Joint Publication 3-59

Meteorological and Oceanographic Operations

10 January 2018

PREFACE

1. Scope

This publication sets forth joint doctrine to plan, execute, and assess meteorological and oceanographic operations in support of military operations.

2. Purpose

This publication has been prepared under the direction of the Chairman of the Joint Chiefs of Staff (CJCS). It sets forth joint doctrine to govern the activities and performance of the Armed Forces of the United States in joint operations, and it provides considerations for military interaction with governmental and nongovernmental agencies, multinational forces, and other interorganizational partners. It provides military guidance for the exercise of authority by combatant commanders and other joint force commanders (JFCs), and prescribes joint doctrine for operations and training. It provides military guidance for use by the Armed Forces in preparing and executing their plans and orders. It is not the intent of this publication to restrict the authority of the JFC from organizing the force and executing the mission in a manner the JFC deems most appropriate to ensure unity of effort in the accomplishment of objectives.

3. Application

a. Joint doctrine established in this publication applies to the Joint Staff, commanders of combatant commands, subordinate unified commands, joint task forces, subordinate components of these commands, the Services, and combat support agencies.

b. The guidance in this publication is authoritative; as such, this doctrine will be followed except when, in the judgment of the commander, exceptional circumstances dictate otherwise. If conflicts arise between the contents of this publication and the contents of Service publications, this publication will take precedence unless the CJCS, normally in coordination with the other members of the Joint Chiefs of Staff, has provided more current and specific guidance. Commanders of forces operating as part of a multinational (alliance or coalition) military command should follow multinational doctrine and procedures ratified by the United States. For doctrine and procedures not ratified by the US, commanders should evaluate and follow the multinational command's doctrine and procedures, where applicable and consistent with US law, regulations, and doctrine.

For the Chairman of the Joint Chiefs of Staff:

KEVIN D. SCOTT
Vice Admiral, USN
Director, Joint Force Development

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SUMMARY OF CHANGES
REVISION OF JOINT PUBLICATION 3-59
DATED 7 DECEMBER 2012

- **Aligns terminology with that in Chairman of the Joint Chiefs of Staff Instruction 3810.01E, *Meteorological and Oceanographic Operations* (i.e., no longer references Service-retained units as "joint").**

- **Deletes sections not specific to meteorological and oceanographic operations, such as the Army command structure and Navy precision, navigation, timing.**

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- **Discusses meteorological and oceanographic information in the joint functions.**
- **Describes meteorological and oceanographic support to joint operations.**

Fundamentals of Joint Meteorological and Oceanographic Operations

Meteorological and Oceanographic Principles

The principles of accuracy, consistency, relevancy, and timeliness are the cornerstone of joint meteorological and oceanographic (METOC) operations.

- **Accuracy.** METOC data and information must be measurably correct in representing the current and future state of the environment.
- **Consistency.** METOC personnel and organizations provide support under the concept of "one operation, one forecast" to ensure the delivery of consistent METOC information describing the state of the natural environment to operational forces at all echelons.
- **Relevancy.** To produce relevant METOC information, the METOC staff must remain cognizant of the commander's intent and aware of how the planned operations are to generate or create effects upon the adversary to achieve the stated military objectives and attain the desired end state.
- **Timeliness.** The principle of timeliness depends upon products that are derived from the latest available data, processed and disseminated quickly, and integrated at the appropriate time into planning and execution processes.

Meteorological and Oceanographic Functions

METOC operations can be divided into two key functions: characterization and exploitation.

Characterization. Characterization of the environment is the ability to collect accurate data and process that data into usable information to produce a coherent and accurate picture of the past, present, and/or future state of the environment.

Exploitation. Environmental exploitation includes minimizing or mitigating any negative effects of the environment on friendly forces while capitalizing on conditions that maximize the operational advantage over enemy forces.

Meteorological and Oceanographic Processes

METOC forces provide METOC data and information through eight processes: collection, processing, analysis, prediction, tailoring, dissemination, integration, and mitigation.

Meteorological and Oceanographic Support Roles and Responsibilities

Joint Staff

The Joint Staff is the focal point for coordination of METOC operational support from the Services and specified US Government departments and agencies to the combatant commanders (CCDRs). They also coordinate issues within the interagency and international arenas and provide representation to interagency and international METOC organizations and working groups.

Combatant Commanders

The CCDR's staff plans and implements METOC-related activities and capabilities that support national security objectives. They ensure METOC capabilities are integrated when performing functions assigned in the Unified Command Plan. The CCDR designates a senior meteorological and oceanographic officer (SMO) to coordinate all METOC operations within their area of responsibility or functional responsibility.

Senior Meteorological and Oceanographic Officer

The SMO:

- Collects METOC requirements from the joint forces, recommends assignment of METOC tasks, and requests additional METOC capabilities from supporting components and/or Services.
- Coordinates with the Services and other agencies for METOC support or other additional capabilities required to fulfill operational needs.

- Integrates METOC information into each operation order, operation plan (OPLAN), or concept plan (CONPLAN).
- Maintains awareness of METOC operations and conditions.

Joint Meteorological and Oceanographic Officer

Joint meteorological and oceanographic officers (JMOs) provide METOC advice to the joint force commander (JFC), determine METOC capabilities required for the joint force, and ensure unity of METOC efforts across the joint force components.

Whereas the SMO's primary function is to support the CCDR in the development and maintenance of established OPLANs and CONPLANs, the JMO supports the JFC in executing a specific mission and/or task by either modifying an existing plan or developing a new one.

Meteorological and Oceanographic Support to Joint Planning

Meteorological and Oceanographic Considerations and the Art of Joint Command

METOC information and assessments contribute to the commanders' knowledge of when to decide and what to decide quickly enough to maintain the advantage over the adversary. METOC data collection and inputs to the joint intelligence preparation of the operational environment (JIPOE) help illuminate the situation for the CCDR, components, and subordinate JFCs.

The Meteorological and Oceanographic Planning Process and Lines of Effort

During planning, METOC activities are generally organized along two lines of effort (LOEs): providing METOC support to joint planning and planning METOC activities.

METOC support to joint planning culminates with the production of a METOC estimate, which is included with appendix 11 (Intelligence Estimate) to annex B (Intelligence). METOC planners should also be assigned as core members of the joint planning group to contribute to the overall plan development by providing METOC effects on operations objectives and the commander's desired effects.

METOC planning activities identify METOC information gaps, prioritize METOC capability requirements, develop METOC collection plans, assess METOC capabilities to identify shortfalls, and develop mitigation strategies to

address those shortfalls. Specific outputs of this LOE are the METOC estimate, which identifies available METOC capabilities and anticipated shortfalls, annex H (Meteorological and Oceanographic Operations), and inputs to annex B (Intelligence) for the campaign or contingency plan.

Meteorological and Oceanographic Information in the Joint Functions

Meteorological and Oceanographic Support for the Joint Functions

Command and Control (C2). Within C2, the JFC should identify METOC elements of information for the operational environment (OE) that are deemed critical to timely decision making. METOC planners should also submit priority intelligence requirements (PIRs) that meet the JFC's guidance to the intelligence directorate of a joint staff (J-2). These PIRs should focus on weather limitations of adversary military capabilities.

Intelligence. METOC assessments and predictions support the commander's understanding of the OE. METOC information and assessments are integrated into the JIPOE, informing the J-2 and the commander how METOC affects employment capabilities.

Fires. METOC planners provide METOC effects assessments to the joint fires officer in support of the joint targeting process for all selected targets and the available weapons and other systems employed to create a specific lethal or nonlethal effect on these targets. METOC planners also provide METOC effects assessments to enable joint fires support that assists joint forces to move, maneuver, and control territory, populations, airspace, and key waters.

Movement and Maneuver. METOC personnel provide the JFC/commanders with METOC assessments for the center of gravity (COG)/decisive point and also to inform the JFC's consideration of various ways and means to help maneuver forces to attain positional advantage.

Protection. METOC planners enhance protection activities by describing METOC effects on adversary capabilities; informing planning and execution of air, space, and missile defense options; supporting Department of Defense information network operations; providing advisories and warning of weather conditions;

enabling mitigation of the effects of chemical, biological, radiological, and nuclear threats; and enabling mitigation of health threats to the joint force using METOC information as part of a composite threat assessment.

Sustainment. METOC personnel provide assessments which allow logistics planners and the JFC to synchronize the supply of food, water, fuel, arms, munitions, and equipment in time and space across the other joint functions to mass combat power and achieve operational objectives.

Meteorological and Oceanographic Support to Joint Operations

Meteorological and Oceanographic Support Across the Range of Military Operations

Military Engagement, Security Cooperation, and Deterrence Activities. In peacetime or prior to conflict, maintaining a forward presence enables METOC forces to gain familiarity and develop a common understanding of the local and regional METOC conditions necessary to ascertain METOC effects on the potential employment of military capabilities.

Crisis Response and Limited Contingency Operations. METOC requirements in support of crisis response; noncombatant evacuation operations; foreign humanitarian assistance; recovery operations; chemical, biological, radiological, and nuclear response; and strikes and raids are similar to those required during major operations.

Major Operations and Campaigns. METOC personnel provide METOC assessments on friendly and enemy capabilities, COGs, vulnerabilities, and probable courses of action. These assessments inform symmetries and asymmetries between friendly and enemy forces and assist the JFC and operational planners in identifying the best means to accomplish the joint force mission by exploiting these gaps in capabilities.

Meteorological and Oceanographic Support by Phase

Shape. METOC activities conducted within the context of deliberate planning during the shape phase develop the basis for METOC activities in subsequent operational phases and in support of theater campaign plans.

Deter. The joint force METOC planners assist the JFC in visualizing relevant METOC effects on all capabilities within the OE and their likely impact on their ability to achieve stated objectives and accomplish the mission.

Seize the Initiative. The JFC exploits friendly advantages and capabilities to shock, demoralize, and disrupt the enemy. METOC personnel provide the JFC with assessments of METOC effects on all available elements of combat power.

Dominate. METOC personnel provide the JFC with METOC assessments to enable overmatching the joint force capability with the adversary's at the critical time and place. This may be accomplished by finding METOC windows wherein friendly capabilities have a distinct advantage over the adversary.

Stabilize. The role of METOC personnel may include assessing the relative effectiveness of METOC capabilities to support operations supporting civil authorities and reconstruction efforts. At this time, METOC collection and assessments transition from supporting combat operations to supporting a focus on actual or potential threats to the joint force.

Enable Civil Authority. In this phase, METOC personnel may remain in place to support intelligence resources supporting host nation authorities. To facilitate this role, METOC sharing agreements may be promulgated.

CONCLUSION

This publication provides joint doctrine to plan, execute, and assess METOC operations in support of military operations.

CHAPTER I
FUNDAMENTALS OF JOINT METEOROLOGICAL AND OCEANOGRAPHIC OPERATIONS

"Know yourself, know your enemy; your victory will never be endangered. Know the ground, know the weather; your victory will then be total…"

Sun Tzu, Chinese General, 500 B.C.

1. Introduction

Few military endeavors, including those of our adversaries, are immune from the effects of the natural environment. Neglected or ignored, the natural environment and its effects can negatively impact even the most carefully planned and executed operation or campaign. Meteorological and oceanographic (METOC) support is critical to providing the commander with awareness of the environmental components of the operational environment (OE) and the ability to exploit that awareness to gain an operational advantage during military operations. Properly integrated, METOC data and information can provide the joint force with a significant or decisive advantage over the adversary.

a. Within joint doctrine, the acronym **METOC** is used to convey the meteorological, oceanographic, and space environmental factors provided by the Services, support agencies, and other sources to the joint force. These factors include the range of atmospheric (weather) and oceanographic phenomena, from the sub-bottom of the Earth's oceans up to the top of the atmosphere and outward into space (space weather). Each of the Services contributes METOC capabilities to the joint force based upon operational requirements. Use of the term METOC does not imply that individual personnel are capable of performing all aspects of METOC operations.

(1) **Atmospheric phenomena** include physical conditions of the atmosphere at a given point and time, long-term climatic averages of those conditions, and any airborne environmental hazards to operations such as volcanic ash, dust, or icing/turbulence. **Oceanographic phenomena** include the physical characteristics of the ocean such as waves, tides, and currents, as well as chemical and biological factors (e.g., salinity, marine mammals, bioluminescence), bathymetry, hydrography, and geophysics. **Space weather phenomena** include the conditions and phenomena in the space and near-Earth environments that typically originate from solar flares and coronal mass ejections.

(2) For the purposes of this publication, METOC information and METOC data are not synonymous. METOC data is manipulated and processed to become METOC information. Human judgment, experience, and intelligence are then used to place METOC information into the specific context of the mission to optimize military decision making in planning and operations.

b. METOC personnel work cooperatively within the Department of Defense (DOD) and across interorganizational lines to collect and provide accurate, consistent, relevant, and timely METOC data and information to the joint force commanders (JFCs) and their

ONE OPERATION, ONE FORECAST

Every forecaster has their own calculus, and it is a rare day when two or more can completely agree on a forecast. But coordinating military actions within a theater requires a coordinated meteorological and oceanographic (METOC) view. This need is expressed in joint METOC by the phrase "One Operation, One Forecast." This was evident during the planning for the Allied assault in Normandy that was Operation OVERLORD.

"June 4, 1944. Group Captain J. M. Stagg of the RAF [Royal Air Force] must provide Ike with the final piece of information he needs to launch OVERLORD—one that no one could control or keep secret. What will the weather be like on D-Day?

To help him answer that crucial question, Stagg had six different weather services (American and British land, sea, and air) feeding him information. On the morning of June 4, to his dismay, he had six distinct weather predictions to pick from…. He made up his own prediction, one that drew upon all the others but was uniquely his. Despite the intense storm of June 4, Stagg predicted a break in the weather for June 6. Ike trusted his source. He decided to take the risk and go."

Stephen Ambrose and Richard Immerman
***Ike's Spies: Eisenhower and the Espionage Establishment,* 1999**

component forces. The lines of responsibility and authority for the collection, production, and distribution of METOC information are sometimes blurred; therefore, it is imperative METOC personnel actively participate in the planning process and in various cross-functional staff organizations to maintain situational awareness (SA) and to ensure effective and efficient handling and distribution of METOC information. This proactive participation by METOC personnel also facilitates the concept of "one operation, one forecast": the ability to provide consistent METOC information across all levels of decision making. METOC information is of greatest value when it contributes to the commander's decision-making process. The primary roles of METOC personnel are to provide the JFC with both current and predictive METOC information, as well as timely knowledge of the effects of those physical environmental factors on friendly and adversary joint capabilities across the range of military operations.

2. Meteorological and Oceanographic Principles

Joint METOC personnel should strive to understand all aspects of the physical environment, to include METOC effects on joint capabilities, and relay these relevant effects to decision makers at all echelons. This understanding includes current and predictive METOC assessments for both friendly and adversary capabilities that help enable the JFC to achieve an advantage over the adversary. The principles of **accuracy, consistency, relevancy**, and **timeliness** are the cornerstone of joint METOC operations. By adhering to these four overarching principles, METOC operations are best prepared to support planning, execution, and decision making.

a. **Accuracy.** METOC data and information must be measurably correct in representing the current and future state of the environment. Joint forces depend on accurate METOC information and assessments in order to plan and execute operations. Inaccurate data and information can cost lives, unnecessarily expend resources, impair readiness, and undermine the successful execution of a mission. The accuracy of composite METOC information is largely affected by the available capabilities to collect basic METOC data within the area of interest (AOI) with sufficient spatial and temporal coverage to provide an accurate depiction of the state of the environment. The limitations of METOC data collection equipment and instrumentation, limitations of numerical modeling of the physical environment, human error, and the perishable nature of METOC data all impact the accuracy of dependent METOC products. The JFC can mitigate some of these limitations by tasking supported joint forces to record and report firsthand observations of mission-area weather conditions and actively provide feedback to METOC personnel on forecast products. In a data-sparse operational area (OA), these observations may prove invaluable to METOC personnel for developing subsequent predictive products.

b. **Consistency.** METOC personnel and organizations provide support under the concept of "one operation, one forecast" to ensure the delivery of consistent METOC information describing the state of the natural environment to operational forces at all echelons. METOC information that supports the JFC and subordinate element decision making usually comes from multiple sources. Unity of effort within the METOC elements supporting the joint force is needed to ensure the environmental information distributed to decision makers at all echelons is spatially and temporally consistent across the AOI. This collaboration and coordination between Service and functional METOC forces is essential when supporting joint operations. It is especially important when METOC conditions will impact the ability of one operational unit to support a larger operation (e.g., close air support to ground maneuver forces, carrier air wing support to littoral operations). Joint planners at all echelons of an operation should be provided with consistent METOC assessments to support operations planning and execution.

c. **Relevancy.** METOC support should not burden the decision maker with information that is of minimal or no importance to the situation. METOC information must effectively contribute to the successful planning and execution of the operation at hand, aid the commander in the accomplishment of the mission, and contribute to the JFC's understanding of both the OE and the effects of existing and anticipated future environmental conditions on friendly and adversary capabilities. Continued relevancy depends upon the supported joint force users of METOC information continually communicating their specific requirements for METOC content, form, medium, presentation, timeliness, and frequency of delivery. To produce relevant METOC information, the METOC staff must remain cognizant of the commander's intent and aware of how the planned operations are to generate or create effects upon the adversary to achieve the stated military objectives and attain the desired end state. The JFC and supported joint forces help enable the METOC principle of relevancy by ensuring METOC personnel are integrated through every stage of the decision-making process. This allows METOC personnel to tailor information and products so the user can quickly identify and apply relevant information to decision making without additional analysis or manipulation. When METOC personnel possess a detailed understanding of the operation and mission,

and understand the layered effects METOC can have on these, they ensure the environmental information provided is relevant.

d. **Timeliness.** METOC support is only effective when the decision maker receives accurate, consistent, and relevant METOC information in time to consider its impact and apply it effectively within the decision-making cycle. The importance of timeliness is furthered by the fact that useful METOC data and information is perishable. The environment is constantly in a state of change. Therefore, the principle of timeliness depends upon products that are derived from the latest available data, processed and disseminated quickly, and integrated at the appropriate time into planning and execution processes. METOC personnel must also be vigilant and proactive in informing decision makers of changing conditions that may impact an operation. The supported joint force can aid in the principle of timeliness by providing and maintaining reliable communication links among and between METOC personnel and systems and the supported forces.

