 12, and 18Z	IMETOC LN	.JPG
Model Forecast Assessment / Variability				Once per day for all forecast periods			.TXT
…..							
4. Meteograms							
Forecast Meteograms – Surface 5-day	UM	Global			00Z, 06Z, 12Z, and 18Z	IMETOC LN	.JPG
…..							

5. Flight-Level Winds and Temperature							
Surface	UM			00 to 120 hours, at 3hr increments	00, 06, 12, and 18Z	IMETOC LN	.JPG
…..							
6. Tephigrams							
Site Name	GME			Every 12hrs	05 and 17Z	IMETOC LN	.JPG
…..							
7. RADAR							
Rain Rate	European RADAR composite			Every 15 min		IMETOC LN	.JPG
…..							
8. Climatology and Seasonal Forecasts							
Monthly Mean Surface Temperature				Available at start of support and updated as required		IMETOC AN	.JPG
…..							
Long Range Forecast				Once per month		IMETOC AN	.PDF
…..							
9. Space Weather							
Impacts to HF Comm: 6-Hour Forecast				2x / day (00Z and 12Z) out to 120 hours		IMETOC AN	.JPG
…..							
10. Oceanographic Forecast Model							
Sea Surface Temperature				00Z only, 00hr		IMETOC LN	.JPG

11. Other Products							
Signal Messages to CTF/TF 508 (info CTF/TF 465)				Daily		IMETOC LN	.TXT
Standing Naval Forces 3-day wind / sea forecast briefing*				Daily	06Z	IMETOC LN	.PPT
…..							
12. CBRN Messages or Artillery Messages	**(Header) Model Type or Data Source**	**NWP Scale (Global / Mesoscale)**	**NWP Resolution / Grid Spacing (km / deg)**	**Forecast Timeframe H+00 ... H+54**	**Time(s) Available (UTC)**	**Originator**	**File Type**
Basic Wind Report BWR	FXXX00 ETGX	Mesoscale	Geographical resolution of 5° * 5°	H +00	00, 06, 12, and 18Z	IMETOC AN	.TXT
…..							
Effective Downwind Report EDR	FXXX20 ETGX	Mesoscale	Geographical resolution of 5° * 5°	H +00	00, 06, 12, and 18Z	IMETOC AN	.TXT
…..							
Chemical Downwind Report CDR	FXXX40 ETGX	Mesoscale	Geographical resolution of 5° * 5°	H +00	00, 06, 12, and 18Z	IMETOC AN	.TXT
…..							
METCM	FOMM90 ETGX	Mesoscale	7 km	H +06	On request	IMETOC AN	.TXT
…..							

ACRONYMS		CATALOGUE REMARKS
Chemical, Biological, Radiological, Nuclear	CBRN	Include any pertinent remarks, such as clarifying product accessibility, etc. For example: "Unless otherwise stated below, all data / products are available via ACOMEX. * Available via JOMOC NSWAN only."
Diagnostic Cloud Forecast	DCF	
Forecaster In The Loop	FITL	
Global Forecast System	GFS	
Global Forecast System	GFS	Operation Name AOR (Bounding Box): XXW XXN XXE XXN

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ANNEX D: GUIDELINE FOR INITIATING AND IMPLEMENTING IMETOC SUPPORT FOR A MISSION OR OPERATION

1. The table below lists the sequential steps for initiating and implementing IMETOC Support for a mission or operation.

2. Notes:

a. The depicted process is iterative and may involve returning to an earlier stage if requirements change.

b. This process may be time consuming. If required, e.g. in case of a quickly emerging NATO (non NRF) operation, SHAPE may pre-coordinate with a Nation to provide IMETOC support until the process described below is completed and an IMETOC Lead Nation (LN) takes over.

	Step	**Actions**	**Responsibility of**
1	Determination of the potential need for IMETOC support (situational awareness)	Identification of the planned mission or operation	SHAPE in cooperation with Subordinate Commands
		Identification of the need for IMETOC support	
2	Determination and definition of IMETOC support requirements	Preparation of the list of data and products required, based on the Annex to the Generic IMETOC Support Plan (ISP) for operations	Subordinate Commands in cooperation with Troop Contributing Nations (TCNs), if available
		Delivery of the IMETOC requirements to SHAPE	
3	Identification of the potential IMETOC LN *This step is also the starting point if it becomes necessary to involve additional ANs after the event starts.*	Sending out a formal letter (with requirements attached) to Nations requesting an IMETOC LN	SHAPE to Nations (via National Military Representatives (NMR))
		Delivery of formal letter(s) of response	Nation(s) to SHAPE

4	Nomination of chosen IMETOC LN *In case of urgent support requirements, this and subsequent steps may occur after support has started, in order to formalize the immediate request for support.*	Sending of a formal letter of nomination	SHAPE to IMETOC LN (via NMR)
		LN may identify the need for Assisting Nation(s) (AN) If not, continue with step 7	IMETOC LN
5	Request for AN(s) *Subject to LN's assessment and decision*	IMETOC LN invites potential AN(s) to deliver special data and products	IMETOC LN to Nations (via NMR/NMA) (info SHAPE)
Request for AN(s) *Subject to LN's assessment and decision*		IMETOC LN invites potential AN(s) to deliver special data and products	IMETOC LN to Nations (via NMR/NMA) (info SHAPE)
		Delivery of formal letter(s) of response	IMETOC AN(s) to IMETOC LN (info SHAPE)
6	Commitment by IMETOC AN(s)	IMETOC LN proceeds final coordination with AN for delivery of the special data and products[11]	IMETOC LN with AN
		IMETOC AN(s) prepares draft ISP for mission/operation	IMETOC AN(s) to IMETOC LN (info SHAPE)
7	Preparation of the IMETOC Support Plan (ISP)	LN prepares draft ISP for mission / operation, supported by SHAPE and / or Generic ISP	IMETOC LN in coordination with AN(s) if required
		LN liaises directly with ACO for operations level coordination	LN and ACO Commands
		Delivery of draft ISP to SHAPE	LN to SHAPE

[11] IMETOC LN coordinates with AN(s) through their MODs the Arrangement for delivery of the special data and products

8	Confirmation that LN/AN(s) are meeting all requirements	Coordination of the requirements and the delivered draft ISP	SHAPE in cooperation with Subordinate Commands to IMETOC LN
9	Finalization of the ISP	Formal approval of the ISP	IMETOC LN and SHAPE
		Publication of the ISP with: a) Request for compliance of the support provided by the ISP b) Request for any feedback in case IMETOC support requirements may change	SHAPE to - IMETOC LN, - Nations, Subordinate Commands
10	Execution of the ISP	Comply with IMETOC principles and provisions (National responsibility to inform all national elements to comply with IMETOC principles and provisions).	All concerned: NATO Command Structure, NATO Force Structure

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ANNEX E: GUIDANCE FOR DETERMINING THE IMETOC LEAD NATION

Introduction

SHAPE, when choosing the IMETOC Lead Nation (LN) utilizes the flowchart Figure 2E-I, shown below. This flowchart serves only as guidance, given that factors requiring consideration may arise which are not addressed in the flowchart. Deviation from the flowchart will also occur should the resulting solution be one that is the most appropriate for ensuring compliance with IMETOC. For additional details, see notes at bottom.

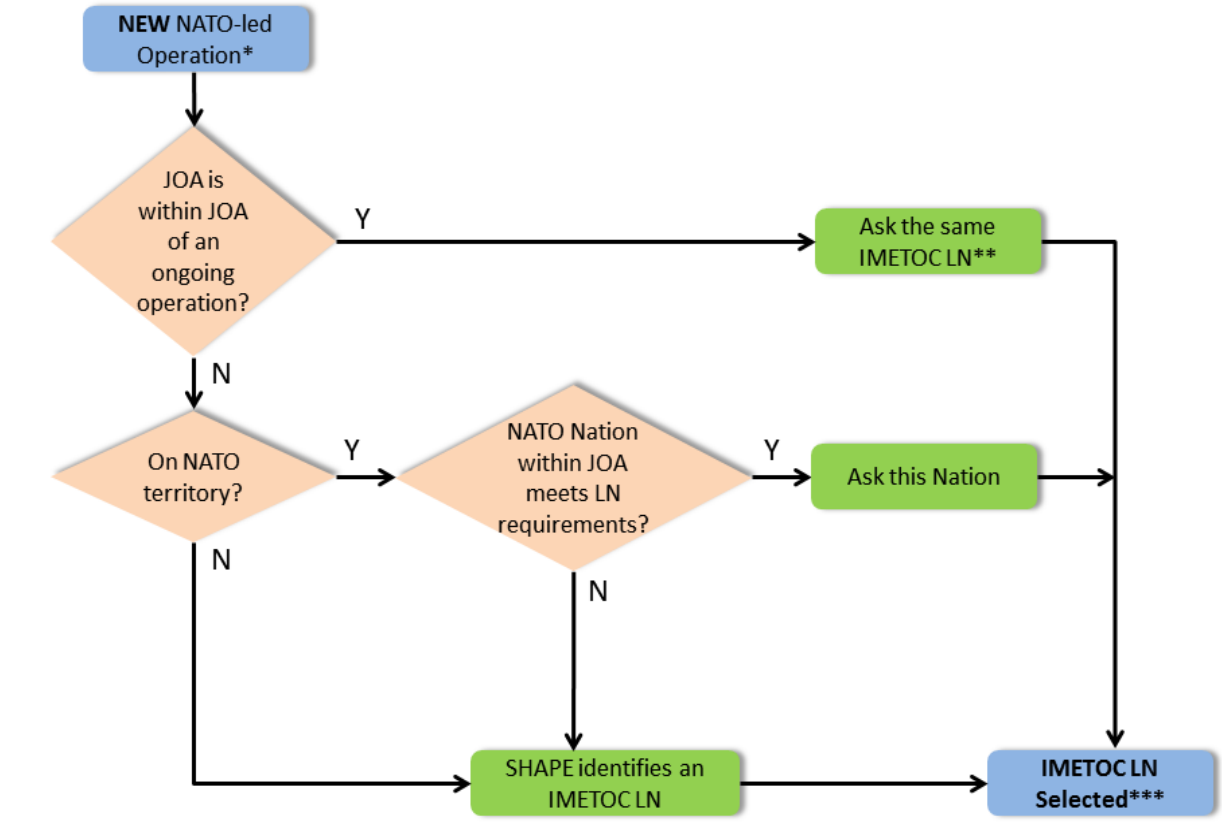

Figure 2E-I Guidance for determining the IMETOC LN

NOTES:

1. Each step may require the coordination with Nations.

2. Reasons for deviation may include:
   - Requirements to exercise future LNs;
   - Avoid overburdening current LNs;
   - Timing considerations (e.g. impending end of an IMETOC LN (NRF) cycle);
   - Capabilities of participating TCNs.

3. In case, an IMETOC LN(NRF) requires more training for exercising that role and requests being IMETOC LN for any specific exercise, SHAPE will propose that Nation as IMETOC LN for that particular exercise (cp. Military Training and Exercise Program (MTEP) process in Reference G).

ANNEX F: IMETOC SUPPORT PLAN REQUIREMENT CHANGES

Introduction

If the requirements of IMETOC Support Plans (ISP) including its list of data and products (as an Annex) change, these changes need to be stipulated immediately after the provisions of an ISP of an operation / mission do not serve anymore for the best available IMETOC support in theatre.

Aim

To amend the ISP of any operation / mission and its list of data and products as quick as possible after the shortcomings of the actual ISP and/or its list of data and products become evident.

Provisions

1. All requirements for the IMETOC support to any NATO operation / mission shall be stipulated in the ISP. Changes and adjustments to that ISP can be requested by NATO-assigned units in theatre, deployed NATO Commands, Troop Contributing Nations (TCN) and IMETOC Lead Nation (LN).

2. If NATO-assigned units in theatre request changes, that request shall be disseminated via the deployed NATO Command in theatre to the ACO Command conducting that operation. If TCNs or IMETOC LN are requesting changes, that request shall directly be disseminated to the ACO Command conducting that operation.

3. If the changes only concern the annexed list of data and products of the ISP (i.e. the list itself, format of data or products, frequency and times of dissemination of a specific product, etc. …), the ISP does not have to be amended formally. An agreement via email between the ACO Command conducting that operation and IMETOC LN is sufficient. SHAPE shall be informed.

4. If the changes concern the ISP itself (i.e. way of dissemination), the ISP has to be amended formally. In that case, the IMETOC LN in cooperation with the ACO Command conducting the operation shall formulate an amended ISP, approve it formally and inform SHAPE. Afterwards, the provisions drafted in “Provisions for initiating IMETOC support” apply for promulgating the amended ISP.

5. If the IMETOC LN in co-operation with possible Assisting Nations (AN) is not able to satisfy the amended requirements, the IMETOC LN either requests an(other) AN for support or notifies the ACO Command conducting the operation that it is not able to meet the amended requirements. The ACO Command conducting the

operation shall inform SHAPE and SHAPE shall identify a new IMETOC LN for that operation / mission. If SHAPE is not in the place of identifying a new IMETOC LN, the request for amendment is rejected.

Responsibilities

1. SHAPE:
   a. Identifies a new IMETOC LN in case the current IMETOC LN cannot satisfy the changed requirements;
   b. Rejects the request for amendment, if it cannot identify a new IMETOC LN;
   c. Promulgates the changed ISP.

2. ACO Commands on Operational Level conducting the operation / mission:
   a. Coordinates, validates, and approves requests for changes of the ISP;
   b. Informs SHAPE about changes;
   c. Initiates drafting of an amended IMETOC Support Plan with IMETOC LN;
   d. Supports IMETOC LN in drafting the ISP.

3. National Met Team supporting a (multi-) national unit involved in NATO operations:
   a. Request changes of the list of data and products of the ISP via the deployed NATO HQ in theatre if the data and products contained in the actual list are not sufficient

4. Nations:
   TCN request changes of the list of data and products of the ISP via the ACO Command on operational level if the data and products contained in the actual list are not sufficient.

5. IMETOC LN:
   a. Requests changes of the list of data and products of the ISP if better data and products are available;
   b. Drafts amended ISP;
   c. Appoints AN(s), if necessary, and informs the ACO Command conducting that operation and SHAPE;
   d. Introduces the required changes as soon as is reasonably possible, together with an AN, if available.

CHAPTER 3 METEOROLOGICAL SUPPORT TO NATO

3.1 References

a. MC 0594/1, Meteorological and Oceanographic (METOC) Support to Allied Forces
b. WMO Publication #306, Manual on Codes
c. WMO Publication #386, Manual on Global Telecommunications System
d. WMO Publication #544, Manual on Global Observing System
e. ICAO Manual 4016
f. AMETOCP-3, NATO Meteorological and Oceanographic Communications Manual
g. AWP-4(B), NATO Meteorological Codes Manual
h. AD 80-34, METOC Services for Allied Command Operations
i. Bi-SC Functional Planning Guide (FPG) for Environmental Support

3.2 Introduction

1. Each NATO nation has its own unique provision of meteorological support to its own military forces when they are employed on national activities. Some nations have a single meteorological organization (military or civil) to meet both military and civil requirements, while other nations have separate civil and military organizations.

