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JOINT OPERATIONS IN THE ELECTROMAGNETIC BATTLESPACE

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CHAIRMAN OF THE JOINT CHIEFS OF STAFF MANUAL

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References: Enclosure F

1. Purpose

a. This manual provides planners, decision makers, and spectrum managers with spectrum management guidance for joint/coalition forces. This guidance is intended to aid and guide the joint force commander (JFC) when establishing a joint command, regardless of echelon in the planning, coordinating, and controlling use of the electromagnetic battlespace (EMB).

b. Use of the electromagnetic spectrum is pervasive in military operations and in all-functional areas and echelons of command, often in competing ways. Therefore, an effective spectrum management structure is necessary not only to satisfy the spectrum needs of military users, but also to coordinate with host nations (HNs) to facilitate effective employment of this finite resource.

c. The selection of a command organization to execute a contingency operation or crisis action depends primarily on the mission to be accomplished and the objectives to be attained. The use of a joint task force (JTF) is considered the most appropriate for short-notice, time-sensitive, contingency, crisis action, or special operations (relief, evacuation) expected to be of limited duration.

2. Cancellation. CJCSM 3320.01A, 27 September 2002, is cancelled.

3. Applicability. This manual is applicable to the Military Departments (to include the US Coast Guard), combatant commands, unified commands, subunified commands, Service component commands, Joint Task Forces, combined commands, Defense agencies and DOD elements of the Intelligence community; hereafter referred to as the DOD components.

4. Procedures. Controlling the EMB is key to successful military operations. This publication will guide the JTF establishing authority, the JFC and staff, and subordinate commanders and staff in planning, coordinating, and controlling the EMB.

5. Summary of Changes. Updates joint planning; JTF spectrum management lifecycle; and tactics, techniques, and procedures for planning, coordinating, and controlling use of the EMB in a JTF environment. Information and procedures contained herein will standardize EMB spectrum operations for JTFs. The objective of this document is to provide guidance on command and spectrum management relationships in a JTF.

6. Releasability. This manual is approved for public release; distribution is unlimited. DOD components (to include the combatant commands), other Federal agencies, and the public may obtain copies of this manual through the Internet from the CJCS Directives Home Page--http://www.dtic.mil/cjcs_directives. Copies are also available through the Government Printing Office on the Joint Electronic Library CD-ROM.

7. Effective Date. This manual is effective upon receipt.

For the Chairman of the Joint Chiefs of Staff:

SCOTT S. CUSTER
Major General, USAF
Vice Director, Joint Staff

Enclosures:
A--Command Relationships in a Joint Task Force
B--Spectrum Management Relationships in a Joint Task Force
C--Joint Planning and Spectrum Management
D--JTF Spectrum Management Lifecycle
E--Spectrum Management Considerations in a Multinational and Coalition Environment
F--References
GL--Glossary

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ENCLOSURE A

COMMAND RELATIONSHIPS IN A JOINT TASK FORCE

1. Introduction. Command is central to all military action, and unity of command is central to unity of effort. Unity of command is the interlocking web of responsibility, which is a foundation for trust, coordination, and the teamwork necessary for unified military action. Outlined in Figure A-1 and as described below are brief descriptions of duties and responsibilities, broken down by command echelon, to give the spectrum manager an overview of this unity of effort.

2. Combatant Command (Command Authority) (COCOM). COCOM is a nontransferable command authority established by title 10 ("Armed Forces"), United States Code, section 164, exercised only by commanders of unified or specified combatant commands unless otherwise directed by the President or the Secretary of Defense. COCOM cannot be delegated and is the authority of a combatant commander to perform those functions of command over assigned forces involving organizing and employing commands and forces, assigning tasks, designating objectives, and giving authoritative direction over all aspects of military operations, joint training, and logistics necessary to accomplish the missions assigned to the command. COCOM should be exercised through the commanders of subordinate organizations. Normally this authority is exercised through subordinate JFCs and Service and/or functional component commanders. COCOM provides full authority to organize and employ commands and forces as the combatant commander considers necessary to accomplish assigned missions. Operational control is inherent in COCOM.

3. Combatant Command. A combatant command is a unified or specified command with a broad continuing mission under a single commander, established and so designated by the President through the Secretary of Defense and with the advice and assistance of the Chairman of the Joint Chiefs of Staff (hereafter referred to as "the Chairman"). Combatant commands typically have geographic or functional responsibilities.

4. Unified Combatant Commander. Are responsible for the development and production of contingency plans. During peacetime, they act to deter war and prepare for war by planning for the transition to war and military operations other than war. During war, they plan and conduct campaigns and major operations to accomplish assigned missions. They will conduct this by maintaining preparedness of the command, and direct coordination with the subordinate commands to ensure unity of effort in all assigned missions, tasks, and responsibilities.

5. Military Departments. The Secretaries of Military Departments are responsible for the administration and support of the forces assigned or attached to combatant commands. Each of the Military Departments and Services coordinates with the other departments, Services, and combatant commands, and have the responsibility for organizing, training, equipping, and providing forces to fulfill certain specific roles and for administering and supporting these forces.

6. Joint Task Force. The Secretary of Defense, the combatant commander, subordinate unified commanders, or an existing JTF commander can establish a JTF. A JTF is established when the mission has a specific limited objective and does not require overall centralized control of logistics. The mission assigned a JTF should require execution of responsibilities involving two or more Services on a significant scale and close integration of effort, or should require coordination within a subordinate area or coordination of local defense of a subordinate area. A JTF is dissolved when the purpose for which it was created has been achieved. The Chain of Command structure is shown in Figure A-1.

a. Joint Force Commander. The JFC will provide the superior commander with recommendations on the proper employment of assigned forces and for accomplishing operational missions assigned by the establishing commander. JFCs are also responsible to the combatant commander for the conduct of joint training of assigned forces.

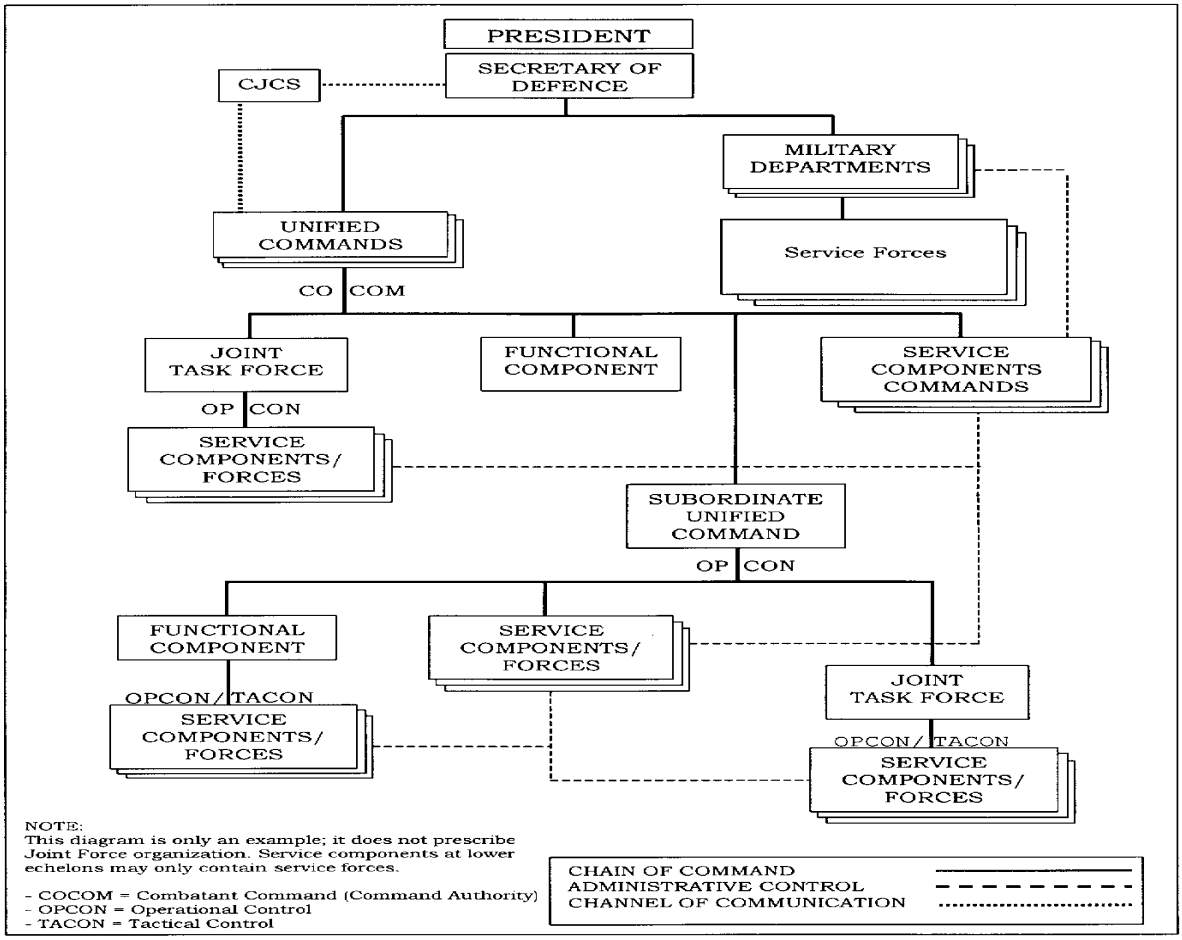

Figure A-1. Chain of Command

b. Joint Task Force Staff. JFCs may organize their joint staff as necessary to carry out their duties and responsibilities. When mission requirements exceed the staff's capabilities (for example, qualified personnel, facilities, and equipment), assistance must be requested through the superior commander. If JFCs are Service component commanders, they also draw from the resources of their components.

c. Establishing the Staff. The authority establishing the JTF should make provisions to furnish the necessary personnel, facilities, and equipment. Composition, location, and facilities of the JTF HQ have a major influence on what the JTF and staff can accomplish (for example, an afloat JTF HQ may have limitations aboard certain flagships that could affect manning levels and equipment capabilities).

(1) Manpower and Personnel Directorate (J-1). J-1 is charged with manpower management, formulation of personnel policies, and administration of personnel of the command.

(2) Intelligence Directorate (J-2). The primary mission of the J-2 is to ensure availability of reliable intelligence and timely warnings on the characteristics of the area of operations. The J-2 also ensures adequate intelligence collection and reporting to disclose enemy capabilities and intentions.

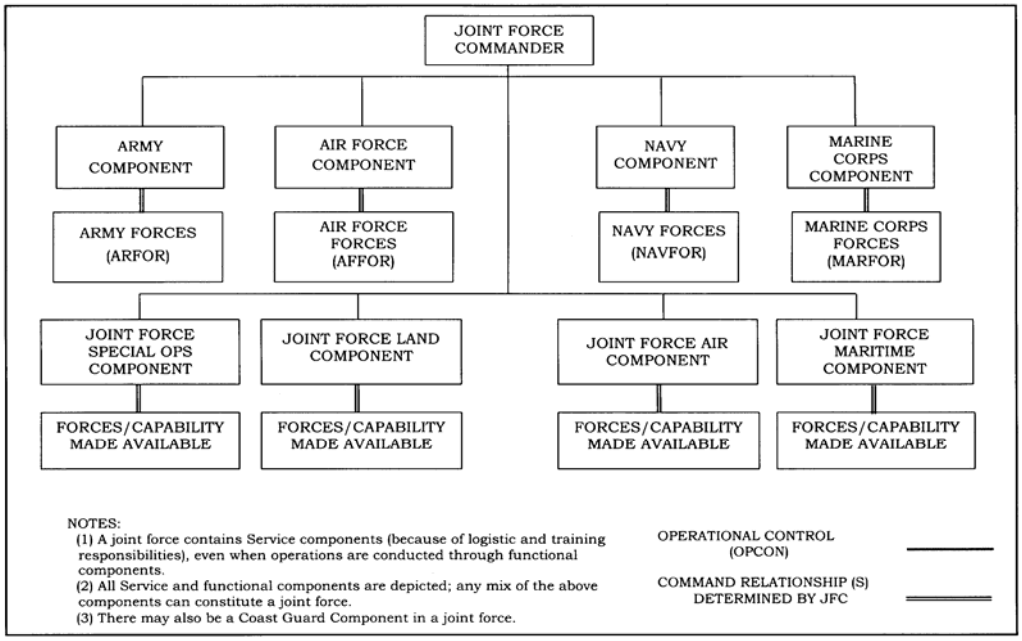

Figure A-2. Sample Joint Task Force

(3) Operations Directorate (J-3). The J-3 assists the commander in the discharge of assigned responsibility for the direction and control of operations. In this capacity this division plans, coordinates, and integrates operations to accomplish the assigned mission.

(4) Electronic Warfare Coordination Cell (EWCC). The EWCC assists the JFC in coordinating Computer Network Operations (CNO), Electronic Warfare (EW), Military Deception (MILDEC), Operations Security (OPSEC), and Psychological Operations (PSYOP). The EWCC consists of, but is not limited to, representatives from staff directorates and component commands. Members of various supporting agencies (e.g., the Joint Information Operations Center (JIOC), Joint Spectrum Center (JSC)) may augment the EWCC.

(5) Logistics Directorate (J-4). The J-4 is charged with the formulation of logistics plans and the coordination and supervision of supply, maintenance, repair, evacuation, transportation, engineering, salvage, procurement, health services, mortuary affairs, communications system support, security assistance, host-nation support, and related logistics activities.

(6) Plans and Policy Directorate (J-5). The J-5 assists the commander in long-range or future planning, preparation of campaign and outline plans, and associated estimates of the situation. It also establishes coordination channels with any host nation (HN), neutral nations, or United Nations (UN) force involved in the JTF operation.

(7) Command, Control, Communications, and Computer Systems Directorate (J-6). The J-6 assists the commander in communications, electronics, and automated information systems. This includes development and integration of C4 architectures and plans supporting the command's operational and strategic requirements. J-6 also provides policy and guidance for implementation and integration of interoperable C4 systems to implement C2.

(a) Joint Communications Control Center (JCCC). The J-6 establishes a JCCC to manage all communications systems deployed during joint operations and exercises. The JCCC, as an element of the J-6, exercises control over all deployed communications systems. The JCCC serves as single control agency for the management and operational direction of the joint communications network (reference b).

(b) JTF Spectrum Management Element (JSME). The JSME's primary function is to ensure assigned JTF military forces are authorized sufficient use of the spectrum to execute their designated missions. It will satisfy spectrum needs and ensure deconfliction, prior to assignment or allotment, of all spectrum-dependent systems including systems used by JTF and component forces, UN, NATO, coalitions, etc.

1. Although control of individually assigned frequencies is in reality exercised by each user, the supported JFC is the ultimate authority for assigning frequencies to users. The JFC normally delegates frequency assignment authority to the JSME. The JSME can further delegate frequency assignment authority to subordinate commands. The JSME also maintains a common source of spectrum-use information to ensure compatible frequency assignments and, in concert with the EW planners, publishes the Joint Restricted Frequency List (JRFL), after approval by the J-3.

2. The JSME may be assigned from the supported component's J-6 staff, from a Service component's staff, or from an external command. The JSME must be staffed with trained spectrum managers, preferably with experience in joint operations and knowledge of the spectrum requirements of the JTF component forces.

7. Functional Component Commands. The JFC may elect to establish functional component commands to control military operations (i.e., joint force land component commander, joint force air component commander (JFACC),

and the joint force maritime component commander). The JFC will designate the military capability to be made available for tasking by the functional component commander. These commands may be established for operational purposes across the range of military operations.

8. Service Component Commands. These commanders have responsibilities derived from their roles in fulfilling the Services' support function and, when designated by the JFC, may also be in the operational chain of command. They are also responsible for accomplishing operational missions, conducting joint operations, keeping the JFC informed of all decisions that may affect the overall joint mission, and are responsible for all internal administration, discipline, training, and Service intelligence matters.

ENCLOSURE B

SPECTRUM MANAGEMENT RELATIONSHIPS IN A JOINT TASK FORCE

1. Introduction. Control of the EMB is a key to successful military operations. The ultimate goal of spectrum use planning and management is to control the electromagnetic spectrum so that it serves the needs of US, UN, allied, and/or coalition forces. This goal supports the efforts of the EWCC to deny the enemy the use of the electromagnetic spectrum so that the enemy is unable to command, control, or otherwise employ its forces effectively.

2. Duties and Responsibilities. Outlined below are the duties and responsibilities, broken down by command echelon, as they apply to spectrum management of the EMB.

a. Unified Commander

(1) It is the responsibility of the unified combatant commander to establish and promulgate command-specific policy and guidance for electromagnetic spectrum-use, the JRFL process, the Joint Communications-Electronics Operation Instruction (JCEOI), software defined radio (SDR) waveform implementation and sharing, and other processes or directives that uniquely apply to their area.

(2) Other duties are to establish a standing frequency management structure that includes a Joint Frequency Management Office (JFMO) and procedures to support planned and ongoing operations. Specific actions will be taken to:

(a) Ensure operational, contingency, and communications plans address coordination among forces using spectrum to enable effective exchange of information, eliminate duplication of effort, and achieve mutual support.

(b) Ensure plans address any necessary augmentation of the JFMO and/or JSME to support the effort.

(c) Resolve user conflicts not resolved at a lower level.

(d) Maintain close contact with appropriate coalition military forces to ensure that mutual spectrum support is considered in combined planning, operations, training, and exercises.

(e) Function as controlling authority for the JCEOI.

(f) Function as controlling authority for software defined radio. Establish policies and procedures for the use and sharing of SDR waveforms.

b. JFMO. The responsibilities of the JFMO are to:

(1) Exercise or delegate frequency assignment authority.

(2) Maintain the common frequency database necessary for planning, coordinating, and controlling spectrum use. The frequency database should contain all communication and noncommunication spectrum emitters and receivers. Examples of such emitters are RADARS, unmanned vehicles, and sensors.

(3) Identify, analyze, and evaluate potential spectrum use conflicts and electromagnetic interference (EMI).

(4) Develop and distribute spectrum usage plans for particular frequency bands, as appropriate.

(5) Provide administrative and technical support for military spectrum use.

(6) Participate as a member of the EWCC.

(a) Combine J-2, J-3, and J-6 inputs to develop a proposed JRFL.

(b) Periodically update and distribute the JRFL. Assist and coordinate the resolution and deconfliction of spectrum conflicts.

(c) Make sure that information operations (IO) spectrum use is coordinated. Ensure IO plans are supportable within the spectrum management architecture.

(7) In accordance with combatant command/J-5 guidance, coordinate military spectrum use with the spectrum authority of the HN(s) involved and in coordination with the US Embassy Defense Attaché Office of Military Cooperation, Friendly Forces Coordination Cell, etc., when appropriate.

(8) Be the focal point for inclusion of spectrum use considerations in the communications annex of OPLANS and CONPLANS.

(9) Receive reports, analyze, and attempt to resolve incidents of unacceptable EMI in accordance with (IAW) Joint Spectrum Interference Resolution Program Guidance found in CJCSM 3320.02A. Act as the focal point for requesting interference resolution support. Provide guidance for resolving radio frequency interference. Report all EMI incidents that cannot be resolved within 4 hours.

(10) Perform the duties required to manage the JCEOI until the JTF J-6 is stood up.

NOTE: Within the bounds of proper classification, the finished JCEOI will be shared with interagency participants in a given operation with the approval of the local commander.

(11) Assist the combatant command/J-3 in resolving EMI and electromagnetic radiation hazard issues and in requesting assistance from the JSC.