For more information, see Appendix E, "Meteorological and Oceanographic Impacts on Operations."

3. Meteorological and Oceanographic Functions

METOC operations can be divided into two key functions: characterization of the environment and exploitation of environmental information by decision makers (see Figure I-1).

a. **Characterization.** Characterization of the environment is the ability to collect accurate data and process that data into usable information in order to produce a coherent and accurate picture of the past, present, and/or future state of the environment. Accurate, consistent, relevant, and timely characterizations of the atmospheric, maritime, and space environments integrated into joint planning help provide decision makers with the ability to anticipate and exploit the best window of opportunity to plan, execute, support, and sustain specific operations.

b. **Exploitation.** Environmental exploitation includes minimizing or mitigating any negative effects of the environment on friendly forces while simultaneously capitalizing on conditions that maximize the operational advantage over enemy forces. It is the fusion of actionable METOC information with decision making. Effective exploitation of METOC information during both operational planning and mission execution helps ensure the optimum employment of sensors, weapons, logistics, equipment, and personnel. Further, since nearly all joint military capabilities are influenced by certain aspects of the environment, analyzing the METOC impacts based on operationally significant METOC threshold sensitivities is central to the development of the environmental estimate. It also supports and influences military processes such as the joint intelligence preparation of the operational environment (JIPOE), the joint planning process (JPP), commander's SA, development of the common operational picture, command and control (C2), and other decision-making processes.

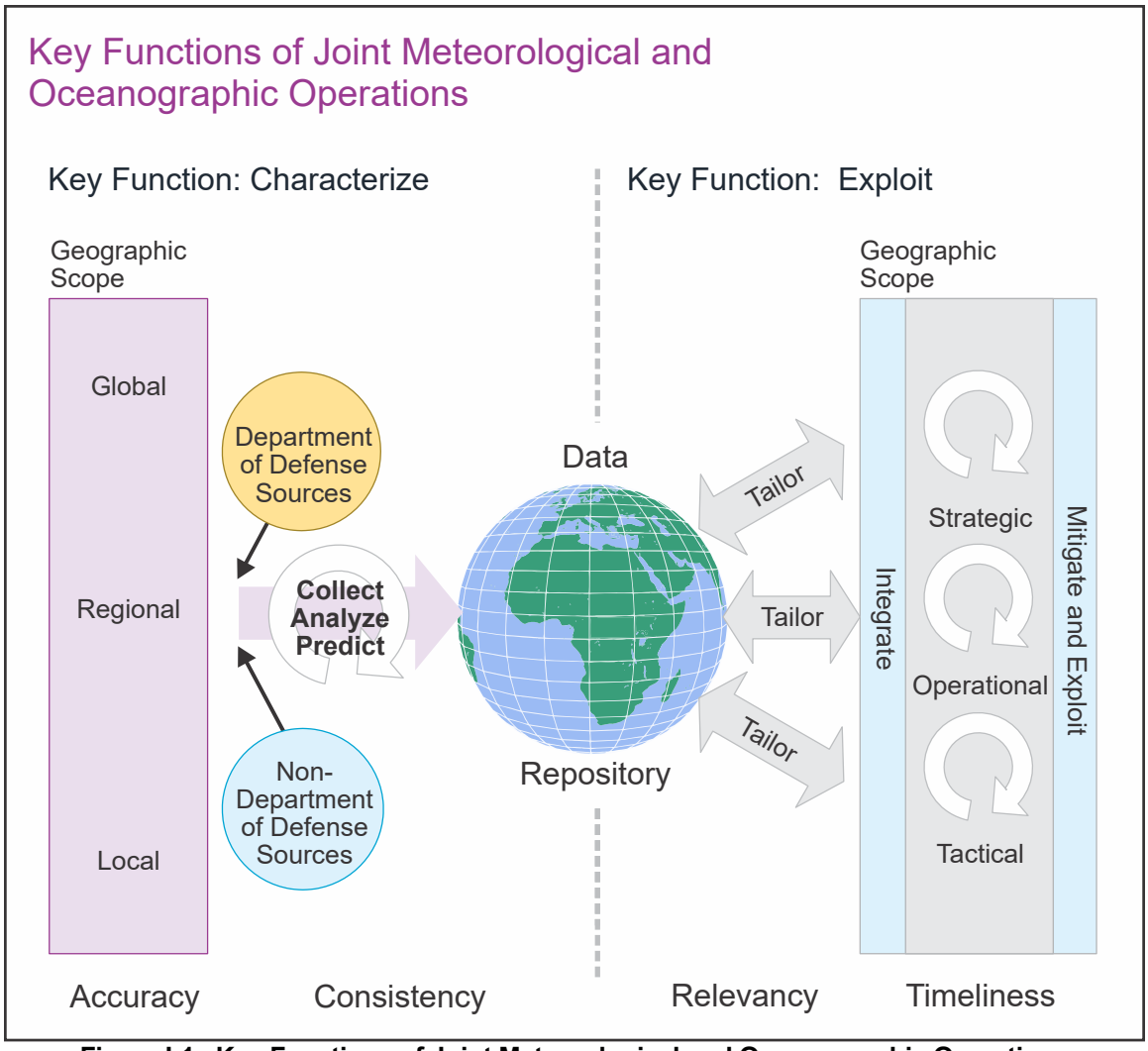

Figure I-1. Key Functions of Joint Meteorological and Oceanographic Operations

4. Meteorological and Oceanographic Processes

METOC forces provide METOC data and information through eight processes: collection, processing, analysis, prediction, tailoring, dissemination, integration, and mitigation (see Figure I-2). Each of these eight linked processes is explained further in the following subsections.

a. **Collection.** METOC personnel and air, land, maritime, and space-based assets and resources collect environmental data, which is then populated into theater, regional, and global databases from which METOC products are then derived. Inadequate data sources and limited availability of METOC data both directly impact the accuracy of derived products; therefore, a METOC sensing strategy and collection plan should be developed early in any JPP. The sensing strategy identifies potential means to meet the JFC's ongoing METOC SA requirements. It identifies available organic DOD METOC data collection capabilities and identifies gaps in the DOD METOC collection plan. Non-DOD METOC data may be identified to supplement organic DOD METOC collection assets if it is determined to be accurate, consistent, relevant, and timely. The collection plan is a

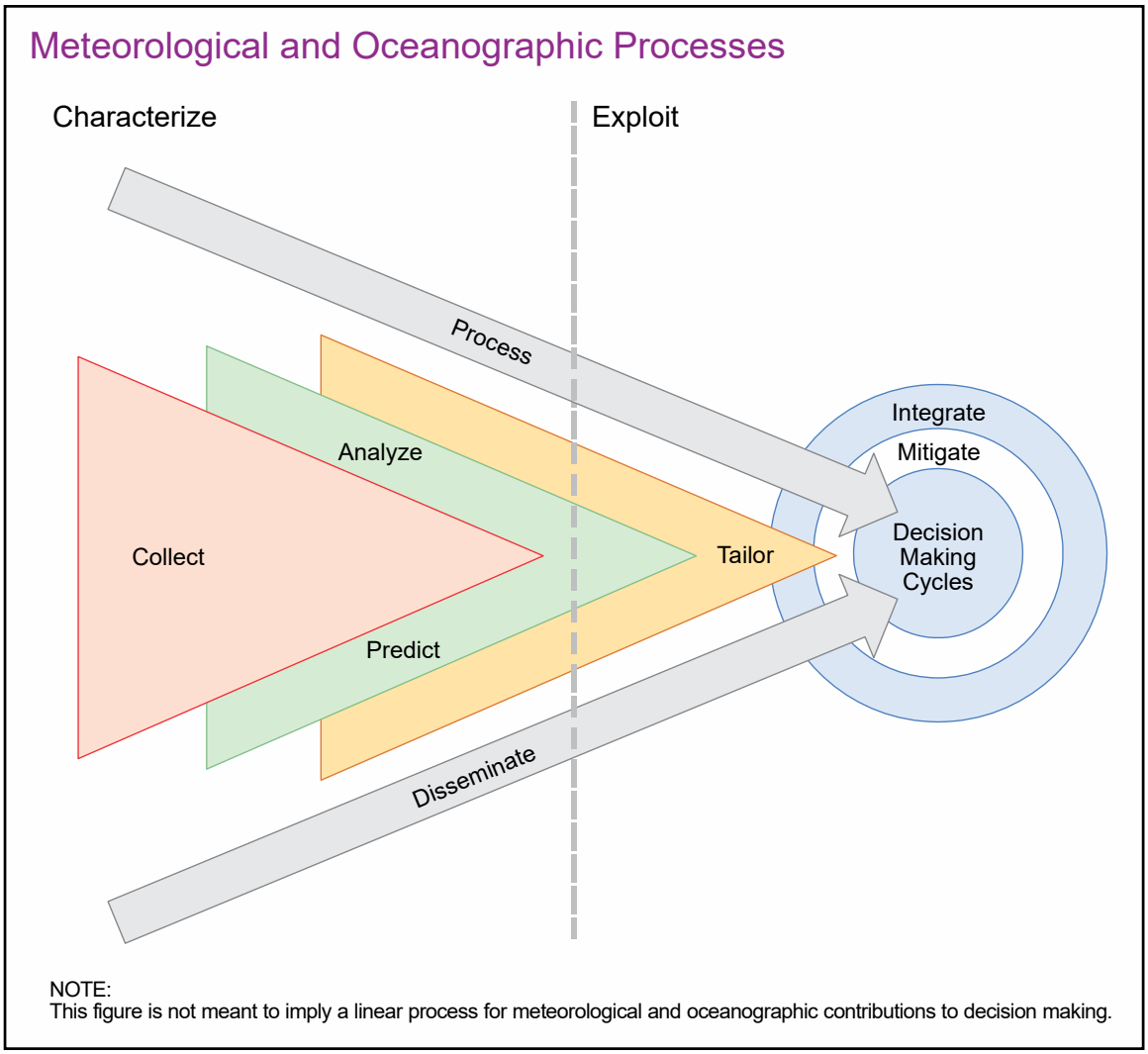

Figure I-2. Meteorological and Oceanographic Processes

dynamic plan that orchestrates timing, distribution of collection sites, and the roles and identity of all participating METOC components within the joint force. A complete plan fosters unity of effort while optimizing data collection, dissemination, and integration into METOC products from indigenous and national sources. Spreading observational resources across an AOI to obtain optimum coverage significantly improves the quality of METOC services provided to the JFC, but may be difficult due to resource and operational constraints. METOC collection plans may be published in annex H (Meteorological and Oceanographic Operations) of operation plans (OPLANs)/operation orders (OPORDs) or may appear as a fragmentary order to the execute order. Nontraditional collection sources augment organic METOC collection capabilities, particularly in remote or data-sparse OAs. This data significantly enhances the commander's SA, provides key data to Service METOC production center modeling efforts, and aids in the generation of tailored tactical forecast products. Commanders should emphasize the value of nontraditional METOC collection efforts and task appropriate units/personnel to make supplemental observations throughout an operation. Such data may provide critical, or possibly, the only METOC information pivotal to mission success. Additionally, coordination should be conducted

with the host nation (HN) METOC organizations, which may have METOC data and information that are not publicly available but could be of significant use to METOC personnel supporting joint operations in that region. Some examples of nontraditional sources of METOC data collection capabilities are summarized in Appendix G, "Nontraditional Sources of Data."

b. **Processing.** Processing is the conversion of collected raw environmental data into usable METOC information. The resulting METOC information serves as input to other METOC processes. For example, aggregated raw observations may be input into predictive models which run physics-based simulations of the environment and provide output representing the spatial and temporal evolution of the environment. Processing time varies depending on the method of processing and the specific output product desired. It is therefore important for commanders and METOC personnel to take into account the processing time required to support timely delivery of METOC products that inform decision making.

c. **Analysis.** Service METOC production units, reachback centers, and on-scene METOC personnel interpret, fuse, and evaluate collected and processed data and information to develop forecasts and recommendations in support of decision-making processes. The analysis process identifies significant METOC features and conditions which may require further study and monitoring in order to determine impacts on operations. Effective analysis helps to ensure the most accurate forecast information is provided to the decision maker.

d. **Prediction.** Through the use of analyzed products, sophisticated numerical models, and human judgment and experience, METOC forces describe the anticipated future state of the meteorological, oceanographic, and space environments. These forecasts include temporal and spatial assessments of atmospheric, terrestrial, maritime, and space environmental features and associated elements. Various modeling methods generate ranges of certainty and confidence in their characterization of the environment and other Earth-system prediction capabilities. METOC personnel rely upon timely feedback from in situ collection capabilities and analysis outputs to continually adjust and assess their predictions and improve their forecasts.

e. **Tailoring.** A key role of METOC support personnel is to enhance the decision-making process of the JFC and the joint force through application of predictive products tailored to the JFC's operational requirements. It is not enough to just understand and predict the METOC conditions. This understanding must be transformed into relevant operational knowledge of how that environment will impact the JFC's operations and military capabilities (weapons; sensors; platforms; mission profiles; tactics, techniques, and procedures; and personnel). Utilizing previously described principles of accuracy, consistency, relevancy, and timeliness, METOC personnel tailor weather information into actionable decision aides and mission planning and execution forecast products by applying METOC thresholds specific to the mission, platform, and/or system. Decision makers identify these operationally significant METOC thresholds and the associated baselines for METOC effects decision aid rules. Decision makers must be involved in this tailoring process as METOC thresholds vary based on platforms, systems used, and the

commander's acceptance of risk. Effective tailoring requires METOC personnel be equipped to anticipate how METOC conditions impact operations, as well as any environmental sensitivities of the supported joint force capabilities.

For additional information on METOC impacts on operations, see Appendix E, "Meteorological and Oceanographic Impacts on Operations."

f. **Dissemination.** Dissemination is the process of delivering the tailored data, information, analyses, and/or predictions to end users in a suitable form as expediently as possible. Dissemination supports the other METOC processes and ensures the output products from the collection, analysis, prediction, and tailoring processes are received by the appropriate end user at the appropriate time. These users may be METOC personnel or decision makers, depending on the type of product being disseminated. For example, processed weather data may be disseminated to METOC personnel for use in analysis or prediction products and tailored forecasts may be disseminated directly to planners for use in joint planning. Because of the perishable nature of METOC products, dissemination must occur in a timely manner. This means transmission and exchange methods must be assured and reliable. Interruption of the dissemination process at any stage will disrupt the flow of information necessary for the decision maker to effectively exploit that information. In general, dissemination occurs using the "push" and "pull" methods for obtaining information. Due to processing requirements, reachback components rely mostly on pull methods to get data and information to the end user. Lower-echelon METOC personnel are provided access to databases, files, and other repositories to select the information required to produce specific tailored products. In contrast, the "push" method consists of sending out large METOC data packages to the user at regular intervals, but this procedure can overwhelm communication systems in low-bandwidth environments. Classification requirements, cross-domain (i.e., network systems) solutions, and the ability to share data with partners must also be factored in when deciding on the appropriate dissemination method.

g. **Integration.** Integration of METOC information into planning and decision-making processes allows the JFC and the joint forces to optimize the employment of military capabilities while marginalizing the benefit of the environment to the adversary, thereby creating an advantage for friendly forces. For these reasons, commanders should fully integrate information concerning environmental impacts on operations and intelligence into their planning and decision-making processes and C2 systems. Effective integration includes getting accurate, consistent, relevant, and timely information to the appropriate decision authorities with enough lead time to enable them to anticipate, exploit, and mitigate any METOC conditions that may impact operations. Integration in the joint environment includes dissemination of METOC products into all networks and through common architectures and machine-to-machine interfaces. It is important to note that some systems allow decision makers to extract mission-specific METOC information from networked METOC data repositories through machine-to-machine interfaces, thereby providing access to METOC information without the need to consult METOC personnel or know if that specific information was tailored by METOC personnel. Because the end user may lack a thorough understanding of the strengths and weaknesses of the available METOC information, METOC personnel (not just METOC information) should be

integrated in the planning process to facilitate decision making based on accurate and timely METOC information.

h. **Mitigation.** Mitigation is the process of providing decision makers with options and courses of action (COAs) to exploit METOC effects on operations using tailored and integrated METOC information as guidance. METOC personnel provide tailored information to aid planners in determining the best employment packages and employment windows considering predicted environmental conditions. METOC personnel articulate their level of confidence in the predictions to allow decision makers to assess and optimally manage risk during the mission. METOC personnel who have been properly and fully integrated into planning and execution processes, and have thus established a relationship of trust and relevancy with their supported decision makers, have far greater influence in enabling effective decision making.

i. METOC personnel should be aware that predictions and forecasts for future states of the physical environment may also be included in intelligence packages such as JIPOE, detailed in Joint Publication (JP) 2-01.3, *Joint Intelligence Preparation of the Operational Environment.*

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CHAPTER II
METEOROLOGICAL AND OCEANOGRAPHIC SUPPORT ROLES AND RESPONSIBILITIES

1. Introduction

This chapter outlines optimal METOC support within a joint force organizational structure and describes the role of key METOC personnel, units, and forces. Because METOC information is both important and perishable, METOC personnel should be integrated into every level of the joint force organization.