2. As indicated in Chapter 2, it is NATO policy that nations will make national centres available for contribution to the production of data, information and products in support of NATO forces. While this covers the basic production of meteorological information, such national facilities are not always capable of providing tailored support to meet the NATO requirements. In such cases, NATO meteorological elements have been established in the NATO Command Structure. The overall organization to provide meteorological Support to Allied Forces comprises, therefore, a combination of national and NATO facilities.

3.3 Requirement

1. The primary requirement for the Integrated Meteorological Support to Allied Forces (Reference A) concerns the provision in a timely manner, of coordinated and tailored meteorological information to NATO HQs, operations centres and NATO maritime, air and land operational forces. The support should be available to any operation in NATO's mission spectrum and should be based on well-tested standardized practices and procedures. When providing the support, the mix of national and NATO support assets should be used efficiently, avoiding duplication of effort. National support to a nation’s own forces in NATO operations should be

consistent with the data, information and products developed by the LN, and coordinated with support provided by other national and NATO meteorological assets. IMETOC LN products are to be considered as guidance and basis for national support in this respect.

2. For the information to be tailored there is a requirement for all meteorological staff involved in NATO support to be familiar with the C2 structure, mission, concept of operations, and functions of the NATO commander to whose HQs and operational units direct support is provided. Also, staff should have a sound knowledge of all OPLANS/Contingency Operation Plans for NATO operations for which they will be required to provide direct support (see previous chapter).

3.4 Organization

1. In the NATO meteorological support organization, both national and NATO meteorological facilities play a role.

2. National Meteorological Centers/Units. These facilities have been established by nations to provide meteorological support to meet their own national requirements, in accordance with national plans and procedures. The nations concerned have agreed that these centres/units will provide Support to Allied Forces. Some national facilities in the organization provide support directly to NATO forces. Others which do not, have nevertheless been included in this manual because they provide essential support to lower echelon national centres involved in direct Support to Allied Forces.

3. The support provided by national facilities to NATO is often limited to products that are developed on a routine basis for national purposes. According to the IMETOC principles (cp. Reference A), a LN will ensure all required data, information and products are available to meet NATO force needs. National facilities assisting the LN will produce additional products to meet specific NATO requirements as Assisting Nations to the IMETOC LN, if applicable.

4. National Centers/Units remain under national command and control at all times when providing support to NATO. This includes responsibility for manpower equipment, logistics support and technical standards. While support by national facilities to NATO is in principle on the basis of no-cost to NATO, national centres/units may qualify for NATO funding for the purchase of equipment (including telecommunications) needed to meet specific NATO requirements which cannot be met by using national or NATO funded facilities. Procedures to obtain such funding will be in accordance with current NATO budget, infrastructure and procurement regulations and should be initiated by the SMO of the NATO command raising the requirement.

5. NATO Meteorological Offices. These Meteorological Offices have been established by NATO funding and form an organic element in an international NATO

HQ, in a few cases with combined functions (e.g. METOC or HGEO/METOC). These offices are normally in the operations division/directorate of the HQ and may vary in size, from one SMO to multiple expert staff. Their mission is to provide meteorological support to the NATO Commander and his staff and, where applicable, to NATO operational units in the command area of responsibility where there is no meteorological centre available to provide the support required. The NATO funded Meteorological Office at the Main Operating Base of the E3A-Component of the NATO Airborne Early Warning & Control Force (NAEW&CF) at Geilenkirchen, Germany, is not linked to a NATO HQ but supports the E3A Component Commander.

6. With the exception of the Meteorological Office at Geilenkirchen, which is manned by NATO civilians, NATO meteorological offices are manned by national personnel with international status i.e. holding a post on the HQ's PE for a fixed period of duty. Authorisation of PE posts is subject to NATO manpower policy and procedures. Equipment, telecommunications and logistic support for NATO Meteorological Offices are normally provided by NATO funding in accordance with NATO budget, procurement and infrastructure procedures.

7. All NATO meteorological offices rely upon national meteorological centres for the routine provision of data and basic products. In some cases, a NATO office might at the same time support national units or forces on a NATO mission by making available specific items of its production. Details of NATO and national support available to NATO forces will be promulgated and kept up-to-date in Supplements based on Annexes A and B of this publication.

8. Types of assets. Development of the meteorological support required by military forces involves three basic processes in sequence: data collection; data processing and production of numerical forecasts; and tailoring of numerical products to produce military-oriented products for use by military forces. The organization of national and NATO meteorological facilities which carry out these functions is comprised of three types of meteorological assets, each with a different mission:

a. Weather Analysis Centers (WAC)

b. Military Forecast Centers (MFC)

c. Meteorological Support Units (MSU)

9. Most meteorological facilities in the organization carry out the functions of only one type of centre, although some combine the functions of more than one. The actual title of each individual asset may vary, reflecting its specific national or NATO responsibilities, e.g. METOC Center, Fleet Weather Center (FWC) etc.

10. Weather Analysis Centers (WACs). WACs are national meteorological centres with a Numerical Weather Prediction (NWP) capability. Most WACs are principal centres in the WMO organization, acting as communications centres for the collection

and dissemination of data on the Global Telecommunication System, maintaining an extensive climatological database and performing research and development. Most WACs are civilian, but some nations have, in addition, military centres that carry out the main functions of a WAC and these are included as WACs in this publication. Some WACs also carry out the functions of an MFC.

11. WACs are involved in NATO support in various ways:

a. Provision of data and NWP products to military forecast centres providing meteorological data, information and products to NATO.

b. Provision of climatological information, which is not readily available in publications, to NATO meteorological offices, to be used for planning purposes.

c. Carrying out research and development of equipment and techniques that will improve its capability to support NATO forces.

12. Annex A lists the centres that carry out the functions of a WAC in support of NATO.

13. Military Forecast Centers (MFCs). MFCs are also mainly national meteorological centres, involved in military-operational weather forecasting but without organic global NWP capability. MFCs have individual titles that reflect their national and/or NATO responsibilities and may support specific maritime, land or air operations (see National Reports according Chapter 10 for details). Some MFCs also carry out the functions of an MSU for a collocated NATO headquarters.

14. MFCs are involved in NATO support in several ways:

a. Using WAC products for the provision of IMETOC LN products and/or providing tailored products from such sources to be used as the single source of meteorological Support to Allied Forces or national forces on a NATO mission. This includes guidance-products for lower echelon meteorological assets (i.e. MSUs) involved in similar operational support.

b. Provision of climatological studies for operational planning, consulting WAC databases as necessary.

15. Annex A lists the centres that carry out the functions of an MFC.

16. Meteorological Support Units (MSUs). MSUs are meteorological facilities established at a military installation (e.g. Command HQ, in an Air Operations Center, on a military airfield, in a ship, with a mobile land or maritime unit). MSUs may simultaneously act as an MFC and provide support to assigned operational units in the Command Group or Task Force. MSUs can be both nationally and NATO funded.

National MSUs include facilities at national and collocated NATO HQs. NATO funded MSUs are NATO Meteorological Offices, found at several NATO Command HQs and at the NAEW&CF Main Operating Base (MOB) Geilenkirchen. MSUs established at deployed HQs are commonly referred to as Combined Meteorological Units (CMUs).

17. MSUs are involved in NATO support in various ways:

a. Using the data and products provided by or based on the IMETOC LN to support operational units.

b. Providing similar support to HQ-assigned operational units that do not have an assigned MSU. If there are MSUs in more than one unit of the same operational group, the MSU supporting the Group Commander assumes responsibility for coordinating support within the Group/Task Force.

18. National Capabilities Overview. To allow effective planning and use of national resources, details on national capabilities for providing meteorological support to NATO need to be known. This overview is updated by nations through the annual reporting cycle, using the format found in Annexes A and B to Chapter 10 of this publication. The distribution of this information will be accomplished via an International Military Staff Memorandum – METOC or by electronic means.

19. Meteorological Organization and Capabilities of Partner Nations. Much of the information in previous paragraphs regarding national meteorological organizational structures and capabilities also applies to Partner Nations. Although not routinely involved in supporting NATO forces, Partner capabilities may form important assets during NATO combined operations and exercises, as well as during times of crisis and conflict. This implies that Partner meteorological facilities could play a role as MFC and/or MSU, provided they meet the required level of NATO meteorological standardization and interoperability, especially with regards to data and product exchange and communications.

20. Non-NATO nations participating in the Partner Program have provided information (updated through the annual reporting cycle) on the capabilities of their national meteorological organizations using the same format in Annex A to Chapter 10 of this publication. The distribution of this information will be accomplished via an International Military Staff Memorandum – METOC or by electronic means.

3.5 Implementation

1. **Practices and Procedures**

Practices and procedures used by national meteorological centres and the international exchange of meteorological data and products between them are normally in accordance with agreed procedures of the WMO and ICAO as laid down in References B through E. National and NATO meteorological centres involved in providing Support to Allied Forces should use WMO and ICAO practices and procedures whenever possible in times of peace and conflict. However, specific operational aspects may require alternative systems and/or procedures, which mainly concern data exchange and data formats. These specific NATO applications and codes are described in References F and G, respectively. Practices, procedures and products of a NATO Meteorological Office are to be defined by the SMO, based on the Command's mission and characteristics of operations (details to be given in following chapters).

2. Procedures for the provision of meteorological support for the warning of hazards of nuclear, biological and chemical warfare are described in Chapter 9 of this publication.

3. Evaluation

As for the supervision of operational standards, evaluation of national meteorological facilities in support of NATO is a national responsibility. For NATO Meteorological Offices, these are an integral part of the HQ to which they belong and therefore are subject to standard and generalised NATO evaluation procedures. Routinely, the HQ Commander will determine whether the day-to-day support from his meteorological staff meets his requirements. Within ACO, nations with assigned air assets are evaluated under the SHAPE Tactical Evaluation (TACEVAL) Program (see Chapter 6 for more details). In NATO operations and exercises evaluation of effectiveness and identification of shortfalls is normally done by special entities (e.g. Permanent Analysis Team (PAT)), which will result in documents on lessons learned and recommendations. Meteorological support is an integral aspect of such evaluations, however for a particular operation or exercise SC or HQ meteorological staff may perform a more in-depth expert review of support provided (Reference H).

4. Coordination

To ensure that consistent meteorological advice is given to commanders at all levels, all meteorological support will be based on meteorological data and products provided by the IMETOC LN.

5. Exercise Support

Meteorological play in NATO exercises is conducted in accordance with the

Bi-SC Exercise Planning Guide (Reference I). In order to 'train as you fight', procedures and services as described in this manual should be exercised to the fullest extent

possible, which includes development of METOC support annexes to exercise EXPLANs or EXORDs (for corresponding templates see Reference H).

6. In live exercises, meteorological support should firstly focus on safety of operations. Also, arrangements should be made to minimise interference with the normal peacetime-work of national meteorological services. To indoctrinate operators on the impact of the environment on operations and to provide ample training to meteorological staff, maximize the use of real-time meteorological conditions in live exercises and pre-scripted weather scenarios as close as possible to real-life weather scenarios in Command Post Exercises (CPX).

7. Feedback from users is vital if the meteorological support provided is to be kept tailored to changing operational requirements. There will usually be opportunities after each live exercise (LIVEX) for users to comment on the meteorological support provided. Comments are requested to be submitted using templates provided in Reference H.

8. For exercises, as for operations (cf. chapter 2), an appropriate IMETOC LN is selected by SHAPE with the tool of the MTEP letter (cf. AJP 3-11). This METOC related MTEP letter, based on the ACT provided electronic MTEP information (eMTEP), proposes an IMETOC LN for every exercise which requires IMETOC support. The selection is conducted according to Figure 2E-I of Annex E to Chapter 2. The letter requests from Nations to:

a. Notify SHAPE at least six months in advance of the start of an exercise if they are willing/not willing to assume LN responsibility as proposed in the letter.

b. Requests Troop Contributing Nations (TCNs) to use IMETOC LN data and products when participating in the respective exercise.

The Annexes of the METOC MTEP letter contain:

a. The exercises that require IMETOC support.
b. The time when the respective exercise will be conducted.
c. The area where the exercise will take place.
d. The aim of the exercise.
e. METOC Point of Contact of the ACO Command conducting the exercise.
f. Proposed IMETOC LN and the reasons for the proposal.

9. The Annexes of the letter are updated as required. After updating on the METOC-Portal, the METOC POCs of all affected potential LNs are notified of the changes.

10. IMETOC LN sends METOC POC to the Initial Planning Conference, Main Planning Conference and to the Final Coordination Conference. If budget is not sufficient, it sends METOC POC at least to the Main Planning Conference.

Annex:

A. Weather Analysis Centres (WAC) and Military Forecast Centres (MFC) Supporting NATO

ANNEX A: WEATHER ANALYSIS CENTRES (WACs) AND MILITARY FORECAST CENTRES (MFCs) SUPPORTING NATO

Nation	WAC	Civ/Mil	MFCs	A/L/M supported (by this MFC)	Remarks
Belgium			Meteo Wing	A, L	
Canada	Montreal (CMC)	Civ	Joint Met Centre (JMC) Gagetown METOC Halifax METOC Esquimalt	A, L, M A, L, M A, L, M	Meteorology only
Czech Republic	Prague	Mil	Prague	A, L	
Denmark	Copenhagen	Civ	Karup Copenhagen	A, L, M M	
France	Toulouse	Civ	CISMF Toulouse	A, L, M	CISMF = the Joint METOC Force Support Centre is also a MOC/MOIC
Germany	Offenbach (DWD)	Civ	None		
	Euskirchen(BGIC)	Mil	BGIC (Euskirchen) HQ German Navy (Rostock / Gluecksburg) Air Operations Command (CAOC Uedem) Geilenkirchen	A, L, M A, M A, L A, L	
Greece	Athens	Mil	FWC Athens WAC Athens HTAF/WC	M A, L A, L	
Hungary			WFD MilMetS Budapest	A, L	
Italy	Pratica di Mare	Mil	CMR Milano	A, L, M	
Netherlands	De Bilt	Civ	RNLAF Met Group Woensdrecht	A, L, M	
Norway	Oslo (Blindern)	Civ	Oslo (Blindern)	A, L, M	
Poland			The Hydrometeorological Service of the Polish Armed Forces FWC Gdynia	A, L A, M	
Portugal	Lisbon	Civ	WAC Lisbon	A, L, M	

Nation	WAC	Civ/Mil	MFCs Supported by this WAC	A/L/M supported (by this MFC)	Remarks
Romania	Bucharest	Civ	Air Force MET Center Bucharest Navy MET Center Constanta	A, L M	
Spain	Madrid (Vitrubio-JS)	Civ	CPVD Madrid WAC Madrid Rota MSU	A, L, M A, L, M A	
Turkey	Ankara	Civ	FWC Bandirma AMO Izmir WAC Ankara	M A, L A, L	
UK	Exeter	Civ	JOMOC Northwood	A, L, M	
US	Washington	Civ	NMOC Norfolk	A, L, M	
	FNMOC Monterey	Mil	NMOC Norfolk NMOC Pearl Harbour, HI	A, L, M A, L, M	
	AFWA Offut	Mil	OWSs	A, L	21 OWS Kapaun Air Station, Germany 28 OWS – ISAF only

CHAPTER 4 METEOROLOGICAL SUPPORT TO NATO COMMAND HEADQUARTERS

4.1. References

a. US Joint METOC Handbook
b. AMETOCP-3, NATO Meteorological and Oceanographic Communications Manual
c. Bi-SC Directive 80-30, Recognised Environmental Picture Concept
d. MC 0594/1, Meteorological and Oceanographic (METOC) Support to Allied Forces
e. AD 80-34, METOC Services to ACO

4.2. Introduction

1. Meteorological information is an important input at all levels of decision-making, both in planning and conducting operations. Therefore, meteorological support should be a basic requirement at any Command HQ.