(12) Provide guidance and procedures for post-conflict spectrum management transitions.

(13) Coordinate, manage, and maintain software-defined radios.

c. Joint Force Commander. Duties are to:

(1) For operations within combatant commander's AOR, follow electromagnetic spectrum use policy and guidance that are established.

(2) Work with the combatant commander's staff if modifications to the spectrum-use policy are necessary for specific situation(s).

(3) For operations outside of combatant commander's AOR, assume the responsibilities listed for the commander.

(4) Coordinate with supporting combatant commanders to determine what functions their staffs must undertake to control use of the electromagnetic spectrum and what outside support is available.

d. JFC Staff

(1) JTF J-1. Duties are to coordinate all personnel augmentation for the JSME and ensure these augmentees are added to the time-phased force and deployment data (TPFDD).

(2) JTF J-2. Duties are to:

(a) Participate (through the EWCC) in multifunctional user spectrum-use conflict resolution.

(b) Assess intelligence needs and provide the J-6 with prioritized spectrum-use requirements for intelligence operations.

(c) Participate in multifunctional user, spectrum-use conflict resolution.

(d) Provide JRFL input.

(e) Provide the JSME with available enemy spectrum-use data IAW releasability constraints through the Director, National Security Agency (NSA), who serves as the signals intelligence (SIGINT) authority.

(f) Include spectrum-use requirements in the Joint Operation Planning and Execution System (JOPES).

(g) Assist the J-6 and/or JSME in determining sources of any unacceptable EMI or other persistent and recurring interference.

(3) JTF J-3. Duties are to:

(a) Prioritize all spectrum use conflicts that occur to the JSME.

(b) Provide spectrum-use requirements to J-6 for inclusion in the JOPES.

(c) Resolve internal spectrum-use conflicts (J-3 systems) when the JSME or EWCC are unable.

(d) Provide concept of operation.

(e) Identify and resolve potential electromagnetic environmental effect (E3) hazards to ordnance, personnel, and fuel. Act as focal point for requesting ordnance assistance team support from the JSC.

(f) Provide and validate JRFL inputs, approve consolidated JRFL.

(g) Be the decision-making authority for the priority of systems when there is insufficient spectrum to support them all.

(4) EWCC. Duties are to:

(a) Provide the JFC with effective EW planning and execution capability throughout all areas of operations to deny the use of the electromagnetic spectrum to the adversary.

(b) Assist the JSME in developing, compiling, and distributing the JRFL.

(c) Assist the component EWCCs and JFC J-6 in assessing instances of hostile EW and assist the JSME in assessing situations requiring EW deconfliction.

(5) JTF J-4. Duties are to provide the JSME with any required spectrum use considerations at ports of embarkation and debarkation, or waypoints during the deployment or redeployment phases.

(6) JTF J-5. Duties are to:

(a) Incorporate spectrum use into long-range and future operations planning and the EW strategy, based upon input from the J-2, J-3, EWCC, and J-6 (JSME).

(b) Establish coordination channels with any HN, neutral nation, or UN force involved in a joint or coalition military operation to negotiate military spectrum use where procedures do not already exist.

(7) JTF J-6. Duties are to:

(a) Provide the JSME with the JTF nets to be included in the JCEOI.

(b) Assist the EW officer in integrating EW activity into operations to ensure minimum impact on friendly use of the EMB.

(c) Update the JRFL as required.

(d) Serve as the EWCC communications representative. Be the primary source for information on the impact of EW actions on friendly C2 nodes and the overall impact of joint EW actions on friendly force operations.

(e) Assist the JSME with coordination of the component command resolution of reported instances of interference or disruption.

(8) JCCC Staff. The duties of the JCCC are to:

(a) Manage all communications systems deployed during joint operations and exercises.

(b) Exercise control over all deployed communications systems.

(c) Serve as single control agency for management and operational direction of the joint communications network. (Figure B-1 has typical JCCC organization)

(9) JTF Spectrum Management Element. The duties of the JSME are to:

(a) Establish JTF specific guidance for managing, requesting, and coordinating electromagnetic spectrum-use, JRFL process, JCEOI, and other processes.

(b) Prepare and combine J-2, J-3, J-6, EWCC, and component inputs to develop a JTF JRFL for approval by the J-3.

(c) When required, periodically update and distribute the JRFL.

(d) Participate in the EWCC representing spectrum management issues.

(e) Exercise frequency allotment and assignment authority. Authority to issue frequency assignments or allotments may be delegated to provide components the maximum latitude and flexibility in support of combat operations.

(f) Maintain the common spectrum-use database necessary for planning and coordinating control of the EMB. This database contains spectrum use information on all friendly military and civilian, available enemy, and neutral forces.

(g) Analyze and evaluate potential spectrum use conflicts.

(h) Assist and coordinate the resolution of spectrum use conflicts as a member of the EWCC.

(i) Coordinate military spectrum use with the spectrum authority of the HN(s) or coalition forces involved IAW with J-5 guidance.

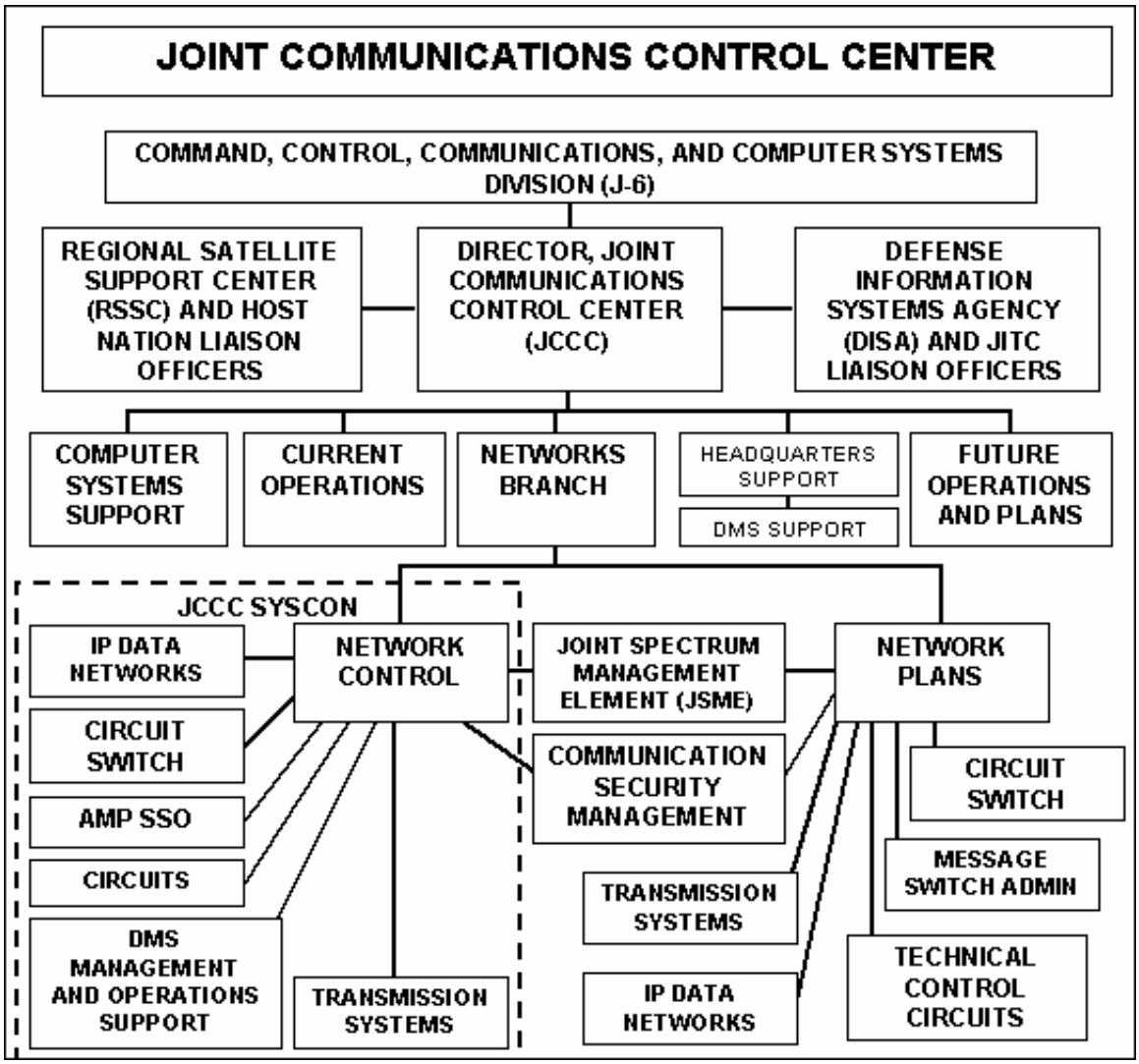

Figure B-1. Joint Communications Control Center (JCCC)

(j) Receive interference reports IAW CJCSI 3320.02 series, analyze, and attempt to resolve incidents of unacceptable EMI.

(k) Develop and distribute spectrum-use plans (see Appendix D, Annex C, Enclosure F) that include frequency reuse and sharing schemes for specific frequency bands, as appropriate.

e. Functional Component Commanders. The duties of the functional component commanders are to:

(1) Provide component JCEOI input to include all callwords requirements to the JSME.

(2) Consolidate and validate component spectrum-use requirements to the JSME.

(3) Provide component JRFL input to the JSME.

f. Service Component Commanders. The duties of the Service component commanders are to:

(1) Consolidate and validate component spectrum-use requirements to the JSME.

(2) Provide component JRFL input to the JSME.

g. Spectrum Users. Duties are to:

(1) Obtain frequency authorization for each use of the electromagnetic spectrum by their appropriate joint force component.

(2) Use frequencies as assigned and operate systems IAW parameters authorized by the frequency assignment process.

(3) Coordinate any need to exceed or operate spectrum-dependent equipment outside the parameters authorized by the appropriate spectrum-use plan.

(4) Ensure the spectrum-dependent equipment is properly maintained to preclude unintentional violation of authorized spectrum-use parameters.

ENCLOSURE C

JOINT PLANNING AND SPECTRUM MANAGEMENT

1. The 2005 Contingency Planning Guidance (CPG). The 2005 CPG continues the shift to compressed, iterative, and adaptive planning. Information sharing, collaboration, and parallel efforts among OSD, the Joint Staff, combatant commands, and other agencies are essential for planning that adapts quickly to changing strategic and military conditions. Recent operations demonstrated that planning processes are too lengthy and sequential. The goal of adaptive planning is to produce flexible options for the President, Secretary, and combatant commanders that anticipate and respond rapidly to changing condition.

a. Changing circumstances or unforeseen contingencies may require rapid development of new plans or modification of existing plans, the 2005 CPG refers to this effort as "Crisis Response Planning."

b. This planning is referred to as "Adaptive Planning" and replaces the previous terms of "Deliberate and Crisis Action" planning.

2. Summary. The JTF spectrum management lifecycle was designed to support the process of spectrum management operations supporting a JTF. The activities of the lifecycle do not change regardless of which type of planning is conducted and are adaptable to the time-sensitive issues. Abbreviating or skipping activities in the lifecycle will negatively affect the deliverable spectrum management products.

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ENCLOSURE D

JTF SPECTRUM MANAGEMENT LIFECYCLE

1. Overview. The JTF spectrum management lifecycle was developed for joint spectrum managers as a guide to follow in establishing a functional and efficient JTF spectrum management element. The lifecycle encompasses the complete process of providing spectrum management support to the JFC. The JTF spectrum management lifecycle consists of 12 activities:

a. Define Policy and Guidance.

b. Gather Requirements.

c. Develop Spectrum Requirements Summary.

d. Define the EMB.

e. Obtain Spectrum Resource.

f. Develop Spectrum Management Plan.

g. Nominate and Assign Frequencies.

h. Generate The JCEOI.

i. Develop the JRFL.

j. Perform EW Deconfliction.

k. Resolve Interference.

l. Report Interference.

m. Some activities are conducted simultaneously while others can only be completed in succession. Most of the activities generate deliverable products that are used in subsequent activities (i.e., the JCEOI and the JRFL). Most of the lifecycle activities, except for Performing Interference Analysis (IA) and maintaining the IA database are initiated in planning, and continue through the execution phase of JTF operations.

2. Define Policy (Revising Spectrum Management Policy to Meet the JTF Mission Requirements). Joint Doctrine states that one of the JSME duties is to establish JTF specific guidance for managing, requesting, coordinating, and assigning electromagnetic spectrum-use, JRFL process, JCEOI, and other processes. Therefore, the first activity in the JTF spectrum management lifecycle is to define policy. This defining of JTF spectrum management policy is the refining of the existing policy and guidance for spectrum use within the

combatant commander's area of responsibility (AOR) to meet the mission requirements of the JTF. Policy and guidance information should be available in the combatant commander's spectrum guidance (i.e., Spectrum Management Manual (SMM), combatant command regulation, instruction, or existing operational plans (OPLANS) and concept plans [CONPLANS).

a. The first step is to read and understand existing command spectrum management policy and guidance to provide spectrum management operations support that complies with the combatant commander's policy. Then, if needed, the spectrum manager must modify command policy and guidance to accommodate JTF mission requirements. Radically changing the combatant commander's policy should be avoided, if possible, to reduce the impact of change on JTF forces. New procedures take time to learn and implement, and they also produce more errors at a time when speed is essential and rework is least desired.

b. Decisions made in this activity greatly affect how efficiently the spectrum management process will function. The spectrum manager's ability to define processes and procedures and leverage automated joint spectrum management tools are the keys to successful policy development. Clearly defined direction and guidance reduce the potential for error.

c. The JFMO should be the resource center for the JSME throughout its lifetime since the JFMO has extensive institutional knowledge concerning the combatant commander's AOR spectrum issues. The JFMO should have prepared the basic spectrum management resources needed to establish a JSME in support of operations anywhere within the combatant commander's AOR. Such resources should include digitized terrain data, background electromagnetic environment (EME) records, country area studies, copies of agreements for spectrum use or sharing with involved or adjacent HNs, and historical spectrum-use records involving the JTF AOR. This task is independent of any other JTF spectrum management lifecycle activity.

d. There are two deliverable products generated with this activity: the JTF spectrum management concept and the spectrum requirements data call message.

e. The spectrum management concept is the vision of how spectrum management operations would best be performed to support the JTF mission. The spectrum management concept comprises assumptions, considerations, and restrictions that, when analyzed together, can illustrate the best approach to managing the JTF EMB for joint/coalition forces. To develop this concept, the JSME must assess the mission requirements, AOR, forces involved, potential radio services, and other operational concerns that affect spectrum use. The initial mission briefing should answer many of these questions; however, the JTF Mission concept of operations (CONOPS) is also a good place

to locate this information. The Command/JTF J-2 can provide further mission-related information on the current situation. The EWCC, if activated, or the command EWO can provide information concerning EW operations being contemplated. The best guideline is to consider everything, seek input from many sources, and trust facts instead of assumptions.

f. Assumptions may have to be made concerning resources and the availability of personnel, equipment, connectivity, and information. To continue planning and making decisions, the spectrum manager may be forced to make educated assumptions based on the most likely scenario. Based on the nature of the JTF mission, the spectrum manager will also make assumptions on the participation of allied or coalition forces, possibility of HN coordination, type of entry (forced or peaceful), and the availability of spectrum resources. Assumptions should not replace information that can be obtained. Do not make assumptions just to expedite the decision-making process at the expense of accuracy. Planning, by its very nature, requires the use of assumptions to accomplish the mission. It is important to document all assumptions made during the planning process so that, if the resulting plan is ever implemented the JFMO/JSME using the plan will know what assumptions were used to make decisions in the development of the OPLAN or CONPLAN.

g. Considerations are dependent upon the JTF mission, political environment, and JFC directed guidance. The size and depth of the JTF spectrum management concept depends upon the planning process in which the spectrum manager is involved and how much time will be allowed for the completion of the planning task (i.e., planning would allow more time to define policy and guidance). As is always true in planning, time will be a precious commodity, and the time spent planning will depend upon the people involved. It must be remembered that decisions made, not made, and those left to chance will affect the quality of the follow-on JSME products. The types of information that should be considered in the spectrum management concept are outlined below.

(1) Allied or Coalition Operations:

(a) Types and numbers of spectrum-dependent equipment.

(b) Information releasability.

(c) Integrated operations with other forces.

(d) Do they have a trained spectrum manager?

(e) Do they use some type of automated spectrum management software?

(f) How will I get frequency assignment information to them?

(g) How will they provide me with new frequency requests?

(h) What format will be used for data exchange with the JSME?

(2) Spectrum Use Considerations:

(a) Type of operations.

(b) Force complement.

(c) Type of entry.

(d) Area of responsibility.

(e) Types of radio services.

(f) Centralized or decentralized frequency assignment authority?

(g) Spectrum coordination/availability.

(h) Radio service sharing of band?

(3) Automation:

(a) Does everyone have SPECTRUM XXI?

(b) Will all components be able to data exchange?

(c) Is there reliable SIPRNET connectivity to the components?

(d) How to handle Area/Mobile assignments.

h. Restrictions constitute spectrum management issues that are not within the spectrum manager's power to change and must be worked around or accepted, unlike the considerations listed above where the spectrum manager may have some latitude in the decision-making process. Some coordination restrictions may cause the JSME extra work, such as in obtaining and maintaining the JTF spectrum resource or planned EW operations. JTF operations and operations being conducted by organizations outside the JTF may restrict the spectrum manager's use of specific frequencies or bands of frequencies. Restrictions come in many forms, command guidance, JTF policy, HN mandates, and political or legal restraints imposed by international law or treaties. Information restrictions may prohibit the spectrum manager from sharing data with certain allied or coalition forces. Many restrictions will be identified in the JTF mission briefing, like the rules of engagement (ROE) and other military-imposed restrictions. As JTF operations are initiated and as the military situation develops, new and different restrictions will affect all aspects of the JTF.

i. The JTF spectrum requirements data call message provides guidance to JTF staff elements, components, and supporting agencies on how to request spectrum support for spectrum dependent systems that operate under their control within the JTF's area of influence (AOI). This multipart message should cover the following subjects: JTF spectrum management policy and guidance, security classification guidance, and frequency and JCEOI master net list (MNL) request procedures, as well as provide guidance for identifying nets and frequencies to be included on the JRFL.

j. The message should include the following:

(1) Procedures for requesting frequencies to support spectrum-dependent equipment including lead times and request format.

(2) Spectrum management automation system and configuration.

(3) JCEOI MNL requirements collection process including the need for identifying nets requiring call signs, call words, and possible frequency sharing.

(4) JFRL submission procedures including lead times and restrictions.

3. Gather Requirements. Gathering requirements, the second Lifecycle activity, can begin as soon as spectrum management guidance has been received and coordination channels have been defined. Joint doctrine states that the JSME must also obtain the requirements of the spectrum users, primarily the JTF staff elements of J-2, J-3, and J-6. These requirements must address both communications and noncommunications (radar, weapons, etc.) systems and are stated in terms of spectrum requirements to support the JTF.

a. Ideally, the Service components would identify all requirements for spectrum dependent systems that they bring to the JTF. However there are always items missed and systems overlooked in coordinating spectrum use. The best approach to gathering requirements is by attending operational briefings, meetings, and planning sessions. You will hear about new units arriving, new systems being deployed, and changes to the operational plan. All of these indicate new or changed spectrum usage. You will usually find spectrum-dependent systems that have been overlooked and need to be included in the frequency assignment database.

b. Many spectrum-dependent systems are designed to receive and not transmit. Users normally will not request spectrum support primarily because their systems are designed to receive and do not radiate or transmit a signal. The way to identify many of these type of systems is to talk to the JTF staff sections, J-3, J-2, etc., and request that they identify any receive only systems that they know are active or plan on activating. You can create standard frequency action format (SFAF) records for these receivers and then afford them protection when nominating frequencies and performing interference analysis.