A full list of duties and responsibilities is directed by Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 3810.01, Meteorological and Oceanographic Operations. *See Appendix B, "Meteorological and Oceanographic Support to Homeland Defense and Defense Support of Civil Authorities," for information on METOC support in the homeland.*

2. Joint Staff

The Joint Staff serves as the focal point for coordination of METOC operational support from the Services and specified United States Government (USG) departments and agencies to the combatant commanders (CCDRs). They also coordinate issues within the interagency and international arenas and provide representation to interagency and international METOC organizations and working groups. As lead agent for international rationalization, standardization, and interoperability (RSI) activities, designated Joint Staff METOC personnel ensure DOD components and other interested parties are kept aware of such RSI activities, participate throughout the process, and can fully support all agreed US positions.

3. Combatant Commanders

The CCDR's staff plans and implements METOC-related activities and capabilities that support national security objectives. They ensure METOC capabilities are integrated when performing functions assigned in the Unified Command Plan. The CCDR designates a senior meteorological and oceanographic officer (SMO) to coordinate all METOC operations within their area of responsibility (AOR) or functional responsibility. CCDRs, through coordination with their SMOs:

a. Employ and integrate METOC capabilities across the range of military operations.

b. Exploit METOC information and assessments to enable synchronization and direction of joint operations across the joint functions.

c. Leverage METOC assessments to enhance understanding of the OE to optimize planning and decision making.

d. Coordinate with the Joint Staff, US diplomatic missions, other USG departments and agencies, multinational forces, and applicable host/indigenous organizations to ensure

all available METOC data and information are considered and made available for use by the joint force. Consider that some non-DOD and foreign assets or capabilities may be interrupted, denied, or otherwise not be available in a contingency environment.

e. Establish or designate a lead METOC production unit as described in paragraph 6.a., "Lead METOC Production Unit."

f. Establish support relationships between METOC units and assign a lead joint meteorological and oceanographic officer (JMO) when appropriate in accordance with (IAW) the "one operation, one forecast" concept.

Additional responsibilities of the CCDR can be found in CJCSI 3810.01, Meteorological and Oceanographic Operations.

4. Senior Meteorological and Oceanographic Officer

The SMO assists the CCDR and staff in developing and executing operational METOC services in support of the joint force. The SMO:

a. Collects METOC requirements from the joint forces, recommends assignment of METOC tasks, and requests additional METOC capabilities from supporting components and/or Services as required.

b. Coordinates with the Services and other agencies for METOC support or other additional capabilities required to fulfill operational needs that are not within the components' ability to provide. The SMO does not exercise command over the METOC forces in theater and does not specifically task how the Service components perform Service-specific or unique tasks. However, the SMO functionally manages METOC activities for the CCDR.

c. Integrates METOC information into each OPORD, OPLAN, or concept plan (CONPLAN).

For more information on METOC information plans, see Appendix C, "Meteorological and Oceanographic Operations Information and Annexes in Operation Plans."

d. Maintains awareness of METOC operations and conditions.

For additional responsibilities of the SMO, see CJCSI 3810.01, Meteorological and Oceanographic Operations.

5. Joint Meteorological and Oceanographic Officer

a. JFCs will establish a requirement for METOC support for the joint force immediately upon initiation of planning, and designate a JMO or lead Service component to plan for METOC support. The JMO should preferably be an experienced field grade officer, with completion of the Joint Staff-sponsored JMO course and phase 1 of Joint Professional Military Education. JMOs provide METOC advice to the JFC, determine

METOC capabilities required for the joint force, and ensure unity of METOC efforts across the joint force components. The JMO interacts with staff components, partner nation METOC units, and the SMO to optimize supporting METOC operations.

b. The duties of the SMO and JMO are complementary and may at times be similar. Whereas the SMO's primary function is to support the CCDR in the development and maintenance of established OPLANs and CONPLANs, the JMO supports the JFC in executing a specific mission and/or task by either modifying an existing plan or developing a new one. The JMO coordinates the JFC's METOC operations via collaboration with the SMO and component METOC forces assigned or attached to the command. The SMO and/or JMO work(s) with planners to ensure the appropriate METOC capabilities are requested from the Services. Like the SMO, the JMO does not command METOC forces in the joint operations area (JOA) and does not specifically task how the Service components perform Service-specific tasks.

c. During planning and execution of joint operations, the JMO:

(1) Integrates METOC assessments into the JIPOE, JPP, commander's SA, C2 products and processes, and operational decision making.

(2) Develops METOC data collection requirements to effectively characterize the METOC environment across the JOA.

(3) Advises the JFC on designation of a lead METOC production unit and any additional supporting METOC capabilities required.

(4) Provides direction to METOC units supporting the JOA, to include publishing METOC information requirements and formats.

(5) Coordinates with the SMO and the Services for specific METOC capabilities requested by deploying forces so they arrive equipped and ready for operational employment.

(6) Monitors METOC operations within the JOA.

(7) Ensures METOC information is integrated into the appropriate plans and annexes.

(8) Considers all METOC data and information sources available within the JOA, identifies critical information gaps, and requests additional capabilities through appropriate joint processes.

(9) Specifies METOC information requirements for inclusion in the commander's critical information requirements (CCIRs), priority intelligence requirements (PIRs), operational reports, and/or the OPLAN annex R (Reports).

(10) Ensures METOC-related after action reports and lessons learned are collected and provided to the CCDR's SMO and entered into the Joint Lessons Learned Information System as appropriate.

6. Subordinate Components

a. **Lead METOC Production Unit.** Upon initiation of planning for joint operations, the CCDR should designate a lead METOC production unit via the appropriate service component or request additional capabilities to support the joint force. The lead METOC production unit is normally designated from existing Service METOC production units/centers and is a reachback organization that does not deploy to the JOA. The CCDR should consider location of operations, production unit capabilities, communication connectivity, and the component preponderance of assets when selecting a lead METOC production unit. For example, in a joint operation largely executing operations in the maritime domain, the CCDR may consider a US Navy center as the lead METOC production unit. Because the lead METOC production unit may not have all the forecast capabilities required to support the joint force, there may be cases where an additional supporting production unit capability must be requested. The lead METOC production unit coordinates support requirements with the JMO and produces a joint operations area forecast (JOAF) and other METOC products as required by the supported joint force and staffs, on a schedule established by the JMO that best supports the JFC decision cycle with timely METOC information. The command relationship between the joint force and the lead METOC production unit is typically direct support.

b. **Service Component METOC Organizations.** Component METOC personnel provide recommendations to their commanders and serve as the focal point for component METOC planning and execution. Based on their component's mission and overall guidance from the SMO and/or JMO, METOC personnel plan, coordinate, and evaluate the METOC support requirements tasked to their component. METOC personnel document these requirements in appropriate annexes to component-level plans. A key duty of METOC officers is to determine which information and products are beyond their capability to provide. In close coordination with subordinate units, each component determines what support it can provide to the joint force and works with the JMO and designated lead production unit to fill any capability gaps. Multiple component METOC resources within an OA collect METOC data, which is integrated to produce METOC products superior to any which an individual component can deliver. Other component duties typically include resolving METOC personnel and equipment problems and providing input to the time-phased force and deployment data as required.

(1) **US Army Forces.** The Air Force provides weather services and support for the Army. No single Army organization is responsible for comprehensive oversight and management of Army-unique weather capabilities. Consequently, Army weather support responsibilities are shared by the Headquarters, Department of the Army; Training and Doctrine Command Headquarters; and various Army proponents and research organizations. The Air Force manages weather resources, develops plans and concepts, and establishes operations policy to address Army-validated requirements.

(a) The US Air Force provides METOC capabilities to the Army forces in a direct and general support role as part of the Air Force forces (AFFOR) (see Army Regulation 115-10/Air Force Instruction 15-157, *Weather Support and Services for the US Army*). To help meet current and emerging Army mission requirements, the Air Force aligns Air Force weather units with respective Army echelons at the corps, division, brigade, and aviation battalion echelons. Air Force weather squadrons and detachments align personnel and equipment to conduct METOC operations and provide METOC services in support of the Army commander's mission. The staff weather officer (SWO) is the Air Force senior weather representative (officer or noncommissioned officer) assigned to provide and/or arrange for weather support at a respective Army echelon. The SWO is designated a special staff officer and coordinates activities under the staff supervision of the S-2/G-2 [battalion or brigade intelligence staff officer/Army or Marine Corps component intelligence staff officer]. The mission requirements of each Army echelon are met using tailored METOC elements structured to support joint/Army operations.

(b) Field artillery units have the capability to obtain and integrate critical weather forecast information via reachback to the Air Force to increase first round hits, conserve ammunition, achieve surprise, and reduce the chances for friendly fire and collateral damage. The weather forecast information (wind direction, temperature, pressure, humidity, precipitation, visibility, and cloud ceiling heights) is transmitted to field artillery fire direction centers.

(2) **Marine Corps Forces (MARFOR).** Marine Corps METOC support is organized as an embedded capability set within selected Marine Corps units (e.g., Marine Corps air stations, intelligence battalions, Marine air control groups) to support military operations in both garrison and OEs. From those units, Marine Corps METOC forces deploy as task-organized teams or detachments with associated expeditionary METOC systems to support the operational requirements of each particular Marine air-ground task force (MAGTF) or mission assignment. Additional details concerning Marine Corps METOC organization can be found in Navy Warfare Publication 3-59M/Marine Corps Reference Publication 2-10.2, *Operational Level Integration of METOC Capabilities.* Marine Corps METOC capabilities include on-scene sensing/collection, assimilation and processing of raw and processed environmental data, dissemination, and integration of METOC products and services. Marine Corps METOC capabilities facilitate the dynamic characterization and understanding of both the current and future state of the OE for MAGTF commanders, planners, and warfighters throughout the planning process.

(3) **Navy Forces (NAVFOR).** Navy METOC personnel provide data collection, assimilation capabilities, products, and services to operating forces ashore and afloat, which are tailored according to the requirements of the component, individual numbered fleet, and task force commanders. Supplied METOC information includes tactical decision aids for weapon and sensor system performance and employment, and climatological information for long-range planning. Details of the organizational structure and functions of the various levels of Navy METOC can be found within Navy Warfare Publication 3-59M/Marine Corps Reference Publication 2-10.2, *Operational Level Integration of METOC Capabilities.*

(a) Navy METOC reachback centers provide on-demand support for naval, joint, national, and multinational missions. The centers act as the point of contact and base for support for all forward deployed strike group oceanography teams and mobile environmental teams and provide tailored METOC products on-demand, to include sea ice services.

(b) Navy numerical modeling centers assimilate METOC data into global and regional atmospheric and oceanographic models which extend from the top of the atmosphere to the bottom of the ocean. These models can be tailored or relocated anywhere in the world to support operations.

(c) The Navy Fleet Survey Team provides high-resolution hydrographic surveys for use in nautical or tactical charts that enable access to the littorals for amphibious landings, mine warfare, and naval special warfare operations.

(d) The Joint Typhoon Warning Center enables effective fleet and joint force planning and operations through provision of tropical cyclone forecasts, warnings, and decision support, and tsunami decision support to DOD assets in the Pacific and Indian Oceans.

(4) **AFFOR.** Air Force METOC forces deliver worldwide atmospheric and space weather and climate information through reachback production centers for weather support to all Air Force and Army installations and activities within Air Force and Army OAs. Other specialized weather support is provided, to include space and climatological weather support to DOD.

(a) Air Force METOC personnel also provide direct and general support to the Army forces. Support required for Army forces and supported echelons includes providing atmospheric weather, hydrometeorology support, and climate and space weather data and information. Air Force weather assets deployed in support of AFFOR are typically organized as flights under an expeditionary operations support squadron. Air Force assets in support of Army operations are normally organized as flights, detachments, or operating locations under an expeditionary weather squadron, depending on the scale of the operation. The Air Force retains operational control and administrative control of all Air Force METOC forces deployed in the AOR, including those supporting the Army. However, the commander, AFFOR, may choose to delegate tactical control to the supported Army unit.

(b) The Air Force is also the DOD lead agency for tactical location identifiers (KQ IDs). For more information, see Appendix D, "Location Identifiers."

(5) **Special Operations Component.** Special operations forces (SOF) METOC capabilities provide METOC operations, tailored services, and support to SOF C2 elements, SOF aviation assets, the joint special operations air component, and subordinate organizations. Their tailored METOC information and knowledge enable planning, command decisions, and execution of SOF operations. These forces have the capability to plan, coordinate, and conduct METOC operations throughout the OE in order to determine

METOC impacts to SOF and joint/multinational operations. Air Force special operations weather teams, Marine Corps METOC forces, and Naval Oceanography Special Warfare Center METOC forces are trained to operate independently in permissive or uncertain environments, or alongside other SOF elements in hostile environments, to provide tailored information and recommendations in support of mission planning and execution. SOF METOC reachback centers provide tailored support to global SOF missions. Implicit capabilities of special operations METOC forces include full integration with other SOF in order to conduct environmental reconnaissance, provide terrain reports, conduct METOC training and operations with indigenous personnel, provide short-term METOC analysis/forecasting, conduct sensor emplacement, and provide weather site surveys for airfields/assault landing zones. Special operations METOC forces are equipped with a variety of Service and SOF equipment to execute these tasks. For additional SOF-specific planning information, see Appendix F, "Meteorological and Oceanographic Integration to Joint Special Operations Planning."

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CHAPTER III
METEOROLOGICAL AND OCEANOGRAPHIC SUPPORT TO JOINT PLANNING

"In military operations, weather is the first step in planning and the final determining factor in execution of any mission."

General Carl Spaatz
Air Force Chief of Staff, 1948

1. Introduction

The management and integration of METOC capabilities and information in joint planning are inherent responsibilities of command. Within the OE, the JFC and staffs must consider METOC conditions that affect the employment of capabilities and bear on decisions of the commander. METOC information is of greatest value when it is distilled into current and predictive METOC effects on force capabilities (friendly and adversary) to positively inform the commander's decision-making processes. This chapter focuses on METOC support and integration of METOC considerations into joint planning, beginning with the role of the commander and the elements that allow for effective decision making during planning.

2. Meteorological and Oceanographic Considerations and the Art of Joint Command

a. The art of command resides in the commander's ability to use situational leadership to maximize operational performance. METOC information enhances commanders' SA and their ability to make difficult decisions. METOC personnel contribute to commanders' effective decision making by providing METOC information and assessments of METOC effects on friendly and adversary capabilities. METOC information and assessments contribute to the commanders' knowledge of when to decide and what to decide quickly enough to maintain the advantage over the adversary.

b. The JFC's SA should encompass the broad operational activities that span joint planning and execution. METOC personnel support SA by identifying METOC requirements in the OA, developing and maintaining a METOC collection plan, and providing METOC assessments for friendly and adversary capabilities and possible adversary COAs in response to any emerging crisis. METOC data collection and inputs to the JIPOE help illuminate the situation for the CCDR, components, and subordinate JFCs. The commander may develop PIRs to assess METOC information gaps. Preliminary recommendations on the appropriate alignment of METOC forces for possible joint task force (JTF) composition could also be considered at this point.

c. Effective SA requires METOC support that is collaborative with other staff SA processes, is adaptive to changing conditions in the OE, and anticipates the needs of the commander in order to provide relevant information to make informed decisions. METOC personnel continuously monitor environmental conditions to notify decision makers of specific impacts.

3. Meteorological and Oceanographic Considerations and Operational Art

a. Operational art is the use of creative thinking to develop strategies, campaigns, and major operations, and to organize and employ military forces. It governs the deployment of those forces and the arrangement of operations undertaken to achieve objectives. Operational art requires a broad vision, the ability to anticipate, and the skill to plan, prepare, execute, and assess. Through operational art, commanders and staffs order their thoughts and understand the conditions for victory before entering into battle.

b. METOC planners aid the commander in operational art by actively integrating their experience and knowledge of METOC conditions and effects, thereby allowing the commander to visualize adverse impacts and assess any potential risks when arranging operations. The CCDR and/or subordinate JFC have competing time requirements in the planning process, particularly during a crisis. Because of this, it is essential the commander articulates and relays the broad vision for the operation to allow the staff to simultaneously work toward the commander's desired operational approach. METOC planners should fully participate in the process to understand the commander's vision so they can identify and articulate back to the commander any potential METOC limitations which may disrupt the operation.

4. Meteorological and Oceanographic Considerations and Operational Design

a. Operational art requires a broad vision, the ability to anticipate, and the skill to plan, prepare, execute, and assess, and operational art encompasses operational design. METOC planners support the JFC's/commander's intellectual framework underpinning joint planning and execution by providing knowledge of weather effects on the employment of joint force capabilities. This knowledge reduces the uncertainty of a complex OE as applied to the planning of strategies, campaigns, and major operations.

b. The operational approach is a commander's description of the broad actions the force must take to attain the desired military end state. The operational approach is based largely on an understanding of the OE, and METOC planners provide METOC effects on the employment of capabilities that bear on the decisions of the commander. The METOC aspects of the OE are associated with physical factors of the air, land, maritime, and space domains and the information environment. METOC planners provide the JFC with assessments of METOC aspects of the OE that could affect the employment of friendly and enemy capabilities to help the JFC attain the military end state. METOC planners provide routine updates to these assessments/estimates in support of the JFC and staff's continual review, update, and modification of the operational approach as the OE, end state, or problem change. During execution, the JFC will likely have reason to consider updating the operational approach. It could be triggered by significant changes to understanding of the OE and/or problem, the conditions of the OE, or the end state.

c. Operational design employs various elements to develop and refine the commander's operational approach. These conceptual tools help commanders and their staffs think through the challenges of understanding the OE, defining the problem, and developing this approach, which guides planning and shapes the concept of operations

OPERATION IRAQI FREEDOM

25-27 MARCH 2003

During the American-led march to Baghdad, meteorological and oceanographic forces predicted the onset of widespread sandstorms in south-central Iraq. Commanders seized the moment and quickly integrated this environmental information into their operational planning. Scheduled missions were modified or cancelled, and new ones were added. Weapons systems vulnerable to the expected conditions were switched out in favor of those that could overcome the degrading effects of persistent strong winds that produced blowing sand and near-zero visibilities up to several thousand feet over the operational area.