2. It is noted that NATO Commanders may hold a full-time NATO appointment, but could also be dual-hatted (NATO and national). By consequence, a NATO commander may be located in an international HQ that has only an international NATO staff, or in a national HQ with an international NATO staff collocated with the national staff. Alternately the NATO commander may be located in a national HQ with a national staff that has a dual-hatted NATO role. In addition to peacetime HQs (PHQ), commanders may have deployed HQ facilities and/or separate HQs during crisis or conflict.

3. At the higher levels of the NATO command structure, NATO commanders have broad responsibilities covering all types of maritime, air and land operations. At the lower levels, the commanders' tasks may be more specialised and usually involve only one of the three types of operations. Nevertheless, NATO's current operations are generally highly joint in nature and are directed from a Joint Headquarters (JHQ) or a Combined Joint Task Force (CJTF) HQ.

4. In general, meteorological support to NATO Operations requires services similar to those for supporting any nation’s operations. The main additional requirements for NATO operations are:

a. Standardization of procedures as much as possible.

b. The usage of the data, information and products from the assigned IMETOC LN of this Joint Operations Area (JOA) or the usage of the one REP (when established) (Reference C). The future REP must then include meteorological, oceanographic and geospatial information and should be the framework on which meteorological information provided to all operational and tactical users in the JOA is based.

c. Additional capability at appropriate NATO Command HQs for dissemination of meteorological information and for operational weather briefing.

4.3. Requirement

1. Meteorological support, tailored to the specifics of the particular mission, will be required for the commander and his staff in his peacetime and/or deployed or alternate location.

2. The support requirement is related to three main functions:

a. Planning and coordination of meteorological support to operational units in the command area in times of tension, crisis and conflict (described in Chapter 2).

b. Provision of real-time meteorological support to HQ staff exercising command and control of NATO operational forces in peacetime and in times of crises and conflict. This aspect is covered in this chapter.

c. Provision of local area meteorological support per Garrison Support Agreements, Arrangements (i.e. installation forecasts, warnings, watches, and advisories) or associated METOC Memorandum of Understanding (MOU) or Memorandum of Agreement (MOA).

3. The requirement for real-time meteorological support at a NATO command depends very much on the command's mission, especially its involvement in exercises or operations. While only occasional staff meteorological briefing support is required in peacetime conditions, real-world operations may require 24-hour support with augmented staff, equipment and facilities. However, a key aspect of a meteorological staff's job at any HQ will be to capture requirements for and to arrange provision of meteorological support to the commander and his staff and to sub-ordinate commanders, especially for operations and exercises.

4. In general, the support required is operational and strategic in nature, i.e. concerns planning forecasts, generalised operational impact information, tailored briefings etc. Tactical meteorological information, i.e. forecasts for a particular flight or mission, is only required in specific support roles (e.g. for NATO Airborne Early Warning operations, for a Deployed Combined Air Operating Center (DCAOC) or a deployed HQ).

5. Where many headquarters have only one SMO (either assigned or dual-hatted), augmentation may be required to support specific operations. This implies temporary assignments of national staff in Crisis Establishment (CE) positions. Such manning will

especially be required in case a CMU is set up in a JFC HQ or CJTF HQ for a particular operation.

6. It should be noted that in real life, the initial support requirement might change as a result of a commander's prioritisation i.e. when meteorological support has to be balanced with priorities in other operational areas. This might result in constraints on available space and/or assets (e.g. limitations on manning or communications bandwidth). In these circumstances, it is the Command SMO's duty to give proper advice to the Commander on the impact of such constraints.

7. Headquarters without assigned SMOs are to be supported by well trained and educated forecaster personnel from the national staff. This support has to be documented, case by case, in specific arrangements in OPLANs, EXPLANs, and HN support agreements / arrangements.

4.4. Organization

1. Meteorological support to a NATO HQ may be provided in a variety of ways, depending on the HQ's mission and the existing support facilities. Where a co-located MSU facility exists, MSU staff under the direction of the HQ SMO will normally provide support. Many HQs however, do not have a co-located facility, in such cases real-time support is provided by the HQ SMO using products from an assigned MFC or MSU. In case a HQ does not have an organic SMO, the SMO at the next higher echelon will arrange for the assignment of an MFC/MSU and its provision of tailored products. In such cases, information will mostly be delivered to the HQ by electronic means (e.g. email, web-page, and video-link).

2. Although in the HQ support chain certain overlaps in activities of units involved may occur, the HQ SMO should make an effort to minimise such duplications and develop an organization which allows support to be not only mission-tailored but also to be provided in the most efficient way. As a basic rule, the Command HQ meteorological staff should not get involved in actual forecast production but rather concentrate on tailoring MFC products, their translation into mission impacts and their dissemination and presentation.

3. In case of an operation, the specific details on the organization of support to any of the command HQs involved (e.g. assigning IMETOC Support LN (Reference D and E), WACs/MFCs), the augmentation and additional equipment arrangements will be covered in Annex T of the appropriate OPLAN or Annex W of the corresponding EXPLAN (see Chapter 2).

4. When a CMU is established at a CJTF or JFC HQ for an operation, its SMO will be a METOC officer who is part of the CJTF HQ nucleus staff from the parent HQ. Other expert posts will be manned by other HQ staff and/or will be augmented by national contributions as documented in the JFC/CJTF HQ's Crisis Establishment (CE).

5. In CJTF-type operations, meteorological support to the Combined Joint Forces Component Commands (CJFCCs) and lower echelon forces could be provided by the same CJTF HQ CMU in many cases. Where specific requirements would dictate an MSU at levels below that of the CJTF HQ, this will come from an organic capability in the CCs (like the Deployable CAOC MSU in the Air CC) or support will be provided from national sources.

4.5. Implementation

1. General. The overall organization and structure implemented to provide meteorological support to NATO Command HQs has been described in Chapter 2.

2. Many HQs are joint by nature, but service-specific expertise could be required in the support to certain elements in such HQs. Other NATO HQs have a distinct orientation towards a specific service (e.g. Component Commands, CAOCs) and will have a stronger focus on land, air or maritime aspects. These aspects are covered in the Chapters 5-7 of this publication.

3. NATO commanders and staff personnel at all levels frequently need rapid, on-call access to various types of meteorological data and products to facilitate knowledgeable decision-making. Selected finished products, tailored for non-meteorological users, and meteorological data (e.g., decoded observations and forecasts) are essential information required on information networks to plan and conduct any type of operation or exercise. Use of (classified) Communication and Control Information Systems (CCIS) networks also facilitates forecast consistency between staffs. However, care should be taken to isolate meteorological information that is intended for use only by meteorologists so that it is only made available to qualified personnel. Details on CCIS are given in Reference B.

4. The SMO at the Command HQ will analyse requirements for support and arrange support for his HQ as well as for those subordinate HQs without a SMO. The SMO will also be responsible for developing procedures (SOPs) to cover and detail the support arrangements on the basis of the commander's requirements. In the case of a deployed HQ with other meteorological units operating in the COMCJTF JOA, the responsible SMO will coordinate meteorological product requirements for consolidated support at all levels.

5. Briefing. Although no generic model exists for HQ meteorological support, a meteorological briefing is a common element in all support activities. NATO SMOs routinely provide weather briefings to the commander and his staff. The typical NATO meteorological briefings vary in format and content as these are set to meet specific demands. The level of detail varies, with the largest detail required at operational (deployed) headquarters. However some commonalities do exist:

a. Briefings normally begin with a slide showing the wide or synoptic view of the command's AOR, Area of Interest (AOI) or Joint Operations Area (JOA). This is usually an analysed or annotated satellite image but may also include a simple map with weather features indicated on it.

b. Next, a chart may be used to forecast the expected generic weather conditions for the AOR/AOI/JOA. This may be a map showing typical meteorological symbols (e.g. fronts, isobars, cloud/rain, temperatures, wind etc.).

c. In addition, the impact of meteorological conditions on the various types of operations during the forecast period is presented by using colour-coded boxes for different types of military functions (e.g. airlift, helicopter, ground/amphibious operations, reconnaissance, personnel, etc). A traffic-light colour scheme is used to represent favourable conditions (green), marginal conditions (yellow), and unfavourable conditions (red). It is noted that the criteria for favourable, marginal and unfavourable conditions may combine meteorological and oceanographic factors. Also, for each type of operation, these criteria are dynamic i.e. need to be tailored to operation specifics in close consultation with operators. For generic METOC impact thresholds for various operations see Reference A.

6. Skills. It is evident that the HQ SMO has a crucial role in providing adequate support to his commander and therefore, should meet certain skill requirements. Generally, skills required for NATO Command SMO's holding a PE position are covered in the appropriate job descriptions. The same is true for augmentation staff in Crisis Establishment (CE) positions.

7. Skill requirements for staff in CE posts are especially critical as this normally concerns national augmentations operating for a relatively short period in an environment that allows little, if any, training. Therefore generic guidance for skill requirements and training has been developed for nations when selecting and preparing staff for manning deployed multinational METOC positions and is described in Annex A.

Annex:

A. Bi-SC Skill Requirements and Training Guidelines for Deployed METOC Personnel in NATO Operations

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ANNEX A: Bi-SC Skill Requirements and Training Guidelines for Deployed METOC Personnel in NATO Operations

REFERENCES

a. SHAPE 1220/SHOPJ/01, Bi-SC Functional Planning Guide for METOC Support

INTRODUCTION

1.1 In NATO crisis management operations, meteorological and oceanographic (METOC) support is provided by a hierarchy of elements, with a small METOC unit being forward deployed in theatre on many occasions. With limited NATO resources, the manning for this unit is often augmented by national contributions. For reasons of efficiency, the METOC staff at this unit is kept to minimal numbers while having maximum output. Therefore, virtually no opportunities are available for staff (most having different backgrounds) to undergo training on the job once deployed. This makes it essential that all deployable staff personnel hold the required skills and have sufficient training before deployment. The frequent rotations in manning make these requirements even more compelling.

1.2 In order to make contributing nations and commands aware of these requirements and also to set a minimum standard, this document describes the necessary skills and provides guidance on training for a generic deployment scenario in ACO. It is evident that the information also applies to any exercise, which involves METOC augmentees.

1.3 The required skills for METOC professional capabilities as well as those related to Information Technology (IT) are addressed below. Also guidelines for adequate training are documented and overall responsibilities defined.

REQUIRED METOC SKILLS

2.1 Professional skills. Staff should have a professional background in meteorology/oceanography with qualifications matching the post requirements (i.e. METOC officer, oceanographer, forecaster and observer). Each member should have been working in the field of operational meteorology/oceanography for at least 2-3 years, preferably with last experience within 1 year from deployment.

2.2 Impact awareness. Staff should have a sound knowledge of the general characteristics of military assets in the operation and the impact of

meteorological/oceanographic factors on operating these assets. Deployed staff should possess adequate briefing skills to present these impacts to senior military commanders.

REQUIRED IT SKILLS

3.1 Hardware & Operating system. Staff should have a basic knowledge of:

a. PC hardware and related devices (printers, CDROM players etc)
b. Operating system (MS Windows)
c. Limited and Wide Area Networks
d. Simple maintenance and problem solving actions including basic software installation

3.2 General applications. Staff should have a practical skill in working with:

a. Presentation tool (MS Power Point)
b. Word processor (MS Word)
c. Email package (MS Exchange)
d. Browsers (Netscape and Internet Explorer)
e. Spreadsheet program (Excel)

3.3 METOC applications. Staff should have good operating skills of tools used in the METOC unit:

a. METOC workstation (NAMIS or AESS or follow-on systems).
b. METOC communications systems
c. Satellite Imagery receiving systems
d. Expert METOC programs (mission specific Tactical Decision Aids (TDAs)
e. NATO Wide Area Network

3.4 For specific functions at an ACO REA Centre, additional expert skills might be required.

TRAINING GUIDELINES

4.1 Military. They must have received the proper basic military training including Survive to Operate (STO)/CBRN aspects. Further, they should have prior experience of working in the appropriate environment (for example, augmentees sent to maritime units should have previous sea experience). Prior to deployment, staff will need to be familiarised with the organizational structure and line of command of the operation.

4.2 METOC. Recent operational experience is a prerequisite, so only mission-orientated METOC aspects need to be trained prior to the actual deployment. This includes a sound study of relevant geography/climatology and of typical

weather scenarios/oceanographic aspects and their impact on the operation's mission. Also, some training may be needed to work with mission-specific TDAs.

4.3 IT. Required IT skills as detailed in paragraphs 3.1 and 3.2 are essential in any modern METOC Office, and normally should require little additional training. However, some IT training might be needed to work with specific IT-components in the deployed METOC unit (paragraph 3.3).

4.4 Training program. Nations should set up their own program to train staff for deployment. Additionally, they may take part in a METOC orientation program (2-4 days) provided by the leading command and in which mission specific aspects can be trained. Important elements of such a program are:

a. Mission objectives and command structures (4.1).
b. Climatological conditions (4.2).
c. Weather/oceanographic impact on mission and specific TDAs (4.2).
d. Familiarisation with specific unit IT systems (4.3).

RESPONSIBILITIES

5.1 Nations and/or commands will be ultimately responsible for meeting the minimal requirements as listed above. Providing a suitable orientation program is the responsibility of the leading command. Any shortfalls in the skills of deployed METOC staff are to be brought to the attention of the CMETO or Staff METOC Officer of the relevant SC.