While receive only systems can be located anywhere in the JTF AOR, documenting known operating locations by creating an SFAF record within the SPECTRUM XXI database is the best way to protect the receiver. Making a single assignment record with an operating radius that encompasses the JTF AOR provides less interference protection than making multiple assignments using a smaller radius (less than 500 kilometer (km).

c. Most single and multi-channel satellite communications systems get authorization for use of the satellite from the satellites controlling authority and are issued a satellite access authorization (SAA) that contains a disclaimer that basically says "Local frequency clearance is the responsibility of the user." In many cases the JSME becomes aware that these systems exist only when interference is caused or received by the satellite terminal. We recommend that the spectrum requirements data call message include instruction to the components to include the JSME on all satellite access request and authorizations. The JSME should create SFAF records for these authorizations. Additionally the JSME may want to make separate specific frequency assignment records for known single channel satellite systems located at the major headquarters to aid in reducing and identifying interference.

d. Making the JSME visible to incoming units and organizations helps not only the unit but introduces the unit to the JSME and lets them know that there is an office that is actively involved in spectrum management. Many units and organizations would gladly coordinate spectrum-use if they knew where to go and from whom to request the support. This proactive attitude will pay great dividends in reduced interference problems later.

e. Gather Requirements also involves capturing and documenting potential JTF spectrum-use identified by the Service components and JTF staff, as well as undocumented requirements from sources external to the spectrum management coordination chain. Using the previously developed spectrum requirements data call message, the JSME requests that spectrum requirements and JCEOI MNL for all units and organizations supporting the JTF be submitted. The data call message requires units to submit their spectrum requests to the combatant command JFMO or JSME. Gathering Requirements is an on-going activity that continues until the JTF is dissolved. Gather Requirements is an activity that is conducted in adaptive planning.

f. The product generated by this activity is a SPECTRUM XXI database containing the known JTF spectrum requirements. This database will also include actual JTF spectrum-use already in the AOR.

4. Develop the Spectrum Requirements Summary (AKA a Spectrum-Use Plan)

a. The third activity is to develop the spectrum requirements summary. This summary can be used to quantify the amount of spectrum necessary to support the JTF, determine the necessity of using frequency sharing and reuse plans, help in the development of allotment or channeling plans. This process requires manipulating the data previously gathered and translating it to a format that will facilitate analysis. The spectrum manager analyzes the summary and draws conclusions concerning the amount of spectrum required to support the JTF. In addition, it determines the number of different radio services competing for spectrum in the same frequency band, determines the different emissions utilizing a particular band, and development of a plan for frequency sharing. This summary has been previously referred to as a spectrum-use plan, a term which is used to describe many products generated by the JSME. We do not use spectrum-use plan in this document except to help clarify the specific product or output being referenced. See spectrum-use plan definition in the Glossary.

b. The spectrum requirements summary generated with this activity is a compilation of the requirements identified in response to the spectrum requirements data call message. This product is for the sole use of the spectrum manager and provides a tool in which to base future decisions about efficient spectrum-use and initial requirements definition. This product may assist the spectrum manager in requesting spectrum from a HN or provide insight into how to better allocate portions of the spectrum to support emitters utilizing varying bandwidths.

5. Define the Electromagnetic Battlespace. The fourth activity is to define the EMB in which the JTF will be conducting operations.

a. Joint military operations require a common, single, authoritative source for spectrum-use information for all friendly, enemy (to the extent available), neutral, and civil emitters and receivers to achieve and manage successful joint spectrum-use. This common source of spectrum-use information is called the EMB, and must be current, accurate, and accessible to authorized users. The JSME is responsible for building and managing this common source of information. Because of the amount and complexity of spectrum-use information typically involved in joint military operations, modern computer and communications networking systems are needed to maintain, analyze, and distribute this common spectrum-use information. When working with allied, United Nations (UN), or coalition forces, the JSME should obtain similar information from each to maximize effective use and control of the spectrum throughout the AOR.

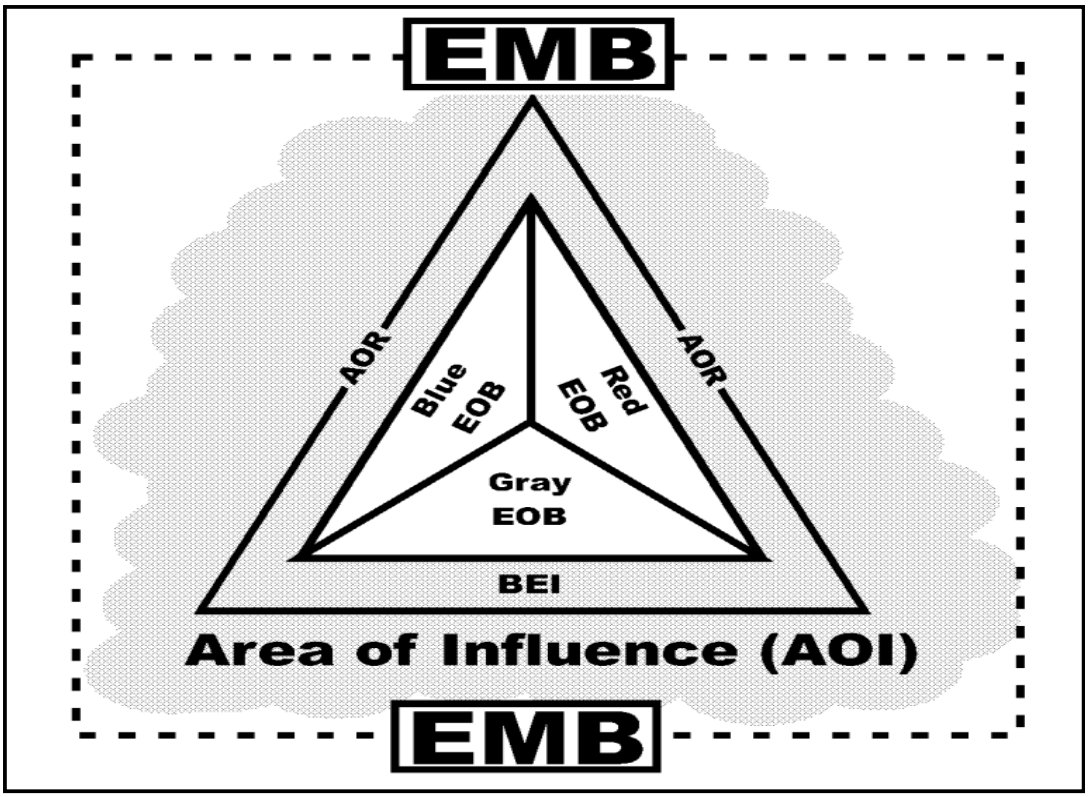

Figure D-1. Electromagnetic Battlespace

b. Joint Doctrine states that that one of the JSME duties is to maintain the common spectrum-use database necessary for planning and coordinating control of the EMB. This database contains spectrum-use information on all friendly military and civilian, available enemy, and neutral forces. Defining the EMB is not only creating a database of frequency assignments, but also identifies factors that effect signal propagation such as environmental characteristics and terrain. This activity starts with defining your AOI and its environmental characteristics, locating necessary terrain data and then locating the data for and creating a database of the known spectrum-use information. This process also includes updating and maintaining this spectrum-use information as well as adding all JTF frequency assignments. Defining the EMB is an ongoing activity until the JTF is dissolved. See Figure D-1:

c. The information produced by this activity will be a baseline database digitally depicting the EMB and will be the basis for all JTF spectrum-interaction analyses.

6. Obtain Spectrum Resources

a. The fifth activity is to obtain spectrum resources needed to support the JTF. Another one of the JSME duties is: IAW J-5 guidance, coordinate military spectrum-use with the spectrum authority of the HN(s) or coalition forces involved. Spectrum resources can be requested from the HNs for exercises or most military operations other than war (MOOTW). Operations that preclude prior coordination with a HN, such as forced entry (FE), require the JSME to determine the spectrum resource, evaluating the background EME will do this. If an evaluation of the background environment is required, it is essential to establish well-defined spectrum requirements and for the EMB to be as completely defined and
up-to-date as possible. This process is an ongoing activity and is expected to continue until the JTF is dissolved.

b. Products generated in previous activities can help in determining the amount of spectrum needed to support the JTF mission. The spectrum requirements summary can help quantify the amount of spectrum needed and identify the different radio services and emissions that will be operating within each frequency band. Spectrum resources are normally created and stored as one or more allotment plans.

7. Develop the Spectrum Management Plan (previously referred to as a spectrum-use plan)

a. The sixth activity is to develop the spectrum management plan. Joint doctrine states that one of the JSME duties is to establish JTF specific guidance for managing, requesting, coordinating, and assigning electromagnetic spectrum-use, JRFL process, JCEOI, and other processes. Additionally, be the focal point for inclusion of spectrum-use considerations in the Annex K development and provide administrative and technical support for military spectrum-use. This process uses the spectrum management concept, developed in the first activity, along with existing combatant command JFMO policy and guidance. Other sources of information are previous operations and exercises, the JSC, other spectrum managers, and all of a spectrum manager's spectrum management training and experience. The JTF spectrum manager will devise a plan to effectively and efficiently use the spectrum resources available. The JTF spectrum manager will be guided by experiences, advice from the JFMO, and other spectrum management sources. This plan depends upon the products of all the previous activities. The spectrum management plan is evaluated continuously for possible improvement.

b. The spectrum management plan, appendices to Annex K of the OPORDER, will provide guidance for all JTF spectrum management functions and specify how those interactions will be conducted, information exchanged, expected coordination, and format for deliverable products to users. This plan

will also document how to address interference problems, reporting procedures, and suggested resolution steps. This plan will become the spectrum management appendices of Annex K to the OPLANS.

8. Nominate and Assign Frequencies

a. The seventh activity, Nominate and Assign Frequencies, is the actual implementation of the spectrum management plan. Authority may be delegated to issue frequency assignments or allotments to provide components the maximum latitude and flexibility in support of combat operations. This activity involves the initial assigning of frequencies. The JTF spectrum manager may assign frequencies or delegate (decentralize) assignment authority using frequency pools (allotment plans) provided to functional and Service component spectrum managers allowing them to assign frequencies. Decentralized assignment authority requires that all temporary frequency assignments be data exchanged with the SPECTRUM XXI regional server so they can be included in other spectrum manager's nominations or interference analysis calculations. Updating the EMB is a continuance of the fourth activity. This activity depends upon the available spectrum resource previously established and the restrictions of the spectrum management plan.

b. The frequency assignment database, the most important resource the spectrum manager has available, is the basis for nominating interference-free assignments, providing impact analyses of EW operations, and identifying and resolving interference issues.

9. Generate a Joint Communications-Electronics Operating Instruction

a. The eighth activity is to generate a JCEOI. Joint doctrine states that combatant commanders will:

(1) Establish command-specific policy and guidance for development and use of the JCEOI consistent with this instruction that uniquely applies to their area and command structure.

(2) Function as the controlling authority for their JCEOIs.

(3) Establish a JCEOI management function to control the JCEOI process, structure, and procedures to support planned and ongoing operations.

(4) Establish procedures for deconfliction of call signs and call words within their AOR.

(5) Ensure liaison is made with appropriate foreign military and multilateral forces (e.g., UN forces, NATO) operating as part of combined operations to ensure that unique requirements are met as part of a combined JCEOI.

b. The JTF commander, acting as the combatant commander's representative assumes the duties of the combatant command concerning the JCEOI. The JCEOI is a two-part document. Part 1 is a directory of radio nets or units and their associated frequencies, call signs, call words, and net IDs listed by time period. Part 2 contains supplemental procedures for electronic, visual and verbal interactions, such as sign/countersigns, smoke/pyrotechnics and suffix/expanders. JCEOI development and distribution is a J-6 responsibility and normally delegated to the JSME because the JSME provides the frequency resource and usually has personnel trained in using JACS.

c. Inputs submitted by the components during the Gather Requirements activity should have included JCEOI MNLs. Having just nominated and assigned frequencies the spectrum manager can now use some of those assignments in generating the JCEOI. This product should be constructed and completed prior to the deployment of forces in support of JTF operations.

10. Develop Joint Restricted Frequency List

a. The ninth activity is to develop the JRFL, a time and geographically oriented listing of functions, nets, and frequencies requiring protection from friendly EW. Joint doctrine states that the JSME will: prepare and combine J-2, J-3, J-6 and component inputs to develop a JTF JRFL for approval by the J-3, and when required, periodically update and distribute the JRFL. The JRFL is a J-3 product; it protects JTF command and control (C2) communications nets, enemy communications nets being exploited, and safety-of-life frequencies being used by the JTF and local civil noncombatants. The development, distribution, and maintenance of the JRFL is tasked to the J-6 and normally accomplished by the JSME. This product is created for the EWCC and developed under the auspice of the COCOM or JTF electronic warfare officer (EWO) or EWCC.

b. The JRFL is a consolidated effort among the JTF staff organizations and the functional/Service components. In addition, selected frequency assignment records from the EMB will be included in the JRFL. The JRFL is developed prior to initiating JTF operations and continues during the operational phase of the JTF.

11. Perform Electronic Warfare Deconfliction. This activity supports the EW activities of the JTF and is performed as part of the EW planning process. Joint doctrine identifies that the JSME will:

a. Participate in the EWCC representing spectrum management issues. This includes providing EW deconfliction analysis. The EWO identifies planned jamming missions and request the JSME perform an analysis on the impact of these missions to JTF operations. This process requires information from the JRFL, JCEOI, and EMB. The analysis will determine what impact the jamming

mission will have on communication nets, JTF systems, enemy communications nets being exploited, and possible safety-of-life situations.

b. This product provides the IO Cell with an analysis of the potential impact of friendly EW operations on friendly forces (fratricide). The EWCC will then decide if the benefits of the jamming mission outweigh the dangers of the potential fratricide. This capability has historically been underutilized in most JTF operations. This product is time-sensitive and produced on an as-needed basis.

12. Resolve Interference. Resolving Interference is a daily activity once forces have deployed and is not a part of the planning process. Joint doctrine in CJCSM 3320.01 states that the JSME will: analyze, and attempt to resolve incidents of unacceptable EMI. This activity encompasses the reporting and attempting to resolve RFI. Interference is a common problem that has many sources and attempts should be made locally to resolve the interference. Interference incidents indicate the possibility of unauthorized users, faulty nomination criteria, lack of timely data exchanges, or equipment problems, etc. Multiple interference problems may indicate adversary EW operations, unintentional impact of Blue/Grey EW operations, or errors in the JTF spectrum management plan. This activity uses the EMB to determine if the problem is something that was either overlooked or a miscalculation by the automated spectrum management system.

13. Report Interference

a. Interference will always be a reality in JTF operations, there are too many emitters operating in too many places to preclude all interference. Interference reporting and tracking provides the JSME with a valuable historical reference for resolving future RFI problems. After performing an interference analysis, always create an interference report to document the results. These reports should be kept in a database to be used as a history of interference problems. These reports will aid in identifying possible causes for subsequent interference. This final activity should include the maintenance of a database, as an ongoing activity, until the JTF is dissolved.

b. Interference will be experienced in any military operation. There is always someone who does not get the proper information, transposes numbers, or disregards established procedures and operates a spectrum-dependent system without authorization. If the offender is an authorized user, the spectrum manager is the best person to locate and identify the interference source. The purpose of the interference report database is to provide the JTF spectrum manager with a repository for past interference incidents and what steps were taken to resolve them. This database provides a wealth of information on unit discipline, training deficiencies, and a starting place for the spectrum manager to begin resolving interference issues. This database

should be shared with all JTF spectrum managers. To the extent unexplained interference persists or recurs coincident with either Red or Blue/Grey operations, the EWCC should be advised.

14. Processes. JTF spectrum management lifecycle, as described earlier, this process encompasses a series of activities, each with a specific purpose and output(s). Most activities depend upon inputs from outside sources as well as products from previous activity, which must be monitored to make sure they are completed and include all of the required inputs. This process will be reviewed multiple times throughout the course of the JTF to evaluate the effectiveness of the spectrum management plan and its execution.

15. Process Dependencies

a. The JTF spectrum management lifecycle activities have inter-dependencies. Each activity is usually dependent upon the resulting product or products of a previous activity as well as on other sources of information. Failure of any one activity will affect the quality of all of the following activities. This does not mean that failure to perform an activity will necessarily cause the JTF operation or even the spectrum management plan to fail; it means that future activities will have to be performed with less information thereby reducing the quality of all future products. Further, all of the potential JTF support activities may not be required. As an example, a JTF established to perform a noncombatant evacuation operation (NEO) might not require a JRFL so that activity would not be needed.

b. If an activity is critical to the spectrum management operation then the spectrum manager must make time to perform the activity. In the case of missing information or data, the spectrum manager will have to redo an activity already performed when the information is made available. If a spectrum manager performs activities out of order, then there may be deficiencies in the output products of one or more of the activities. The caution here is that if the spectrum manager starts assigning frequencies before developing a sound spectrum management plan, and then he will have to possibly live with those assignments for a long time. Once a frequency assignment is in the field it is difficult to recall.

16. Executing the JTF Spectrum Management Plan. As illustrated in Figure D-2, this process begins once JTF forces have been deployed. The effectiveness of the spectrum management plan becomes apparent at this stage of the JTF. If adjustments need to be made to the plan they are made as needed. The JSME will settle into a routine of attending operational briefings, status meetings, processing new requirements, resolving interference, modifying the JCEOI, obtaining additional spectrum resources, updating the JRFL, generating EW deconfliction analysis, and coordinating assistance with agencies outside the JTF.