Various Sources

(CONOPS). METOC planners provide METOC assessments related to the implementation of these tools to enhance the JFC's/commander's understanding of the OE. METOC planners provide METOC assessments along lines of operation (LOOs) and for lines of effort (LOEs), decisive points, enemy centers of gravity (COGs) and friendly and enemy capabilities to inform the JFC's use of the direct or indirect approach to defeat an enemy's armed forces, destroy an enemy's war-making capacity, or seize or retain territory.

d. METOC planners support the JFC's ability to maintain freedom of action throughout the operation by providing METOC assessments beyond the limits of the JOA. Operational reach can extend far beyond the limits of a JFC's JOA, and losing the capability to operate beyond the JOA can greatly diminish the JFC's freedom of action.

5. The Meteorological and Oceanographic Planning Process and Lines of Effort

In developing the operational approach, the commander may use LOOs or LOEs to further organize and visualize the joint operation. LOEs link multiple tasks and missions using logic of purpose to focus efforts toward establishing operational and strategic conditions, and help leaders visualize how capabilities can support the overall effort. Commanders at all levels can utilize LOEs to aid in developing missions and tasks and allocating resources. During the planning process, METOC activities are generally organized along two LOEs: providing METOC support to joint planning and planning METOC activities.

a. LOE 1: Providing METOC Support to Joint Planning

(1) METOC planning activities along this LOE include the production of assessments and estimates of METOC effects on friendly and adversary military capabilities and on proposed COAs. To accomplish this, METOC planners must compile and maintain a thorough understanding of the weather-limiting thresholds for all friendly and adversary military capabilities to be employed in the OE. Outputs are tailored METOC products for use in (or as an output of) the JIPOE process. Related tailored METOC products are disseminated at all levels to inform joint planning and the development of the

commander's estimate through which military options are planned to meet strategic objectives. These METOC activities are continuous and always conducted in parallel with and in support of the planning and assessment processes. Assigned METOC planners also evaluate METOC data and information to identify gaps relevant to the COA under consideration.

(2) The process culminates with the production of a METOC estimate, which is included with appendix 11 (Intelligence Estimate) to annex B (Intelligence). METOC planners should also be assigned as core members of the joint planning group (JPG) to contribute to the overall plan development by providing METOC effects on operations objectives and the commander's desired effects.

b. **LOE 2: Planning METOC Activities**

(1) METOC planning activities along this LOE identify METOC information gaps, prioritize METOC capability requirements, develop METOC collection plans, assess METOC capabilities to identify shortfalls, and develop mitigation strategies to address those shortfalls. Specific outputs of this LOE are the METOC estimate, which identifies available METOC capabilities and anticipated shortfalls; annex H (Meteorological and Oceanographic Operations); and inputs to annex B (Intelligence) for the campaign or contingency plan. Additional outputs of this LOE may include resource demand signals that may be articulated through the CCDR's integrated priorities list or requests for forces (RFFs). METOC activities along this LOE are typically conducted internal to the staff by METOC planners in coordination with the intelligence directorate of a joint staff (J-2).

(2) METOC planners develop a METOC planning timeline that is synchronized with the CCDR's planning timeline. This ensures any resulting tailored METOC information, the initial METOC estimate, and the initial METOC staff estimate will all meet the JPG's timeline requirements. To generate the METOC staff estimate, the METOC planning team, in coordination with Service component commanders and subordinate JFCs, identifies and analyzes all command-inherent METOC capabilities available to support execution of the plan. For contingency plans, supporting METOC capabilities may include those of assigned and apportioned forces. Capabilities of the lead METOC production unit should also be considered in all cases.

(3) Based on the list of all available METOC capabilities, the METOC planners draft and submit the initial METOC staff estimate to the JPG to support the command's overall force structure analysis. In addition to listing all available METOC capabilities, the initial METOC staff estimate should identify all factors that may affect the employment of METOC capabilities. Factors such as logistical supportability, communication architecture requirements, and METOC personnel availability should be considered. Considering all of the identified METOC gaps relevant to the planning effort and recognizing the uncertainties in analytic conclusions, METOC planners, in collaboration with the JPG, may nominate additional planning assumptions and initial PIRs for validation during the current planning cycle. Upon approval by the J-2 and CCDR, initial PIRs are passed back to the METOC planners for action. If PIRs are not answered prior to plan

development, they may be included as part of the final CCIRs to be monitored during plan assessment.

c. **METOC in the Four Planning Functions.** The four planning functions are strategic guidance, concept development, plan development, and plan assessment. The functions may be accomplished sequentially or simultaneously depending on the timeline as determined by the nature of the crisis. The role of METOC personnel in each of these planning functions is discussed below.

(1) **Strategic Guidance.** During the strategic guidance function, the CCDR crafts theater and operational objectives to support the national strategic objectives as laid out by the President, the Secretary of Defense (SecDef), and the Chairman of the Joint Chiefs of Staff. Like the rest of the planning staff, METOC personnel should review the appropriate strategic guidance documents to frame the problem at hand and begin to assess how METOC effects will impact the OE. The SMO should advise the CCDR on any relevant METOC information aiding in mission analysis. At this point in the planning process, this support may come in the form of a climatological assessment.

(2) **Concept Development.** During the concept development function, the commander develops COAs and recommends one for SecDef approval.

(a) Consistent with METOC LOE 1, METOC planners evaluate products to be disseminated to the JPG and present these products IAW the established planning timeline. At this point, they also coordinate their participation as subject matter experts in the COA analysis step, to include wargaming of COAs. METOC assessments play a role in highlighting the advantages and disadvantages of each COA.

(b) Along LOE 2, METOC planners consider how assigned METOC assets and external METOC resources can be employed to support the execution of the COA. They determine how the various METOC collection assets should be employed, revise the METOC staff estimate as required, and capture any additional factors unique to each of the proposed friendly COAs, which may limit the employment of METOC capabilities. They also consider final PIR nominations required to support CCDR decisions. During COA approval, these METOC planners recommend PIRs through the J-2 for CCDR approval. PIR nominations not approved by the CCDR are processed at a lower priority and satisfied when METOC resources become available.

(3) **Plan Development.** During this function, campaign plans, contingency plans, orders, and supporting annexes are fully developed. The end product from plan development is an approved plan or order.

(a) Along METOC LOE 1, METOC planners provide support to the JPP by completing the METOC estimate and providing METOC inputs to other portions of the plan and/or annexes.

(b) On LOE 2, the planning of METOC activities, annex H (Meteorological and Oceanographic Operations) is developed outlining the METOC mission, concept of METOC operations, METOC PIRs, and guidance for how METOC activities will be

performed during mission execution. Annex H also specifies tasks to subordinate and supporting METOC organizations and any requirements for external support.

(4) **Plan Assessment.** In this function, the complete plan is continuously assessed and may be refined, adapted, terminated, or executed. Commanders continuously assess the OE and the progress of their operations or campaigns, and then compare them to their initial vision and intent. Continuous and timely assessments are essential to measure progress of the joint force toward mission accomplishment. Commanders and their staff elements (to include METOC planners) determine relevant assessment actions and measures during planning. This is often in the form of measures of effectiveness (MOEs) or measures of performance (MOPs).

(a) METOC planners should consider assessment measures as early as mission analysis and include assessment measures and related guidance in commander and staff estimates. These assessment considerations should be focused on helping commanders guide operational design in order to improve the sequence and type of actions along the overall LOOs/LOEs. During execution, assigned METOC planners must continually monitor progress toward accomplishing tasks and achieving objectives. Assessment requirements and any resources required to conduct analysis should be built into plans and monitored. During execution, METOC collection and production requirements may change in response to dynamic changes to the CCDR's PIRs.

(b) METOC planners, in coordination with the J-2, assess METOC effects on friendly and adversary military capabilities in the OE. The METOC planners advise the commander and staff on what METOC aspects of the OE should be measured and how to measure them in order to determine progress toward accomplishing a task, creating an effect, or achieving an objective. The assessment process is continuous and linked to the CCIR process by the commander's need for timely information and recommendations to make decisions during all phases of the operation or campaign. The METOC support role in assessments applies to all phases of the operation (see Chapter IV, "Meteorological and Oceanographic Information in the Joint Functions").

6. Meteorological and Oceanographic Considerations in the Joint Planning Process

a. The JPP is an orderly, analytical process through which the JFC and staff translate the broad operational approach into detailed plans and orders. Through the JPP, planners develop options, identify resources, identify and mitigate risk, and ultimately translate the commander's planning guidance into a feasible COA and CONOPS by which the joint force can accomplish its assigned mission and attain the military end state. To be effective contributors to the JPP, the SMO/JMO and assigned METOC planners should fully participate throughout, completely understand the assigned mission, and be prepared to provide timely and relevant METOC assessments during each step. This METOC support will result in a shared common understanding of METOC effects between the commander and the staff as they finalize development of the JFC's plans and orders.

For more information on the JPP, see JP 5-0, Joint Planning.

b. **METOC Support to JPP Step 1: Initiation**

(1) Fully understand the strategic guidance.

(2) Understand the initial JFC's guidance and intent.

(3) Develop METOC assessments for JIPOE to support joint planning.

(4) Review higher headquarters (HQ) guidance.

(5) Assess current theater METOC collection capabilities.

(6) Assess current theater METOC production process.

c. **METOC Support to JPP Step 2: Mission Analysis**

(1) Develop METOC assessments for JIPOE parallel to planning.

(2) Determine specific, implied, and essential METOC tasks.

(3) Begin development of the METOC staff estimate.

(4) Determine METOC constraints and restraints.

(5) Identify/recommend METOC CCIRs.

(6) Develop guidance on METOC operations for subordinate and supporting commands.

(7) Identify METOC support gaps and priorities.

(8) Develop METOC assumptions and identify operational limitations.

(9) Accomplish a preliminary assessment of METOC assets and capabilities for development of a METOC support plan.

(10) Develop the METOC estimate, which supports the CCDR's estimate.

d. **METOC Support to JPP Step 3: COA Development**

(1) Determine METOC effects on the employment of military capabilities for the developed COAs.

(2) Capture assumptions for potential METOC collection tasking.

(3) Revise the METOC staff estimate.

(4) Develop the initial METOC collection and production plan.

(5) Identify METOC tasks for assigned and supporting METOC units.

e. **METOC Support to JPP Step 4: COA Analysis and Wargaming**

(1) Develop the METOC support and collection plan, and answer METOC-related CCIRs identified during wargaming.

(2) Refine METOC assessments for each friendly COA.

(3) Develop METOC assessments for the adversary's military capabilities, as well as their most likely and most dangerous COAs.

f. **METOC Support to JPP Step 5: COA Comparison**

(1) From a METOC perspective, analyze and evaluate the advantages and disadvantages of each COA and present this information to the JPG.

(2) If METOC effects are a criteria for the COA decision matrix, provide applicable METOC assessments to evaluate COAs against the most likely and most dangerous enemy COA.

g. **METOC Support to JPP Step 6: COA Approval**

(1) Provide updated METOC effects to the COAs.

(2) Revise PIRs.

(3) Finalize METOC support plan for OPLAN or OPORD.

h. **METOC Support to JPP Step 7: Plan or Order Development**

(1) Develop the annex H (Meteorological and Oceanographic Operations) to support the CCDR's CONOPS.

(2) Provide inputs to other plans as appropriate, to include annex B (Intelligence).

CHAPTER IV
METEOROLOGICAL AND OCEANOGRAPHIC INFORMATION IN THE JOINT FUNCTIONS

1. Introduction

The joint functions are related capabilities and activities placed into six groups to help the JFC synchronize, integrate, and direct joint operations. This chapter presents an overview of how METOC support applies to the joint functions.

2. Meteorological and Oceanographic Support for the Joint Functions

METOC personnel provide METOC data, information, and assessments that help enable the JFC to effectively integrate, synchronize, and lead joint operations through the joint functions across the range of military operations.

a. **C2.** METOC assessments inform the JFC's guidance and direction to the joint force. METOC personnel provide these timely assessments to enable the commander to make operational decisions at a more rapid pace than the adversary. This decreases risk and allows the commander opportunities to gain an operational advantage (i.e., control the timing and tempo of operations). METOC assessments also enable the JFC and subordinate commanders to allocate means and integrate and synchronize the other joint functions throughout the OA.

(1) The JFC plans, directs, and controls most aspects of the operation informed by the staff's expertise and efforts. A stable battle rhythm is a tool that staff use to facilitate effective information management and decision making within the HQ and with higher, supporting, and subordinate HQ. METOC planners, when properly integrated into this

OPERATION INHERENT RESOLVE

FALL 2015

During planning for a joint ground assault operation consisting of tribal fighters, US and coalition special operations forces, and conventional command and control and air support, a two-person meteorological and oceanographic (METOC) team embedded with the operational commander proved vital during joint intelligence preparation of the operational environment. Recognizing the critical thresholds for the friendly capabilities involved in the operation, the METOC team provided METOC assessments during the planning process which identified an exploitable window between weather systems and advised the commander's decision to utilize capabilities which mitigated forecast cloud cover. The integration of the METOC team's expertise into planning enabled a successful operation which secured multiple villages out from under the control of insurgent forces.

Various Sources

structure, play essential roles in planning, preparing for, monitoring, and assessing operations. METOC personnel should fully participate in the HQ battle rhythm and its daily operations cycle of briefings, meetings, and report requirements.

(2) Within the function of C2, the JFC should also identify METOC elements of information for the OE that are deemed critical to timely decision making. At a minimum, these CCIRs should be reviewed and updated during each phase of the operation based on changes in the OE. METOC planners should also submit PIRs that meet the JFC's guidance to the J-2. These PIRs should focus on weather limitations of adversary military capabilities. METOC planners also recommend and submit proposed friendly force information requirements (FFIRs) to the plans directorate of a joint staff (J-5) during planning and to the operations directorate of a joint staff (J-3) during current operations. The J-2, J-3, and J-5 submit these staff recommendations to the JFC for approval, and these JFC-approved PIRs and FFIRs may be designated CCIRs.

(3) Timeliness of METOC information depends greatly on communications systems. The precision, speed, and interoperability of these systems improve access to METOC data and information and enhance a common METOC perspective of the OE. METOC planners should coordinate with the communications system directorate of a joint staff (J-6) to ensure METOC requirements are addressed in the operation and connectivity of C2 communication systems and processes supporting information management. Bandwidth requirements and capacity are some key issues that should be discussed. Since decisions are the most important products of the C2 function, commanders and their staffs require shared METOC information and knowledge that results in the wisdom essential to sound decision making. Efficient METOC information sharing contributes to shared understanding and the free exchange of information between the commander, METOC planners, and the other joint staff directorates. Shared METOC knowledge and the individual knowledge of numerous other functional experts modify and increase the collective knowledge of the joint force. This holistic knowledge sharing should begin early in the operational design process.

(4) Risk is inherent in military operations. METOC planners provide METOC assessments to enable the commander to identify, assess, and control the risks arising from military operations and to make decisions that balance risk cost with mission benefits. Risk management helps commanders preserve lives and resources, avoid or mitigate unnecessary risk, identify feasible and effective control measures, and develop valid COAs. METOC planners provide METOC assessments to enhance the commander's ability to alleviate, mitigate, or reduce risk in a variety of ways (e.g., changing the CONOPS or plan for employment of operational fires or executing a branch to the original plan).

(5) METOC capabilities and information should also be included in military deception actions executed to deliberately mislead adversary decision makers as to friendly capabilities, intentions, and operations. These actions should cause the adversary to take or not take specific actions that will contribute to the accomplishment of the friendly mission.

OPERATION IRAQI FREEDOM

Working with intelligence analysts, meteorological and oceanographic personnel provided an analysis of weather conditions during enemy attacks that resulted in the correlation of adversary action with meteorological phenomena that reduced visibility (e.g., dust storms). This knowledge allowed friendly forces to anticipate potential attacks, enabling the joint force commander to adjust security posture during these occasions or to position forces near known adversary points of origin to successfully apprehend insurgents and weapons caches.

Various Sources

b. **Intelligence.** The intelligence function helps commanders and staffs understand the OE and achieve information superiority. METOC assessments and predictions support the commander's understanding of the OE. METOC information and assessments are integrated into the JIPOE, informing the J-2 and the commander how METOC affects employment capabilities. The collection authority optimizes collection capabilities in the OA using METOC assessments for platforms and sensor payloads. In return, J-2 planners provide METOC limiting thresholds adversely affecting the adversary's military capabilities to METOC planners. METOC planners then provide METOC assessments based on the J-2's assessment of adversary capabilities, COGs, and probable COAs. Comparing METOC effects on friendly and adversary capabilities enables the JFC to achieve advantage, exploit favorable METOC windows of opportunity, achieve information superiority, act inside the adversary's decision cycle, and employ capabilities that enhance the probability of mission success.