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CHAPTER 5 METEOROLOGICAL SUPPORT TO NATO MARITIME OPERATIONS

5.1. References

a. MCM-0051-2000, Maritime Rapid Environmental Assessment (REA) Concept of Operations (CONOPS)
b. MC 0588, Concept of Maritime Security Operations (MSO)
c. ATP-32, NATO Handbooks of Military Oceanographic Information and Services
d. APP-11(C), NATO Message Catalogue
e. ACP-176(H), Allied Naval and Maritime Air Communication Instructions
f. ATP-02(B) Volume II, Naval Co-operation and Guidance for Shipping Manual Guide to Owners, Operators, Masters and Officers
g. AWP-4(B), NATO Meteorological Codes Manual
h. AHP-01(C), Allied Worldwide Navigation Information System
i. AMETOCP-2.1, NATO Catalogue of Meteorological and Oceanographic Tactical Decision Aids
j. AMETOCP-3, NATO Meteorological and Oceanographic Communications Manual
k. MC 0594/1, Meteorological and Oceanographic (METOC) Support to Allied Forces
l. AJP 3.11, Allied Doctrine for Meteorological and Oceanographic Support to Joint Forces

5.2. Introduction

1. Maritime Forces require meteorological support service for both peacetime activities, as well as for operations and exercises. Potential users of the information contained in this chapter are meteorological staff planning meteorological support for NATO operations and NATO Commanders.

2. In real-world operations, many national ships may be allocated to NATO control under NATO Task Force Commanders in single-nation, or multinational Task Groups in accordance with NATO OPLANS. National sea-going commanders will assume a dual-hatted NATO role as Task Force or Task Group Commanders.

3. Expeditionary operations in an unfamiliar littoral environment may require additional maritime Rapid Environmental Assessment (REA) operations as described in Reference A. Significant portions of the REA products will be delivered to users through the future REP (when established).

5.3. Requirement

1. Support tailored to the specifics of the mission of NATO maritime operations, as described in Reference B and NATO OPLANS, will be required by:

a. Maritime commanders and their staffs in shore-based headquarters or embarked in ships.

b. Ships and submarines with a wide variety of operational roles including merchant ships involved in NATO operations.

c. Aircraft involved in maritime operations, either ship-borne or land-based. These include Maritime Patrol aircraft (MPA), Anti-Submarine/Anti-Surface Warfare (ASW/ASuW) helicopters, tactical air support of maritime operations (TASMO) and mine laying operations by aircraft.

2. The requirements themselves will relate to:

a. Safety. Severe weather may significantly reduce the capability of operational units to carry out their mission or may create a significant hazard to the safety of personnel and ships. For ships, warnings are required for strong surface winds, high sea state, poor visibility, sea ice, freezing precipitation and thunderstorms. For ships with embarked aircraft, applicable aviation hazards are described in Chapter 6.

b. Mission Effectiveness. Meteorological data and products, both surface and upper-air, are required to improve mission effectiveness of ships and ship-borne aircraft. This supports determining the best mode of operation of weapon and sensor systems on-board and providing correction factors for use with the guidance system of weapon systems to compensate for atmospheric conditions. Such information will most likely require the use of special Tactical Decision Aids (TDAs). A library of NATO TDAs can be found in Reference I.

c. Survivability. This mainly relates to the prediction of CBRN hazards. For more information on this subject, see Chapter 9 of this publication.

3. Requirements at HQs. Details are given in Chapter 4 of this publication. In particular for CJTF-like operations, HQ MARCOM Northwood will probably require a REA Coordination Center (REA CC) to plan and conduct REA operations in unfamiliar scenarios.

4. Requirements in Ships. Most warships are equipped to carry out a special role. The armament or sensor systems used to carry out these roles may require some forms of meteorological support which are unique to each particular role, implying the need for tailored support. However, the main part of the support required is common to all ships:

a. Actual information of current conditions that is needed to support weapon and sensor systems. When transmitted to shore-based centres, this information also meets the requirement of meteorological centres for real-time weather data from the operations area. Most ships are equipped with suitable instrumentation to make accurate current weather observations.

b. Forecast information for the area of operations that is provided either from an MSU in the ship, or in another ship in the same task group or from a weather centre ashore.

c. Radar and Electro-Magnetic (EM) propagation forecasts will be essential in some operating areas to ensure the effective use of the communications, navigation, sensors and weapons systems.

5. The support required by a ship will depend on whether or not the ship has an embarked MSU and on the principal operational role of the ship. Generally, ships with an MSU will need to receive, on a routine basis, substantial amounts of real-time information (e.g. synoptic data, NWP products) for an area large enough to enable it to provide the necessary support for the ship's area of operations. Ships without an MSU will mainly require end products concerning relevant operational parameters as listed in Figure 5-I. It should be noted, that rather than numerical parameter values, impact assessments of these forecast values will be required by the ship’s operators (i.e. tailored support).

6. Requirements for naval aircraft. For ship-borne aircraft or land-based aircraft in support of maritime operations, the air operations requirements are covered in Chapter 6; however, the sometimes limited and restrictive communication pipelines available aboard naval vessels must be taken into consideration as well.

5.4. Organization

1. The organization to meet the requirements for meteorological support to NATO maritime operations is provided by a combination of WACs, MFCs, and MSUs as described in Chapter 3.

2. WACs. Although WACs are generally not directly involved in support to maritime operations, they are important assets as they provide the basic data and numerical products required by MFCs and MSUs. Also, they provide specialist support (e.g., numerical wave height forecasts, CBRN, EM/Radar propagation). WACs (including MFCs) that have the capability to provide required NATO support are depicted in Chapter 3.

3. FWCs. MFCs that provide support to maritime operations are known collectively as Fleet Weather Centers (FWCs), although individual centres may have

different titles relating to the specific national or NATO responsibilities. FWCs are all national assets.

4. Since oceanographic and acoustic support products for sub-surface and littoral warfare operations are often dependent on meteorological conditions, FWCs are frequently collocated with Military Oceanographic Information Centers (MOICs) to facilitate the exchange of data and to share manpower, equipment, and communications. For more information on MOICs, see Reference C.

5. In preparation for and during the conduct of a NATO operation, MFCs may be designated to play a role in a Rapid Environmental Assessment (REA) program as a REA Coordination Center (REA-CC) or a REA Support Center (REA-SC). Designation as a REA-CC or a REA-SC will typically be discussed during the Operational Planning Process (OPP) and included in the corresponding Annex to the OPLAN.

6. The detailed capabilities of the FWCs and their AORs for providing meteorological support to NATO maritime operations are given in National reports according to Chapter 10.

7. MSUs. MSUs may also carry different titles, e.g. METOC Cell. MSUs are located in some maritime HQs, in some ships and at some airbases that provide support to maritime operations. Centers that serve as MSUs in maritime headquarters are all FWCs whose primary responsibility is to provide support to maritime units in the command area.

8. If a ship in any Task Group, particularly fixed-wing carriers, has an MSU, it is normal practice for the MSU to issue routine forecasts to the other ships in company via the ship-to-ship broadcasts. If more than one ship in the Group has an MSU, the Task Group Commander should delegate the Meteorology Guard responsibility for providing such forecasts to the most appropriate ship.

9. An MSU supporting MARCOM Northwood for expeditionary operations may be reinforced to help it to undertake the heavy additional workload in performing its role as REA CC. The reinforcement could be in the form of a Mobile METOC Team (MMT) provided by a nation as a dedicated asset in the Force Composition, or arranged as augmentation to the organic MSU. NATO has a MMT attached to the MARCOM Northwood (the REA Center of Expertise, REA COE) for deployments in support of maritime expeditionary operations.

10. Planning. The planning and organization of METOC support to maritime operations follows the same principles and procedures as outlined in Chapter 2 for the OPP. Specifically for the maritime environment, responsibilities for the support and details of its organization are communicated to and coordinated with all units in the maritime Task Force and supporting METOC centres by the OPTASK METOC Message. Composition and structure of this message are covered in Annex C of Reference D.

5.5. Implementation

1. General. Tactical support to naval forces is provided primarily through:

   a. NATO common-user broadcasts.

   b. Dedicated METOC broadcasts.

   c. Internet/Intranet web pages (unclassified and NATO-SWAN).

2. It is important that all components of a maritime operation make use of the same suite of meteorological information to ensure the IMETOC Support Principle “One Operation, One Forecast” is respected. One WAC and FWC of the IMETOC LN should be recognized as the main source of meteorological information in the OPLAN. This responsibility may shift as the fleet transits to a new geographic area.

3. Meteorological Products. FWCs routinely produce a great variety of products for national usage, which are also available to NATO units. They should be tailored, wherever possible, to meet the requirements listed in Figure 5-I. On request, various FWCs are also capable of generating special products, including ship-route forecasts. Optimum Track Ship Routing (OTSR) services and Special Track Weather Forecast/En route Weather Forecast (TRAX/WEAX) services for oceanic crossings are available to naval ships of NATO nations, on request, from Fleet Weather and Oceanographic Centre (FWOC) Northwood and FLEET WEATHER CENTER Norfolk. For details on OTSR and TRAX/WEAX, consult Reference G. For details on specific FWC services, the National reports according to Chapter 10 should be consulted.

4. FWCs also provide ballistic meteorological support; details can be found in STANAGs. FWCs do not produce CBRN messages; these should be requested from the appropriate WAC as discussed in Chapter 9.

5. Support to Maritime Commanders. Commanders operating from a shore-based HQ will be supported as described in Chapter 4. Commanders at sea will normally be in ships that have an organic MSU or a dedicated CMU to provide the necessary support. These MSUs will receive basic and derived data from a FWC or the IMETOC LN via naval broadcast and/or from WACs via exclusive meteorological broadcasts from those centres. These MSUs, when required, will act as maritime REA CC, supported by the REA COE or augment as appropriate. Minimum connectivity for MSUs supporting a maritime commander should grant, at least:

   a. Access to the JOA data, information and products.
   b. Access, through the Internet/intranet, to the supporting FWC.

   c. Maritime and REA in situ data.

6. Commanders who do not have direct access to an MSU will be served by forecasts on an appropriate naval broadcast (normally on a routine twice-daily basis) or request additional support, if required, from the appropriate FWC or IMETOC LN.

7. Support to Ships. In principle, meteorological support, in both alphanumeric and graphic format, is readily available to ships anywhere in the world on a variety of radio broadcasts. For merchant ships wherever possible, use should be made of commercial/ national civil meteorological organizations that provide support in peacetime.

8. Support to Submarines. Because of the limited capacity of submarine broadcasts, meteorological support is transmitted only at the discretion of the appropriate submarine operating authority. Only brief extracts of forecasts should be produced for submarines. Details of submarine broadcasts are given in SUPP-1 to Reference E.

9. Support to Aircraft Carriers. With their ship-based air operations, fixed-wing aircraft carriers require considerably more meteorological support from shore-based centres than any other ships. Only a few NATO nations operate carriers and most of them have organic METOC-support facilities (i.e. an MSU) with a similar capability to that of an airbase weather office as described in Chapter 6. Ships carrying a full-time or part-time meteorological organization will be able to receive basic and derived meteorological data from the appropriate FWC/WAC or IMETOC LN via exclusive meteorological broadcasts originated in those centres.

10. Support to Aircraft Involved in Maritime Operations. As described above, fixed-wing aircraft on board carriers usually have organic MSU support. For ship-borne helicopters, only a few ships, other than fixed-wing carriers, have an MSU with limited personnel and equipment that can provide the necessary support. Most ships of destroyer/frigate size with embarked helicopters have no such capability and can receive support only by the means described in Paragraphs 7, 14 and 15**.** Some FWCs provide products that are specifically designed for use by such ships. Support to land-based maritime aircraft is covered in Chapter 6.

11. Support for Standing Naval Forces. The support to standing Naval Forces will be coordinated by MARCOM Northwood with the IMETOC LN (see Annex A).

12. Communications. Ships not carrying meteorological organizations will be served by several methods. All ships should receive forecasts on appropriate naval broadcasts on a routine basis; in addition, special forecasts (WEAX, OTSR) may be obtainable on request from the appropriate FWCs. Finally, all ships should receive severe weather warnings for gale, storm, and hurricane force winds from the appropriate FWC.

13. In times of crisis and conflict, special procedures will have to be taken as described down in Reference J.

14. Meteorological Reports. With sea areas being data-sparse, it is essential that, whenever possible, NATO ships and maritime aircraft take meteorological observations and report to the appropriate centres in a standard format. All ships, while at sea, should take at least one meteorological observation every six hours (for aircraft every three hours), unless a significant change in weather requires a more mfrequent update. Ships and aircraft in company should make arrangements for one unit to make the necessary reports. Merchant ships instructions for the origination of weather reports in times of conflict and crisis are covered in Reference F.

15. The centres to which observations should be reported will be listed in the respective MARCOM OPLAN. For missions beyond the North Atlantic and Mediterranean Sea, appropriate OPORDS will describe meteorological reporting procedures. All routine reports should be given the precedence PRIORITY. Non - routine reports should be allocated a higher precedence dependent upon circumstances. Instructions for handling weather reports from ships at sea by shore authorities are contained in Reference E. These reports should be handled with the greatest possible dispatch and given as wide a distribution as possible within their classification.

16. Ships are to report surface weather observations in WMO code FM 13 or, by exception in plain language. Ships are encouraged to include as many of the optional groups in FM 13 as possible, in particular the sea temperature and wave groups. Special reports should be made in accordance with FM 13 instructions. Upper air observations by ships should be reported in WMO codes code FM 33 (PILOT) and FM 36 (TEMP), respectively. Bathy-thermograph reports should be made in WMO code FM 63; see Reference C for further details.

17. MCWG(METOC) has approved the use of non-WMO codes for specific NATO applications; these codes are referred to as NATO Meteorological Codes. Details of these codes are contained in Reference G. One of them, MAWEC is particularly designed for MPA. Another one, RECCO, is designed for Meteorological Reconnaissance Aircraft. A supplement section of the RECCO code is used by the US for reporting sea-ice conditions. For reporting ice phenomena, an interim NATO code is contained in Reference G. However, WMO code FM 13 may also be used for transmitting limited ice information. Navigational warnings involving ice conditions should be reported according to the procedure in Reference H.

18. Ballistic meteorological messages and CBRN Reporting formats. Ballistic meteorological message formats and procedures for data exchange have been agreed under STANAGs 4061, 4082, 4103, 4131, and 4140. Information on CBRN reporting formats is given in Chapter 9.

19. Standard Gridded Data Message. Under STANAG 6022 a Standard Gridded Data Meteorological Message was adopted for use in NATO.

METEOROLOGICAL PARAMETERS REQUIRED BY SHIPS TO SUPPORT MARITIME OPERATIONS

Meteorological Parameters	Requirements by Ships without an MSU										
	All Ships	Additional Requirements for Specific Maritime Operations									
		Anti-Submarine Warfare	Anti-Air Warfare	Surface Warfare	Mine Warfare	Command, Control, & Comms	Logistics Ops (RAS)	Sub-marines	Carrier Air Ops (Note 1)	Helo Ops (Note 1)	Amphib Ops
Synoptic Situation & Developments	F										
Severe Weather Warnings	F										
Air Temperature	C						F				
Surface Wind – Direction, Speed, Gusts	C/F										
Sea Surface Temperature		C/F						C/F			
Humidity			C	C							
Sea State	C/F										
Swell (Period, Height, Direction)	F				C		C				
Precipitation	C/F										
Sea Ice	C/F										
Visibility	C/F										
Cloud Cover	C/F										
Radio Propagation Conditions		C/F	C/F	C/F		C/F		C/F			C/F
CBRN	F										
BALMETs			F	F							
Surf											C/F
Tactical Indices (Para 505b)			F	F							

FIGURE 5-I

C = Current Information, which is observational data collected by each ship to meet its own requirements.