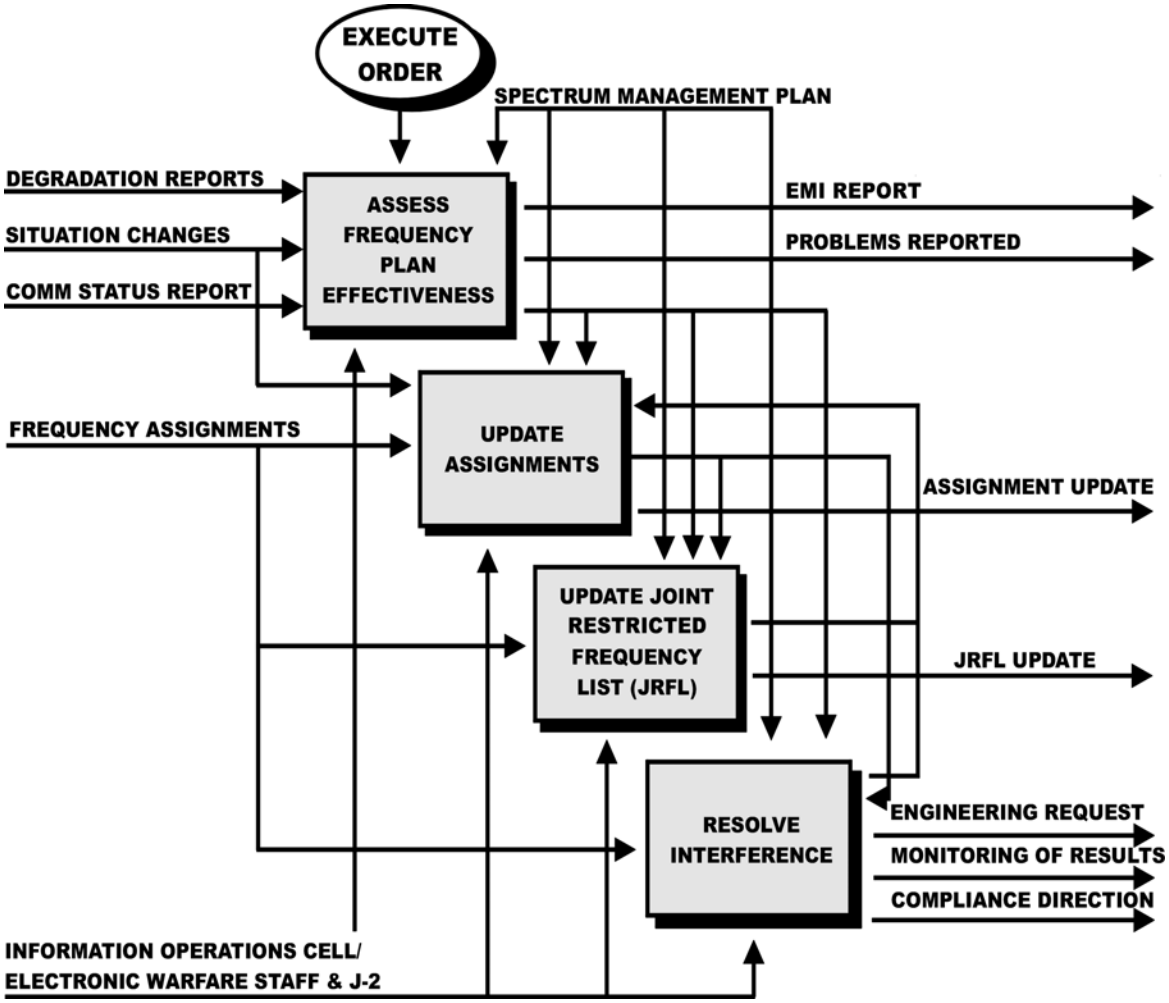

Figure D-2. Executing the Spectrum Management Plan

a. New and experimental spectrum dependant systems will be introduced as the JTF mission progresses, these new requirements will need to be identified, evaluated, and coordinated as they arrive in the AOR. Situational awareness of new systems, additional forces, incidents of interference and the movement or relocation of existing forces must be maintained by attending operational meetings, briefings, and planning sessions. JSME participation in all EWCC and daily operations briefings benefits the JTF immensely. J-6 staff representation at the same meetings is required and has been thought to negate the needs for the JSME spectrum manager to attend the same events. The JSME representative, due to the involvement in operations not performed or conducted by the J-6 can often recognize issues and concerns dealing with spectrum management that are not evident to others in the JCCC or the J-6.

b. Managing information is very important in the operation within the JSME. Tracking messages, updates, and meetings require that a log be created and maintained. This action item log documents actions to be completed, those actions already completed, and those actions no longer required due to changing events.

17. Transition. The last function of the JSME will be to transition the spectrum management function to the HN or other responsible governmental authority. This task is not considered an activity within the JTF spectrum management lifecycle, but does require planning and time to accomplish. This process can be as simple as providing a list of frequency assignments to the incoming spectrum management authority or involve much coordination and bureaucratic maneuvering. The JSME's primary concern is to make sure that only information that is authorized for released outside of the DOD is provided. This determination is not made by the JSME and must be coordinated through the JTF J-2. The incoming spectrum management authority may require assistance in understanding the methodology used in making, documenting, and managing spectrum use. Any assistance; training, reference documents, frequency assignment information, etc., provided to personnel outside of the US Government requires a foreign disclosure evaluation and authorization. This evaluation and determination is usually a lengthy process and should be initiated as soon as the situation allows.

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APPENDIX A TO ENCLOSURE D

DEFINING POLICY AND GUIDANCE

1. Overview

a. Defining policy is the responsibility of the unified combatant commander. Joint doctrine allows a JTF commander to modify or adhere to existing command policy and guidance, as needed, to accomplish the JTF mission. Modifications to command policy and guidance are accomplished with the concurrence of the combatant commander. Documented guidance provides the JTF spectrum manager with a baseline to begin making further decisions and complimenting the JTF commander's vision.

b. The defining policy activity, as defined in this appendix, is determining what decisions and modifications to existing spectrum management policy and procedures should be made prior to initiating the development of the spectrum requirements data call message and sending it to JTF components and participants.

c. The first step is to read and understand existing command spectrum management policy and guidance to provide spectrum management operations support that complies with the combatant commander's policy. Then, if needed, the spectrum manager must modify command policy and guidance to accommodate JTF mission requirements. Radically changing the combatant commander's policy should be avoided, if possible, to reduce the impact of change on JTF forces. New procedures take time to learn and implement, and they also produce more errors at a time when speed is essential and rework is least desired.

d. Decisions made in this activity greatly affect how efficiently the spectrum management process will function. The spectrum manager's ability to define processes and procedures and leverage automated joint spectrum management tools are the keys to successful policy development. Clearly defined direction and guidance reduce the potential for error.

e. The JFMO should be the resource center for the JSME throughout its lifetime since the JFMO has extensive institutional knowledge concerning the combatant commander's area of responsibility (AOR) spectrum issues. The JFMO should have prepared the basic spectrum management resources needed to establish a JSME in support of operations anywhere within the combatant commander's AOR. Such resources should include digitized terrain data, background electromagnetic environment (EME) records, country area studies, copies of agreements for spectrum use or sharing with involved or adjacent HNs, and historical spectrum-use records involving the JTF AOR.

e. The JFMO and JSME must work closely together during the crisis action planning (CAP) cycle. The JFMO and JSME should operate concurrently while the JTF and JSME forward deploy and until the JSME is fully operational at the deployed location. Once the JSME is deployed and operational, the JFMO takes on an advisory role while performing oversight of spectrum issues for the command.

2. JTF Spectrum Management Concept. The spectrum management concept is the vision of how spectrum management operations would best be performed to support the JTF mission. The spectrum management concept comprises assumptions, considerations, and restrictions that, when analyzed together, can illustrate the best approach to managing the JTF EMB. To develop this concept, the JSME must assess the mission requirements, AOR, forces involved, potential radio services, and other operational concerns that affect spectrum use. The initial mission briefing should answer many of these questions; however, the JTF mission CONOPS is also a good place to locate this information. The command/JTF J-2 can provide further mission-related information on the current situation. The EWCC, if activated, or the command EWO can provide information concerning EW operations being contemplated. The best guideline is to consider everything, seek input from many sources, and trust facts instead of assumptions.

a. Assumptions. Assumptions must be made concerning resources and the availability of personnel, equipment, connectivity, and information. Assumptions are the theoretical pieces of information the spectrum manager substitutes in the absence of concrete information. To continue planning and making decisions, the spectrum manager may be forced to make educated assumptions based on the most likely scenario. An example of an assumption made in this course is that the JFMO will delegate frequency assignment authority to the JTF as indicated in joint doctrine. This assumption may be unfortunate if the spectrum manager operates in a multiple JTF environment and if the JFMO chooses to not delegate assignment authority. Can the spectrum manager assume that there will be spectrum managers at the JTF components? This assumption will impact his decision to delegate frequency assignment authority below the JSME. Based on the nature of the JTF mission, the spectrum manager will also make assumptions on the participation of allied or coalition forces, possibility of host nation (HN) coordination, type of entry (forced or peaceful), and the availability of spectrum resources. Assumptions should not replace information that can be obtained. Do not make assumptions just to expedite the decision-making process at the expense of accuracy.

b. Considerations. All of the information the spectrum manager needs to consider cannot be detailed in this chapter, as it changes for each JTF operation. Based upon experience and assumptions, the spectrum manager must decide what issues must be considered, and at what level of detail to

consider them, when developing a plan to manage the spectrum. The considerations given to the development of the spectrum management concept are left up to the JFMO and/or JSME. The size and depth of the JTF spectrum management concept depends upon the planning process in which the spectrum manager is involved and how much time will be allowed for the completion of the planning task (i.e., deliberate planning would allow more time to define policy and guidance). As is always true in the CAP process, time will be a precious commodity, and the time spent planning will depend upon the people involved. It must be remembered that decisions made, those not made, and those left to chance will affect the quality of the follow-on JSME products. The types of information that should be considered in the spectrum management concept are outlined below.

(1) Allied or Coalition Operations

(a) Types and numbers of spectrum-dependent equipment.

(b) Information releasability.

(c) Integrated operations with other forces.

(d) Do they have a trained spectrum manager?

(e) Do they use some type of automated spectrum management software?

(f) How will I get frequency assignment information to them?

(g) How will they provide me with new frequency requests?

(h) What format will be used for data exchange with the JSME?

(2) Spectrum Use Considerations

(a) Type of operations.

(b) Force complement.

(c) Type of entry.

(d) Area of responsibility.

(e) Types of radio services?

(f) Centralized or decentralized frequency assignment authority.

(g) Spectrum coordination/availability.

(h) Radio service sharing of band?

(3) Automation:

(a) Does everyone have SPECTRUM XXI?

(b) Will all components be able to data exchange?

(c) Is there reliable SIPRNET connectivity to the components?

(d) How to handle Area/Mobile assignments?

c. The following paragraphs are examples of spectrum management automation (SPECTRUM XXI) considerations, combined with some spectrum-use points that should be considered.

(1) Area Assignments. Spectrum managers must consider how they plan to use area assignments before making frequency assignments. Area assignments are frequencies assigned for use in a designated area that is not defined using a fixed geographical coordinate. The area could be within the boundaries of a state, country, or maybe a training area. Area assignments cannot be analyzed because of the lack of a geographic reference data. Area assignments and proposals are not included in any nomination or interference analysis calculations.

(a) To make an area assignment, the spectrum manager must coordinate the use of these frequencies, through a manual coordination process, everywhere within the area designated in the assignment as well as beyond the area for the distance over which use of frequency might cause interference beyond the authorized boundary. Normally, an area assignment is made on a noninterference basis (NIB), meaning the assignment shall not cause harmful interference to, or require protection from, existing assignments.

(b) SPECTRUM XXI does not include area assignments in nomination or interference calculations. The nomination results process flags proposed frequencies that have a corresponding area assignment somewhere in the frequency assignment database and enables the user to view that record before accepting or rejecting the nominated frequency. This process of reviewing each nominated frequency with an area assignment somewhere in the database and manually evaluating its impact is fine when the spectrum manager has adequate time to perform that task. However, JTF operations, especially those conducted in the planning process; do not allow the time needed to perform this level of manual engineering in the assignment process.

(c) Area assignments are the spectrum users' first choice as they provide maximum flexibility to the user, but they should not be the assignment type of choice for use in JTF operations. The lack of automated engineering

tools to nominate or consider area assignments make them time consuming and difficult to manage. Users should be required to define an area of some type that is tied to a geographic coordinate with a radius of operation and then allow the assignment authority to determine if and when area assignments best fit the situation.

(2) Mobile Assignments. Mobile assignments are used heavily in a JTF. Spectrum managers must consider how they intend to manage mobile assignments, what parameters automated spectrum management systems use to make mobile assignments, and what limitations should be placed on mobile assignments before making any frequency assignments in a JTF.

(a) Mobile assignments are those assignments that are portable or transportable and operate within a radius that is around a defined geographic point. These assignments are usually for omni directional antennas with a relatively low transmit power. Mobile assignments are common in JTF operations and much preferred over area assignments. Mobile assignments are those assignments where the station uses a fixed radio service and has a radius of mobility as listed in SFAF item 306/406. A mobile assignment does not actually reflect how the station is intended to be operated and can skew the nomination and interference analysis results by placing fixed directional antenna gain values in an omni directional manner. While the use of mobile assignments is preferred over area assignments they too can invalidate nomination and interference analysis results. Mobile assignments were found to present unique problems in the nomination process, as the mobility of stations was hard to accommodate using the existing frequency assignment algorithms in SPECTRUM XXI.

(b) SPECTRUM XXI provides the spectrum manager with options on how to handle mobile assignments. These options enable the spectrum manager to determine how to best accommodate the JTF forces involved and to optimize the nomination of interference-free frequencies. To better understand the impact of choosing mobile assignments, it is necessary to review how SPECTRUM XXI deals with mobile assignments and what options the spectrum manager can modify and to what level those options should be set. This section provides a review of the SPECTRUM XXI radius of mobility multiplier and the SPECTRUM XXI fixed and mobile logic model.

(3) Radius of Mobility Multiplier. Earlier automated spectrum management tools calculated nominations and interference for mobile assignments as if the mobile assignments could be located anywhere within the authorized radius listed in SFAF item 306/406. This approach created a situation where the mobile station could actually be collocated directly with other fixed and mobile stations. This method was very conservative and greatly reduced the available spectrum resource. A review of actual mobile and fixed station interactions found that most stations were seldom collocated and that

by placing the mobile stations off a reasonable distance from other fixed and mobile stations the available spectrum was increased. To accommodate this concern, a capability was created to separate mobile and fixed stations from each other to better replicate the actual interactions of mobile and fixed stations.

(a) The capability to separate mobile stations from other fixed and mobile stations is called the radius of mobility multiplier. Mobile stations are stood off a distance that is between 1 and 25 percent of the radius of the mobile assignment (SFAF item 306/406). The SPECTRUM XXI default is 10 percent of the radius. While this seems a reasonable default, there are some potential concerns when using the radius of mobility multiplier. For a mobile assignment with a radius of 1,000 km, the SPECTRUM XXI default radius of mobility multiplier would stand off all mobile stations by 10 percent of the radius of their assignment. Ten percent of 1,000 km is 100 km, or 60 miles, and this distance might preclude two mobile stations from being considered in a nomination or interference analysis and would stand off mobile stations from fixed transmitters within their area of operation. Therefore, the spectrum manager should consider the size of the operating radius along with the size of the stand off distance that will be caused by the radius and multiplier.

(b) The radius of mobility multiplier is one means of effecting how conservative the SPECTRUM XXI nomination and interference analysis algorithm operates. Policy and guidance should be provided to JTF participants in the size of allowable mobile assignments along with the JTF standard for radius of mobility multiplier. This issue also affects the JCEOI frequency proposals and their radius values.

(4) Fixed and Mobile Logic. The US Department of Commerce's National Telecommunications and Information Administration (NTIA) developed a model for fixed and mobile station interactions. This model causes changes to be made to frequency assignment analysis records and better replicates the effects to the EME.

(a) Fixed and Mobile Logic, is available to Department of Defense (DOD) spectrum managers in SPECTRUM XXI. Before choosing to use this capability, however, the spectrum manager needs to understand how the fixed and mobile logic evaluates both background assignments and proposals. The fixed and mobile logic model interprets fixed and mobile frequency assignment records and builds analysis records that more accurately reflect how the system is deployed. For instance, when the record contains both a fixed station class and a mobile station class, and a radius of operation is specified, that radius is applied to the mobile station not the fixed station. Propagation loss calculations between the fixed and mobile stations do not use digitized terrain data for calculations, they use smooth earth. Also, two or more receiver analysis records are created, one for the fixed site (without a radius) and one

for the mobile site (with a radius). Modified values for antenna height, gain, polarization and azimuth, are used in the calculations. For example, mobile stations (station classes beginning with MO) are given an antenna height of at least 10,000 feet, mobile aeronautical stations (station classes beginning with MA) are given an antenna height of at least 30,000 feet, and mobile land stations (station classes beginning with ML) are given an antenna height of 2 meters.

(b) While use of the NTIA fixed and mobile logic model for mobile records is recommended, the decision must be documented in JTF policy and guidance. Not selecting the fixed and mobile logic model, as is the case for all non frequency resource record system (FRRS) and government master file (GMF) assignments causes SPECTRUM XXI to analyze the assignment records using the values stated in the record and using previously stated defaults for missing data. When the fixed and mobile logic model is not used, the following recommendations are made for mobile class designations: use station class MA only for Air Force aircraft operating above 10,000 feet use station class MO for aircraft operating up to 10,000 feet, and use station class ML for land-based emitters.

(c) Restrictions constitute spectrum management issues that are not within the spectrum manager's power to change and must be worked around or accepted, unlike the considerations listed above where the spectrum manager may have some latitude in the decision-making process. Some coordination restrictions may cause the JSME extra work, such as in obtaining and maintaining the JTF spectrum resource or planned EW operations. JTF operations and operations being conducted by organizations outside the JTF may restrict the spectrum manager's use of specific frequencies or bands of frequencies. Restrictions come in many forms, command guidance, JTF policy, HN mandates, and political or legal restraints imposed by international law or treaties. Information restrictions may prohibit the spectrum manager from sharing data with certain allied of coalition forces. Many restrictions will be identified in the JTF mission briefing, like the ROE and other military-imposed restrictions. As JTF operations are initiated and as the military situation develops, new and different restrictions will affect all aspects of the JTF.

(d) Spectrum Management Concept Summary

1. Now that some of the assumptions, issues for consideration, and restrictions on spectrum management operations within the JTF have been identified, it is time to define how to best manage the spectrum. Based upon an assessment of the JTF's location, force complement, type of operation, type of entry, radio services used, spectrum availability, and HN restrictions, the spectrum manager should develop the spectrum management concept. The spectrum management concept is the initial plan on how to best use the spectrum.

2. The concept will include any decision to delegate, or not to delegate, frequency assignment authority to the Service and functional components. The spectrum manager may consider delegating the management of specific frequency bands or functions to one of the JTF Service components. In some JTF operations, the management of the line-of-sight (LOS) radio relay spectrum is totally delegated to the Army force (ARFOR) component because it has an automated spectrum management tool that manages the radio relay bands (224-500 and 1350-1850 MHz) better than SPECTRUM XXI. The Afloat Electromagnetic Spectrum Operations Program, (AESOP), is a surface Navy spectrum management software tool for managing radar and communication frequencies of shipboard equipment. This automated spectrum management tool can manage radar frequency assignments. The JSME provides these Service components with a frequency resource to use and then lets the component manage the individual assignments. The concept will outline the spectrum manager's plan to use allotment plans, restrictions for delegated assignment authority, and radio service sharing of frequency bands. The spectrum management concept will also contain conclusions.

3. In deliberate planning, the JTF spectrum management concept should be included in the OPLAN Annex K as one of the spectrum management appendices. The spectrum management concept can provide the spectrum manager tasked to convert the OPLAN into an operations order (OPORD) with the known assumptions used and the political and planning restrictions placed on the OPLAN developers. OPLAN development is conducted against a hypothetical situation, and problems encountered in the joint planning process are not resolved often due to time constraints but are set aside for further consideration and resolution at a later date. Since the impact of that delayed decision could affect spectrum management decisions, this issue should be included in the spectrum management concept as a constraint, restriction, or possible assumption. In the CAP process, the spectrum management concept is the first draft of the spectrum management plan.