(1) **Intelligence Requirement and Information Requirement Planning.** During mission analysis, METOC personnel provide the OE estimate of METOC effects on operations, assess significant METOC information gaps about the OE within a gap analysis, formulate requirements for the collection of METOC information, and provide METOC-related PIRs to the J-2. The PIR nominations must consider the mission, commander's intent, operational objectives, and the time frame of expected operations. METOC-related PIRs support critical decisions over the course of an operation. Commanders update PIRs to address new requirements or concerns and, as the situation changes, eliminate some or develop others. If any METOC requirement is designated as a PIR, METOC personnel develop a series of more specific questions known as information requirements—those items of information that must be collected and processed to develop the intelligence required by the commander. METOC-related PIRs assist the JMO in determining and prioritizing the type and level of METOC resources required to support the joint force. The JMO uses these requirements to justify requests for METOC capabilities.

(2) **Collection and Exploitation Planning.** METOC collection planning matches anticipated collection requirements with appropriate theater collection capabilities. It is a continuous process that coordinates and integrates the efforts of all collection units and agencies. This multi-echelon collaboration helps identify collection

gaps and redundant coverage in a timely manner to optimize the employment of all available collection capabilities.

(3) **Intelligence, Surveillance, and Reconnaissance (ISR).** The JMO/METOC personnel must routinely collaborate with the J-2 and J-3 staffs to synchronize the employment of assigned and allocated ISR platforms and sensors against specified collection targets. METOC personnel provide continuous updates and predictions of METOC effects on platforms and sensor payloads to optimize the use of collection assets against specified collection targets. Knowledge of current and predictive METOC effects enables adaptive collection planning by the J-2 and effective management and optimal employment of all available platforms; sensors; and associated processing, exploitation, and dissemination systems.

(4) **Planning METOC Support to the Joint Targeting Cycle.** Based on the commander's objectives, and desired and undesired effects, targeteers begin the process of target system analysis and target development. Predicted METOC effects information should be applied to the target development process through the JIPOE process. As targeteers develop these lists, they leverage METOC personnel to provide predicted METOC effects over approved targets.

(5) **Collection Management.** Collection operations management includes the selection and tasking of specific assets and sensors. JMO/METOC personnel enable the optimal employment of collection capabilities to collection requirements by providing predictive METOC effects information for platforms and sensors to inform the collection operations manager's selection of assets best suited to collect the information needed to satisfy the information requirements and accomplish the mission.

(6) **Target Intelligence.** Target characterization, a component of target intelligence, includes analyses of the physical attributes of the target and signatures to support target detection and positive identification. METOC personnel provide METOC information in the vicinity of and over the target in addition to METOC effects on the target signature in support of all target engagement options.

(7) **Estimative Intelligence.** Estimative intelligence identifies, describes, and forecasts adversary capabilities and the implications for planning and executing military operations. The integration of METOC forecasts into estimative intelligence aids planners in providing more accurate assessments of relevant actors' responses based on friendly actions.

c. **Fires.** Joint fires are those delivered during the employment of forces from two or more components in coordinated action to produce desired results in support of a common objective. METOC planners provide METOC effects assessments to the joint fires officer in support of the joint targeting process for all selected targets and the available weapons and other systems employed to create a specific lethal or nonlethal effect on these targets. METOC planners also provide METOC effects assessments to enable joint fires support that assists joint forces to move, maneuver, and control territory, populations, airspace, and key waters. METOC information and assessments optimize joint fire support planning;

effectiveness; and synchronization of air, land, maritime, and SOF capabilities. METOC personnel should be integrated into the joint targeting coordination board to provide METOC assessments to synchronize targeting with intelligence and operations.

d. **Movement and Maneuver.** This function encompasses the disposition of joint forces to conduct operations by securing positional advantages before or during execution. At the operational level, the objective of maneuver is usually a COG or decisive point. METOC personnel provide the JFC/commanders with METOC assessments for the COG/decisive point and also to inform the JFC's consideration of various ways and means to help maneuver forces to attain positional advantage. JFCs leverage METOC information for both friendly and adversary movement and fires capabilities to exploit METOC windows of opportunity and outmaneuver the adversary through the flexible application of friendly movement and fires. METOC information is also used to evaluate the movement and deployment of forces into an OA and the maneuver of these forces to operational depth for offensive and defensive purposes. METOC planners routinely collaborate with geospatial engineers on the joint staff and provide geospatial engineering teams with METOC conditions creating significant impact in the terrain and hydrological systems which may impact friendly and adversary trafficability and mobility challenges.

e. **Protection.** The protection function is focused on preserving the joint force's fighting potential. METOC planners enhance protection activities by providing detailed METOC information and assessments to commanders to:

(1) Describe METOC effects on adversary capabilities (in coordination with J-2).

(2) Inform planning and execution of air, space, and missile defense options and tasks.

(3) Support Department of Defense information network (DODIN) operations to provide information that can be used to protect networks and supporting infrastructure from weather events.

(4) Support protection of forces, bases, joint security areas, and lines of communication (i.e., advisories and warning of weather conditions).

(5) Enable mitigation of the effects of chemical, biological, radiological, and nuclear (CBRN) threats and hazards through CBRN response.

(6) Enable mitigation of health threats to the joint force using METOC information as part of a composite threat assessment, which includes enemy actions; environmental, geographical, and meteorological conditions; endemic diseases; and CBRN employment.

f. **Sustainment.** Sustainment provides the JFC flexibility, endurance, and the ability to extend operational reach. METOC personnel provide assessments to logistics planners. This information is important to the development of a feasible, supportable, and efficient concept of logistics support. Geospatial engineering teams use current and predicted

OPERATION ENDURING FREEDOM

At a forward operating base (FOB) in Afghanistan, meteorological and oceanographic (METOC) personnel routinely provided critical weather data (temperature and altimeter) to joint fires personnel to ensure counter-rocket systems were calibrated for accuracy. As an attack on the FOB commenced, METOC personnel, aware of the critical nature this data played in system accuracy, immediately contacted the counter-rocket operators and relayed the current conditions. Integration of up-to-the minute data into the system allowed for successful engagement of an incoming rocket which, based on the radar-projected track, would have directly impacted the fully-manned battalion tactical operations center.

Various Sources

METOC information in support of mobility/trafficability assessments. These assessments allow logistics planners and the JFC to synchronize the supply of food, water, fuel, arms, munitions, and equipment in time and space across the other joint functions to mass combat power and achieve operational objectives. Since sustainment activities may occur outside JOA boundaries, METOC personnel should maintain awareness of and advise the JFC on METOC effects, which may limit operational reach or diminish flexibility.

CHAPTER V
METEOROLOGICAL AND OCEANOGRAPHIC SUPPORT TO JOINT OPERATIONS

1. Introduction

Military operations vary in scope, purpose, and conflict intensity across a range that extends from military engagement, security cooperation, and deterrence activities to crisis response and major campaigns. This chapter addresses how critical METOC support and integration of METOC information are to the safe deployment and redeployment of forces and successful planning and execution across the range of military operations.

2. Meteorological and Oceanographic Support Across the Range of Military Operations

a. **Military Engagement, Security Cooperation, and Deterrence Activities.** In peacetime or prior to conflict, maintaining a forward presence enables METOC forces to gain familiarity and develop a common understanding of the local and regional METOC conditions necessary to ascertain METOC effects on the potential employment of military capabilities. METOC assessments are essential to enabling activities such as emergency preparedness, arms control verification, combating terrorism, counterdrug operations, enforcement of sanctions and exclusion zones, ensuring freedom of navigation and overflight, nation assistance, protection of shipping, shows of force, and support to insurgency and counterinsurgency operations. METOC personnel provide the JFC with current and predicted METOC effects on the employment of specific military capabilities in support of these activities, if needed. METOC personnel may work with partner nation METOC forces to develop relationships and collaborative agreements to support future multinational activities, including access to indigenous METOC data and information.

b. **Crisis Response and Limited Contingency Operations.** METOC personnel provide METOC assessments for military capabilities that help the JFC determine when, how, and where to employ these capabilities in a manner that accomplishes the mission. METOC requirements in support of crisis response, noncombatant evacuation operations, foreign humanitarian assistance, recovery operations, CBRN response, and strikes and raids are similar to those required during major operations.

c. **Major Operations and Campaigns.** METOC personnel provide METOC assessments on friendly and enemy capabilities, COGs, vulnerabilities, and probable COAs. These METOC assessments inform symmetries and asymmetries between friendly and enemy forces and assist the JFC and operational planners in identifying the best means to accomplish the joint force mission by exploiting these gaps in capabilities. METOC information enables the JFC to focus and leverage combat power and to determine acceptable risk in order to exploit the most effective and efficient use of joint fires. Accurate, consistent, relevant, and timely METOC assessments are enablers for targeting by informing weapons and platform delivery recommendations to create the JFC's desired effect on the target.

3. Meteorological and Oceanographic Support by Phase

METOC support is crucial to all aspects of execution. Accurate, consistent, relevant, and timely METOC support to force employment is important to achieving military success throughout all phases of a joint operation. METOC planners must be familiar with specific phasing arrangements of each command OPLAN because the phasing may differ for specific types of operations. During execution, METOC planners strive to stay at least one step ahead of operations and not only support the current phase of the operation, but also lay the METOC informational groundwork required for subsequent phases. Execution of joint operations requires optimizing the use of limited METOC resources and maximizing the efficiency of METOC support and is the ultimate test of the efficacy of METOC support planning.

a. **Shape.** JFCs are able to take actions before committing forces to assist in determining the shape and character of potential operations. In many cases, these actions enhance bonds between future multinational partners, increase regional understanding, ensure timely access to indigenous sources of METOC data and information, and prevent crises. METOC activities conducted within the context of deliberate planning during the shape phase develop the basis for METOC activities in subsequent operational phases and in support of theater campaign plans.

(1) Military METOC liaisons and the establishment of METOC sharing arrangements with multinational partners are examples of activities initiated during the shape phase. US METOC personnel should participate in mutual METOC training, temporary exchanges of METOC personnel, federated METOC arrangements, and the integration and exercise of METOC support architectures. National METOC cells should be formed as early as possible and a multinational METOC center established to coordinate activities. Partner nation access should be established and partner nation participation should be initiated to the maximum extent feasible during this phase. Theater METOC collection capabilities need to be optimized by integrating the various METOC capabilities of both the combatant command (CCMD) and partner nations within the AOR. Many potential multinational partners have capabilities that may prove invaluable to successful METOC operations.

For additional information on METOC support to multinational operations, see Appendix A, "Joint Support to Multinational Operations."

(2) METOC support can also aid in the effectiveness of civil-military operations. An analysis and assessment of METOC effects on the civil dimension (civil society key influences, organizations, structures, and areas) may be useful to inform the determination of what military engagement actions may serve as effective points of influence during the shape phase. For example, assessments of heavy, prolonged rainfall contributing to flooding in an area may inform actions in the health and sanitation areas to mitigate public health issues.

b. **Deter.** Deterrence attempts to stop undesirable adversary action by demonstrating the capabilities and resolve of the joint force. The joint force METOC planners assist the

JFC in visualizing relevant METOC effects on all capabilities within the OE and their likely impact on their ability to achieve stated objectives and accomplish the mission. METOC assessments should be provided to the JFC at the outset of the deter phase.

(1) During deterrence activities, JIPOE analysts support early warnings by looking for specific indications of imminent adversary activity that may require an immediate response or an acceleration of friendly decision-making processes. METOC planners provide corresponding METOC assessments on adversary capabilities, COGs, and probable COAs in support of JIPOE efforts. At the same time, METOC planners also look ahead and prepare METOC assessments in support of potential follow-on phases. Neutralizing the adversary's METOC collection capabilities may be particularly important to reinforce their isolation, facilitate their susceptibility to deception operations, and at the same time protect friendly forces.

(2) Once the crisis is defined, METOC planners may provide tailored METOC assessments in support of mobilization, predeployment activities, initial deployment into a theater, increased security cooperation activities, show of force operations, deployment of missile defense forces, and employment of ISR assets to provide real-time and near-real-time SA.

c. **Seize the Initiative.** At the appropriate time in the operation, JFCs seek to seize the initiative through the application of appropriate joint force capabilities. This involves executing offensive operations at the earliest possible time, forcing the adversary to offensive culmination, and setting the conditions for decisive operations. The JFC exploits friendly advantages and capabilities to shock, demoralize, and disrupt the enemy. METOC personnel provide the JFC with assessments of METOC effects on all available elements of combat power.

(1) In coordination with the J-2, METOC personnel provide the JFC with METOC assessments for enemy capabilities, which may impede friendly force deployment from bases, to ports of embarkation, to lodgment areas. Support to the JFC's target intelligence element is accomplished by providing METOC assessments for targets on the joint integrated prioritized target list. METOC personnel provide the deception planning cell METOC information to be incorporated in friendly deception planning efforts.

(2) Real-time surveillance and dynamic collection management are particularly critical during the seize the initiative and follow-on dominate activities as adversary capabilities must be tracked with a level of persistence and accuracy sufficient to support precision engagement and/or re-targeting efforts. METOC planners provide current and predicted effects of weather on all available US, partner nation, and HN collection capabilities assets (platforms and sensor payloads) to inform an integrated collection strategy that fully optimizes their use for persistent surveillance. The CCMD joint intelligence operations center facilitates collection management through ISR visualization. It is important METOC planners remain integrated in providing continuous real-time updates of METOC effects for all intelligence platforms and sensors to inform dynamic re-tasking and time-sensitive decision making.

d. **Dominate.** Dominate activities focus on breaking the enemy's will for organized resistance or, in noncombat situations, control of the OE. METOC personnel provide the JFC with METOC assessments to enable overmatching the joint force capability with the adversary's at the critical time and place. This may be accomplished by finding METOC windows wherein friendly capabilities have a distinct advantage over the adversary. METOC personnel provide the JFCs and CCDRs with current and predictive METOC assessments to inform the employment of conventional forces and SOF in sustained combat operations. The JFC also leverages METOC assessments during this phase to enable the execution of specific missions and operations (i.e., strategic attack, interdiction, and military information support operations) concurrently with other combat operations to deny the enemy sanctuary, freedom of action, or informational advantage. The JFC also uses these METOC assessments to adapt operations to take advantage of METOC conditions or prevent the enemy from taking advantage of them.

e. **Stabilize.** Stabilization is required when there is no fully functional, legitimate civil governing authority present and the joint force may be required to perform limited local governance, integrating the efforts of other supporting/contributing multinational, international organization, nongovernmental organization (NGO), or USG department and agency participants until legitimate local entities are functioning. Stabilization is typically characterized by a change from sustained combat operations to stability operations. As progress is made, military forces increase their focus on supporting the efforts of HN authorities, USG departments and agencies, international organizations, and/or NGOs. The role of METOC personnel may include assessing the relative effectiveness of METOC capabilities to support operations supporting civil authorities and reconstruction efforts. At this time, METOC collection and assessments transition from supporting combat operations to supporting a focus on actual or potential threats to the joint force (e.g., insurgent groups, criminal elements, and terrorist cells).

f. **Enable Civil Authority.** Enable civil authority activities are predominantly characterized by joint force support to legitimate civil governance in the OA. Depending upon the level of indigenous state capacity, joint force activities may be at the behest of that authority. The goal is for the joint force to enable the viability of the civil authority and its provision of essential services to the largest number of people in the region. In this phase, METOC personnel may remain in place to support intelligence resources supporting HN authorities. To facilitate this role, METOC sharing agreements may be promulgated. Before the operation is terminated, it is important the JMO ensures all METOC products, assessments, collection plans, and lessons learned are appropriately archived. This material may prove valuable to planning in the event US forces are directed to redeploy to the area.

4. Assessment

Assessment is the continuous monitoring and evaluation of the current situation and progress of a joint operation toward mission accomplishment. Assessments are accomplished throughout all phases of an operation. METOC forces actively coordinate with their supported unit and solicit feedback on the accuracy, consistency, relevance, and timeliness of their support. Feedback is used to improve processes and may drive changes

OPERATION EAGLE CLAW: A HARD LESSON TO LEARN

Top-secret planning for what would be one of the most complicated and ambitious raids in American history, the Iranian hostage rescue attempt of 1980, lasted well over five months but it fell short of fully considering an incorrigible foe: the weather.

Historical records pointed to winter as the optimal time for a mission of this type, as limited moonlight and suitable temperatures and densities represented favorable conditions for night RH-53D operations. Nevertheless, the mission was set up for late April, introducing additional weather challenges such as suspended dust, which proved to be a factor in the subsequent mishap. This mission-impacting information was never briefed to joint task force (JTF) planners and decision makers….

Recommendations to use a WC-130 weather reconnaissance aircraft as a scout in advance of the RH-53Ds were discounted, based on assumed favorable weather conditions and for security reasons. Additionally, it was determined that pilot reports from accompanying C-130s, flying the same route, could provide advance notice of unfavorable weather as needed. However, the C-130s ended up arriving at the destination, Desert One, well ahead of the helicopters and were unable to relay up-to-the-minute weather data to the RH-53D crews.

Weather operations personnel were excluded from planning and rehearsal exercises at the JTF training areas, eliminating their ability to work with the aircrews. Furthermore, mission execution weather briefings, developed by weather operations personnel, were presented by [J-2] joint intelligence officers who had little, if any, formal weather training or experience. Aircrew feedback was provided in the same indirect way. Pilots were thus unaware of the possibility of encountering suspended dust and unprepared to handle it. Integration of weather information, a vital contributor to mission success, never occurred.

Paul B. Ryan
The Iranian Rescue Mission: Why It Failed

to how support is integrated into joint operations. METOC MOPs and MOEs are continuously evaluated during execution. Monitoring available information and using MOPs and MOEs, the SMO and JMO assess the performance of METOC activities and measure their impact toward achieving operational objectives. MOP and MOE results may suggest modifications to the METOC CONOPS (e.g., relocate sensors to improve better collection effectiveness). Modifications to the METOC CONOPS form the basis of, and serve as a source for, lessons learned and after action reports.