F = Forecast Information, which is provided by an MSU embarked in the ship, or a ship in the same Task Group, or from a shore-based weather centre.
Note 1: See Chapter 6 for detailed requirements.

Annex:

A. IMETOC Support to NATO Standing Naval Forces

ANNEX A: IMETOC SUPPORT TO NATO STANDING NAVAL FORCES

Introduction

The NATO Standing Naval Forces (SNF), composed of the Standing NATO Maritime Groups (SNMGs) and Standing NATO Mine Countermeasure Groups (SNMCMGs), require continuous METOC support as weather phenomena can pose a threat to the safety of the vessels and their personnel, or can impede the effective use of specific sensors and weapon systems.

Aim

According to requirements outlined in current ACO Directives, publications and Reference K and L, this annex stipulates provisions to establish and conduct METOC support to the SNF in accordance with IMETOC principles.

Provisions

1. One IMETOC LN shall be appointed to provide permanent, worldwide METOC support to all SNF units, unless said ships are directly supporting or participating in a NATO operation.

2. Ships assigned to SNF transiting under national Command and Control to or from points of transfer of authority (TOA) must approach their individual Nations in order to receive METOC support. Nations that cannot provide this support are responsible for arranging the necessary support with another nation.

3. Ships assigned to SNF sailing under NATO Command and Control will receive IMETOC support from the IMETOC LN (SNF). This provision does not apply if a ship (or group) is directly supporting, or participating in, a NATO operation.

4. Ships assigned to SNF supporting or participating in a NATO operation will be provided with IMETOC data and products by the IMETOC LN of this specific operation.

Responsibilities

1. SHAPE: Appoints the IMETOC LN (SNF).

2. ACO Commands on Operational Level:

    a. Provide detailed guidance to the IMETOC LN (SNF) on the operational requirements;
    b. Liaise with the IMETOC LN (SNF), if required, and offer feedback on the products.

3. National METOC Team embarked on an SNF Flagship: Liaise with the assigned LN on tactical METOC matters and offer feedback on the products for quality management.

4. Nations:
   a. Comply with the principles of IMETOC support.
   b. Ensure that participating national units fully understand IMETOC, as well as the products provided by the IMETOC LN (SNF), and any embarked METOC team.

5. IMETOC LN:
   a. Provides the products as stated in the IMETOC Support Plan in a timely manner, and responds to additional requests.
   b. Is able to respond rapidly to changing requirements.

6. Personnel providing forecasts for the SNF using the IMETOC LN (SNF) data:
   a. Is able to communicate with the units at all times and with various means, including via signal messages, the internet, email and telephone;
   b. Provides timely warnings of significant weather phenomena that could impact operations and/or the safety of the SNFs and its personnel.

CHAPTER 6: METEOROLOGICAL SUPPORT TO NATO AIR OPERATIONS

6.1. References

a. AMETOCP-2.1, NATO Catalogue of Meteorological and Oceanographic Tactical Decision Aids
b. ACOMEX Handbook
c. AMETOCP-3, NATO Meteorological and Oceanographic Communications Manual
d. AWP-4(B), NATO Meteorological Codes Manual
e. AFS “ACO Forces Standards”, Volume VI
f. AD 80-34, Meteorological and Oceanographic Services for Allied Command Operations
g. WMO-No. 8, WMO Guide to Meteorological Instruments and Methods of Observation, Edition 7 (2008)
h. ICAO DOC 9837, Manual on Automatic Meteorological Observing Systems at Aerodromes ED. 2
i. ICAO Annex 3, Meteorological Service for International Air Navigation
j. MC 0594/1, Meteorological and Oceanographic (METOC) Support to Allied Forces

6.2 Introduction

1. NATO Air Operations require meteorological support services that are Similar to those for supporting any nation’s Air Operations. The purpose of this chapter is to provide general guidance on planning and providing meteorological support to air operations. Potential users of the information contained in this chapter are Meteorological Staff planning Met support for NATO operations and NATO Commanders.

2. NATO aircraft may be deployed to airfields outside of NATO countries. The requirement for meteorological support will in principle be the same as when operating from the home base. Deployed units may rely on host nation Meteorological Units to provide services such as airfield weather observations and forecasts (e.g. METARs and TAFs). Alternatively they may take their own meteorological units, or may rely on reach back procedures or a combination of the above. Proper advance planning is a requirement. If aircraft from more than one nation are deployed in order to participate in one combined operation the information provided should be based on the products of an IMETOC LN to ensure the IMETOC Support Principle is respected.

3. Many aspects of support are very similar to those required for civilian aviation. For reference, the civilian standards, recommended practices and guidance material governing the provision of meteorological services to civilian international air navigation can be found in reference I.

6.3. Requirement

1. There are different types of air assets (e.g., transport aircraft, fast jets, helicopters, Airborne Early Warning Aircraft, Maritime Patrol Aircraft**,** etc.). Each of them may be capable of a variety of different missions (e.g. fast jets can be used for reconnaissance, air defence, air attack**,** electronic warfare**,** etc.). Moreover different command levels will be involved in the planning and execution of air operations; and the meteorological information requirement for each of these levels may differ (e.g. timescale or level of detail needed). The meteorological support requirement from each of the participants involved, even if working in the same Area Of Operations and within the same timeframe will therefore vary and the information provided must be tailored to each of the users' needs (not forgetting the "One Operation, One Forecast" principle). Meteorological support, tailored to the specific requirements of air operations, can be categorised at the strategic, operational and tactical levels.

2. Requirement for Strategic and Operational Commands. At the strategic and operational level there is a requirement for an overall analysis of the main weather features and an assessment of their impact on the relevant operations. In general the Strategic Commander needs only to be informed about those weather aspects that may delay the operation. The emphasis will be on medium to long-range forecasts (five days and further into the future) or climatological data; however, operational commands may also routinely require data primarily meant to support tactical commands and mission execution. The Staff Met Officer must be included in the Directing Officer's planning and coordination meetings, in order to ensure that the daily Commander's Decision briefings include the weather and its impact.

3. Requirement for Tactical Commands. Joint Force Air Components, Air Operations Centres and units conducting mission execution will occasionally require medium- to long-range forecasts and climatological data similar to strategic and operational level requirements. However, the primary focus will be short- and medium-range forecasting (ranging from the present to approximately five days in the future) to facilitate effective, yet safe weapon system employment or to enable other functions to operate effectively.

The NATO Air Operations Centres require the following meteorological products:

a. Products required for Area of Responsibility (AOR):

(1) Severe Weather warnings
(2) General Forecasts (0-72 hrs)

(3) Aviation Weather Forecasts (0-18 hrs)
(4) NATO Airfield Weather Actuals
(5) NATO Airfield TAFs
(6) NATO Airfield Colour States
(7) Specific Target Forecasts
(8) Enemy Airfield Forecasts
(9) CBRN Predictions

b. Content of Aviation Forecasts required by Air Operation Centres:

(1) Upper Winds, Surface Winds and Temperatures
(2) Icing
(3) Turbulence, Low Level Turbulence and CAT
(4) Contrails
(5) Height and Temperature of Tropopause
(6) D Values
(7) Pressure Altitude
(8) Sea State
(9) Sea Ice
(10) Sea Surface Temperature

c. The following additional support is also required:

(1) Actual weather information at the airbases should be continuously monitored and routinely measured by qualified meteorological observers and/or certified automated observing equipment, in accordance with ICAO/WMO standards.

(2) Severe weather warnings for the home airbase must be provided to avoid significant hazards to air operations, safety of aircraft, aircrews, ground staff and equipment.

(3) Briefings of forecast information for the home airbase, designated diversion airbases, the area of operations, and route should be provided to the aircrews, whenever possible, by personal briefing to individual aircrews, or group of aircrews on the same mission, by a trained weather briefer or forecaster as short a time as possible before the start of the mission to ensure that the most up-to-date information is used.

(4) Amendments should be provided for any forecast where an unanticipated change in actual weather has crossed a threshold that is critical to flight operations and was not forecast to occur.

d. Surface and upper air forecasts are required for the location of SAM units and likely areas of deployment. Additionally, severe weather warnings are required for conditions that may affect sensor/weapon performance.

e. When helicopter attack and lift missions originate from an airfield, the requirements are similar to those for fixed wing aircraft but with greater emphasis on low-level weather to support nap-of-the-earth flying. Often helicopters operate from landing zones or tactical locations without permanent observation equipment and the mission may cover several hours. In this case the weather brief must include information on landing zones. Also for helicopter operations, the forecast should describe how weather is expected to change over time over the entire area of flight operations, and not just a point forecast for takeoff, mid-flight, and landing.

4. Requirement for Mission Execution

a. Airfield weather observations and forecasts are an essential requirement for the Commander and his staff to efficiently and effectively manage the many different airfield operations. Most wing/squadron flying missions are to perform a specific specialist task. The meteorological support that is provided to the aircrews for each mission needs to be tailored to the requirements of the specific role, the area of operations, and the time period of the mission. The mission specific forecast information is required for route planning, tactical planning, and to help determine the best mode of operation for weapon and the sensor systems. Mission specific requirements include forecasts of electro-optic and infrared range, night illumination levels, radar ducting, sound propagation, and CBRN dispersion/fallout patterns. Depending on the type of mission, a review of the listing of Tactical Decision Aids (TDAs) listed in reference B may prove beneficial in mission planning.

b. Details of support need to be described in Local Operation Procedures / Local Staff Instructions. It is normal for these procedures to be established by direct liaison between the Staff Met Officer, the squadron commanders and the aircrew.

c. Warnings of severe weather are required for any weather element that could create a significant hazard to air operations and safety of aircraft and ground personnel.

d. Meteorological data and products, both surface and upper-air, are required for:

(1) Flight planning.

(2) Determination of the best mode of operation of weapon and sensor systems.

(3) Development of correction factors for use in guidance systems of weapons to compensate for atmospheric conditions. This information may be required in the form of a tactical index for electro-optical systems.

(4) Deciding particular aircraft weapon systems to be used for a specific mission.

(5) Making a choice of specific targets for missions.

(6) Assessment of aircraft performance by air defence controllers.

(7) Prediction of CBRN dispersion/fall-out patterns.

6.4. Organization

The organization to meet the requirements for support to NATO Air Operations is provided by a combination of WACs, MFCs and MSUs, as described in Chapter 3.

6.5. Implementation

1. Support at Airbases:

a. Support to national airbases in their own country is provided by a national meteorological organization of that country.

b. Support to national airbases located in another NATO country is normally provided by the nation that operates the base, not the host nation. A WAC and/or MFC may provide support to the MSU on such airbases either from:

(1) The host nation by bilateral agreement, or

(2) Their own country, or

(3) Another NATO country by bilateral agreement.

c. Support to aircrews operating from an airbase in another NATO country, belonging to that country, is normally provided by the host nation's meteorological organization.

d. Support to the NATO airbase Geilenkirchen for the NAEW&CF is provided by NATO civilian Meteorological staff. The head of this MSU is

also responsible for the coordination of the meteorological support on the Forward Operating Base/Forward Operating Location (FOB/FOL) of the NAEW&CF.

e. The MSU at an airbase may be either:

(1) A Forecast Office that is normally manned by qualified forecasters and observers on a 24 hours-per-day, 365 days-per-year basis. Because the support to be provided to the aircrews needs to be based on the very latest information possible, most forecast offices receive data and products directly from a WAC rather than use more tailored products from a MFC.

(2) A Briefing Office is not normally manned on a 24 hours-per-day basis. Qualifications of the staff depend on the requirements of the airfield users. They interpret tailored products from a MFC to provide briefings to aircrews and ground support staff. The MFC which provides support should itself operate on a 24 hours-per-day, 365 days-per-year basis.

f. Although a significant number of operational aircraft of different NATO nations will be deployed at an appropriate stage in a NATO Crisis Response System operation, the airbases to which they deploy will normally all be operational in peacetime, together with their supporting services, including the MSU. The MSUs should be able to provide aircrew information contained in flight documentation recommended by ICAO. If host nation support is deemed to be not adequate for NATO operations, augmentation will be instituted through appropriate OPLANS.

g. Aircraft**/**Pilot (PIREP) weather reports

All airbase MSUs should have procedures for debriefing, evaluating and processing aircrew weather observations (TARWI, plain language pilot reports (PIREPs), etc.). These observations should be transmitted as soon as possible by means of the communications networks used for the transmission of routine airbase observations for use by air operations centres, MFCs and other airbases.

h. Support at temporary "airbases" in the battlefield area for helicopters and VSTOL aircraft should be defined in appropriate plans covering those operations. Often the support is provided via communications with the closest appropriate weather unit.

2. Support to Peacetime NATO Integrated Air and Missile Defence Operations

NATO Integrated Air and Missile Defence (IAMD) peacetime components protect NATO Nations' populations and territories. Meeting the METOC requirements for

such a large Area of Functional Responsibility (AoFR) is a non-trivial task that requires resources that most Nations do not have.Therefore, a cooperative approach represents a more realistic means to meet all mission requirements while applying IMETOC principles towards this operation (Annex A).

3. Support to NATO Airborne Early Warning Aircraft Operations

The role of the NATO Airborne Early Warning and Control (NAEW&CF) E-3A Airborne Warning and Control System (AWACS) is to carry out airborne surveillance, and command, control and communications (C3) functions. METOC support is highly contributing to the mission success. Therefore during operations (covering any IMETOC assigned activity such as NATO exercises**,** etc.), where the mission of the E-3A AWACS is a coordinated mission with many other assets in theatre, the usage of the IMETOC principle is inevitable (Annex B).

4. Support to NATO Allied Ground Surveillance (AGS)

The role of the NATO Allied Ground Surveillance is to inform NATO political and military leaders, and national ones, at the strategic, operational, and tactical levels. Components of the AGS mission involve continuous (24/7) operations requiring meteorological support on a global scale to secure mission success. Tailored meteorological support to AGS mission planning and execution has to be compliant with the IMETOC principle according to Reference J.

5. ACO Meteorology and Oceanography Information Exchange Network (ACOMEX)

In operations and live exercises, there is a requirement for the Rapid exchange of weather and oceanographic data, particularly TAFs, METARs, TARWIs and PIREPs, among the headquarters, air operations centres, and airbases throughout ACO. To achieve this, a dedicated network of communication circuits, called the ACOMEX network, has been established. Details of the configuration of the network and the organization and operation are provided at References B and C.

6. Airfield Weather Colour Codes

A simple and (within NATO) much Practiced method of transmitting and displaying actual and forecasted information on visibility and clouds is the usage of the so-called Airfield Color State Code. See reference D for more details on the exact colour code and its usage.

7. Tactical Evaluation (TACEVAL) and Operational Evaluations (OPEVAL) of Meteorological Units

To ensure the quality of support provided to air operations, regular quality control must be executed both through national and NATO arrangements. NATO quality control is done through processes such as TACEVALs and OPEVALs. For more detailed information see references E and F.