3. Concept to Policy

a. Once the spectrum manager decides how to manage the spectrum, based upon assumptions, considerations, and restrictions, then he will need to determine what policy and procedures need to be in place to make his vision a reality.

b. First, the spectrum manager should review and understand the existing command spectrum management policy and guidance. The best source of this information is the combatant command's SMM, instruction, or publication. Once the spectrum manager fully understands the existing command spectrum management policy and guidance, he can determine what specific areas need to be clarified, expanded, and modified. Experience has shown that modifying

or changing existing policy and guidance usually produces many errors, as the staff and components learn and comply with the new guidance. In the time-sensitive planning process, these modifications and the associated learning curve often prove worse than using the existing policy. Ideally, policy and guidance for establishing a JSME is incorporated into the combatant command's SMM, publication, or instruction. The JSME policy and guidance should also be included in all the combatant commander's planning products (i.e., OPLANs, CONPLANS, and functional plans).

c. Second, the spectrum manager should establish contact with each of the components and identify the office and person responsible for spectrum management as well as each component's organic EW execution capability. The spectrum manager should also acquire complete contact information for each component representative; name, message address, e-mail address for both the nonsecure internet protocol router network (NIPRNET) and secure internet protocol router network (SIPRNET), phone and fax numbers for secure and nonsecure devices. This information should be included in the spectrum requirements data call message.

d. Finally, once the spectrum manager has decided how to manage the spectrum in support of JTF operations and has determined what, if any, policy changes should be made to existing command spectrum management policy and guidance, he should document and publish this guidance in a spectrum requirements data call message.

4. Spectrum Requirements Data Call Message

a. The JTF spectrum requirements data call message provides guidance to JTF staff elements, components, and supporting agencies on how to request spectrum support for spectrum-dependent systems that operate under their control within the JTF's AOI. This multipart message should cover the following subjects: JTF spectrum management policy and guidance, security classification guidance, and frequency and JCEOI master net list (MNL) request procedures, as well as provide guidance for identifying nets and frequencies to be included on the JRFL.

b. The JSME, if established, should send this message to the JFMO, supporting JFMOs, JTF staff elements and components, JTF supporting agencies, military satellite control facilities, and any other organization that may be tasked to provide forces or equipment to the JTF. The message should reference the combatant command's SMM, instruction, or publication along with the Chairman of the Joint Chiefs Staff manual (CJCSM) 3320.01, "Joint Operations in the Electromagnetic Battlespace," and any warning orders, OPLANs or CONPLANs being utilized.

c. The subject line of the message should be as follows: Frequency and JCEOI Requirements Request. This subject line will identify the message as a frequency management and JCEOI function and should ensure that it is routed to the appropriate personnel for action.

d. The spectrum requirements data call message should contain four message parts. Part One should provide JTF specific spectrum management policy and guidance to the JTF participants. Part Two should direct JTF staff, components, and other associated agencies to submit their spectrum requirements, through the appropriate Service channels, to the JTF. Part Three should request the JTF staff, components, and other associated agencies to submit their initial JCEOI MNL and Part Four should request the JTF staff, components, and other associated agencies to submit proposed JRFL entries to the JTF.

5. Part One – Policy and Procedures. Policy and procedures should not literally be copied from the SMM, instruction, or publication. The purpose of this portion of the message is to provide specific guidance on how to request spectrum resources.

a. Items to be addressed should include the designation of the automated spectrum management system to be used to support the JTF. This guidance should also specify request formats to be used for requesting spectrum, along with coordination instructions that direct components to use designated agency serial number (SFAF item 102) conventions, and for the component spectrum managers to consolidate and validate proposals before sending them on to the JTF JSME. Part one should designate points of contact for the JSME and the JTF components along with the contact information for phone, fax, e-mail, and JTF job account names. Exercise and/or operations name (SFAF item 910) should be designated by the JFMO and/or JSME and instructions not to deviate given to the component spectrum managers. Separate instructions for allied or coalition forces should be included if necessary. The following topic illustrates one aspect of this concept.

b. The agency serial number (SFAF Item 102) of every new frequency proposal must be unique. Permanent frequency proposals are required to use specific prefixes and the use of those specific prefixes are dictated by the agency responsible for their frequency proposals and assignments. Temporary proposals and assignments have no automated method to manage agency serial numbers and must rely upon the diligence of spectrum managers. It is up to the JFMO or JSME to develop an agency serial numbering scheme to provide an adequate number of unique agency serial numbers for the JTF JSME and components.

c. How does the spectrum manager determine if an agency serial number prefix is unique? First, select a prefix scheme that is suitable for the operation

and/or exercise. For example, for an operation named TANDEM THRUST, use a prefix of "TT" for frequency assignments made by the JSME as shown in the example below.

TT	=	JSME TTMC	=	JTF Marine Corps Component
TTAC	=	JTF JFACC TTAR	=	JTF Army Component
TTLC	=	JTF JFLCC TTAF	=	JTF Air Force Component
TTSO	=	JTF JFSOCCTTNV	=	JTF Navy Component

d. Next, create a SPECTRUM XXI AOI that queries all temporary frequency proposals and assignments that have an agency serial number starting with the prefix "TT." If no records are found then the spectrum manager has a unique agency serial number prefix and can use the numbering system shown above. If the spectrum manager finds records with a TT prefix, then he must find another combination of letters that is not being used. The values in the example would provide for 999,999 individual records for each component and another 999,999 for the JTF JSME. A similar approach would be to include a one or two digit year in the serial number. For example, as a two-digit year TTAF029999 would allow for 9,999 unique serial numbers, and as a one-digit year TTAF299999 would allow for 99,999 unique serial numbers. Using a year indicator may allow a past exercise prefix scheme to be reused. If the first attempt to identify unique agency serial numbers fails, continue trying until an unused set of letters is found.

e. Classification guidance must be included in the JTF initial spectrum requirements data call message. This guidance will identify what information does or does not need to be protected and what level of protection subject requires. The classification guidance is normally prepared by the combatant command J-2 and is supplemented by the JTF staff. It provides users with subjects requiring protection, specifies the level of protection, and establishes the period during which the protection must be continued.

6. Part Two – Spectrum Request Procedures. This message part should define the required data items to be included in all frequency requests. The specific data items, any standardization of these items, and any special instructions should be included in this part. Instruction on how data should be entered into the SFAF (i.e., emission groups starting from largest bandwidth to smallest, standard SFAF 200 series items). Request lead-time and unique coordination of special systems should be addressed in this section. Non-data exchanging SPECTRUM XXI client procedures should be addressed here along with specific requirements for when a data-exchanging client must perform data exchange.

a. Part Two should address the actual spectrum requirements data call. This request should task units to submit all spectrum requirements for units tasked to deploy. This tasking should include instructions to identify spectrum use for a unit as it operates deployed and fully functional. It is better to over state the requirements than to underestimate them and then have to adjust later.

b. This instruction should include the request format for spectrum requests, specify SFAF for all US forces, and the JTF standard for allied or coalition units. Additionally, this instruction should specify the required data items for all spectrum requests and any specific guidance regarding the way data should be entered, items not required, and situations unique to this JTF's operation. Guidance should be included for: agency serial number (SFAF item 102) prefix and numbering, control request number (SFAF item 702) prefix and numbering, and use of the operation and/or exercise name (SFAF item 910). See Appendix B for a complete list of recommended Engineering SFAF items.

7. Part Three – JCEOI Master Net List. This message part will request inputs for the JCEOI MNL. The JTF staff, whose inputs are usually collected by the JSME and components, should compile their MNL as if they were deploying on a doctrinal mission. The normal requirements for call signs, call words, frequencies, and net IDs should be identified. Any sharing plan that would be used should also be included. The reuse class and zone information is needed in case the JSME spectrum manager is not from the same Service and is not familiar with constructing a JCEOI. This requirement does not exclude the user from submitting SFAF requests for spectrum support. Instructions to Service components should include that only CEOI/Signal Operations Instructions (SOI) nets unique to their units should be included.

8. Part Four – Joint Restricted Frequency List Data Call. The fourth message part should request all JTF participants to submit initial JRFL inputs. These inputs must be collected and consolidated at this time. While still early in the planning process, there are standard frequencies that will always be included in the JRFL. This message should also define the schedule that will be used to collect new JRFL inputs and if possible the schedule of the official JRFL publication.

ANNEX A TO APPENDIX A TO ENCLOSURE D

SAMPLE DATA CALL

1. The following is a sample AUTODIN/DMS data call message.

FM JTF XRAY//J6//
TO AIG #####
BT
UNCLAS
EXER/OCEAN VENTURE//
MSGID/GENADMIN//
SUBJ: FREQUENCY REQUEST AND JOINT COMMUNICATIONS-
/ELECTRONICS OPERATION INSTRUCTIONS (JCEOI) REQUIREMENTS
/DATA CALL//
REF/A/MSG/OCEAN VENTURE WARNING ORDER//
REF/B/DOC/COMBATANT COMMAND SPECTRUM MANAGEMENT
MANUAL//
NARR/REF A IS OCEAN VENTURE WARNING ORDER. REF B IS COMBATANT
COMMAND SPECTRUM MANAGEMENT MANUAL//
1. THE PURPOSE OF THIS MESSAGE IS TO PROVIDE GUIDANCE TO JOINT
TASK FORCE (JTF) COMPONENTS AND SUPPORTING ORGANIZATIONS AND
COMMANDS FOR REQUESTING FREQUENCIES, SUBMITTING JCEOI
MASTER NET LIST (MNL) INPUTS, AND JOINT RESTRICTED FREQUENCY
LIST (JRFL) INPUTS ISO EXERCISE OCEAN VENTURE. THIS MESSAGE
CONTAINS FOUR PARTS; POLICY AND GUIDANCE, REQUESTING
FREQUENCIES, JCEOI MNL REQUIREMENTS, AND JRFL INPUTS.
2. PART ONE – POLICY AND GUIDANCE
A. SPECTRUM XXI IS THE DESIGNATED JOINT SPECTRUM AUTOMATION
TOOL AND WILL BE USED TO COORDINATE, NOMINATE, AND ASSIGN
SPECTRUM RESOURCES. SPECTRUM XXI WILL BE USED TO SUBMIT
COMPONENT FREQUENCY REQUEST TO THE JTF SPECTRUM
MANAGEMENT ELEMENT (JSME) AS WELL AS NOTIFICATION OF
ASSIGNMENTS FROM THE JSME BACK TO THE COMPONENTS. THE JOINT
AUTOMATED COMMUNICATIONS-ELECTRONICS OPERATION INSTRUCTIONS
SYSTEM IS THE DESIGNATED AUTOMATED JCEOI TOOL AND WILL BE
USED TO CREATE, UPDATE, AND MANAGE JCEOI PRODUCTS.
B. COMPONENTS WILL ESTABLISH SPECTRUM XXI JOB ACCOUNTS
USING THE FOLLOWING NAMING CONVENTIONS FOR THIS EXERCISE.

ORGANIZATION	JOB ACCOUNT	POC	DSN PHONE
JSME	OVJSME	MSG BLOOD	222-1210
ARFOR	OVARFOR	SFC YOUNG	222-1211
AFFOR	OVAFFOR	SSGT SHOE	222-1213
NAVFOR	OVNAVFOR	ITCS SOLE	222-1214

MARFOR	OVMARFOR	GYSGT HEART	222-1215
JFACC	OVJFACC	SSGT WING	222-1216
JFLCC	OVJFLCC	SFC MAUGHAN	222-1217
JFMCC	OVJFMCC	ITC SHIP	222-1218
JFSOCC	OVJFSOCC	MSG HOOD	222-1219

C. SATELLITE REQUEST AND AUTHORIZATIONS WILL INCLUDE THE JSME AS AN INFORMATION ADDRESSEE. COMPONENTS SHOULD IDENTIFY ALL RECEIVE ONLY STATIONS TO THE JSME FOR PROTECTION FROM UNINTENDED INTERFERENCE.

3. PART TWO – FREQUENCY REQUEST

A. REQUEST FOR FREQUENCY WILL BE SUBMITTED IN THE STANDARD FREQUENCY ACTION FORMAT (SFAF) FROM THE COMPONENTS TO THE JSME. THE JSME WILL RESPOND TO THE COMPONENTS USING SFAF. FREQUENCY REQUESTS WILL BE SUBMITTED BY THE COMPONENTS AND WILL INCLUDE THE JCEOI MNL REQUIREMENTS. SPECTRUM XXI DATA EXCHANGE IS THE PREFERRED METHOD OF EXCHANGING PROPOSAL AND ASSIGNMENT INFORMATION. FREQUENCY REQUESTS WILL BE SUBMITTED THROUGH NORMAL SERVICE COORDINATION CHANNELS UP TO THE COMPONENT LEVEL OF THE JTF. COMPONENTS WILL VALIDATE REQUIREMENT AND QUANTITY OF SPECTRUM NEEDED ALONG WITH FORMAT AND NECESSARY INFORMATION. ALL SFAF REQUEST WILL INCLUDE, AT A MINIMUM, THE FOLLOWING ITEMS; 005, 010, 102, 110, 113, 114, 115, 140, 141, 144, 200, 201, 202, 204, 205, 207, 300, 301, 303, 340, 354, 357, 358, 359, 362, 363, 400, 401, 403, 440, 454, 457, 459, 462, 463, 502, 513, 702, 801, 803, 804, 806, 910. ITEMS 306 AND 406 WILL BE USED FOR MOBILE ASSIGNMENTS BUT SHOULD NOT EXCEED 500KM. ALL PROPOSALS MUST HAVE EITHER A FIXED LOCATION OR A GEOGRAPHIC POINT OF REFERENCE AND A RADIUS. THIS LIST SHOULD BE USED AS A MINIMUM STANDARD.

B. THE FOLLOWING AGENCY SERIAL (SFAF 102) NUMBERING CONVENTIONS AND STANDARD 200 SERIES ENTRIES WILL BE USED.

ORGANIZATION	SERIAL NUMBER
JSME	OV000000
AFFOR	OVAF000000
ARFOR	OVAR000000
NAVFOR	OVNV000000
MARFOR	OVMC000000
JFACC	OVAC000000
JFLCC	OVLC000000
JFMCC	OVNC000000
JFSOCC	OVSO000000

C. THE FOLLOWING AGENCY STANDARD 200 SERIES ENTRIES WILL BE USED. SELECT THE APPROPRIATE ENTRY.

200. JNTSVC/USA/USN/USAF/USMC (SELECT ONE)

201. CINCSOU
202. JTF OV
204. AFFOR/ARFOR/NAVFOR/MARFOR/JFACC/JFLCC /JFMCC/JFSOCC (SELECT ONE)
205. IDENTIFY USING UNIT'S HIGHER HQ
207. IDENTIFY USING UNIT

D. FOR MOBILE EMITTERS THE FOLLOWING STATION CLASS CONVENTION WILL BE USED:

(1) ML FOR LAND MOBILE STATIONS
(2) MS FOR MARITIME MOBILE
(3) MO FOR MOBILE STATIONS OPERATING BETWEEN 45 FT TO 10,000 FT (I.E., HELICOPTERS)
(4) MA FOR MOBILE STATIONS OPERATING ABOVE 10,000 FEET.

E. EMISSION DATA (SFAF ITEM 114) WILL BE ENTERED WITH THE LARGEST BANDWIDTH AS THE FIRST OCCURRENCE AND SHOULD ONLY INCLUDE THE EMISSIONS THAT WILL ACTUALLY BE USED BY THE STATION, NOT ALL POSSIBLE EMISSIONS.

F. LOCATION DATA SHOULD BE STANDARDIZED BY THE COMPONENTS FOR MOBILE STATIONS AND LIMIT THE OPERATING RADIUS (SFAF ITEM 306/406) TO LESS THAN 500KM. REFERENCE AREAS WITH AN OPERATING RADIUS HAVE BEEN ESTABLISHED AS FOLLOWS:

REF	AREA COORDINATES	RADIUS
OV–AOR	181500N0662000W	200 KM
OV–EAST	180700N0652500W	50 KM
OV–WEST	182923N0670737W	30 KM
OV-NORTH	200000N0660000W	100 KM

4. PART THREE – JCEOI MASTER NET LIST SUBMISSIONS. THE EXERCISE JCEOI WILL BE GENERATED AT THE JSME. COMPONENTS WILL SUBMIT THEIR MNL VIA ELECTRONIC MEANS OR MESSENGER TO THE JSME. THE MNL WILL REFLECT CURRENT SERVICE DOCTRINE CONCERNING FORCE DEPLOYMENT, FREQUENCY SEPARATION, SHARING, AND REUSE CLASS AND ZONES. COMPONENT MNL WILL INCLUDE ALL SINGLE CHANNEL RADIO NETS, CALL SIGN, CALL WORD, COLOR WORD, CHALLENGE / PASSWORD, AND RUNNING CALL WORDS NEEDED TO SUPPORT THE UNIT. SERVICE COMPONENTS SHOULD DECONFLICT THEIR MNL WITH THE FUNCTIONAL COMPONENTS AS MANY NETS THAT A SERVICE USES BECOME JOINT NETS IN A JTF.

5. PART THREE – JRFL SUBMISSIONS. UNITS CAN SUBMIT JRFL NOMINATIONS ALONG WITH SFAF AND MNL INPUTS. COMPONENTS WILL IDENTIFY NETS REQUIRING PROTECTION IN THE MNL ENTRY OR IN SFAF ITEM 985 FOR NON-JCEOI REQUIREMENTS. NO MORE THAN 10 PERCENT OF YOUR NETS MAY BE INCLUDED IN YOUR JRFL NOMINATIONS. JRFL WILL BE SUBMITTED USING SPECTRUM XXI FORMAT AND SENT VIA SECURE EMAIL TO THE JSME. INTERNATIONAL TABOO FREQUENCIES

WILL BE INCORPORATED AT THE JSME AND THE COMPONENTS NEED NOT SUBMIT THEM.

6. POC THIS ACTION IS JSME OIC.

ANNEX B TO APPENDIX A TO ENCLOSURE D

AUTOMATED TOOLS

1. Introduction. The following are joint approved systems for use by the spectrum manager for spectrum management and JCEOI development.

2. SPECTRUM XXI

a. SPECTRUM XXI should be used in peacetime by the JTF staff at its permanent HQ to assist in planning and executing phases of exercises or contingencies, as well as in performing routine spectrum management functions. In a crisis, contingency, or combat situation, the JTF staff will use SPECTRUM XXI, either at the headquarters or at deployed locations to support spectrum management tasks.

b. Proponent. Joint Chiefs of Staff and the Joint Spectrum Center.

c. Point of Contact. JSC/J6, 2004 Turbot Landing, Annapolis, MD, 21402-5064, DSN 281-4956, commercial (410) 293-4956.

d. Security Note. SPECTRUM XXI will display a security banner equal to the highest classification level of data loaded into the software. This allows operations in a TOP SECRET environment and all local security directives must be followed.

CPU	Pentium III or (fastest available at time of purchase)
Operating System	NT Workstation
Memory	128 MB RAM (more is better)
Software License	No cost registration
Floppy Drives	3.5-inch
Mass Storage	10 GB Removable Hard Disk Drive
Monitor	Color monitor
Printer	Yes
Other	CD-ROM Reader, Mouse
Graphics / Video	VGA Video Card

Table D-A-B-1. System Requirements for SPECTRUM XXI

3. Joint Automated Communications Electronics Operating Instruction (CEOI) System (JACS). JACS provides a common tool that will interface between spectrum managers and communication planners, allowing for automated transfer of information that is easily understood by both parties.