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APPENDIX A
JOINT SUPPORT TO MULTINATIONAL OPERATIONS

1. Multinational Operations

Multinational operations require early planning to overcome the differences in language, techniques, data formats, and communications. Therefore, standardization programs should be sought to ensure efficient use of resources and the reduction of operational, logistical, communications, technical, and procedural obstacles. The multinational force commander (MNFC) should designate a lead multinational METOC officer to coordinate METOC support and interoperability. This officer monitors, synchronizes, and when appropriate, integrates all METOC operations to ensure "one operation, one forecast" and all METOC requirements for the multinational force are met. When a multinational force is operating in parallel with another multinational force (e.g., North Atlantic Treaty Organization [NATO]), care must be taken to ensure METOC support is consistent between the parallel command structures.

For a more detailed explanation of multinational operations, refer to JP 3-16, Multinational Operations, *and JP 5-0,* Joint Planning.

2. Multinational Considerations

a. **Planning for METOC Activities in Multinational Operations.** The lead multinational METOC officer should consider the specific factors below when planning METOC support to multinational operations. Detailed planning checklists for multinational operations can also be found in JP 3-16, *Multinational Operations.*

(1) Has the OPLAN annex H (Meteorological and Oceanographic Operations) been coordinated with appropriate national and interagency partners?

(2) Have appropriate METOC inputs been incorporated into other OPLAN annexes and coordinated with national and interagency partners?

(3) Have command relationships been established between the MNFC and national METOC forces?

(4) Have METOC billet requirements been identified?

(5) Have the personnel for the multinational METOC staff been chosen to reflect the required functional skills, training level, and language skill requirements?

(6) Are there sufficient interpreters available for both planning and execution?

(7) Do liaison elements have appropriate linguistic, communications, logistical, and office support capabilities in place?

(8) Have the multinational partners with a lesser C2 capability been provided appropriate liaison personnel and interpreters (if necessary) to enable interaction with other METOC elements?

(9) Have arrangements been made for intra-staff and inter-staff communication among same-nation staff members?

(10) Are METOC system capabilities and support robust enough to respond to increased levels of operational intensity?

(11) Has coordination been accomplished with multinational members regarding METOC equipment capability?

(12) Have multinational METOC forces been provided access to the appropriate level of METOC data sources through the authorized release agency?

(13) Have agreements on cryptographic, communications and/or automated data processing (ADP) security issues, and other planning factors been reached among all multinational components? Are compatible materials available (where appropriate)?

(14) Have arrangements been made or established to allow contract multinational foreign nation employees to work on METOC staffs without exposure to ADP and classified information used in daily operations?

(15) Have special, adequate, and supportable METOC data sharing and foreign disclosure procedures been established?

(16) Have efforts been made to assign METOC data gathering tasks IAW the MNFC's METOC requirements and according to the capability of the multinational equipment under multinational control?

b. **Operational Considerations**

(1) **Data Collection.** Multinational operations depend on the timely collection and sharing of high-quality METOC data. A comprehensive, collaborative collection plan should be developed to ensure unity of effort while optimizing data collection, dissemination, and integration into METOC databases, models, and forecast products. Employment of observation resources across an AOI to collect METOC data specific to climatic zones will significantly improve the quality of METOC services. The collection plan should support the commander's objectives.

(2) **Forecasting.** METOC forecasts are developed for the strategic, operational, and tactical levels. Lead METOC production units and other forecast elements develop specific METOC products to enhance multinational operations and to meet joint requirements. Reachback and production units may be designated to ensure METOC operations support a "one operation, one forecast" concept. The JOAF is the primary tool used to develop unified weather forecasts and is the primary mechanism to ensure METOC consistency across an operation. The JOAF is used in planning multinational operations

to ensure commanders at all levels are planning from the same anticipated METOC conditions. Special consideration and effort are required to maintain "one operation, one forecast" when the US is not the lead METOC production unit.

For a more detailed explanation of NATO METOC operations, refer to Allied Joint Publication-3.11, Allied Doctrine for Meteorological and Oceanographic Support to Joint Forces, *and NATO Military Committee Memorandum 0178-2005,* Integrated METOC Support Concept.

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APPENDIX B
METEOROLOGICAL AND OCEANOGRAPHIC SUPPORT TO HOMELAND DEFENSE AND DEFENSE SUPPORT OF CIVIL AUTHORITIES

1. Introduction

Operations conducted within the homeland involve a unique collaboration of federal, state, and local agencies, presenting a number of challenges, to include interoperability issues, availability of resources, and legal considerations. Thus, interagency cooperation is essential. These operations fall into two categories: homeland defense (HD) and defense support of civil authorities (DSCA). These categories are not interchangeable and are distinguished by which federal agency is designated lead for the operation.

2. Homeland Defense

DOD is designated as the lead federal agency for HD to defend against traditional external threats or attack and against external asymmetric threats. Dependent upon the location and type of threat to the homeland, Commander, US Northern Command, and/or Commander, US Pacific Command, would be designated as a supported CCDR for HD. During these operations, DOD METOC organizations may be tasked to provide primary METOC support, services, and information.

3. Defense Support of Civil Authorities

a. In DSCA operations, DOD is designated as a supporting agency to the lead federal agency in response to requests for assistance for domestic emergencies, law enforcement support, and other domestic activities. DSCA is initiated by a request for DOD assistance from civil authorities or qualifying entities or is authorized by the President or SecDef.

b. DOD METOC capabilities provided to other federal agencies for DSCA must be approved by SecDef. DOD METOC support employed in support of DSCA operations should be deconflicted and synchronized with national-level METOC capabilities.

For additional information on HD and DSCA, refer to JP 3-27, Homeland Defense, *and JP 3-28,* Defense Support of Civil Authorities.

4. Interagency Meteorological and Oceanographic Support

a. General interagency coordination within the METOC community is conducted by the National Response Center. The National Response Center leads operations and coordinates METOC support from all the various interagency METOC entities. However, the DOD METOC forces still remain under DOD control. For specific time-sensitive DOD support to other USG departments or agencies, the supported CCMD may take the lead for interagency coordination; within the METOC community, the CCMD SMO normally becomes the DOD focal point for any METOC coordination between non-DOD agencies and supporting military forces.

b. The CCMD SMO and designated subordinate JMOs facilitate METOC support to the joint force consistent with METOC information provided to the organizations and agencies supported by those forces. While support to DOD forces is normally provided by their traditional Air Force and Navy METOC providers, the SMO/JMO may direct the Service METOC providers to ensure their products are consistent with those produced by the National Weather Service (NWS) or official local or state meteorologists (to include state National Guard METOC), especially for locations where DOD and civil responders are working in the same areas. In peacetime operations, the NWS is the authoritative source for official forecast and related information for US civil locations. For DOD installations, DOD METOC units are the authoritative source for all forecasts and resource protection. The NWS has established homeland securities activities lead at the Department of Homeland Security (DHS) to serve as the primary liaison for the SMOs with the NWS. During DSCA operations, the NWS will normally name a particular weather service field office to serve as the lead METOC organization. The CCDR/JFC should designate a Service-aligned lead METOC production unit in the same manner as overseas contingency operations.

c. The SMO/JMO plans and manages the employment of METOC personnel and equipment supporting military forces and airfields through command OPORDs or fragmentary orders, and by submitting RFFs as required. Air National Guard (ANG) METOC personnel operating under Title 32, US Code, remain under the authority of their state governor. However, mobilization in federal active duty status and deployment of ANG METOC forces in support of the CCMD may be necessary to provide direct support to joint operations.

d. The SMO works with NWS to provide a single, authoritative forecast of METOC information in support of offices that produce depictions of hazardous clouds or plumes. In the case of a CBRN incident, the SMO also works with supporting CBRN personnel within the CCMD staff and the Defense Threat Reduction Agency (DTRA).

e. The Interagency Modeling and Atmospheric Assessment Center (IMAAC) is designated as the single federal source of airborne hazard predictions for DHS once a CBRN incident is declared a national special security event. The federal partners for the IMAAC include DHS, DOD, Department of Energy, Environmental Protection Agency, National Oceanic and Atmospheric Administration (NOAA), Nuclear Regulatory Commission, Department of Health and Human Services, and National Aeronautics and Space Administration. The IMAAC collects the appropriate agencies' modeling data and coordinates with the modeling centers of the federal agency partners listed above to ensure standardization of modeling source terms, material type and amount, location and time, expulsion parameters, and meteorology. The IMAAC then provides a single, coordinated "plume model output" sent to all necessary DHS decision makers to include the on-scene commander through national leadership. CCMD METOC personnel should coordinate with DTRA to receive the latest information on the meteorological data used in the creation of the subject plume. Some agencies will utilize METOC data not readily available to the CCMD personnel. In that case, DTRA will attempt to gain access to that data or provide a suitable substitute, deconflicting and ensuring consistency in METOC parameters is maintained to the greatest extent possible.

f. The SMO maintains relationships with other federal and international centers and agencies, such as the National Interagency Fire Center; NOAA/Space Weather Prediction Center; NOAA/National Hurricane Center; the Canadian Department of National Defence; Environment Canada; Navy, Air Force, and Marine Corps METOC organizations and activities; US Geological Survey; and other organizations, to ensure consistent forecasts in support of operations in the homeland in keeping with the "one operation, one forecast" concept.

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APPENDIX C
METEOROLOGICAL AND OCEANOGRAPHIC OPERATIONS INFORMATION AND ANNEXES IN OPERATION PLANS

SECTION A. INTRODUCTION

1. Overview

This appendix describes METOC information necessary for inclusion in OPLANs. It also summarizes standard locations where METOC information is used within the Adaptive Planning and Execution enterprise. The information in this appendix is provided to aid the SMO/JMO in determining where and what type of METOC information integrates with other staff functions as the JFC's plan develops. JMOs should work with the appropriate joint staff directorates to ensure METOC guidance and information provided in other functional annexes is complete and accurate. The JMO is responsible for METOC information commonly used in the intelligence estimate; the commander's estimate; and plan annexes A, B, C, D, H, K, N, P, R, and V. The SMO determines the appropriate content of these annexes as they apply to the AOR versus a JOA.

For more information, refer to Chairman of the Joint Chiefs of Staff Manual (CJCSM) 3122 series, and CJCSM 3130.03, Adaptive Planning and Execution (APEX) Planning Formats and Guidance.

SECTION B. METEOROLOGICAL AND OCEANOGRAPHIC INFORMATION IN OPERATION PLAN ESTIMATES

2. Intelligence Estimate

a. Accurate, consistent, relevant, and timely METOC information supports the formulation of an accurate intelligence assessment. Reconnaissance assesses the topography, terrain, and approaches and exits from borders; natural obstacles; the nature of the coastline; adjacent islands; location, extent, and capacity of landing beaches and their approaches and exits; the nature of the offshore approaches, including type of bottom and gradients; natural obstacles; and surf, tide, and ocean and/or water current conditions.

b. The intelligence estimate requires METOC parameters such as temperature, humidity, cloud cover, visibility, precipitation, illumination data, and other METOC conditions to assess effects on roads, airfields, rivers, and soil trafficability, including tactical impacts on both friendly force and enemy capabilities. From these METOC specifications, geospatial intelligence (GEOINT) analysts can assist in accurately determining the METOC effects on GEOINT sensing capabilities, enemy capabilities, and possible COAs for friendly and enemy forces.

3. Commander's Estimate

The commander's estimate includes the characteristics of currents, tides, and similar maritime considerations, and states extremes of temperature, wind velocities, cloud cover, visibility, precipitation, and other such factors that can affect all military operations.

Sunrise and sunset; moonrise and moonset; civil, nautical, and/or astronomical twilight data; and moon percent illumination are also normally provided.

SECTION C. METEOROLOGICAL AND OCEANOGRAPHIC INFORMATION IN OPERATION PLAN ANNEXES

4. Annex A, Organization

Annex A lists the METOC organizations, including reachback, that provide operational support. JMOs should refine annex A for the specific joint force mission.

5. Annex B, Intelligence

Annex B should reference annex H and any others (e.g., C, K, N) as required, including climatology and weather aspects as they pertain to the OE, and should include a thorough intelligence preparation of the OE from a METOC perspective. It should also summarize hydrographic data needed to support amphibious, logistics over-the-shore, and expeditionary operations, such as water depths, tides, wave height, and currents. See CJCSM 3130.03, *Adaptive Planning and Execution (APEX) Planning Formats and Guidance*, for specific information for inclusion in annex B.

6. Appendix 7, Geospatial Intelligence, to Annex B

The National Geospatial-Intelligence Agency (NGA) provides a broad range of data in support of DOD METOC requirements. For safety of navigation, NGA uses bathymetric, hydrographic, gravimetric, aeronautical, and topographic information to produce, maintain, and participate in the distribution of maps, charts (nautical and aeronautical), and related materials to support military operations and safety of ship, aircraft, and land navigation. This data includes global foundation data, as well as multiple analytic products and data used to identify, characterize, and target entities of interest to the CCDR. As an intelligence and combat support agency, NGA provides additional data that includes analysis derived from various imagery and imagery-related sensors. Expertise and analysis capabilities resident at the national level are available to the CCDRs and Services via a reachback process. The SMO/JMO should ensure any METOC requirements for geospatial information and services are included in this appendix. This should include any special METOC products formatted geospatially, METOC input to geospatial databases, and any special oceanographic/hydrographic survey requirements such as a rapid environmental assessment.

For more information, refer to JP 2-03, Geospatial Intelligence in Joint Operations.

7. Annex C, Operations

Annex C summarizes the general nature of METOC phenomena and conditions, with emphasis on those that could have an impact on the main and supporting efforts of the operation, as well as any planned deception actions. Annex C also summarizes METOC forces and activities documented in annex H. Information provided in annex C is used to complete the METOC input for annexes B and H.

8. Annex D, Logistics

Annex D documents special logistics support required by the METOC forces.

9. Annex H, Meteorological and Oceanographic Operations

Annex H describes METOC activities and services within a joint force. It is the SMO/JMO's primary vehicle to provide directive guidance on tasks and responsibilities, coordinating instructions, and the joint METOC CONOPS. Additionally, strategic-, operational-, and tactical-level METOC MOEs and MOPs are identified in this annex.

a. List documents that provide information required for use with this annex.

b. State the general concept of METOC operations and the forces apportioned to the supported CCDR to execute the OPLAN. State the assumptions that affect the METOC operations required by the plan, to include availability of facilities and support from non-US and US nonmilitary agencies.

c. Identify and define the METOC sensing strategy or data collection plan requirements as appropriate for the operation. Include realistic estimates of the availability of data from DOD METOC and non-DOD METOC sources and the feasibility of obtaining METOC data from nontraditional satellites and unmanned systems.

d. Identify any significant METOC conditions that may influence the execution of the plan. The purpose of this paragraph is to establish the requirement for any unusual METOC operations that will clarify the assignment of specific responsibilities. Include METOC factors that may influence operations and the probability of their occurrence.

e. State clear and concise METOC operational objectives in support of the plan.

f. Describe the METOC support system and how it will function in the implementation of the plan. Refer to other documents available to tasked units that establish doctrine and procedures, as appropriate. Note any deviations from standard practices and any additional procedures peculiar to the operation.

g. Identify the Service component(s) responsible for providing METOC support to the operation, including communications and production responsibilities for METOC information. Assign responsibilities to specific Service components. Ensure operations security (OPSEC) planning guidance is included so as to not reveal indicators of friendly intentions. Clearly delineate, for each applicable component or other subdivision of the force, individual METOC services, tasks, and responsibilities. Ensure severe weather notification procedures are outlined for each METOC agency providing support within the AOR.

h. **Coordinating Instructions.** Include the instructions common to two or more components or subdivisions.

i. **Administration and Logistics.** Provide broad guidance on how logistical and administrative support is to be furnished for the METOC forces (a reference to the OPLAN's annex D or other pertinent command directives may suffice).

j. **C2.** Indicate the channels for control of METOC operations, if different from the command relationships outlined in the basic plan or in annex J (Command Relationships). Provide instructions to cover periods when communication circuits are not operational. Provide instructions for transmitting METOC information to units where METOC or standard C2 circuits are not available. Provide instructions for denying METOC data and information to the enemy through implementation of control of meteorological information, oceanographic information, ice information, and space information. Provide a short description of strategic and tactical communications architectures that will be developed to support METOC data transmission and information flow. Current information condition level should be considered when preparing to conduct collaborative sessions.

10. Annex K, Communications Systems Support

Communications is an essential element of METOC operations. Because METOC data is perishable, effective METOC operations are dependent on timely and reliable communications support. Special attention must be given to include METOC in the communication architecture. The joint communications architecture should support the collection or interception, storage and retrieval, dissemination, quality control, and processing of large amounts of data. High-speed communications are required to rapidly transmit and receive real-time, global-scale METOC information between the supporting METOC organizations, components, and tactical units. However, both adversary action and environmental phenomenon, such as solar activities, can impair communication capabilities and should be planned for accordingly. The SMO/JMO should work with the J-6 to determine the overarching backbone communication architecture needed for weather operations. METOC communications concept, procedures, and requirements to support METOC information flow throughout the JOA, to include outage backup procedures, should be included in this annex. They should also coordinate with J-6 on the development of the technical details in annex K (e.g., network diagrams that identify all connections). In general, the METOC providers are subscribers to the DODIN and to the tactical communication resources listed in annex K. Annexes H and K will not list all of the communications resources used.

11. Annex N, Space Operations

Annex N provides a description of weather satellites and weather satellite terminals available to the AOR, along with a brief description of the capabilities these terminals provide. It mentions types (e.g., solar, ionospheric, and geomagnetic disturbances) and levels of possible degradation to communications, radar, and navigation systems which cause mission impacts. Commanders may require specific quantification of impacts at execution; this level of detail will be facilitated as METOC capabilities mature. Optimally, this requires the SMO, JMO, and component METOC forces to be proactive on behalf of their customers in assessing space impacts.