8. Automated observations

a. Meteorological observations from airfields are a vital source of data in often data sparse regions and are increasingly becoming automated. The appropriate quality of the observational data needs to be assured. Nations are expected to implement their own commissioning and quality control process for automatic observing systems, ensuring that the instrumentation is verifiably deployed and maintained by qualified personnel, sited appropriately, tested and the performance regularly assessed. The uncertainty, range, and resolution of the weather elements measured are advised to meet those described in reference H.

b. The ICAO procedures described in reference I should be used by NATO as the minimum requirements for automatic weather observation stations at military airfields. Annex 1.B of Part 1, Chapter 1 of reference H provides useful guidance to the expected operational measurement uncertainty and instrument performance.

Annexes:

A. IMETOC Support to Peacetime NATO Integrated Air and Missile Defence Operations
B. IMETOC Support to E-3A Operations

ANNEX A: IMETOC SUPPORT TO PEACETIME NATO INTEGRATED AIR AND MISSILE DEFENCE OPERATIONS

Introduction

Meeting the METOC requirements for such a large Area of Functional Responsibility (AoFR) is a non-trivial task. Therefore, a cooperative approach represents a more realistic means to meet all mission requirements while applying IMETOC principles towards this operation.

Aim

To establish and conduct METOC support to peacetime NATO IAMD operations in accordance with IMETOC principles.

Provisions

1. Host Nations of NATO-assigned garrisons shall receive initial consideration for providing IMETOC support. A common agreement on the IMETOC support shall be established between the Host Nation and SHAPE.

2. If the Host Nation of NATO-assigned garrisons cannot support the requirements, an IMETOC LN shall be selected to provide the required support.

3. Based on the commonly-agreed list of IMETOC data and products, an IMETOC LN, if needed, may be supported by one or more Assisting Nations (ANs) to provide tailored air and missile defence forecasts for one or more sub-regions. Any sub-region shall mirror NATO IAMD functional responsibility regions as much as possible.

Responsibilities

1. SHAPE: Establishes initial support provisions among ACO and Nations, including the list of IMETOC data and products.

2. ACO Commands on Operational Level:

   a. Conduct IMETOC support provisions with established LN and maintain them to ensure that all operational areas and requirements are covered;

   b. Collect and coordinate further requirements for the Command itself and subordinate units for operational and tactical-level matters.

3. Nations: Ensure official aerodrome forecasts and observations exist and are made available to all NATO IAMD participants.

4. IMETOC LN (if assigned): Provides the products as stated in the IMETOC Support Plan in a timely manner, and responds to additional requests.

ANNEX B: IMETOC SUPPORT TO E-3A OPERATIONS

Introduction

During operations, where the mission of the E-3A AWACS is a coordinated mission with many other assets in theatre, the usage of the IMETOC principle is inevitable.

Aim

To establish and conduct METOC support in accordance with IMETOC principles to the NAEW&CF E-3A AWACS aircraft when flying in NATO operations or exercises.

Provisions

1. One IMETOC LN shall be appointed for each NATO operation, mission or other event to provide METOC support to all assets in theatre including the NAEW&CF E-3A AWACS aircraft.

2. E-3A Aircraft participating in a NATO operation, mission or other event will receive IMETOC support on the operational level, and support based on the provisions of the IMETOC support by the LN and the requirements as set by the NAEW&C Force Commander on the tactical level.

3. Where more than one NATO operation, mission or event can geographically overlap with neighboring AORs with different IMETOC LNs, and deployed E-3A might participate in several of those operations, missions or other events, special attention is needed to de-conflict the information and secure geographically consistent METOC Support for the E-3A throughout all levels of command. This is typically done at the tactical support level, but might also need to be done at the operational support level. The MSU at MOB Geilenkirchen is responsible to coordinate the information.

Responsibilities

1. SHAPE:
   a. Appoints the IMETOC LN for every NATO-operation;
   b. Manages the long term appointment of LNs/ANs.

2. ACO Commands on Operational Level:
   a. Provide detailed guidance to the IMETOC LN on the operational requirements;
   b. Liaise with the IMETOC LN, if required, for changes in the requirements and to offer feedback on the products.

3. Head of Meteorological Office at the NAEW&CF MOB Geilenkirchen:

   a. Assesses the required operational and tactical METOC support for deployed E-3A AWACS aircraft based in site surveys;

   b. Drafts Annex-T for the operational orders for the E-3A deployment based on the assessment of required METOC support;

   c. Assures a minimum level to the quality of the METOC support to deployed E-3A;

   d. Liaises with the responsible ACO Command on Operational level to organise the METOC support for deployed E-3A;

   e. Ensures a liaison with HN in case a HN contribution is part of the IMETOC support requirements.

4. Meteorological Office at the NAEW&CF Main Operating Base Geilenkirchen: Provides support for the deployed E-3A as detailed in Annex-T. This can require on-site support (deployed METOC) or reach-back support from the Main Operating Base.

5. Host Nations: Deliver IMETOC support as detailed in Annex-T.

6. IMETOC LN:

   a. Provides the products as stated in the IMETOC Support Plan in a timely manner;

   b. Responds to additional requests;

   c. Is able to respond rapidly to changing requirements.

CHAPTER 7 METEOROLOGICAL SUPPORT TO NATO LAND OPERATIONS

7.1. References

a. AJP-3.2, Allied Joint Doctrine for Land Operations
b. AD 80-34, Meteorological and Oceanographic Services for Allied Command Operations
c. MC 0594/1, Meteorological and Oceanographic (METOC) Support to Allied Forces

7.2 Introduction

1. The NATO Response Force (NRF) concept allows for NATO to rapidly deploy forces should a crisis or conflict occur. During times of crisis and war, NATO land forces will be composed of single nation units up to brigade level which will combine to form multinational army corps and groups. As with NATO maritime and air operations, most NATO army commanders have double-hatted national and NATO responsibilities in peacetime, becoming NATO commanders in wartime.

7.3 Requirement

1. Meteorological support tailored to specific requirements of land operations, as described in Reference A, will be required by NATO headquarters for commanders and their staffs at all levels. The geographic coverage, period of interest and general nature of the support required at the various levels of command and control and by operational users are summarised in Figure 7-I.

2. More detailed requirements will relate to warnings of severe weather that could reduce the capability of operational units to carry out their mission or create a significant hazard to the safety of personnel and equipment. Details are given in Figure 7-II for land units.

3. Meteorological data and products, both surface and upper-air, are used for:

a. Trafficability assessments, including the state of the ground and the condition of river crossings.

b. Assessments for parachute drops and amphibious landings.

c. The development of correction factors for artillery and surface-to-surface missiles to compensate for atmospheric effects, tank operations for thermal tank sights, light infantry operations in support of TOW systems, and air defence artillery.

d. The assessment of transport and diffusion of smoke and the prediction of CBRN fallout patterns.

e. Intelligence collection systems, particularly Unmanned Aerial Vehicles (UAVs).

f. Sound propagation assessments, both continuous and impulse, from both friendly and enemy sources.

4. Meteorological information will be required by units for friendly territory occupied by the unit, the battle area of specific interest to the unit, and the forward area extending to targets for artillery (up to 200 km for deep fire).

5. Requirement at Deployable Command Centres

a. The support required will comprise:

(1) Actual information from the areas occupied by own units and by opposing enemy units in forward area of responsibility, for assessment of effect of the weather on capabilities.

(2) Forecast weather for the same areas for planning future operations.

6. Requirements of operational army units

a. Most army units carry out a specialist role that may require specific meteorological support that is unique to that role. The support required will comprise:

(1) Actual information for the area of current operations:

(a) For artillery units for calculation of ballistic corrections, and target area weather for deep fires,

(b) To support close combat heavy and light forces,

(c) To provide information to support CBRN defence, smoke employment, terrain analysis, mobility, and counter-mobility estimates, and forecasting future conditions.

(2) Forecast information for the area of current operations for planning upcoming missions.

b. Detailed requirements of the different land operational missions are given in Figure 7-III.

c. Requirements for army air units are given in Chapter 6.

7.4 Organization

1. The organization necessary to meet the requirements for support to NATO land operations is provided by a combination of WACs, MFCs and MSUs (See Chapter 3). In addition, some nation provide detailed meteorological products

below corps level directly to division headquarters and to some brigade headquarters.

2. MFCs. There are no MFCs that are dedicated to the support of land operations. MFCs that support land operations also support air operations or air and maritime operations. The organization of MFCs that provides support to NATO land operations in Europe is comprised of both NATO centres and national centres.

3. MSUs. MSUs are located at NATO headquarters at the JFC and Land Component Command (LCC) level, and at the Army Group level, mobile and/or static. MSUs are also located with mobile army corps headquarters, army airbases, mobile air units, and some mobile artillery units. With the exception of MSUs at some NATO headquarters, all other MSUs supporting land operations are national. Details of support required by land MSUs from WACs and/or MFCs are given in Figure 7-IV.

7.5 Implementation

1. Support to land headquarters:

   a. For MNC, MSC, PSC and Army Group levels, see Chapter 4.

   b. Below Army group level. These commanders will normally be supported in garrison by a Staff Meteorological Officer (SMO) and/or the Post's MSU. During a crisis, the SMO may operate from a mobile command centre if it is activated; or the SMO may deploy with the supported unit, if and when they deploy.

2. Support to deployable command centres at corps level. Support will depend on whether the mobile command centre is involved in a crisis situation or not. While attached to a garrison during peacetime, support is normally provided to national corps by their own national met organizations via a predetermined communications connection and thence by tactical communications networks. During a crisis, the most convenient NATO or national centre normally provides support. Details of how the support will be provided should be determined by the appropriate command SMO for each individual OPLAN, as discussed in Chapter 2 and guided by the IMETOC principles outlined in Reference C.

3. Support to operational army units. With current technological advances, operational army units operating independently or jointly may have the ability to receive met data and products via numerous methods. Units with an MSU may produce their own products in addition to receiving support from a WAC/MFC. The higher echelon SMO should determine details of how the support will be provided. Met data and products for use by operational army units are listed in Figure 7-IV.

SUMMARY OF REQUIREMENTS

Level	Primary Area of Interest	Primary Period of Interest	Meteorological Support Required
MNC/MSC/ PSC/Army group	Command area and entire forward area	0 – 120 hrs	General situation and developments. Problem areas of bad weather that could significantly affect land operations. CBRN prediction.
Army Corps	Area of operations including forward area of responsibility	0 – 48 hrs	General situation and developments. Problem areas of bad weather that could significantly affect land operations, including state of land, CBRN prediction.
Operational Army units	Area of operations	0 – 12 hrs	Mission oriented forecasts. CBRN predictions. Upper air soundings and METGM data.
Army Air Units	Area of mission	Period of mission	Mission oriented forecasts. CBRN predictions.

Figure 7-I

SEVERE WEATHER WARNINGS FOR NATO LAND OPERATIONS

Meteorological Elements	All	Infantry	Artillery	Tank Units	Amphib-ious Units	Para-chute Units	Remarks
Strong surface winds	Yes						
Strong upper winds						Yes	Below 10,000 ft
Low-level wind shear			Yes			Yes	
Poor visibility	Yes						
Snow	Yes						
Hail	Yes						
Freezing Precipitation	Yes						
Thunderstorms	Yes						
Frost	Yes						
Excessive drop in temperature		Yes	Yes	Yes		Yes	> 10°C to values below 0° C
Heavy precipitation	Yes						
High sea state and surf conditions					Yes		

Figure 7-II

METEOROLOGICAL INFORMATION REQUIRED IN SUPPORT OF NATO LAND OPERATIONS

Meteorological Information Required	Operational Users						Remarks
	Corps HQs	Infantry Units	Artillery Units	Tank Units	Amphib-ious Units	Para-chute Units	
Severe weather warning	Yes	Yes	Yes	Yes	Yes	Yes	See Figure 7-II
Synoptic situation and development	F/C	F/C	F/C	F/C	F/C	F/C	
Surface wind direction & speed	F	F	F/A	F/A	F	F	Gusts > 10 kts over mean
Visibility	F	F	F	F	F	F	
Weather	F	F	F	F	F	F	
Cloud Amount, Base, Tops	F	F	F/A F/A	F	F	F/C F/C F/C	
Surface Temp	F	F	F/A	F/A	F	F	
Atmospheric Pressure	F			A			
Upper Winds	F		F/A			F/C	0 - 10,000 ft
Upper air temp	F		F/A			F/C	0 - 10,000 ft
Inversion height	F	F	F	F	F	F	For smoke diffusion
Humidity	F	F	F	F	F	F	For smoke diffusion
State of land	F/A	F/A	F/A	F/A	F/A	F/A	
Sea/swell height and direction					F/C		
Surf	F/C				F/C		
BALMETs			F/A				METCM/METGM
Battlefield surface observations	A					C	Mobile Obs (MOBOB)
Forward area data	F/C		F			F/C	
CBRN fallout predictions	F	F	F	F	F	F	

C = Current information from latest observations in the area or assessment by a trained forecaster
A = Actual information measured by qualified personnel in area of operations
F = Forecast information for the area of operations

FIGURE 7-III

METEOROLOGICAL DATA AND PRODUCTS REQUIRED BY MSUs SUPPORTING NATO LAND OPERATIONS

Meteorological Data and Products	Frequency per Day Required by MSUs Supporting NATO Land Operations					
	HQ at MNC & MSC Level	Mobile Army Corps	Artillery Corps	Army Air & Para-troop (Ch. 6)	Mobile Air Units (Ch. 6)	Source of Data and Products
1.Alpha-numeric products						
Synoptic review & guidance forecasts	2	2	2	2	2	WAC/MFC
Severe weather warnings (Fig. 7-II)	A	A	A	A	A	MFC
Surface synoptic data	4	4	4	4	4	WAC
Upper-air synoptic data			2			WAC
Forward area data	A	A	A	A	A	SIGINT, Spec Ops Forces
Climatological information	R					WAC/MFC/in house
Effective downwind messages	2	2	2	2	2	WAC/MFC
Observations from battlefield area (MOBOBs)	A	A	A	A	A	WAC
2. Graphic & Gridded Field Products						
Surface Analyses	4	4	4	4	4	WAC
Surface Prognoses (+24 hrs)	4	4	4	4	4	WAC
Surface Prognoses (+48, 72, 96 hrs)	1	1	1	1	1	WAC
Satellite pictures	A	A	A	A	A	WAC/MFC/on site
Significant weather	2	2	2	2	2	MFC
Effective downwind forecast	2	2	2	2	2	Selected WACs (See Ch. 9)
Upper air analyses, 850hPa, 700 hPA			2	2	2	WAC

A = whenever available, as soon as possible
R = on request

FIGURE 7-IV

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CHAPTER 8 METEOROLOGICAL DATA

8.1 Reference

a. AWP-4(B), NATO Meteorological Codes Manual

8.2 Introduction

1. In the context of this document, meteorological data are defined as quantitative values of meteorological parameters. Data can be:

a. Actual, when the data have been measured or assessed at a specific time in the recent past. This type of data may also be referred to as real-time data.

b. Forecast, when the data have been predicted for some time in the future.

c. Historic, when actual data are no longer valid. Because of the rapid changes that occur in the atmosphere, actual data normally remains valid for only a few hours.

d. Climatological, long-term, statistical data including mean values range of variability of various measurable quantities, and frequencies of various events.