CPU	Pentium II 266 MHZ
Operating System	Windows NT v4.0 w/SP6
Math Coprocessor	No
Memory	96 MB (128 MB Recommended) (512K L2 CACHE)
Removable Storage	24X CD ROM
Floppy Drives	3.5-inch
Mass Storage	4 GB Hard Disk Drive
Monitor	Color
Printer	Yes
Other	Mouse
Other	Serial and Parallel Port
Graphics / Video	800 x 600 SVGA Video Card
Other Software	Personal Oracle 8.0.4
Other Software	Oracle Report Writer
Other Software	Adobe Acrobat Reader 4.0
Other Hardware	Data Transfer Device (DTD)

Table D-A-B-2. System Requirements for JACS

ANNEX C TO APPENDIX A TO ENCLOSURE D

COMBATANT COMMAND POINTS OF CONTACT AND AREAS OF RESPONSIBILITIES

The following table provides POC information for the combatant command frequency management offices.

COMMAND	TELEPHONE NO.	MESSAGE ADDRESS
USCENTCOM	COMM (813) 827-5366 DSN 299-6597 FAX (UNCLAS info) DSN 299-6659 FAX (SECURE info) DSN 299-5279	USCINCCENT MACDILL AFB FL//CCJ6-COF//
USEUCOM	COMM 49-711-680-8523 DSN (314) 430-8523 FAX (UNCLAS) DSN 314-430-5006 FAX (SECURE) Call for info	HQUSEUCOM VAIHINGEN GE//ECJ6-F/JFMO//
USSOCOM	COMM (813) 299-7313 DSN 299-7313, 299-0825 FAX (UNCLAS info) DSN 299-3811	USSOCOM MACDILL AFB FL//SONC-J6-OC//
USJFCOM	COMM (757) 836-8006/5436 DSN 836-8006/5436 FAX (UNCLAS) DSN 836-8022 FAX (SECURE info) DSN 836-8006/5436	JFMO LANT NORFOLK VA//
USPACOM	COMM (808) 477-1051/2/4 DSN (STU III) (315) 477-1051/2/4	JFMO PAC HONOLULU HI//J61//
	FAX (UNCLAS) (808) 477-0691 FAX (SECURE) (808) 477-1048	
USSOUTHCOM	COMM (305) 437-1661 DSN 567-1661 FAX (UNCLAS) X-1951 FAX (SECURE) X-1875	USSOUTHCOM MIAMI FL//SCJ632//
USNORTHCOM	COMM (719) 554-8014/4008/4656 DSN 692-8014/4008/4656 FAX (UNCLAS) DSN 692-0978	HQ USNORTHCOM//JFMO-NORTH//

Table D-A-C-1. Combatant Command's JFMO POC Information

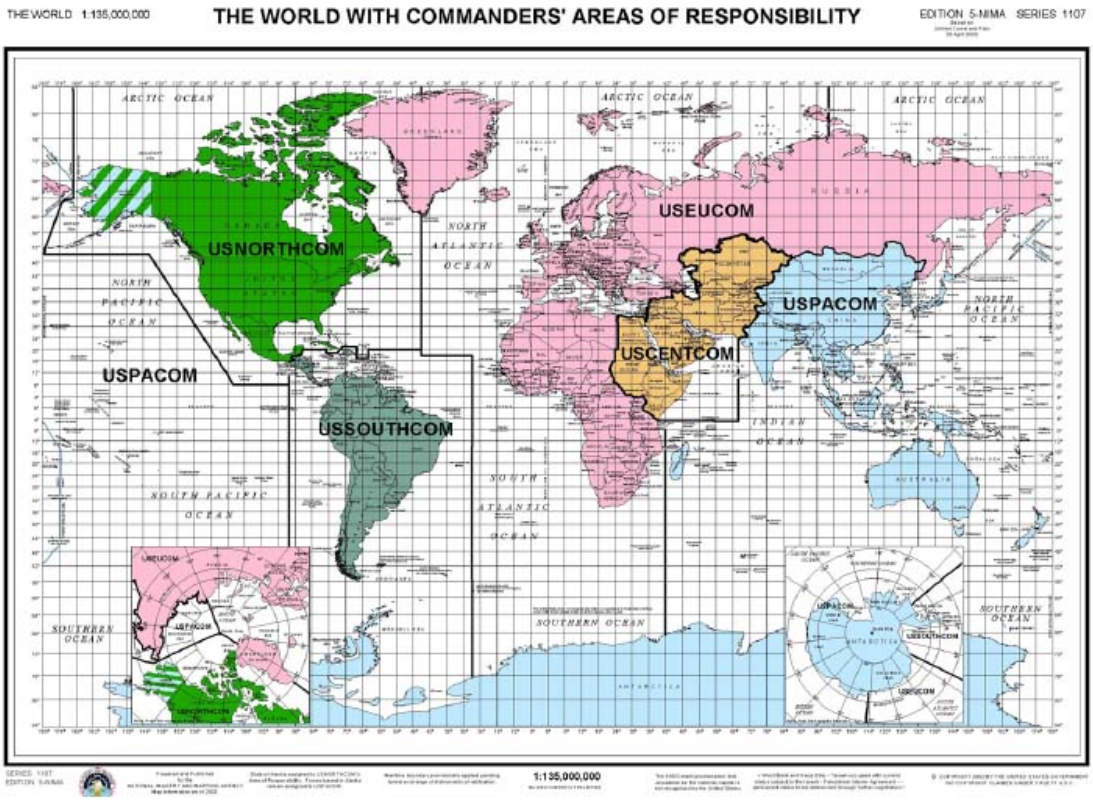

Figure D-A-C-1. Combatant Commanders' Areas of Responsibility

APPENDIX B TO ENCLOSURE D

GATHERING REQUIREMENTS

1. Overview. Spectrum dependent systems are in almost all units and organizations. Ideally, the Service components would identify all of the requirements for spectrum dependent systems that they bring to the JTF. However there are always items missed and systems overlooked in coordinating spectrum use. The best approach to gathering requirements is by attending briefings, meetings, and planning sessions. The JTF EWO or EWCC, if activated, is also a point of contact and coordination. You will hear about new units arriving, new systems being deployed, and changes to the operational plan. All of these indicate new or changed spectrum usage. You will usually find spectrum dependent systems that have been overlooked and need to be included in the frequency assignment database. Many agencies and organizations get called upon to support the JTF that are not subordinate to the JTF and who often do not coordinate spectrum dependent systems. It is incumbent upon you to always be alert for new systems being deployed in the JTF AOR and contacting the unit about the system.

2. How Requirements Are Gathered. Ideally all of the JTF spectrum requirements would be submitted to the JSME in SFAF via SPECTRUM XXI data exchange. However, since we live in the real world and not the ideological one, requirements come from many different sources, through nonstandard channels, and some not even in electronic format. Requirements will come to you as phone calls, faxes, e-mails, messages, and spreadsheets. You may have to develop SFAF records from bubble diagrams or illustrations that are provided by the requestor.

a. Many spectrum dependent systems are receive only and users do not request spectrum support because their systems do not radiate. These users do not realize that part of the spectrum management mission is to protect receive only systems from interference. The way to identify many of these types of systems is to contact the JTF staff sections, J-1, J-2, etc., and request that they identify any receive only systems that they know are active. You can create SFAF records for these receivers and then afford them protection when nominating frequencies and performing interference analysis.

b. Most single and multi-channel satellite communications systems get authorization for use of the satellite from the satellites controlling authority and are issued a SAA that contains a disclaimer that indicates “Local frequency clearance is the responsibility of the user.” This creates a situation that allows some users to disregard the disclaimer. The JSME becomes aware that these systems exist when interference is caused or received by the satellite terminal. Recommend that the components include the JSME on all satellite access request and authorizations. The JSME should create SFAF records for these

authorizations. Additionally the JSME may want to make separate specific frequency assignment records for known single channel satellite systems located at the major headquarters to aid in reducing and identifying interference.

c. Attending meetings and briefings is another way of gathering information about spectrum issues and concerns. The daily operations brief usually identifies problems and issues affecting the JTF at a very high level. Spectrum managers can often listen and identify possible spectrum issues or new spectrum requirements that are not obvious to even the other J-6 personnel. Meetings concerning the planning of future operations, incoming units, or new systems being deployed into the JTF should all have JSME representation.

d. Making the JSME visible to incoming units and organizations helps not only the unit but introduces the unit to the JSME and lets them know that there is an office that is actively involved in communications and spectrum management. Many units and organizations would be eager to coordinate spectrum use if they knew where to go and from whom to request the support. A proactive approach will pay great dividends in reduced interference problems later.

e. Combatant command JFMO should already know what frequencies have been provided (assigned) to supporting and supported forces operating within the AOR. These records need to be included in your database not as requirements but as assignments, this is mentioned here as many of these assignments are identified while gathering requirements.

f. NAVFOR spectrum requirements, unlike the other Services, may be provided to you in a form other than SFAF, specifically as an operational tasking for communications (OPTASKCOM). A CTF may not have a billet for a trained spectrum manager. Hence, the communications officer, or more likely a senior chief, may be tasked to provide the NAVFOR spectrum requirements. The lowest level that the Navy has an assigned spectrum manager is at the numbered fleet. Since the CTF will already be deployed and operating in order to arrive at your location it must have an operational frequency plan in use. This document will list all of the communications links, (frequency, emission, and type of use) operating in the CTF. There is also an OPTASKLINK that provides the same type of information for Navy data links. Many of the JTF JCEOI nets will be the same as some operational nets used by a CTF.

3. Documenting the Process (Tracking Action Items). Information flow becomes critical as the proposals come flowing in. Incoming proposals needed to be tracked to make sure that all requirements are addressed. It is best to create an event log. The event log should include everything that happens throughout the day that effects productivity. Any event that causes a change

in the tasking of the JSME should be entered into the log; new tasks, modification of tasking, elimination of tasking. Meeting minutes, interference reports, reprioritization of existing tasks, and all incoming message traffic should be recorded in the event log. Some JSMEs create a separate log just for incoming and outgoing message traffic. You may choose to create a frequency proposal log and track incoming proposals and outgoing assignments. This type of log is best kept in an automated spreadsheet or database so that it can be searched and sorted for case numbers, agency serial numbers. The event log should be reviewed periodically to create an action item list. The action item list is used to prioritize tasks for the JSME. The log also provides a historical document for when things arrived at the JSME, when they were processed, and when they were completed. The logs along with the action item list assist the spectrum manger in ensuring that nothing is left unfinished.

4. Spectrum Manager to the JTF Staff. The JSME becomes the spectrum manager for the JTF staff and will gather much information in this role to help in identifying JTF spectrum use. JSME representatives should establish contact with each JTF staff section and discuss the importance in documenting all known spectrum use so that those systems will be protected from JTF operations. The JTF staff sections have little to no spectrum dependent systems, unless they have wireless local area network (LAN)s or cordless phones, but they do plan for the arrival and deployment of many units that do have such systems. You will be required to document many of these requirements in your role as the JTF spectrum manager.

a. Many systems providing intelligence and weather information are broadcast systems that do not transmit but only receive. It is important to identify these systems and document the locations of the receivers to protect them from unintentional interference. The users of these systems usually do not realize the importance of coordinating receive only systems with the JSME.

b. Spectrum managers are investigators, of a type; they continually seek undocumented spectrum use. They do this because experience has shown that it is the unthought-of-emitter that causes the problem. Murphy's Law is in effect and the impact will be greatest when you least expect it. As each JTF staff section tells you about what spectrum dependent systems they use, encourage them to explain what they do and how they do it. This method increases your knowledge and fosters good will as you are letting them talk about themselves. In the telling of their mission, you will here about spectrum dependent systems that they either do not realize use spectrum or just did not remember.

5. Reviewing the Requirements. Spectrum requirements submitted by the components should be reviewed and validated by the component prior to submission to the JSME. Validation includes justifying the need, accurate

reflection of the need (not an inflated number), correct format, and completeness of request.

a. Service Components should also coordinate with Functional Components prior to submitting request for spectrum to reduce or eliminate the possibility of duplicate requirements being identified to support radios nets that are used by both the Services and JTF directed nets. The JSME will perform the validation for spectrum request from JTF staff and organizations submitting request other than the components. The JSME should review request for anomalies or ambiguities that may adversely affect the request process.

b. Inflated requirements are the result of users attempting to over compensate in their desire to provide interference free communications. If a spectrum dependent system requires 5 frequencies to operate then you should request that many. The JSME should provide a quick response to a request for another frequency if interference is encountered. Some users think that if it takes 5 frequencies to operate, then I need to have spare frequencies to use in the case of interference. They usually take the worst case and ask for 10 (double the need). Even this approach can seem conservative, for example, a Trackwolf system (which requires 8 frequencies to operate) was once requesting 40 frequencies as its minimum requirement. In this type of case where the requested number seems extreme the best approach is to have them explain how the system works. Conversely, making assumptions without adequate background information can cause you to believe that spectrum requests are over-inflated when in fact they just what is needed. A Navy spectrum manager would have a hard time justifying the spectrum requirements submitted by an Army Corps, because the Navy use of frequencies is much different than that of the Army. Do not let your personal experience limit your thinking but guide you to ask questions that will flush out potential inflation.

c. To assist you in the task of understanding what the Service Components may be sending to you as spectrum requests, we will be reviewing the forces normally assigned to a JTF and how they operate. This will also include an overview of many joint systems that are used in JTF operations.

6. Joint Components

a. Joint Forces Air Component Commander. The JFC will normally designate a JFACC to exploit the capabilities of joint air operations. The JFACC directs this exploitation through a cohesive joint air operations plan (centralized control) and a responsive and integrated control system (decentralized execution). The JFC will normally assign JFACC responsibilities to the component commander having the preponderance of air assets and the capability to plan, task, and control joint air operations. The JFACC is responsible for overseeing: airspace control authority, planning, and managing

joint air operations through the air tasking order (ATO), data link management, and for designating the Area Air Defense Commander (AADC) usually delegated to the Army Air-Ground System (AAGS). The JFACC can be from the Navy, Marines, or Air Force component (not always the AFFOR). In some cases, it may be necessary for a naval officer to function as the JFACC at sea, especially in quick-breaking operations before land-based air contingents are in place or when significant land-based air assets are not required.

b. Theater Battle Management Core System (TBMCS). The TBMCS is the primary C2 tool used for theater integration of air assets. TBMCS is used to organize intelligence, build and disseminate the ATO, monitor and control the ATO execution, track progress of the air war, and to control all air activity under the JFACC and is interoperable with the Global Command and Control System (GCCS). The JFACC spectrum requirements seem large because they include the JTF nets that are designated Air Component AC nets. Which nets and how many frequencies needed is dependent on the overall structure and integration of the C2 systems being employed to oversee and manager joint air operations.

(1) Theater Air-Ground System. The Theater Air-Ground System (TAGS) provides the JFACC with the capability to plan and conduct joint air operations. TAGS is made up of: AF Theater Air Control System (TACS), AAGS, Navy Tactical Air Control System (NTACS), Marine Air Command and Control System (MACCS). Each Service has elements with similar functions that work together in the overall C2 infrastructure of the JFACC. Table D-B-1 lists these functions and the Service elements.

Function	**Air Force**	**Marine**	**Navy**
Headquarters	Air Operations Center	Tactical Air Control Center – Ashore	Tactical Air Control Center – Afloat
Surface Radar	Control & Reporting Center	Tactical Air Operations Center	Fleet Air Warfare Coordinator
Surface Radar	Control & Reporting Element	Early Warning/Control	Sector Air Warfare Coordinator
Air Support	Air Support Operations Center	Direct Air Support Center	Air Support Control Section
Air Support (Airborne)	Airborne Command Control Center	Direct Air Support Center Airborne	
Terminal CAS Control	Tactical Air Control Party	Tactical Air Control Party	
Forward Air Control	Airborne Forward Air Controller	Forward Air Controller –Airborne	
Airborne Surveillance	E-3 Sentry		E-2 Hawkeye

Table D-B-1. TAGS Service Functional Similarities

(2) The following is a brief description of each of these TAGS functions:

(a) Headquarters. As the senior TAGS element, these facilities provide the JFACC and battle staff a command post to plan, supervise, coordinate and execute all current and future joint air operations. The battle staff is divided into two sections. One handles current air operations (executes the ATO) while the other plans future operations (develops and disseminates the ATO). This element originates all air defense control measures, including air defense warning conditions and control status. These headquarters by Service elements are:

1. USAF - Air Operations Center (AOC)

2. USMC - Tactical Air Control Center (TACC) Ashore

3. Navy - Tactical Air Control Center (TACC) Afloat

(b) Surface Radar. Ground and ship-based radar elements of the TAGS can exercise tactical control over air defense missions that provide air battle management, early warning, and fighter control. The ground-based elements can be linked to medium and high-altitude surface-to-air missile units and may have authority for launch control and target assignment. Common missions and tasks are:

1. Long-range radar surveillance and identification friend-or-foe of airborne objects.

2. Airspace battle management.

3. Fighter direction.

4. Data link management (i.e., Tactical Digital Information Link (TADIL) A/B [Link-11], and the Joint Tactical Information Distribution System (JTIDS) [Link-16]).

5. Provide threat warnings

(c) Naval and ground tactical radar elements by Service element are:

1. USAF - Control & Reporting Center (CRC) and Control & Reporting Element (CRE)

2. USMC - Tactical Air Operations Center (TAOC) and Early Warning/Control (EW/C)

3. Navy - Fleet Air Warfare Coordinator (FAWC) and Sector Air Warfare Coordinator (SAWC)

Note: The CRE, EW/C and SAWC are subordinate elements.

(d) Air Support. Ground, air, and ship-based air support elements of the TAGS provide advice and liaison to supported ground combat commanders for close air support (CAS), interdiction, surveillance, reconnaissance, airlift, electronic warfare, and special operations. These elements have the capability to receive, process, and commit allocated sorties to satisfy requests for immediate air support, and they integrate those missions with supported ground unit's fire support plan and scheme of maneuver. Air support elements by Service element are:

1. USAF - Air Support Operations Center (ASOC).

2. USMC - Direct Air Support Center (DASC).

3. Navy - Air Support Control Section (ASCS).

4. Airborne air support elements include; the USAF Airborne Battlefield Command and Control Center (ABCCC) and the USMC DASC-Airborne (DASC-A). Both operate on specifically configured C-130 aircraft performing the same functions as the ground-based elements.

(e) Terminal Close Air Support Control. This element of the TAGS is comprised of USAF and USMC Tactical Air Control Parties (TACP) as well as airborne forward air controllers (FAC). These elements are responsible for immediate CAS request, provide terminal attack control of CAS assets, and are advisors to the ground combat maneuver commander on weapons employment techniques, procedures, suitability, and capabilities.

(f) Airborne Surveillance. The airborne surveillance elements of the TACS are comprised of the USAF E-3 Sentry Airborne Warning and Control System (AWACS) and the Navy E-2 Hawkeye. Both aircraft perform the missions of air battle management, airspace control, fighter control, and early warning. These airborne platforms provide radar surveillance and communications beyond the range of surface-based radars and can look down to detect, identify, and track low-flying aircraft. Another key role of these aircraft, along with the TAGS surface based radars, is sending the combined radar picture of the air war to command authorities and other agencies.