12. Annex P, Host-Nation Support

Annex P documents HN-provided METOC services and other HN support required.

13. Annex R, Reports

Annex R identifies required reports from METOC elements, communications functions supporting METOC operations, and staff functions about METOC impacts (including space) on operations. In addition, the SMO/JMO should be included as addressees on reports regarding METOC personnel or factors.

14. Annex V, Interagency Coordination

Annex V specifies procedures for coordinating METOC operations or requirements outside of DOD. This may include, but is not limited to, leveraging HN capabilities (see annex P), other governmental organizations, or NGOs.

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APPENDIX D
LOCATION IDENTIFIERS

1. Overview

METOC personnel are tasked with providing environmental information to joint air, land, maritime, space, and SOF decision makers to evaluate and select appropriate COAs or exploit weapons/platform employment. METOC personnel generate time-critical information and assessments at all levels of operations in classified or unclassified environments from permanent and temporary locations. To ensure dissemination and sharing of this information, each location originating decodable METOC messages requires a site-specific location identifier. Permanent DOD locations will typically have an International Civil Aviation Organization (ICAO)/World Meteorological Organization (WMO) location identifier. For nonpermanent DOD locations, METOC forces may employ a four-letter KQ ID to uniquely identify their site.

2. Management of Tactical Location Identifiers

a. The Air Force is the DOD lead for the KQ ID process. (Note: identifiers are also used for nonpermanent locations supporting NATO forces; however, they are managed by Germany's Bundeswehr Geoinformation Office).

b. KQ IDs are typically assigned to METOC forces:

(1) Deployed to support exercises or real-world contingencies.

(2) Supporting garrison training or exercises in the immediate operating area of METOC forces or civilian weather stations using permanent ICAO location identifiers.

(3) Supporting testing programs requiring temporary location identifiers.

(4) Denied or pending approval of a requested permanent ICAO/WMO location identifier.

(5) Operating in locations in which the HN prohibits the use of indigenous ICAO/WMO location identifiers for foreign military operations or in which it was not possible to acquire an approved ICAO/WMO location identifier for the site.

c. SMOs/JMOs and Service component METOC forces should refer to the classification guidance for the operation being supported to determine the appropriate level of classification for the KQ ID. Unclassified systems (e.g., nonsecure telephone or e-mail) shall not be used to correlate a KQ ID to a classified location/operation. Doing so constitutes a breach of security and may compromise military operations. Any breach of security involving KQ IDs shall be reported to the SMO/JMO or, if a JTF is not stood up, to the lead METOC element. KQ ID and related METOC information also typically qualifies as operations-sensitive or combat mission-sensitive information, per DOD Instruction 8520.03, *Identity Authentication for Information Systems.* Access to such information by non-DOD entities (e.g., NGOs, multinational partners) should be restricted

to the operation in which they participate, as specified by the JFC or initial requestor of the KQ ID.

d. The SMO/JMO should serve as the focal point to coordinate KQ IDs for the entire joint force. As the lead agency for KQ ID management, the Air Force should provide KQ ID management policies.

e. The SMO/JMO should:

(1) Request KQ IDs as far in advance as possible.

(2) Inventory and revalidate subordinate units' KQ ID requirements periodically.

(3) Notify lead agency when KQ IDs are no longer needed and recommend inactivation.

(4) Immediately respond to mitigate compromised KQ IDs. All affected organizations will follow the guidance in DOD Manual 5200.01, Volume 1, *DOD Information Security Program: Overview, Classification, and Declassification*.

(5) Deconflict KQ IDs in the OA, as required.

f. If no subordinate joint force is established, KQ ID requests should normally flow through the Air Force lead METOC production unit, the Navy lead METOC element for KQ ID requests (typically the Fleet Numerical Meteorology and Oceanography Center), or the Marine Corps lead element (typically the Marine expeditionary force SWO).

APPENDIX E
METEOROLOGICAL AND OCEANOGRAPHIC IMPACTS ON OPERATIONS

1. JFCs must be aware of METOC factors that affect operations in order to mitigate and exploit environmental conditions during operations. Mission planners and operators must be familiar with critical METOC thresholds to effectively employ weapon systems and capabilities. Commanders, operators, and planners must communicate their mission-specific thresholds to METOC personnel so assessments of potential operational impacts can be developed and accurate, consistent, relevant, and timely information provided to decision makers during mission planning and execution. METOC personnel must be knowledgeable about critical METOC thresholds for the weapon systems they support to ensure they provide relevant information required by decision makers.

2. METOC personnel may produce decision aid graphics, impacts-matrices (e.g., stoplight charts) and target-area depictions through the application of METOC thresholds. These products enable the decision maker to easily relate METOC forecast information with mission, system, and platform thresholds. METOC personnel must articulate their level of confidence in the enabling information provided to ensure the decision makers accurately assess and manage operational risk.

3. Weather impacts to systems and operations are typically provided in "stoplight" format with the following criteria:

a. Green (favorable): zero or minimal operational impact.

b. Amber (marginal): moderate operational impact.

c. Red (unfavorable): severe operational impact.

4. In addition to manual methods for analyzing METOC effects on operations, there are systems that can predict weapons/sensor performance based on METOC effects for planning and execution processes, allowing decision makers to extract mission-specific METOC information through machine-to-machine interfaces without consulting METOC personnel or without knowing if the specific METOC information was tailored by any METOC personnel. Because decision makers may lack a thorough understanding of the strengths and weaknesses of available METOC information, METOC personnel should remain integrated in all phases of planning and execution.

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APPENDIX F
METEOROLOGICAL AND OCEANOGRAPHIC INTEGRATION TO JOINT SPECIAL OPERATIONS PLANNING

1. Overview

Joint special operations differ from conventional operations in degree of physical and diplomatic risk, operational techniques, modes of employment, and dependence on detailed operational intelligence and indigenous assets. Consequently, intelligence and weather requirements can be greater in scope and depth than those of conventional forces. Like conventional operations, the combination of air, ground, maritime, and space capabilities used by SOF is significantly affected by adverse environmental conditions which are based on specific environmental sensitivity thresholds inherent to these capabilities.

2. Meteorological and Oceanographic Support to Joint Special Operations Planning

a. Commanders leverage environmental effects information to select favorable windows of opportunity to execute, support, and sustain specific SOF operations. Operational decisions may be based on exploiting specific environmental conditions to provide the best advantage to friendly forces in comparison to the impact of similar environmental conditions on adversary capabilities. Special operations decision makers rely on METOC personnel to provide accurate, consistent, relevant, and timely weather information to gain environmental SA, achieve information superiority, fully exploit the environmental advantage necessary to apply and maximize combat power at critical points in space and time and create the desired effects in the OE.

b. Within the JIPOE process, METOC personnel develop environmental staff estimates, which include an assessment of environmental effects on mission profiles and capabilities under consideration in joint planning. This includes environmental effects on enemy capabilities, weapon systems, and mission profiles for possible/potential enemy COAs. These estimates enable commanders and their staffs to visualize the full extent of the OE (enemy, weather, and terrain) and to support the commander's situational understanding of the environment and influence decision making. Due to the dynamic nature of special operations, environmental running estimates are continuously updated as operational and intelligence details and environmental conditions change.

c. Special operations decision makers also rely on METOC personnel to identify points, routes, and locations that may be specifically vulnerable to environmental impacts (environmental choke points), which influences the development of environmental CCIRs. Commanders rely on weather personnel to make recommendations for the execution of environmental reconnaissance. Commanders may then direct special operations weather team personnel to conduct environmental reconnaissance operations to collect against those CCIRs.

d. During the COA development phase, commanders expect METOC personnel to provide operationally relevant environmental estimates based on critical weather thresholds to assess feasibility of mission; anticipate effectiveness of platform, weapon

systems, and munitions; identify opportunities to exploit environmental conditions for operational advantage; and determine optimal or favorable weather windows of opportunity for conducting operations. During COA analysis and wargaming, METOC personnel identify advantages and disadvantages of each COA based on their environmental estimate, which includes an assessment of environmental impacts on the adversary's capabilities in comparison to those of friendly forces. During COA comparison and approval, the environmental estimate is then used in COA comparison to influence the recommended COA and selection rationale. SOF commanders evaluate merits of each COA for environmental and other operational criteria and select a COA.

APPENDIX G
NONTRADITIONAL SOURCES OF DATA

1. Overview

This appendix summarizes METOC data available from nontraditional sources. Non-METOC Service personnel and units can provide supplemental METOC data and, for areas in which there are no METOC personnel, may be the sole source of weather and environmental data. This additional data is critical to supplementing the METOC database from which the various METOC echelons derive analysis and forecast products.

2. Services

a. **Army Forces.** The Army has organic resources that provide supplemental reports of METOC conditions. These Army elements possess a limited measuring capability designed to address their own immediate tactical requirements. Since Army units are mobile, locations must be included as part of the METOC report; consequently, US classification guides may require these reports to be classified and transmitted over secure communications channels. The Army has the capability to collect both full observations and limited parameters or elements. The following represents the most significant sources of weather data within the Army tactical structure:

(1) **Air Traffic Control (ATC) Units.** ATC units may have weather-observation instruments to include measurement of surface pressure, temperature, and surface wind velocity and direction. In addition, aircrews, flight operations personnel, and control tower operators visually estimate horizontal visibility and obstructions to visibility. They also observe such phenomena as lightning, thunderstorms, and tornadoes. Control tower operators assigned to ATC units should be trained by Air Force METOC personnel to supplement weather SA via the cooperative weather watch process.

(2) **GEOINT Cells.** These cells can provide general information on visibility, cloud cover, trafficability, stream flow measurements, predictions of river stages, and flooding, and also offer reachback to intelligence community capabilities that could provide valuable sources of other METOC information.

(3) **Aviation Squadrons and/or Brigades.** Aircrews provide en route or post-mission pilot reports (PIREPs). Unmanned aircraft systems (UASs) and observation platforms/balloons may provide sensor data via digital downlink or as deduced by visual imagery.

(4) **Space Support Teams.** The Army obtains some space environmental information from Army space support teams, as well as outside sources, such as the Air Force.

(5) **Reconnaissance Units.** Army brigade combat teams have CBRN reconnaissance vehicles that can provide limited meteorological information such as

temperature, humidity, wind speed, and wind direction. The Army also has long-range reconnaissance and surveillance capabilities that can provide meteorological information.

(6) Generally, all company-sized units have a field sanitation team that can provide temperature, wet bulb, and globe temperature readings, as required, to monitor heat stress conditions.

(7) **Computerized Meteorological Support.** Artillery units provide computerized meteorological support utilizing upper-air weather information from the Air Force. Computerized meteorological support includes local input of limited/available surface weather observations within the local area of operations. This support provides input to artillery ballistic trajectory calculations.

b. **MARFOR**. The Marine Corps has additional non-METOC resources that can provide supplemental METOC condition reports. These Marine Corps elements possess a limited sensing capability designed to meet their specific operational requirements. Consequently, their METOC observation capabilities are supplemental to their primary mission. Since Marine Corps units are expeditionary, locations may be included as part of the METOC report; consequently, Marine Corps observations are normally classified and transmitted over secure communications channels unless otherwise directed. The following represents the most significant sources of METOC data within the Marine Corps' structure:

(1) **Artillery Meteorological.** Marine Corps artillery units use the Modeled Meteorological Information Manager (MMIM) as the primary artillery meteorological capability, supporting battalion and regimental artillery operations by providing real-time meteorological information to firing units and target acquisition systems. The MMIM software uses a mesoscale atmospheric model, a limited-area, nonhydrostatic, terrain-following, sigma-coordinate model designed to simulate or predict mesoscale atmospheric circulation. The MMIM removes the requirement to employ balloon borne radiosondes, eliminating the logistical requirements associated with the latter capability.

(2) **Marine Air Control Squadron (MACS).** The MACS supports the MAGTF commander by providing continuous all-weather radar/non-radar approach, departure, en route, tower ATC, and meteorological services to friendly aircraft. Within this mission, the meteorological section of the Marine ATC detachment provides meteorological surface sensing, meteorological upper air sensing, meteorological satellite receiving, meteorological product generations, and information dissemination systems. IAW the Navy Meteorology and Oceanography Command Instruction 1500.3, *Procedures for Qualification and Certification of Navy and Marine Corps Air Traffic Controllers as Tower Visibility Observers,* MACS personnel are trained and certified to visually estimate horizontal visibility and obstructions to visibility. Additionally, they can observe and identify such special phenomena as lightning, thunderstorms, and tornadoes. MACS personnel are trained by Marine Corps METOC personnel to provide weather observations for forward operating bases and forward arming and refueling points.

(3) **ATC Units.** ATC units may have weather-observation capability to include measurement of surface pressure, temperature, and surface wind velocity and direction. ATC control tower operators can visually estimate horizontal visibility and obstructions to visibility and should be trained by Marine Corps METOC personnel to supplement weather SA under the Tower Visibility Observation Program.

(4) **Reconnaissance Units.** Marine Corps reconnaissance units may provide limited scope METOC observations through intelligence channels. Additionally, reconnaissance units may be tasked through intelligence channels to provide specialized, mission critical observations (e.g., measure ice thickness at a river crossing point).

(5) **GEOINT Sections**

(a) These sections, when available, can provide imagery information on visibility, cloud cover, battlefield contaminants, and flooding. These sections also offer access to UAS full motion video and reachback to intelligence community capabilities that can provide valuable sources of other METOC information.

(b) These sections can provide geographic and geospatial information and intelligence and increased characterization of the environment, offering detailed studies of the terrain, inland and coastal hydrography, littoral penetration points, helicopter landing platforms, helicopter landing zones, drop zones, beaching and unloading conditions, and beach trafficability. These sections integrate terrain and METOC studies into the geodatabases and work to ensure a seamless geospatial foundation is available to support MAGTF planning.

(6) **Operating Forces.** Some Marine Corps operating forces can provide weather observations. Forces such as intelligence (limited weather observation), counterintelligence (limited weather observation), aviation squadrons (en route and post-mission PIREPs), UASs (visual imagery or sensor data via digital downlink), and tank battalions (atmospheric pressure and temperature readings) can provide limited weather observations when requested through appropriate channels from their OA. JMOs must be sensitive to OPSEC considerations when requesting and incorporating this data into their collection plan.

(7) **Navy Medical Units Assigned to Marine Corps Units.** Navy medical units attached to a Marine unit without a Marine Corps METOC section will normally possess and utilize a wet bulb globe temperature index measuring set and can provide temperature, wet bulb, and globe temperature readings.

c. **NAVFOR**

(1) **Surface Ships.** All surface combatants, aircraft carriers, and amphibious warfare ships provide surface weather observations. Oceanographic depth/temperature profiles are collected when assets are available for launching expendable bathythermographs (BTs) based on operational need and/or prescribed data collection plan.

(2) **Subsurface METOC Data.** Subsurface METOC focuses on oceanographic analysis, bathymetry, and hydrographic mapping. Oceanographic analysis focuses on the tactical aspects of subsurface METOC data, volume and seafloor features, and their variability over the spatial and temporal frame of interest. Bathymetry analysis focuses on natural and man-made features on or near the seafloor. The Navy acquires subsurface METOC data from shipboard surveys aboard Military Sealift Command surveying vessels, operational Navy and commercial ships, remotely sensed data from airborne and satellite sensors, buoys, and autonomous underwater vehicles and gliders. Hydrographic surveys, launched from survey ships by fleet survey teams, determine navigational hazards that could impede movement of naval assets.

(3) **Carrier Air Wing and/or Maritime Patrol Aircraft.** Aircrews provide METOC observations as specified by their mission or when required in areas of sparse data. BT observations are taken by sonobuoy-equipped aircraft. Generally, a minimum of one BT observation is taken during each antisubmarine warfare flight and/or in data sparse areas.

d. **AFFOR.** The most significant non-METOC Air Force sources of weather data are aircrews. This is often in the form of PIREPs, Aircraft Communication Addressing and Reporting System reporting, or the information is contained in the target weather and intelligence report. ATC teams have limited observation capabilities. When available, full motion video from a UAS can also be a significant source of data. AFFOR METOC personnel also maintain SA of environmental events such as volcanoes, earthquakes, and tsunamis using the various regional volcanic ash advisory centers and the US Geological Surveys World Data Center for Seismology, respectively. Webcams, news reports, and government sources indigenous to each region of the globe can be excellent sources of volcanic ash, earthquake, and other non-METOC environmental phenomena where reporting is denied or unavailable.

e. **SOF.** Army and Air Force special operations aviation units can provide PIREPs to support specific missions. Sensors on SOF's manned and unmanned systems can also provide data of meteorological value, including, but not limited to, that from unmanned aerial, maritime, underwater, and ground systems. Limited forward weather observations can be taken by SOF in denied areas and transmitted to the joint special operations task force or next echelon weather element on an as-required basis. Naval special warfare forces can provide beach profile data as well as surf zone observations. The JMO must be sensitive to OPSEC considerations when incorporating this data into the METOC collection plan. SMOs or JMOs should coordinate with the theater special operations command METOC branch to identify SOF METOC capabilities specific to the theater of concern.

f. **United States Coast Guard (USCG).** The USCG does not have dedicated METOC personnel; however, METOC capability is embedded in selected USCG units. USCG cutters can provide surface weather observations, which include sea surface temperature readings. USCG helicopters and maritime patrol aircraft can provide inflight METOC observations as required. Limited METOC observations are collected and passed to US Navy METOC and the NOAA NWS. USCG units receive METOC products from

US Navy and US Air Force METOC, NWS, and the Federal Aviation Administration. For METOC coordination with the USCG, the SMO works through the CCDR's staff USCG liaison officer to determine which organization (e.g., US Navy, NOAA NWS, Federal Aviation Administration, or other federal/commercial source) will provide METOC support for missions of interest and works with that office and the USCG to ensure forecasts remain consistent regardless of source.