2. The meteorological support organization collects the actual data, to be used as the basis for the development of all meteorological products.

3. In peacetime, meteorological data is collected from a worldwide network of observing stations and freely exchanged between all nations of the world under the coordination of the World Meteorological Organization (WMO). In times of crisis (political or natural disaster), it must be expected that the collection and free exchange of data may be severely disrupted.

8.3 Requirements

1. The requirements for meteorological data for the support of NATO forces can be divided into:

a. Military requirements, which are the specific data required by each individual type of military user in order to support his mission.

b. Meteorological requirements, which are the data required by the individual meteorological centres in the support organization in order to achieve their mission.

2. Military Requirements

The detailed requirements of different military users are defined in various figures in Chapters 4 through 7.

a. Actual data. There is a requirement for actual data to support weapon and sensor systems or safety of ships, aircraft and personnel. These data will normally be collected by the operational unit using its own resources or received from a WAC.

b. Forecast data. This is the primary requirement of most military forces to support current operations and those planned for the near future.

c. Historic data. Most units have little or no requirement for these data.

a. Climatological data. Required by planning staffs involved in long term planning.

3. Meteorological Requirements

a. Weather Analysis Centres (WACs) are the primary users of data:

(1) Actual Data are required in sufficient spatial and temporal distribution to satisfy the numerical analysis models in order to produce the analysis and forecast products required by Military Forecast Centres (MFCs) and Meteorological Support Units (MSUs).

(2) Forecast Data are produced by the WACs.

(3) Historic Data are required by the WACs for the development and maintenance of climatological databases.

(4) Climatological data are normally produced by the WACs.

b. Military Forecast Centres (MFCs)

(1) Actual data are required from their area of responsibility for use in detailed analysis. The WACs as data collectors usually provide these.

(2) Forecast data. The output from the numerical analyses of the WACs, usually received as a product in alphanumeric or graphic format, required for the development of military oriented products.

(3) Historic data. Little requirement.

(4) Climatological data required for development of climatological appreciations for use by military planners.

c. Meteorological Support Units (MSUs). MSUs have very similar requirements for data as MFCs, however, they may be required to provide actual data to operational units, e.g. airfield data to aircrews

about to launch or recover. In this case, the actual data are normally measured by the MSU.

8.4 Data Collection

1. Meteorological data are collected in peacetime primarily by a network of observing sites and platforms as part of the WMO and ICAO networks. Limited amounts of data are also collected by military and academic research organizations. The following methods of data collection are used:

a. Fixed, manned observing stations (surface and upper-air)

b. Automated weather stations and automated data collection buoys (moored or drifting)

c. Weather satellites and weather radars

d. Warships and merchant ships

e. Military, commercial, meteorological research, and tropical storm search aircraft

f. Mobile army observing stations (surface and upper-air)

g. Constant-level balloons, rocketsondes and electronic atmosphere profilers

2. Data collection from data sparse regions may be limited to satellites, strike aircraft, military reconnaissance aircraft (including Unmanned Aerial Vehicles), Signal intelligence sources (SIGINT), and radar. Rapid Environmental Assessment (REA) techniques applied to meteorological data and as described in ATP-32, might be put in place to populate observations availability as the operation is planned and executed. In such cases it will be necessary to use highly deployable temporary meteorological measurement equipment that should work automatically and (if appropriate) autonomously. The parameters measured should be at least wind (speed, direction), temperature, humidity and air pressure. The accuracy of the sensors should follow the WMO standards (see section 6.1.5, paragraph 6). Nations and commands are encouraged to make the data of such observing sites available to NATO and NATO forces in real-time by appropriate means.

8.5 Data Dissemination

1. The provision of meteorological support to military forces is dependent on the rapid flow of data between weather centres and the NATO METOC Data Hub (NMDH) and from the NMDH to operational forces.

2. Data are disseminated as raw data and as products that have translated data into a METOC data format required by the NCS.

3. Raw data are normally disseminated in a code format. This permits the transmission of large amounts of data in a relatively short period of time. Whenever

possible, the NATO meteorological support organization should use WMO code formats. However, WMO formats do not meet all NATO requirements for data dissemination and it has been necessary to establish code formats documented in Reference A.

8.6 Climatology

National Reports describe climatology sources from each nation available to NATO forces (see Chapter 10).

CHAPTER 9 METEOROLOGICAL SUPPORT TO CHEMICAL, BIOLOGICAL, RADIOLOGICAL AND NUCLEAR (CBRN) OPERATIONS

9.1 Reference

a. ATP-45(E), Warning and Reporting and Hazard Prediction of Chemical, Biological Radiological and Nuclear Incidents (Operators Manual) (STANAG 2103)

9.2 Introduction

1. CBRN attacks and the resulting contamination are expected to have a decisive influence on any battle situation, on land or at sea. In order to enable commanders at all levels to assess the impact of CBRN attacks on plans and decisions, they must be provided with timely, accurate and evaluated information on these attacks. Collection, evaluation and exchange of information on CBRN attacks form an extremely important part of the CBRN defence system. To ensure timely provision of the most accurate data on enemy CBRN attacks and the resulting hazard areas, CBRN Warning and Reporting Centers (WRC) have been established.

2. CBRN WRCs must be established at all levels of command. CBRN WRCs will be established by each nation to cover the geographic areas within their national borders. NATO Commands will not establish CBRN WRCs. For additional information on the formation and responsibilities of CBRN WRCs, consult Chapter 1 of Reference A. Neighbouring CBRN WRCs are to make arrangements for mutual exchange of CBRN information through lateral lines of communications. This mutual exchange of information should be executed at the lowest possible level.

3. There is a NATO requirement for nations to produce Effective Downwind Messages (EDMs) and Chemical (or biological) Downwind Messages (CDMs) so that the movement of CBRN fallout can be forecast and advice given to the appropriate authorities. The formats of EDMs and CDMs are delineated in Reference A. This responsibility is assumed by the appointed IMETOC LN.

9.3 CBRN Predictions

1. Current meteorological data are a vital prerequisite for radiological fallout and chemical, biological and release other than attack downwind hazard predictions. The meteorological service agencies will collect data and distribute the messages described below to support the CBRN warning system. Reference A, Chapter 2 describes the three types of messages:

a. Basic Wind Report (BWR). A BWR is either a Basic Wind Message (BWM) for the next 6 hours, or a Basic Wind Forecast (BWF) for the subsequent 6-hour period. These messages contain basic meteorological data to be used

for fallout prediction. They also contain information on the wind conditions, i.e. wind direction (from which the wind comes) and wind speeds in a number of layers from the surface of the earth to 30,000 m altitude. Additionally, the zone of validity and the effective date-time are stated.

b. Effective Downwind Report (EDR). An EDR is either an Effective Downwind Message (EDM) or an Effective Downwind Forecast (EDF). These messages contain information on downwind speed and downwind direction (towards which the wind is blowing) for each of seven pre-selected weapon yields.

c. Chemical (Biological) Downwind Report (CDR). A CDR is either a Chemical Downwind Message (CDM) or a Chemical Downwind Forecast (CDF). These messages contain basic meteorological information for predicting chemical vapour hazard areas or biological aerosol hazard areas.

9.4 Nuclear Fallout Predictions

1. There are two procedures used to compute nuclear fallout predictions: a detailed procedure and a simplified procedure.

a. Detailed Procedure. This procedure requires nuclear burst or target analysis information and meteorological data. A fallout wind vector plot is prepared each time new meteorological data are received. Effective downwind speed, downwind direction and width of predicted zone are determined from the wind vector plot. The Basic Wind Message (BWM) and the Basic Wind Forecast (BWF) are the source of meteorological data for use in this procedure. Details on this procedure are found in Reference A, Ch. 6, Section V.

b. Simplified Procedure. This procedure requires nuclear burst information, a current Effective Downwind Message (EDM) and a simple template (radiological fallout predictor). This procedure affords the subordinate commands direct and immediately useable means to estimate the fallout hazard with the least possible delay. Effective downwind speed and downwind direction for each of seven pre-selected weapon yields are transmitted periodically to subordinate units by higher headquarters, in the form of the EDMs, to enable subordinate commands to use this procedure. EDMs can be produced at CBRN centres and meteorological centres from the Basic Wind Message or by use of standard pressure level winds. Details on this procedure and on EDMs are found in Reference A, Ch. 6, Section IV.

2. Naval Procedures. Fallout prediction at sea is based on the principles described above. However, the sea acts as an absorbent of and shield against radioactive products and ships have the advantage of manoeuvrability that most land units lack. Therefore, some procedures are different. Hazard prediction and warning for NATO are described in Reference A, Ch. 7, Section II and III. A simplified fallout warning

system has been established by NATO for broadcasting, via coastal radio stations, warnings of fallout endangering civilian merchant shipping. This warning system is called the MERWARN System and is specified in Reference A, Ch. 7, Section IV. This system provides 5 types of messages that can be used to provide guidance on CBRN fallout/vapour hazard areas, as well as provide diversion orders to evade contamination.

3. Standard Pressure Level Winds. There may be cases where units, in particular naval ships, cannot obtain the meteorological information that is normally used for fallout prediction, i.e. the Basic Wind Message and the Effective Downwind Message. It may however be possible for the unit to obtain basic wind data that are generally available from meteorological sources (airbases, or mobile weather stations) and make use of these data for the computation of effective downwind direction and effective downwind speed. This method of computation involves the use of "Standard Pressure Level Winds". The method assumes that the standard pressure level winds used are representative mean vector winds for contiguous layers or air.

9.5 Chemical Predictions

1. Meteorological conditions can significantly influence the effectiveness of chemical agents in addition to forecasting the distribution and spread of the agents after their release.

a. Temperature. The rate of evaporation of liquid chemical agent or toxic industrial chemical varies with the temperature. High temperatures will increase the rate of evaporation while lower temperatures will decrease it. Initially, the vapour hazard of both persistent and non-persistent agents will be greater at higher temperatures, while the duration of the liquid contamination and vapour hazard will be shorter. Lower temperatures will have just the opposite effect. It should be noted that lower temperatures might actually reduce or even eliminate casualty potential. However, a contact hazard may remain for several days.

b. Air Stability. Air stability category describes the degree of mixing of a released agent with the air in the lower atmosphere. There are three general air stability categories:

(1) Stable. Under stable conditions there is little mixing in the lower atmosphere, and thus higher concentrations. The agent cloud will be effective over long distances.

(2) Neutral. Under neutral conditions, the intermediate range is most common for agent cloud predictions.

(3) Unstable. Under unstable conditions there is strong mixing and thus shorter hazard distances.

c. Wind. High wind speeds increase the evaporation rate of liquid chemical agents and dissipate chemical clouds more rapidly than low wind speeds. The effects of wind speed on persistent agent attacks are variable. Large area non-persistent chemical attacks are most effective in winds not exceeding 8 m/s (15 knots, 28 km/hr). Small area non-persistent agent attacks are most effective in winds not exceeding 2.5 m/s (5 knots, 9.5 km/hr). High wind speed, in general, increases the effectiveness of massive non-persistent agent surprise attacks. The wind speed as well as the wind direction will affect the spread of chemical clouds.

d. Humidity and Precipitation. Humidity and precipitation alter the effect of chemical agents in different ways. For example, high humidity increases the effectiveness of blister agents but does not directly affect the effectiveness of nerve agents. Heavy or lasting rains wash away liquid chemical contamination. Light rainfall occurring after a liquid contamination can cause recurrence of a contact hazard. Rainfall after a persistent nerve or blister agent contamination will temporarily increase the evaporation rate and consequently increase the vapour hazard. Snow reduces the evaporation rate of liquid chemical contamination, thereby lowering the vapour hazard in the attack area.

e. Inversion Layers. In most cases the concentration of the chemical agent will decrease with increasing height and reach a low concentration at approximately 800 metres. Normally there will be no risk above 3000 metres. Inversion layers (associated with stable air conditions) will concentrate the chemical agent within the layer. Concentration of the chemical agent above the layer will be very small.

9.6 Biological Predictions

1. Meteorological conditions can significantly influence the effectiveness of biological agents in addition to forecasting the distribution and spread of the agents after their release.

a. Temperature. Temperature is not expected to have any significant effect on the hazard area resulting from a biological attack.

b. Air Stability. The stability of the lower levels of atmosphere will affect biological agents in the same manner as chemical agents. See paragraph 9.5, section 1.b for more information.

c. Wind. The wind speed and direction will affect the spread of biological clouds.

d. Humidity and Precipitation. Humidity and precipitation will alter the effects of biological agents in different ways. Very low humidity will decrease

the effectiveness by increasing the rate at which agents dry out from atmospheric exposure. Heavy or continuous rain will locally reduce biological contamination by washing it out of the air.

e. Inversion Layers. The formation of inversion layers will affect biological agents in the same manner as chemical agents. See paragraph 9.5, section **1.**e for more information.

f. Sunlight and Air Exposure. Most biological agents will lose their viability or toxicity with time after exposure to the atmosphere. Most biological agents will have a greater rate of loss of viability or toxicity when exposed to bright sunlight.

9.7 Radiological Predictions

1. Fallout predictions provide a means of locating probable radiation hazards. Military significant fallout is expected to occur only within the predicted area. However, the prediction does not indicate exactly where the fallout will occur or what the dose rate will be at a specific location. Rainout or washout can also increase radiological contamination on the ground creating local hot spots. Areas of neutron induced radiation also can be caused by low air bursts.

2. Before planning operations in a nuclear environment, commanders must be aware of these residual contamination hazards. The information required for such planning is derived from the equations and nomograms given in Reference A, Chapter 8. The basic information needed is contained in NBC 4 NUC reports. They provide information on actual measured contamination in the form of dose rates. Most contaminated particles in a radioactive cloud rise to considerable heights. Thus, fallout may occur over a large area. It may also last for an extended period of time.

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CHAPTER 10 DOCUMENTS AND REPORTS

10.1 References

a. MC 0594/1, Meteorological and Oceanographic (METOC) Support to Allied Forces
b. AMETOCP-3, NATO Meteorological and Oceanographic Communications Manual
c. AWP-4(B), NATO Meteorological Codes Manual
d. WMO NO.9, Volume A, - Observing Stations

10.2 Documents

1. The MCWG (METOC) has established a structured and coordinated set of NATO documents for the promulgation of policies, plans and procedures to ensure the provision of meteorological Support to Allied Forces. These documents include a single policy document, Reference A, which outlines the general policy and guidance for the provision of meteorological Support to Allied Forces in peacetime and in times of crisis and conflict. They also include a series of Allied METOC Publications (References B and C) that provide background and details for the implementation of this policy and guidance. This information is aimed at the NATO-wide provision of meteorological support. Details for meteorological support at lower levels will be documented in the appropriate lower-level documents.