7. Army Air-Ground System. The Army's control system for synchronizing, coordinating, and integrating air power with the commander's scheme of maneuver is the AAGS. The AAGS provides the means to initiate, receive, process, and execute request for air support and to disseminate information

and intelligence produced by aerial assets. Each Army Component of the system is designed to operate with an element of the Air Force TACS, but is also compatible with both the Navy and Marine Corps air control systems. The AAGS synchronizes, coordinates, and integrates air power with Army land forces. Army components of the AAGS are comprised of:

a. Command Post. This is where the Army commander issues directives, allocates resources, synchronizes operations, monitors the movement of the battle, plus processes and approves request for tactical air support. The AADC is the head of Air Defense Artillery (ADA) system and the ADA command post. The ASOC is normally collocated with a corps main command post providing fast response to the corps and subordinate unit's request for immediate air support.

b. Fire Support Element (FSE). The FSE is the focal point for planning, coordinating, and synchronizing all categories of fire support on surface targets. The FSE forwards pre-planned request for air support, including CAS, through Army command channels to the AOC.

c. Army Airspace Command and Control (A2C2). Under the JFACC airspace control authority, A2C2 is the Army's principal organization charged with the responsibility for airspace control in the Army's area of operations. Normally, the principal staff sections and liaison elements in an A2C2 element consist of representatives from the ADA, Army aviation, air liaison officer, FSE, air traffic services units assigned, combat electronic warfare, and when required, an air and naval gunfire liaison company.

d. Air Defense Artillery Brigade. The brigade is the largest unit in ADA. The ADA Brigade (BDE) mission supports the mobilization and worldwide deployment of units providing air defense force protection to allow freedom of maneuver for joint operations. The ADA BDE oversees the multiple ADA Battalions (BN).

e. Air Defense Artillery Battalion. The ADA BN deploys systems that provide theater air defense coverage using:

(1) HAWK medium range air defense systems.

(2) Linebacker and Avenger shoot-on-the-move air defense systems.

(3) Patriot missile systems capable of intercepting and destroying tactical ballistic missiles and aircraft in flight.

(4) Theater High Altitude Area Defense (THAAD) missile systems.

(5) Sentinel air defense radar systems.

8. Joint Force Land Component Commander (JFLCC). Simply stated, the JFLCC is a command structure in which all land forces, regardless of Military Department, are consolidated under a single land force/component commander. A combatant commander or other JFC may choose such a functional organization in order to achieve an integrated joint ground operation, particularly if the JFC feels he can best control land operations with minimal external distractions through a subordinate commander. The JFLCC is expected to use existing communications assets utilized by land forces to communicate. The JTF has joint nets that can be activated to support the JFLCC in performing the mission. The JFLCC uses communications systems as follows:

a. Combat Net Radio (2-30 MHz/30-88 MHz).

b. Air-Ground-Air (115-149.975 MHz).

c. Air-Ground-Air, Radio Relay, Single Channel SATCOM (225-400 MHz).

d. C4I Backbone Radio Relay (1350-1850 and 4400-5000 MHz).

e. GMF SATCOM (7250-8400 MHz).

f. Radars – Personnel/ADA/ATC

g. Existing C4 systems supporting land components already in theater.

9. Joint Force Maritime Component Commander (JFMCC). The JFMCC has an already established war fighting capable system in place. The JTF provides for additional joint nets to be used when coordinating with other JTF components and adjacent navel forces. The JFMCC uses various communications systems using both SATCOM and terrestrial based systems in the following frequency bands; HF, VHF, UHF, SHF, and EHF.

10. Joint Force Special Operations Component Commander JFSOCC. The JFSOCC uses assets from the component Services, commercial off-the-shelf (COTS) equipment to accomplish the missions given by the JTF commander. Many of the communications needs that support JFSOCC operations are classified beyond what the spectrum manager can coordinate. Most of these spectrum requirements are for single channel voice and data transmissions between elements. Expect heavy use in the 30-88 MHz, 115-150 MHz, 225-400 MHz, and, 402-420 MHz bands.

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APPENDIX C TO ENCLOSURE D

DEVELOP SPECTRUM REQUIREMENTS SUMMARY

1. Spectrum Requirements Summary. The Spectrum Requirements Summary has been called a "Spectrum-Use Plan" in joint documents. However, the title Spectrum-Use Plan has at least three different definitions. Therefore, this chapter uses a more descriptive title to identify the actual plan being developed.

a. The purpose of the Spectrum Requirements Summary is to provide the JSME spectrum manager with a document to better analyze JTF spectrum requirements to determine the quantity of spectrum needed to support the JTF operations, the number of radio services competing for use within a given frequency band, and the number of different emission designators operating within a frequency band. (It is common to have many different emissions operating with a frequency band allotted to a single radio service.) Once the spectrum manager has quantified the spectrum requirements and either requested or determined the available spectrum resources, the summary plan can be used to devise frequency-sharing plans.

b. To create this plan, the spectrum manager compiles the spectrum requirements documented in the Gather Requirements activity and reformats this data, using the spreadsheet and export options in SPECTRUM XXI. The spectrum manager can import the resulting file into a commercial spreadsheet application and then manipulate, sort, or record data, to help gain a better understanding of the JTF spectrum requirements. The information needed to compile the spectrum requirements summary is found in the SFAF items required by the spectrum requirements data call message.

2. How to Create the Spectrum Requirements Summary

a. Exporting the Requirements from SPECTRUM XXI. The Spectrum Requirements Summary is created by using the "Spreadsheet Output" feature in SPECTRUM XXI, which enables the user to select specific SFAF items to include in a spreadsheet report that can be exported as a .txt file. The resulting file can be opened using a commercial spreadsheet application like Microsoft Excel.

(1) Once the spectrum manager has received a preponderance of JTF spectrum requirements data, he will use SPECTRUM XXI to query the requirements from the database. The spectrum manager will then tag all records in the query results, select the "Output" option, and then select "Spreadsheet." When creating the spreadsheet, the following SFAF items should be included to provide the necessary information to properly evaluate the requirements: 005, 110, 113, 114, 300, 301, 513, 804. These SFAF items

were identified as mandatory items in the data call message and should be present in all SFAF records. The spectrum manager should save the requirements summary as a template in the SPECTRUM XXI spreadsheet menu.

(2) While not specifically a requirements summary issue, a standardized file-naming convention should be used to preclude losing or misplacing files. Provide guidance to everyone within the JSME as to how files are to be named and where they are to be stored.

b. Sorting the Requirements (Spreadsheet Application). Once the summary file has been exported from SPECTRUM XXI and opened in a commercial spreadsheet application, the JSME spectrum manager will resort the spreadsheet by frequency and divide the requirements by frequency band: 200-500 kHz, 2000-29999 kHz, 30-88 MHz, 88-136 MHz, 136-225 MHz, 225-400 MHz, 400-1000 MHz, 1-3 GHz, 3-6 GHz, 6-10 GHz, and 10-20 GHz. After reviewing the number of requirements in each frequency band, the spectrum manager may choose to subdivide these bands further based upon the number of proposals, radio services, or emissions. In the process of dividing these requirements, the spectrum manager should recognize many of the potential conflicts, issues, and concerns that must be considered in the analysis.

3. Analyzing the Requirements. Once the requirements have been sorted by frequency band, the JSME spectrum manager can analyze the data and determine the amount of spectrum needed to support each band. There is no automated method for this process. Geographical separation between users must be considered, along with the number of frequencies requested, radio services used, and density of users in a given area. Each of these considerations will help the spectrum manager formulate an educated guess as to the number of frequencies needed to support the requirements. Historical records from past exercises, personal experience, and unit institutional knowledge are all information sources that will assist in determining the spectrum requirement.

a. In the requirements analysis, the spectrum manager must consider HN restrictions and band sharing plans. When requesting a spectrum resource from a HN authority, the spectrum manager may find restrictions imposed on the frequency bands being requested. Less industrialized nations may grant a JTF spectrum manager more latitude regarding spectrum use. However, these nations are more likely to have undocumented spectrum-dependent systems operating that may cause interference.

b. Additionally, the concern over frequency sharing plans has become less important as most industrialized countries have defined spectrum-use plans that address possible sharing. An example of frequency bands being shared by different radio services is found within NATO, which shares the single-channel

satellite allocation with the fixed and mobile service provided to radio relay systems. Since radio relay systems are terrestrial based, use very directional antennas, and are usually easily identified, they can share the same frequencies as the space based, skyward directed antennas used by single-channel satellite. This sharing periodically results in interference but is easily resolved through basic siting and local interference investigations.

c. The spectrum manager should document analysis the results once he has analyzed the spectrum requirements and determined the quantity of spectrum needed, the possible need of sharing plans, recommendations for sharing plans, and systems requiring operational deconfliction. By documenting these findings, the spectrum manger creates a decision baseline for follow-on spectrum managers to use in understanding why and how the spectrum is being allocated and assigned. Just like the spectrum management concept, this document becomes important for future decisions and provides the JSME spectrum manager a form of institutional knowledge management.

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APPENDIX D TO ENCLOSURE D

DEFINE THE ELECTROMAGNETIC BATTLESPACE

1. Defining the Electromagnetic Battlespace

a. The JTF battlespace comprises the air, land, sea, and space within a geographical area, as well as the electromagnetic spectrum. While the JTF commander needs to know the battlefield characteristics that affect operations, such as mountains, climate, civilian population centers, as well as friendly, hostile, and neutral troop formations, the JTF spectrum manager needs to know the particular characteristics of the EMB.

b. Defining the EMB is more than creating a database of frequency assignments. Environmental parameters, terrain elevation, and spectrum-use information define the EMB. Spectrum-use information includes background environmental information (BEI) of the civilian electromagnetic communications infrastructure and the friendly, neutral, and adversarial electromagnetic order of battle (EOB) within the AOI as shown in Figure D-D-1. The EOB is the spectrum-use information of a military force's C2 infrastructure, and other spectrum-dependent systems (i.e., navigational aids, weapon systems, and radars). All of these factors have an affect on a JTF's use of frequencies within the EMB.

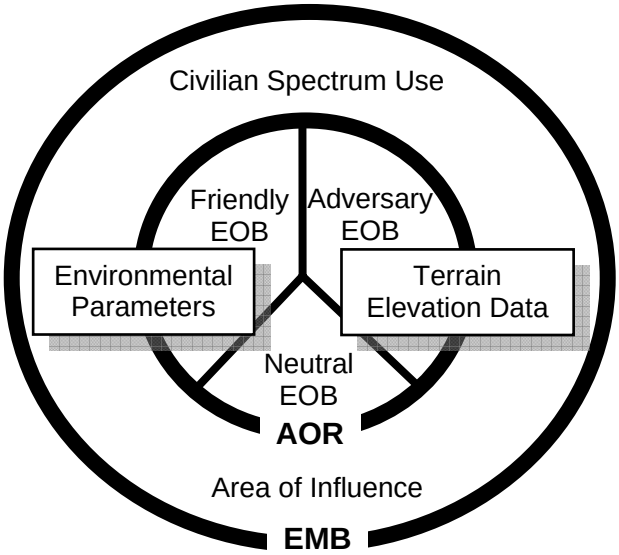

Figure D-D-1. The Electromagnetic Battlespace

2. Identifying the Area of Influence

a. To define the EMB, the spectrum manager must identify the JTF AOI. The AOI is the area beyond the AOR where the JTF's use of the spectrum could affect or be affected by other spectrum users. As illustrated in Figure D-D-1, the EMB is the outer parameter of the AOI. The AOI is always greater than the geographical area in which the JTF will be conducting operations because radio waves do not stop at borders or lines on a map.

b. How far beyond the AOR should the AOI extend? There are different approaches to answering this question. One approach is the "Give me everything, more is better." This approach advocates capturing all spectrum-use data from "DC to Daylight" for a geographical area extending well beyond the AOR. Capturing all the data has advantages and disadvantages. The advantage of this approach is that it is a quick and simple method for selecting frequency assignment records. However, the disadvantage is that the frequency assignment database becomes saturated with records, which do not affect JTF operations. For example, if the AOI was described as everything within 1,000 miles, then every low-powered emitter in a band reserved for land mobile radio (LMR) service within that radius would be included, even though those emitters would never be close enough to have any affect on JTF operations. In this same example, emitters would be captured in bands, which may not have an affect on JTF operations, or in which the JTF is not operating. These excess records would add to the size of the database and increase the processing time just to rule them out of any analysis. The greater the number of records in the frequency assignment database, the longer it takes to complete an analysis.

c. Another approach is the "Give me only what affects me, the leaner the meaner." This approach advocates varying the size of the AOI based on the frequency bands and the radio services in which the JTF will operate. As shown in Figure D-D-2, the distance beyond the AOR would be much greater for an aeronautical mobile assignment, which could be received for hundreds of miles, than for a land mobile assignment, which may only propagate 20 miles. The 4400-5000 MHz band is only used for LOS and tropospheric (TROPO) scatter communications whose maximum propagation range is limited to less than 160 miles. The advantage to this approach is that the number of excess records would be greatly reduced, thereby reducing the analysis time. Conversely, the disadvantages are the increased complexity in describing the AOI and the longer data exchanges.

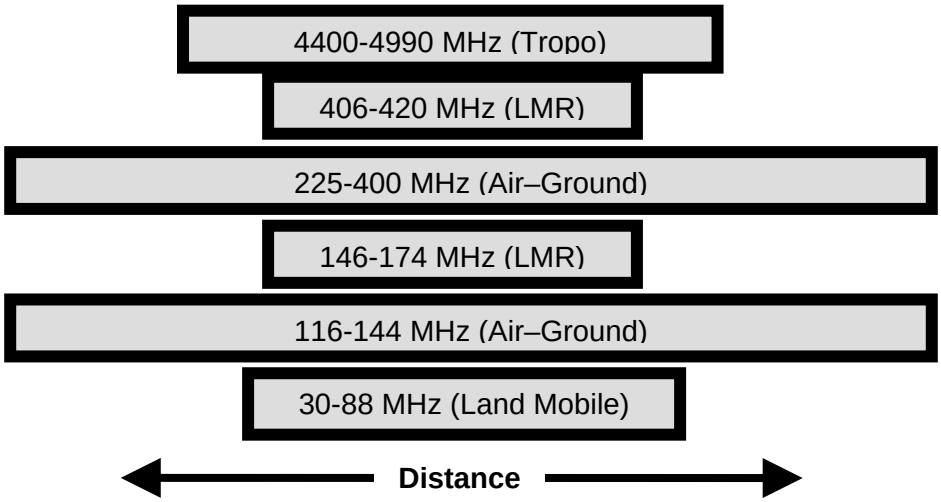

Figure D-D-2. AOR Distance vs. Frequency Bands

d. Another point that should be considered when capturing spectrum-use data, specifically for frequencies below 30 MHz, is the SPECTRUM XXI analysis capabilities. SPECTRUM XXI analysis capabilities are used to calculate path loss between proposed transmitters/receivers against transmitters and receivers in the frequency assignment database. For those records below 30 MHz, it should be noted that only groundwave propagation is analyzed and that skywave propagation is not considered. In other words, SPECTRUM XXI cannot nominate nor do an interference analysis on frequencies propagating via skywave. With this thought in mind, the spectrum manager should decide whether or not to capture spectrum-use information, other than the JTF's assignments, for frequencies below 30 MHz. It should be noted that approximately 30 percent of the frequency assignment records in the FRRS and International Telecommunications Union (ITU) databases are below 30 MHz. This information would be of limited analysis value and could contribute to slower computer performance.

3. Importing and Exporting Area of Influence Definitions. Whichever approach is taken, the concept and parameters of the AOI should be determined before creating the AOI in any software tool. The parameters of the AOI should be applied both to capturing the initial frequency assignment database from available sources and to updating the database via SPECTRUM XXI data exchanges. AOI queries are interchangeable between SPECTRUM XXI and the Frequency Assignment Retrieval System (FARS). These AOI queries can be imported and exported between the two software tools with the following considerations:

a. The number of queried SFAF fields is fewer in FARS than it is in SPECTRUM XXI. Therefore, the AOIs built with SPECTRUM XXI may contain

conditions on fields that are not allowed in FARS. When opening such an AOI, FARS will automatically delete any conditions on fields not queried in FARS.

b. SPECTRUM XXI performs geographic queries as circular radius selects, while FARS geographic selects are always rectangular. However, the user may specify the rectangular area using a center point and radius. When opening a SPECTRUM XXI AOI in FARS, radius selects are automatically converted to geographic rectangular selects. Inversely, when importing a FARS query into SPECTRUM XXI, geographic rectangular selects are automatically converted into radius selects. Therefore, SPECTRUM XXI selects a "smaller" portion of the Earth than does FARS, given the same center point and radius (the "corners" of the rectangle outside the circle are not selected). Figure D-D-3 illustrates the difference between FARS and SPECTRUM XXI radius selects.

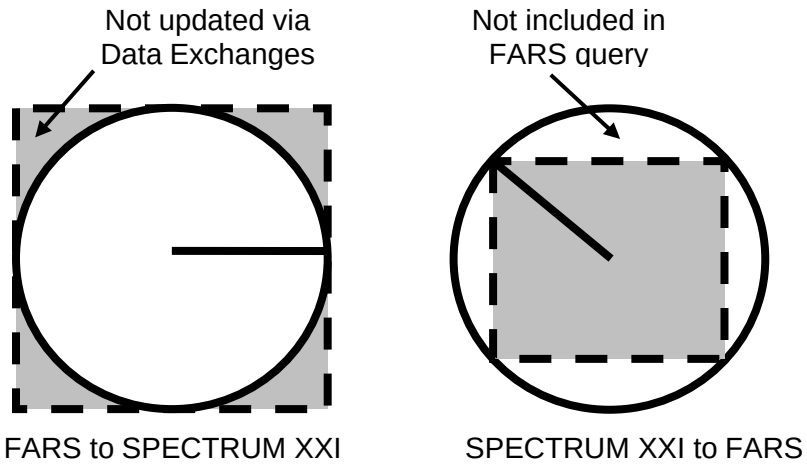

Figure D-D-3. FARS vs. SPECTRUM XXI Radius Selects

c. The geographic area of a FARS created AOI would include records outside the SPECTRUM XXI radius, and it should be noted that these records would not be updated via a SPECTRUM XXI data exchange. However, for a SPECTRUM XXI created AOI used in FARS, all records would be queried.

d. Geographic selects in SPECTRUM XXI support Authorized Radius (SFAF items 306 and 406). In FARS, these fields are not supported. When opening a SPECTRUM XXI AOI in FARS, any options concerning Authorized Radius are ignored. When importing a FARS query into SPECTRUM XXI, these options take their default values.

4. EMB Data Sources. As stated earlier, spectrum-use information, environmental parameters and terrain elevation data define the EMB. Joint military operations require the most current, accurate, complete, and authoritative spectrum-use information available. If information on a

spectrum-dependent system, transmitter, or receiver is not in the frequency assignment database, there is no way of ensuring it will not interfere with other systems or that its capabilities would not be degraded by other emitters. Decisions must be made based on the best information available, therefore spectrum managers should not expect to have information on every spectrum-dependent system within the EMB, identified in the frequency assignment database. There are various sources for capturing and updating EMB spectrum-use information. Figure D-D-4 illustrates some of the data sources available to the spectrum manager.

a. Background Frequency Assignment Data Sources. The following is brief description of the sources that can be used to capture initial BEI within the EMB:

(1) Frequency Assignment Retrieval System. FARS is a Windows-based program that enables the user to query and retrieve frequency assignment records by area, organization, or other SFAF items and then output those records in SFAF format. FARS is provided on CD-ROM with the frequency assignment data from the following sources: FRRS, ITU, and Federal Communications Commission (FCC). FARS is used to provide DOD spectrum managers with initial background EMB data that is not available on the SPECTRUM XXI regional server.