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APPENDIX H
REFERENCES

The development of JP 3-59 is based upon the following primary references:

1. Department of Defense Publications

a. DOD Directive 3025.18, *Defense Support of Civil Authorities (DSCA).*

b. DOD Instruction 8520.03, *Identity Authentication for Information Systems.*

c. DOD Manual 5200.01, *DOD Information Security Program: Overview, Classification, and Declassification, Volume 1.*

2. Chairman of the Joint Chiefs of Staff Publications

a. CJCSI 3810.01E, *Meteorological and Oceanographic Operations.*

b. CJCSM 3130.03, *Adaptive Planning and Execution (APEX) Planning Formats and Guidance.*

c. CJCSM 3500.03E, *Joint Training Manual for the Armed Forces of the United States.*

d. Chairman of the Joint Chiefs of Staff Notice 3500.01A, *2015-2018 Chairman's Joint Training Guidance.*

e. JP 1, *Doctrine for the Armed Forces of the United States.*

f. JP 2-0, *Joint Intelligence*.

g. JP 2-01.3, *Joint Intelligence Preparation of the Operational Environment*.

h. JP 2-03, *Geospatial Intelligence in Joint Operations*.

i. JP 3-0, *Joint Operations*.

j. JP 3-05, *Special Operations*.

k. JP 3-11, *Operations in Chemical, Biological, Radiological, and Nuclear Environments.*

l. JP 3-16, *Multinational Operations*.

m. JP 3-27, *Homeland Defense*.

n. JP 3-28, *Defense Support of Civil Authorities*.

o. JP 3-29, *Foreign Humanitarian Assistance*.

p. JP 3-41, *Chemical, Biological, Radiological, and Nuclear Response*.

q. JP 5-0, *Joint Planning*.

r. JP 6-0, *Joint Communications System*.

3. Service and Combatant Command Publications

a. Air Force Doctrine Annex 3-59, *Weather Operations*.

b. Army Techniques Publication, 2-01.3, *Intelligence Preparation of the Battlefield/Battlespace*.

c. Army Regulation 115-10/Air Force Instruction 15-157, *Weather Support and Services for the US Army*.

d. Commander, Naval Meteorology and Oceanography Command Instruction 3140.1M, *US Navy Meteorological and Oceanographic Support Manual*.

e. Navy Meteorology and Oceanography Command Instruction 1500.3K, *Procedures for Qualification and Certification of Navy and Marine Corps Air Traffic Controllers as Tower Visibility Observers*.

f. Navy Warfare Publication 3-59M/Marine Corps Reference Publication 2-10.2, *Operational Level Integration of METOC Capabilities*.

g. Special Operations Command Manual 525-6, *Critical METOC Thresholds for SOF Operations*.

h. *Joint Meteorological & Oceanographic (METOC) Handbook.*

4. North Atlantic Treaty Organization Publications

a. Allied Joint Publication-3.11, *Allied Doctrine for Meteorological and Oceanographic Support to Joint Forces*.

b. NATO Military Committee Memorandum-0178-2005, *Integrated METOC Support Concept (IMETOC)*.

5. Other Publication

Geospatial Intelligence (GEOINT) Basic Doctrine Publication 1.

APPENDIX J
ADMINISTRATIVE INSTRUCTIONS

1. User Comments

Users in the field are highly encouraged to submit comments on this publication using the Joint Doctrine Feedback Form located at: https://jdeis.js.mil/jdeis/jel/jp_feedback_form.pdf and e-mail it to: js.pentagon.j7.mbx.jedd-support@mail.mil. These comments should address content (accuracy, usefulness, consistency, and organization), writing, and appearance.

2. Authorship

a. The lead agent for this publication is the US Air Force. The Joint Staff doctrine sponsor for this publication is the Director for Operations (J-3).

b. The following staff, in conjunction with the joint doctrine development community, made a valuable contribution to the revision of this joint publication: lead agent, Mr. Dick Austin, US Air Force; Joint Staff doctrine sponsor, Lt Col Patrick Williams, Joint Staff J-35, Future Operations Cell; Lt Col Robert Pekarek, Joint Staff J-7, Joint Doctrine Analysis Division; and LTC Gregory Browder, Joint Staff J-7, Joint Doctrine Division.

3. Supersession

This publication supersedes JP 3-59, *Meteorological and Oceanographic Operations,* 7 December 2012.

4. Change Recommendations

a. To provide recommendations for urgent and/or routine changes to this publication, please complete the Joint Doctrine Feedback Form located at: https://jdeis.js.mil/jdeis/jel/jp_feedback_form.pdf and e-mail it to: js.pentagon.j7.mbx.jedd-support@mail.mil.

b. When a Joint Staff directorate submits a proposal to the CJCS that would change source document information reflected in this publication, that directorate will include a proposed change to this publication as an enclosure to its proposal. The Services and other organizations are requested to notify the Joint Staff J-7 when changes to source documents reflected in this publication are initiated.

5. Lessons Learned

The Joint Lessons Learned Program (JLLP) primary objective is to enhance joint force readiness and effectiveness by contributing to improvements in doctrine, organization, training, materiel, leadership and education, personnel, facilities, and policy. The Joint Lessons Learned Information System (JLLIS) is the DOD system of record for lessons learned and facilitates the collection, tracking, management, sharing, collaborative resolution, and dissemination of lessons learned to improve the development and readiness

of the joint force. The JLLP integrates with joint doctrine through the joint doctrine development process by providing lessons and lessons learned derived from operations, events, and exercises. As these inputs are incorporated into joint doctrine, they become institutionalized for future use, a major goal of the JLLP. Lessons and lessons learned are routinely sought and incorporated into draft JPs throughout formal staffing of the development process. The JLLIS Website can be found at https://www.jllis.mil (NIPRNET) or http://www.jllis.smil.mil (SIPRNET).

6. Distribution of Publications

Local reproduction is authorized, and access to unclassified publications is unrestricted. However, access to and reproduction authorization for classified JPs must be IAW DOD Manual 5200.01, Volume 1, *DOD Information Security Program: Overview, Classification, and Declassification,* and DOD Manual 5200.01, Volume 3, *DOD Information Security Program: Protection of Classified Information.*

7. Distribution of Electronic Publications

a. Joint Staff J-7 will not print copies of JPs for distribution. Electronic versions are available on JDEIS Joint Electronic Library Plus (JEL+) at https://jdeis.js.mil/jdeis/index.jsp (NIPRNET) and http://jdeis.js.smil.mil/jdeis/index.jsp (SIPRNET), and on the JEL at http://www.dtic.mil/doctrine.

b. Only approved JPs are releasable outside the combatant commands, Services, and Joint Staff. Defense attachés may request classified JPs by sending written requests to Defense Intelligence Agency (DIA)/IE-3, 200 MacDill Blvd., Joint Base Anacostia-Bolling, Washington, DC 20340-5100.

c. JEL CD-ROM. Upon request of a joint doctrine development community member, the Joint Staff J-7 will produce and deliver one CD-ROM with current JPs. This JEL CD-ROM will be updated not less than semi-annually and when received can be locally reproduced for use within the combatant commands, Services, and combat support agencies.

GLOSSARY

PART I—ABBREVIATIONS, ACRONYMS, AND INITIALISMS

ADP	automated data processing
AFFOR	Air Force forces
ANG	Air National Guard
AOI	area of interest
AOR	area of responsibility
ATC	air traffic control
BT	bathythermograph
C2	command and control
CBRN	chemical, biological, radiological, and nuclear
CCDR	combatant commander
CCIR	commander's critical information requirement
CCMD	combatant command
CJCSI	Chairman of the Joint Chiefs of Staff instruction
CJCSM	Chairman of the Joint Chiefs of Staff manual
COA	course of action
COG	center of gravity
CONOPS	concept of operations
CONPLAN	concept plan
DHS	Department of Homeland Security
DOD	Department of Defense
DODIN	Department of Defense information network
DSCA	defense support of civil authorities
DTRA	Defense Threat Reduction Agency
FFIR	friendly force information requirement
GEOINT	geospatial intelligence
HD	homeland defense
HN	host nation
HQ	headquarters
IAW	in accordance with
ICAO	International Civil Aviation Organization
IMAAC	Interagency Modeling and Atmospheric Assessment Center
ISR	intelligence, surveillance, and reconnaissance
J-2	intelligence directorate of a joint staff
J-3	operations directorate of a joint staff
J-5	plans directorate of a joint staff

J-6	communications system directorate of a joint staff
JFC	joint force commander
JIPOE	joint intelligence preparation of the operational environment
JMO	joint meteorological and oceanographic officer
JOA	joint operations area
JOAF	joint operations area forecast
JP	joint publication
JPG	joint planning group
JPP	joint planning process
JTF	joint task force
KQ ID	tactical location identifier
LOE	line of effort
LOO	line of operation
MACS	Marine air control squadron
MAGTF	Marine air-ground task force
MARFOR	Marine Corps forces
METOC	meteorological and oceanographic
MMIM	Modeled Meteorological Information Manager
MNFC	multinational force commander
MOE	measure of effectiveness
MOP	measure of performance
NATO	North Atlantic Treaty Organization
NAVFOR	Navy forces
NGA	National Geospatial-Intelligence Agency
NGO	nongovernmental organization
NOAA	National Oceanic and Atmospheric Administration (DOC)
NWS	National Weather Service
OA	operational area
OE	operational environment
OPLAN	operation plan
OPORD	operation order
OPSEC	operations security
PIR	priority intelligence requirement
PIREP	pilot report
RFF	request for forces
RSI	rationalization, standardization, and interoperability
SA	situational awareness
SecDef	Secretary of Defense

SMO	senior meteorological and oceanographic officer
SOF	special operations forces
SWO	staff weather officer
UAS	unmanned aircraft system
USCG	United States Coast Guard
USG	United States Government
WMO	World Meteorological Organization

PART II—TERMS AND DEFINITIONS

atmospheric environment. The envelope of air surrounding the Earth, including its interfaces and interactions with the Earth's solid or liquid surface. (DOD Dictionary. Source: JP 3-59)

joint meteorological and oceanographic coordination cell. None. (Approved for removal from the DOD Dictionary.)

joint meteorological and oceanographic coordination organization. None. (Approved for removal from the DOD Dictionary.)

joint meteorological and oceanographic officer. Officer designated to provide direct meteorological and oceanographic support to a joint force commander. Also called **JMO.** (DOD Dictionary. Source: JP 3-59)

joint operations area forecast. The official baseline meteorological and oceanographic forecast for operational planning and mission execution within the joint operations area. Also called **JOAF.** (DOD Dictionary. Source: JP 3-59)

maritime environment. The environment corresponding to the oceans, seas, bays, estuaries, islands, coastal areas, including the littorals and their sub-surface features, and interfaces and interactions with the atmosphere. (Approved for inclusion in the DOD Dictionary.)

meteorological and oceanographic. A term used to convey all environmental factors, from the sub-bottom of the Earth's oceans through maritime, land areas, airspace, ionosphere, and outward into space. Also called **METOC.** (DOD Dictionary. Source: JP 3-59)

meteorological and oceanographic assessment. The assimilation of climatology, current and predictive meteorological and oceanographic conditions, and knowledge on limiting thresholds for friendly and adversary military capabilities; tactics, techniques, and procedures; mission profiles; and weapon systems into a tailored product for planning and decision-making processes. (Approved for inclusion in the DOD Dictionary.)

meteorological and oceanographic data. Measurements or observations of meteorological and oceanographic variables. (DOD Dictionary. Source: JP 3-59)

meteorological and oceanographic environment. None. (Approved for removal from the DOD Dictionary.)

meteorological and oceanographic information. Actionable information to include meteorological, climatological, oceanographic, and space environment observations, analyses, prognostic data or products, and meteorological and oceanographic effects. (Approved for incorporation into the DOD Dictionary.)

meteorological and oceanographic operations support community. None. (Approved for removal from the DOD Dictionary.)

meteorological watch. None. (Approved for removal from the DOD Dictionary.)

meteorology. The study dealing with the phenomena of the atmosphere including the physics, chemistry, and dynamics extending to the effects of the atmosphere on the Earth's surface and the oceans. (DOD Dictionary. Source: JP 3-59)

oceanography. The study of the sea, embracing and integrating all knowledge pertaining to the sea and its physical boundaries, the chemistry and physics of seawater, and marine biology. (DOD Dictionary. Source: 3-59)

precise time and time interval. A reference value of time and time interval (frequency). Also called **PTTI.** (DOD Dictionary. Source: JP 3-59)

senior meteorological and oceanographic officer. Meteorological and oceanographic officer responsible for assisting the combatant commander and staff in developing and executing operational meteorological and oceanographic service concepts in support of a designated joint force. Also called **SMO.** (DOD Dictionary. Source: JP 3-59)

space environment. The environment corresponding to the space domain, where electromagnetic radiation, charged particles, and electric and magnetic fields are the dominant physical influences, and that encompasses the Earth's ionosphere and magnetosphere, interplanetary space, and the solar atmosphere. (Approved for incorporation into the DOD Dictionary.)

space weather. The conditions and phenomena in space and specifically in the near-Earth environment that may affect space assets or space operations. (DOD Dictionary. Source: JP 3-59)

terrestrial environment. None. (Approved for removal from the DOD Dictionary.)

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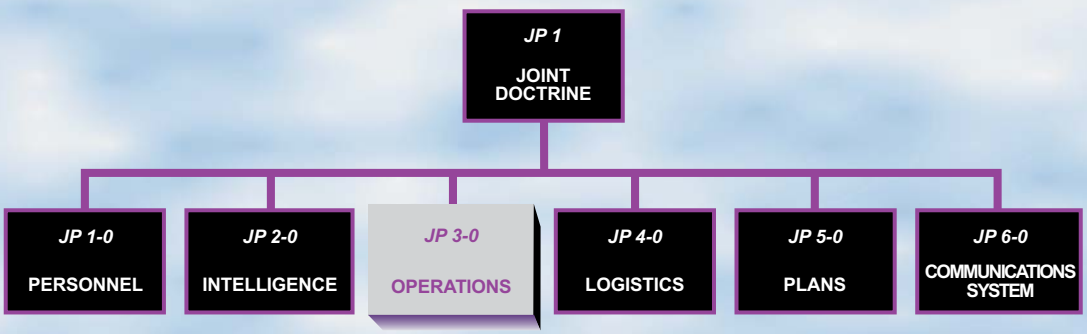
JOINT DOCTRINE PUBLICATIONS HIERARCHY



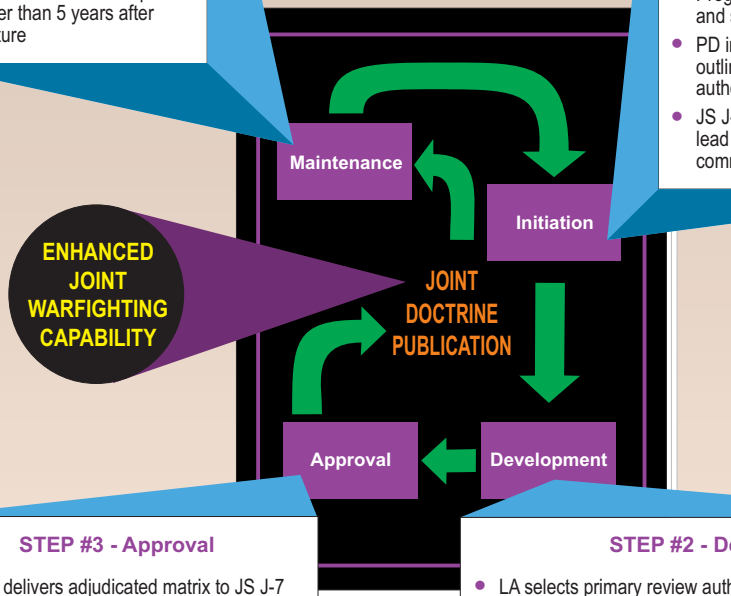
All joint publications are organized into a comprehensive hierarchy as shown in the chart above. **Joint Publication (JP) 3-59** is in the **Operations** series of joint doctrine publications. The diagram below illustrates an overview of the development process:

STEP #4 - Maintenance

- JP published and continuously assessed by users
- Formal assessment begins 24-27 months following publication
- Revision begins 3.5 years after publication
- Each JP revision is completed no later than 5 years after signature

STEP #1 - Initiation

- Joint doctrine development community (JDDC) submission to fill extant operational void
- Joint Staff (JS) J-7 conducts front-end analysis
- Joint Doctrine Planning Conference validation
- Program directive (PD) development and staffing/joint working group
- PD includes scope, references, outline, milestones, and draft authorship
- JS J-7 approves and releases PD to lead agent (LA) (Service, combatant command, JS directorate)



STEP #3 - Approval

- JSDS delivers adjudicated matrix to JS J-7
- JS J-7 prepares publication for signature
- JSDS prepares JS staffing package
- JSDS staffs the publication via JSAP for signature

STEP #2 - Development

- LA selects primary review authority (PRA) to develop the first draft (FD)
- PRA develops FD for staffing with JDDC
- FD comment matrix adjudication
- JS J-7 produces the final coordination (FC) draft, staffs to JDDC and JS via Joint Staff Action Processing (JSAP) system
- Joint Staff doctrine sponsor (JSDS) adjudicates FC comment matrix
- FC joint working group


JOINT
CHIEFS OF STAFF