10.3 Reports

1. Meteorological planning shall be supported by a reporting system that will provide information on national METOC organization and capabilities, as well as commitments to meteorological support to NATO. All NATO and Partner Nations, in addition to SCs, are requested to submit their input every year to the MCWG(METOC), through the IMS SMO, to arrive not later than 15 Sept. If possible, submission of these reports is preferred by unclassified/cleared for Internet transmission via electronic mail. These reports will follow the format provided in Annexes A and B to this chapter and will be made available for all members by electronic means. Interim reports are requested from nations if a significant change should occur in a national or command capability.

2. WACs and MFCs. Reports from nations providing WACs and MFCs facilitate the comparison of users' needs with centres' capabilities. Nations and commands providing WACs and MFCs should indicate in their national information:

a. Acceptance of responsibility for meeting requirements as a WAC or MFC;

b. Changes in the capability for providing meteorological support;

c. Future plans that will affect capability.

3. Nations and commands requiring meteorological support from other WACs and MFCs in times of crisis and conflict should review the information provided in National Reports (see Annexes A and B) and make necessary arrangements directly with the nation or command concerned, noting the need for the advance programming required to effect changes in the availability of data and products from the WACs and MFCs.

4. Upper-air Soundings. Nations who operate upper-air stations are requested to provide information only on those stations not listed in WMO publications (Reference D) or whose mode of operation is expected to change in time of crisis or conflict.

5. Reconnaissance Aircraft. Nations who have accepted responsibility for the provision of weather reconnaissance aircraft are requested to confirm their continued acceptance of the commitment, along with any changes in capability.

6. Allied METOC Publications. Should errors or corrections be noted or changes occur in any portions of the information provided in the text, figures, or tables of the Allied METOC Publications, provide those under the standardization item of the Annual Report (Annex A). The Custodian of the respective Allied METOC Publication will take these notes forward for the standardization update process.

Annexes:

A. Format for Reports on Military Meteorology and Oceanography
B. Classified National METOC Capabilities

ANNEX A FORMAT FOR REPORTS ON MILITARY METEOROLOGY AND OCEANOGRAPHY

Aim

National Reports shall be updated annually and submitted electronically to the NATO IMS METOC Officer by 15 September, in advance of the MCWG (METOC) meeting. Reports should be unclassified and releasable to Partner Nations, with a separate classified supplement if required. Indicate text changes since the last report, for example with a vertical line in the right margin, or underlined and bolded type (for additions) and strike-through (for deletions). Nations should maintain the following format:

1. Organizational structure of the national meteorological and oceanographic (METOC) services or agencies that support military operations:

   a. Diagram depicting the organizational structure for each meteorological and oceanographic service supporting military operations;

   b. If there is more than one organization, describe the degree of cooperation between organizations and how it is achieved.

2. Military Meteorological Support Components. Describe the following (if existing). Include brief description of internal organization, capability, typical operational support product types, and limitations to provision of services that could impact support to NATO operations:

   a. National Meteorological Centres (NMC), Weather Analysis Centres (WAC), Fleet Weather Centres (FWC), and other major production facilities. Include size, sources of data, computing capability, numerical models used or run on site and output, and contact information;

   b. Meteorological support units that provide direct support (fixed and/or mobile) including workstations used and outputs;

   c. Meteorological research and development centres/units supporting military weather programs and contact information;

   d. Climatology Centres or other capability to produce climatological products, including extent of coverage (national, continental, global), capability to provide maritime data, and contact information;

   e. Meteorological capabilities to support NBC defense against military and accidental threads.

3. Military Oceanographic Support Components. Describe the following (if existing). Include a brief description of internal organization, capability, typical operational support product types, and limitations to provision of services that could impact support to NATO operations:

a. National Oceanographic Centres and other major support facilities. Include size, sources of data, output, and contact information;

b. Oceanographic and acoustic models used, indicating which are releasable to NATO and/or Partner Nations;

c. Oceanographic support units that provide direct support (fixed and/or mobile);

d. Oceanographic research and development centres/units supporting military programs;

e. Oceanographic climate centres.

4. Meteorological Observing Capabilities. Provide a list of meteorological collection capabilities not covered by WMO No. 9, Volume A - Observing Stations http://www.wmo.ch/pages/prog/www/ois/volume-a/vola-home.htm in the following categories:

a. Surface observing network (manned and automated);

b. Upper air network;

c. Remote sensing capabilities;

d. Meteorological reconnaissance and REA capabilities.

5. Oceanographic Observing Capabilities:

a. Current observing capabilities;

b. Current trends in sources and quality of real time and historical data;

c. Oceanographic reconnaissance and REA capabilities.

6. Training. Educational background and/or training process for meteorological and oceanographic personnel in national meteorological organizations supporting the military.

7. Future Plans and Capabilities. Provide a list and brief description of changes in national METOC capabilities that may affect the quantity or quality of METOC

information and services to NATO in the short term (current and next two years) and in the long term (3-6 years).

8. NATO Cooperation.

a. Current or future cooperation or exchanges with other NATO nations to improve METOC capabilities and interoperability in the short term (previous year and next two years) and in the long term (3-6 years);

b. Meteorological or oceanographic training courses available to NATO and/or Partner Nations. To include: content, level, duration, cost, dates of courses in the upcoming year, point of contact and method of application;

c. New or updated METOC publications and atlases releasable to NATO and/or Partner Nations;

d. List of national METOC surveys, studies and reports releasable to NATO and/or Partner Nations;

e. Data provided to NATO Standard Oceanographic Database (NSODB);

f. Data reported to NATO Rapid Environmental Assessment (REA) Category I database;

g. Major oceanographic surveys planned in the NATO area, which could conflict in time and space with major exercises;

h. Suggested inputs for future Military Oceanography (MILOC) survey programs for the purpose of improving the environmental support for submarine, anti-submarine, amphibious and MCM operations.

9. NATO Standardization. Provide unclassified recommended changes, corrections, or additions to any of the Allied METOC Publications and STANAGs.

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ANNEX B CLASSIFIED NATIONAL METOC CAPABILITIES

Aim

Notes for submitting information in reports containing information that is not releasable to Partner Nations: Reports are intended to stand alone, and should be complete. Do not refer to previous reports. Information should not duplicate information in the unclassified report. Indicate text changes since the last report with a vertical line in the right margin.

1. Future Plans, Capabilities, and Requirements

Provide a list and brief description of the following:

a. New techniques and/or equipment planned for the provision of meteorological information and services to NATO in the short term (next two years) and long term (three to six years).

b. Plans for changes in national capabilities that may impact the quantity or quality of meteorological information and services to NATO in the short term (next two years) and long term (three to six years).

c. New techniques and services deemed necessary for the provision of meteorological information and services to NATO in the short and long term.

2. Classified Observing Capabilities

Provide an overview of classified meteorological collection capabilities in the following categories:

a. Surface observing network (manned and automated).

b. Upper air network.

c. Remote Sensing capabilities.

d. Meteorological Reconnaissance capabilities.

3. Classified Communication Capabilities. Provide an overview of capabilities to communicate classified meteorological information including access to classified NATO networks.

4. Meteorological Support to Operations and Exercises. Provide a list and brief description of any meteorological support to activities in the following categories during the past year, indicating whether the information provided is classified.

a. NATO Operations

b. NATO Exercises

c. Other Multilateral operations and exercises with nations under NATO initiative.

d. National surveys, studies, and reports relevant to NATO support.

5. Other

a. Recommended changes, corrections, or additions to any of the Allied METOC Publications or Multinational Manuals.

b. Comments and observations designed to highlight specific areas of operations not covered above as well as, recommendations designed to increase the effectiveness of the NATO military meteorological support.

c. Any additional information.

CHAPTER 11 GLOSSARY

AAR	After Action Report
ACOMEX	Allied Command Operations METOC Information Exchange
ACO	Allied Command Operations
ACT	Allied Command Transformation
AESS	Allied Environmental Support System
AGS	Allied Ground Surveillance
AJP	Allied Joint Publication
AIREP	Aircraft Report
AMETOCP	Allied METOC Publication
AN	Assisting Nation
AOR	Area of Responsibility
ASW	Anti-Submarine Warfare
ATP	Allied Tactical Publication
AWP	Allied Weather Publication
BALMET	Ballistic Meteorological Message
BDR	Biological Downwind Report
BGIC	Bundeswehr Geoinformation Centre
BI-SC	Bi-Strategic Command (ACO and ACT)
BWF	Basic Wind Forecast
BWM	Basic Wind Message
BWR	Basic Wind Report
C2	Command and Control
CAOC	Combined Air Operation Center
CBRN	Chemical, Biological, Radiological and Nuclear
CC	Component Command
CCIS	Command, Control and Information System
CDF	Chemical Downwind Forecast
CDM	Chemical Downwind Message
CDR	Chemical Downwind Report
CE	Crisis Establishment
CJFCC	Combined Joint Forces Component Command
CJTF	Commander Joint Task Force
CMETO	Chief Meteorological Officer
CMC	Canadian Meteorological Centre
CMETOCO	Chief Meteorological and Oceanographic Officer
CMFWC	Command Meteorological and Fleet Weather Centre
CMR	Centro Meteorologico Regionale (Regional Met Centre)
CMU	Combined METOC Unit
COE	Centre of Excellence
COMCJTF	Commander CJTF
CP	Co-operating Partner
CPVD	Centro de Prediccion y Vigilancia para Defensa (Defense Forecasting and Nowcasting Centre)

CPX	Command Post Exercise
DCAOC	Deployable CAOC
DWD	Deutscher Wetterdienst (German Meteorological Service Civil)
E3-A	NATO AWACS
ECMWF	European Centre for Medium-range Weather Forecasts
EDF	Effective Downwind Forecast
EDM	Effective Downwind Message
EDR	Effective Downwind Report
EE	Emergency Establishment
EM	Electro-magnetic
EMC	European METOC Centre (formerly European Forecast Unit)
EO	Electro-optical
FAX	Facsimile
FLENUMMETOCCEN	Fleet Numerical Meteorology and Oceanography Center
FNMOC	Fleet Numerical Meteorology and Oceanography Center
FOB	Forward Operating Base
FOL	Forward Operating Location
FWC	Fleet Weather Centre
FWOC	Fleet Weather and Oceanographic Centre
GTS	Global Telecommunications System
HF	High Frequency
HQ	Headquarters
HN	Host Nation
HTAF	Hellenic Tactical Air Force
IAMD	Integrated Air and Missile Defense
ICAO	International Civil Aviation Organization
IMETOC	Integrated Meteorology and Oceanography
IMS	International Military Staff
ISAF	International Security Assistance Force
JFC	Joint Force Commander
JHQ	Joint Force headquarters
JOA	Joint Operations Area
JPG	Joint Planning Guide
LCC	Land Component Command
LI	Lessons Identified
LIVEX	Live Exercise
LL	Lessons Learned
LN	Lead Nation
LOI	Letter of Instruction
MARCOM	Maritime Command
MAWEC	Maritime Aircraft Weather Code
MC	Military Committee
MCWG(METOC)	Military Committee Working Group on METOC
MD	Mediterranean Dialogue
MERWARN	Warnings to Merchant Ships at Sea
METAR	Meteorological Airfield Report

METGM	Gridded Data Meteorological Message
METGUARD	Lead Meteorological Ship
METOC	Meteorology & Oceanography
METOCREP	Meteorological and Oceanographic Report
MFC	Military Forecast Centre
MILMET	Military Meteorology Panel
MMT	Mobile METOC Team
MMU	Mobile MET Unit
MNC	Major NATO Command
MOB	Main Operating Base
MOBOB	Mobile Observations
MOC	Meteorological and Oceanographic Centre
MOIC	Military Oceanographic Information Centre
MOS	Model Output Statistic
MOU	Memorandum of Understanding
MPA	Maritime Patrol Aircraft
MSC	Major Subordinate Command
MSU	Meteorological Support Unit
MTEP	Military Training and Exercise Program
NAEW&CF	NATO Airborne Early Warning and Control Force
NATO	North Atlantic Treaty Organization
NAMIS	NATO Automated Meteorological Information System
NBC	Nuclear, Biological and Chemical
NCRS	NATO Crisis Response System
NEMOC	Naval European Meteorology and Oceanography Center
NLMOC	Naval Atlantic Meteorology and Oceanography Centre
NMC	NATO Meteorological Centre/National Meteorological Centre
NOMPS	NATO Operations METOC Predeployment Seminar
NRF	NATO Response Force
NWP	Numerical Weather Prediction
OCE	Officer Conducting Exercise
OPEVAL	Operational Evaluation
OPLAN	Operations Plan
OPORD	Operations Order
OPP	Operational Planning Process
OPTASK	Operational Task
OSE	Officer Scheduling Exercise
OTSR	Optimum Track Ship Routing
PAT	Permanent Analysis Team
PE	Peacetime Establishment
PHQ	Peacetime Headquarters
PIREP	Pilot Report
POC	Point of Contact
PSC	Principle Subordinate Commander
RATT	Radio Teletype
RC	Regional Command

REA	Rapid Environmental Assessment
REA CC	Rapid Environmental Assessment Coordination Centre
REA COE	REA Centre of Expertise
REA SC	Rapid Environmental Assessment Support Centre
RECCO	Meteorological Reconnaissance Aircraft Report Code
RE/RE	Reinforcement/Resupply
REP	Recognised Environmental Picture
RNLAF	Royal Netherlands Air Force
SACT	Supreme Allied Commander Transformation
SAM	Surface-to-Air Missile
SC	Strategic Command
SHAPE	Supreme Headquarters Allied Powers Europe
SIGINT	Signals Intelligence
SITREP	Situation Report
SME	Subject Matter Expert
SMETO	Staff Meteorological Officer
SMETOCO	Staff Meteorological and Oceanographic Officer
SMO	Staff METOC Officer
SNF	Standing Naval Forces
SNMCMG	Standing NATO Mine-Countermeasure Group
SNMG	Standing NATO Maritime Group
SOP	Standard Operating Procedure
STANAG	Standardization Agreement
STC	SHAPE Technical Centre
SWAN	Secure Wide Area Network
TA	Technical Arrangement
TACEVAL	Tactical Evaluation
TACON	Tactical Control
TAF	Terminal Aerodrome Forecast
TARWI	Target Weather Information
TASMO	Tactical Air Support of Maritime Operations
TAWS	Target Acquisition Weapons Software
TCN	Troop Contributing Nation
TDA	Tactical Decision Aid
TOR	Terms of Reference
TOW	Tube-launched Optically-tracked Wire-guided
TRAX	Special Track Weather Forecast
UAV	Unmanned Aerial Vehicle
UTC	Universal Time Coordinated/Coordinated Universal Time
VSTOL	Vertical/Short Take-off or Landing
WAC	Weather Analysis Centre
WAN	Wide Area Network
WEAX	Weather En Route Forecast
WG	Working Group
WMD	Weapons of Mass Destruction

WMO	World Meteorological Organization
WRC	Warning and Reporting Centre

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