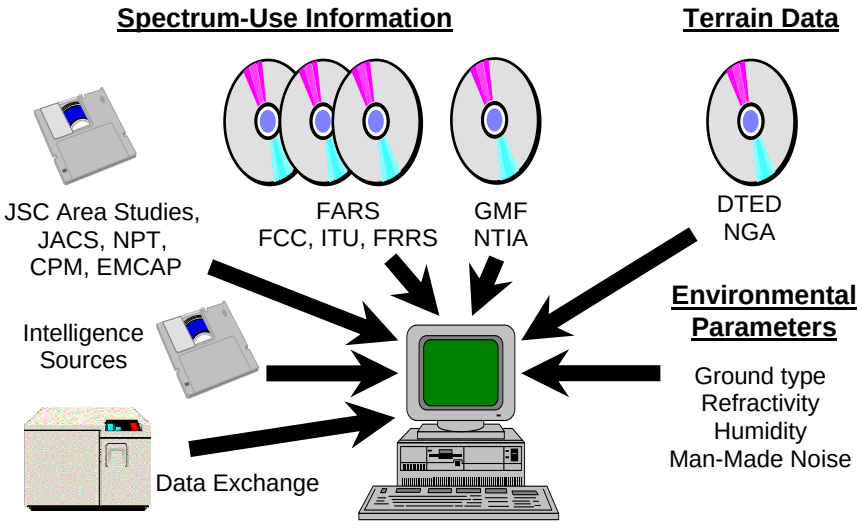

Figure D-D-4. EMB Data Sources

(2) NTIA GMF Monthly CD. The NTIA GMF is a Windows-based program that enables the user to query frequency assignment records by area, organization, or other GMF formatted data items. Spectrum managers who will be operating in or near the United States or its possessions use this program. This confidential CD includes all US government frequency assignments.

(3) JSC Area Studies. JSC area studies contain information on a country's physical and cultural characteristics and their civil telecommunications sector including frequency management; broadcasting; telephone, telegraph, and telex; data communications; aeronautical information; and transmission systems. Frequency assignment data is provided in both SFAF and spreadsheet formats. Additional SFAF records are provided on broadcast transmitters, along with navigational aids the JSC found were not registered with the ITU. Since 1995, these Area Studies have included SFAF records on international search and rescue (TABOO) frequency assignments.

b. Update Spectrum-Use Information. The frequency assignment information from the above data sources should be used as the foundation of the EMB; however, these sources do not always contain the most up-to-date spectrum-use information available. There are additional data sources that provide spectrum-use information, and there are methods that can be used to provide a more current picture of the EMB.

(1) SPECTRUM XXI Data Exchanging Capability. The SPECTRUM XXI Data Exchange module is used to electronically exchange frequency assignment data between regional servers and client computers. It is used to create AOIs as well as establish and manage the various necessary SPECTRUM XXI accounts (e.g., Oracle server accounts and Job Accounts) used for exchanging data between a networked client and a server. Data exchanging is the method that the JSME, the JTF components, and other spectrum management organizations use to stay abreast of new assignments or proposals that could affect their EMB.

(2) Joint Automated CEOI System. JACS is used to create the JCEOI, a directory of C2 radio nets consisting of radio call signs and frequencies for use by the warfighter. The JCEOI also includes challenge and password, as well as instructions for conducting visual communication. This program imports and exports data in SFAF and provides JCEOI information for input into either an OPTASKCOM or ATO message.

(3) Afloat Electromagnetic Spectrum Operations Program. AESOP is a combination of the Electromagnetic Compatibility Analysis Program (EMCAP) and Communications Planning Module (CPM). EMCAP is a Windows-based program, sponsored by the Navy, which provides radar frequency deconfliction within a carrier battle group or naval task force and between known land-based radars. This program maintains a database of emitters and can include non-Navy radars if the parametric data is available. This program provides an SFAF output. CPM is a Windows-based program that consists of applications to assist Navy communications planners. CPM maintains a database of nets (circuits) and, provided a frequency resource, will assign frequencies to those nets by applying required separation criteria and produce the OPTASKCOM.

The OPTASKCOM is the Navy equivalent of a JCEOI. CPM has the ability to import and export frequency assignment information in SFAF.

(4) MSE Network Planning Terminal /Integrated Systems Control. Network Planning Terminal (NPT) and the Integrated Systems Control (ISYCON) are Army-sponsored communications planning and engineering systems that, when provided a deconflicted frequency resource, assign interference-free frequencies to multi-channel radio relay systems. These systems will assign frequencies for LOS and TROPO radio systems. NPT can provide the component spectrum manager with an SFAF output of the radio network. ISYCON, the next evolution of Army communications planning software, has no SFAF output and does not interface directly with the joint spectrum management tools.

(5) Intelligence Sources. The Intelligence Community may be a source of spectrum-use information on adversarial and neutral forces, given their SIGINT capabilities. Joint Publication 3-51*, Joint Doctrine for Electronic Warfare,* states that information on adversary emitters and receivers should be provided to the spectrum manager. Also, Joint Publication 2-01.3, *Joint Tactics, Techniques and Procedures for Joint Intelligence Preparation of the Battlespace* (JIPB), discusses how the JIPB analyst must work closely with the spectrum manager to ensure the EMB is based on current adversarial and neutral forces information.

5. Know the Battlespace. As stated earlier, the frequency assignment database needs to be current, accurate, and complete, and each analysis will be based on the information gathered to define the EMB. Regardless of which approach was used to identify the AOI, the spectrum manager should be aware of the following issues, which could adversely affect the analysis results and performance time:

a. Missing SFAF Items. It is not uncommon for some frequency assignment records within the database to be missing critical SFAF items needed to perform an analysis: emission (item 114), transmitter power (item 115), antenna gain (items 357/457), and antenna feedpoint height (items 359/459). For analysis purposes, if a record is missing any of these items, SPECTRUM XXI will use the default values specified by the user's preferences based on the record's frequency. These default values may or may not accurately depict the emitter with the missing SFAF items. For example, a record for an air-ground assignment operating between 225-400 MHz missing the antenna gain would for analysis purposes use the initial default value of 8 dBi for the antenna or more than 4 times the actual radiated power leaving the antenna. Another example is that many FCC frequency assignment records for television (TV) stations are missing the emission designator (item 113) and the antenna gain (item 357). For analysis purposes, the initial default values would be used for these missing items. The initial default values greatly

misrepresent the actual emitters, where the VHF TV station actual bandwidth is 6 MHz wide, but the initial default value of only 16 kHz is used for analysis purposes; likewise the UHF TV station initial default bandwidth is only 6 kHz wide. As for the missing antenna gain for these TV stations, the initial default values of 5 dBi for VHF and 8 dBi for UHF greatly exaggerate the effective radiating power of the stations. Knowing the faults of the database and adjusting the initial default preference values will minimize the necessity for missing data.

b. Deleted History. When SPECTRUM XXI performs a data exchange, expired and deleted records are added to the frequency assignment database. Unless otherwise specified, expired and deleted records residing on the regional server that conforms to the user's selected AOI definition will be downloaded and identified as deleted history. These deleted history records are needed to update the initial FRRS and GMF database selects and, after the first data exchange, will be unnecessary bulk in the frequency assignment database--slowing down every analysis. To preclude these records from being included in a data exchange the following expressions should be included in the SPECTRUM XXI AOI definition:

```
========(START GROUP========
[Deleted History] == F
=========END GROUP)=========
```

c. FRRS vs. GMF vs. ITU. There are usually several frequency assignment records on the same emitter contained in the FRRS, GMF, and ITU databases. As mentioned earlier, the greater the number of records in the frequency assignment database, the longer it will take SPECTRUM XXI to perform each analysis. A good number of permanent DOD frequency assignments are in both the FRRS and GMF databases, with the FRRS records containing more information. With this in mind, all DOD records with a records source equaling GMF should be purged from the frequency assignment database, and to preclude them from being downloaded via a data exchange, the SPECTRUM XXI AOI definition should contain the following expressions:

```
========(START GROUP========
[Record Source] == FRRS
==============OR============
========(START GROUP========
[Record Source] == GMF
=============AND============
[102-Agency Serial Number] Not in Set 'N  ','AR  ','AF  ','NS  '
=========END GROUP)=========
```

In addition to the FRRS versus GMF issue, there is the probability of duplicate frequency assignments between the GMF and ITU databases. This probability is based on the theory that the frequencies the United States registers with the ITU are assignments outlined in the GMF database. These duplicate records should be removed from the frequency assignment database by querying and purging records with a record source equaling ITU and where the transmitter or receiver state country code is either US or one of the codes used for US possessions, like PR for Puerto Rico and VI for the US Virgin Islands.

d. Protect Spectrum-Use Information. Since the information collected while defining the EMB is invaluable and used in every analysis, the JTF spectrum manager must safeguard it. The SPECTRUM XXI archive manager should be used to backup and restore the database files should they become corrupt or lost. Using the archive manager, the spectrum manager can create and name archive files and save them to a user-defined folder. These archive files are created by compressing (zipping) all the files in the \SXXI\DBFS folder and saving them to a single file. The archive files serve only as backups for the databases not for the software. An archive should be performed immediately after establishing the initial databases and then periodically to backup the databases when significant changes are made. In most cases, it should be two or three times a week. This procedure takes only a few minutes to complete and could save hours if the databases become corrupted. It is recommended that the archive files be stored on a different computer or even at a different location, as a safeguard in the event that the computer itself is lost or corrupted.

e. Environmental Parameters. The environmental parameters of the AOR affect the way in which frequencies propagate within the electromagnetic spectrum. These parameters impact the path-loss calculation made by the SPECTRUM XXI interference analysis and path-loss modules and will have a significant impact on the analysis results. The values selected under SPECTRUM XXI preferences should be changed to reflect the battlespace geography of the area for which the analysis will be performed. There are two categories of environmental parameters, ground and atmospheric.

(1) Ground Parameters. The ground parameters affect the path-loss calculation and should be changed each time an interference analysis or path-loss calculation is made for a different geographical area. Table D-D-5 contains the seven possible ground types and their associated conductivity and permittivity values. Set the parameter that best applies to the AOI.

Ground Type	**Conductivity in Seimens per meter (S/m)**	**Permittivity**
Fresh Water (20 C)	0.00600	80.0
Ice (Fresh Water-1	0.00002	3.0

Ground Type	Conductivity in Seimens per meter (S/m)	Permittivity
C)		
Medium Dry Ground	0.02780	15.0
Pure Water (20 C)	0.00500	80.0
Sea Water (20 C)	5.00000	70.0
Very Dry Ground	0.00100	3.0
Wet Ground	0.01200	30.0

Table D-D-1. Electrical Earth Properties of Various Ground Types

(2) Atmospheric Parameters. Atmospheric parameters differ throughout the world and affect radio wave propagation. These parameters should be changed to reflect the conditions at the location for which an interference analysis will be performed. These atmospheric parameters are refractivity, humidity, and man-made noise levels.

(a) Refractivity. Radio waves propagating in free space follow a straight-line path. However, in passing through the Earth's atmosphere, the waves tend to bend along a curved path. This phenomenon is termed tropospheric or atmospheric refraction. This affect is influenced by changes in atmospheric pressure, temperature, and humidity at different altitudes. The variation of refractivity with altitude is referred to as the refractivity gradient. The refractivity gradient causes the curved path of the electromagnetic wave. Propagation models, such as the Terrain-Integrated Rough Earth Model (TIREM) and the Spherical Earth Model (SEM) used in SPECTRUM XXI, calculate the appropriate refractivity gradient and use it to calculate the Earth radius factor for the entire propagation path. Based on the climate of the battlespace, select the appropriate refractivity values as listed in Table D-D-6.

Climate	Refractivity
Equatorial	360
Continental Subtropical (Sudan)	320
Maritime Subtropical	370
Desert	280
Continental Temperate	301
Maritime Temperate, over land	320
Maritime Temperate, over sea	350

Table D-D-2. Refractivity Values in Various Climates

(b) Humidity. The amount of water vapor molecules in the atmosphere determines the overall humidity in an environment. Water vapor causes absorption of electromagnetic energy at millimeter (mm) wavelengths. Absorption is typically considered a factor in predicting the propagation loss for frequencies above 10 GHz. Humidity is measured in grams per cubic meter,

and Table D-D-7 lists these values for various climate types. Select the appropriate value that best characterizes the battlespace.

Climate	**g/m³ Setting**
Very Dry	0.0
Dry	2.5
Average	5.0
Humid	10.0
Very Humid	50.0

Table D-D-3. Absorption Factors in Various Climates

(c) Man-Made Noise. Man-made noise has an impact on the interference calculation and should be set to match the local conditions for which the interference analysis will be performed.

1. Rural – Quiet: Used for rural (country) areas.

2. Residential – Average: Used for suburban areas (area outside the city).

3. Urban – Noisy: Used for urban areas (area inside a city or town).

(3) Terrain Elevation Data. Terrain elevation has a significant impact on the distance signals can propagate within the EMB. The TIREM propagation model in SPECTRUM XXI uses elevation data to calculate transmission loss over irregular terrain. However, it should be noted that terrain elevation is not considered whenever either the transmitter or receiver is afforded some radius of operation listed in SFAF items 306 or 406. In other words, a mountain range separating a mobile system from a fixed system would not exist for analysis purposes.

(a) TIREM uses the terrain elevation information processed by the Topographic Manager (TOPOMAN) module in SPECTRUM XXI. TOPOMAN converts and stores Level-1 Digital Terrain Elevation Data (DTED) from the National Geospatial Intelligence Agency (NGA) in compatibly formatted files. Much of Level-1 DTED from NGA is derived from maps that portray the Earth smoother than it is, softening and omitting many features and terrain irregularities. It should be noted that DTED does not reflect the presence of trees or other obstacles, such as buildings, and may contain blank areas that reflect missing elevation data. The JSC has processed the NGA DTED on most of the world at 15-second spacing, and this data is available on their Topographic Data System (TOPODATS) CD.

(b) The NGA terrain elevation information can be processed by TOPOMAN at a spacing of every 3, 6, 12, 15, or 30 seconds. These processed

files can become very large, and if available hard disk space is an issue, note that each increase in spacing significantly decreases the hard disk storage requirements for the data. For example, the size of a file containing terrain data at 3-second spacing is 25 times larger than a file for the exact same area at 15-second spacing. Studies have shown that the use of 15-second versus 3-second data reduces input/output times of the application program by as much as five to one with a negligible loss in accuracy of the prediction.

ANNEX A TO APPENDIX D TO ENCLOSURE D

SUPPORT AGENCIES AND INFORMATION SOURCES

1. Joint Spectrum Center

a. Combatant Command Support Teams. The JSC support teams provide spectrum management assistance or support to the combatant commands and JTFs. Support includes: JCEOI training, JRFL training, background database support, and spectrum management training using SPECTRUM XXI software. The team is staffed with seven noncommissioned officers (two Navy, two Army, two Air Force, and one Marine Corps). For additional information contact JSC Support Team, DSN 281-9815, commercial (410) 293-9815/3763 (Fax); NIPRNET E-mail operations@jsc.mil.

b. JSIR Team. The JSC's JSIR team will analyze and recommend corrective action for reported interference problems by first using the JSC and JSIR databases, analytical tools, and then, if needed, by providing personnel and equipment to perform on-site direction finding, equipment testing, and problem solving. If the assistance is requested for electronic attack incidents, the JSC JSIR office will coordinate analysis, collection, and field support activities with the appropriate agencies. To request assistance from the JSC JSIR Team, contact the JSC Duty Officer at DSN 281-9857, commercial (410) 293-9857, NIPRNET E-mail operations@jsc.mil.

c. Area (Country) Studies. Area studies provide information concerning the physical, cultural, and civil telecommunications characteristics of countries selected by the Joint Staff.

(1) Specific items addressed include: frequency management, broadcasting, telephone, telegraph, telex, data communications; aeronautical information; maritime communications; transmission systems (HF, VHF/UHF, SHF, satellite); frequency assignments, frequency assignment site maps, frequency assignment histograms for the 0.2-0.5, 2-30, 30-88, 225-400, 406-450, 600-900, 1350-1850, 4400-5000, 7250-8400, and 14500-15350 MHz frequency bands; as appropriate. The reports also contain frequency allocations for the 0.2-0.5, 2-30, 30-88, 138-174, 225-400, 406-450, 600-900, 1350-1850, 4400-5000, 7250-8400, and 14500-15350 MHz frequency bands; general propagation information for reliable in-area and long-haul communications; groundwave planning ranges, predictions of maximum usable frequencies for short-distance HF skywave communications, HF Defense Communications System (DCS) entry reliabilities, magnetic azimuths and distances from in-area site to selected HF DCS entry stations, and look angles from in-area sites to selected geostationary satellites. Area studies are produced on CD-ROM or as printed documents on a case-by-case basis. The

CD-ROM contains files of civil frequency assignments, aeronautical frequency assignments, and broadcast frequencies in vertical SFAF format for use with SPECTRUM XXI. Included with the printed reports are two 3.5-inch high-density floppy disks containing the same files as the CD-ROM.

(2) JSC area studies are compiled from unclassified sources, are "For Official Use Only," and are authorized for release to USG agencies only. JSC area studies cannot be released outside the Department of Defense without permission from the JSC. A list of countries for which studies have been completed is provided in Table D-D-A-1. For information, contact the JSC area studies team at DSN 281-2217, commercial (410) 293-2217. To receive current area studies, contact the JSC Operations directorate at (410) 293-9814, NIPRNET e-mail operations@jsc.mil.

COUNTRY/YEAR REPORT COMPLETED			
COUNTRY	YEAR	COUNTRY	YEAR
AFGHANISTAN	2001	LIBERIA	1998
AFRICA (SOUTH)	1995	LIBYA	1995
ARGENTINA	2001	MACAU	1991
AUSTRALIA	2000	MACEDONIA	1999
AZORES	1991	MALAYSIA	1996
BAHRAIN	2003	MARSHALL ISLAND	1994
BANGLADESH	1993	MAURITANIA	1992
BARBADOS	1989	MEXICO	1997
BERMUDA	1988	MICRONESIA	1994
BOLIVIA	1991	MOROCCO	1992
BOSNIA-HERZEGOVINA	1999	NEPAL	1988
BRAZIL	1984	NEW CALEDONIA	1991
BRUNEI	1991	NEW ZEALAND	1991
BULGARIA	1999	NICARAGUA	1991
BURMA	1988	NIGER	1987
BURUNDI	1995	NIGERIA	2001
CAMBODIA	1991	NORWAY	1990
CANARY ISLANDS	1991	OMAN	1997
CHAD	1987	PAKISTAN	1996
CHILE	1984	PANAMA	1989
CHINA	1997	PAPUA NEW GUINEA	2003
COLOMBIA	1997	PARAGUAY	1990
CROATIA	1999	PERU	1996
COSTA RICA	1992	PHILIPPINES	2000
CUBA	1995	PORTUGAL	1983
CYPRUS	2001	POLAND	1998

COUNTRY/YEAR REPORT COMPLETED			
COUNTRY	YEAR	COUNTRY	YEAR
CZECH REPUBLIC	1997	PUERTO RICO	1988
DENMARK	1990	QATAR	1998
DIEGO GARCIA	1991	ROMANIA	1998
DJIBOUTI	2003	RWANDA	1992
DOMINICAN REPUBLIC	1999	SAUDI ARABIA	2001
ECUADOR	1997	SENEGAL	2001
EGYPT	2002	SEYCHELLES	1991
EL SALVADOR	1989	SINGAPORE	1993
ETHIOPIA	1986	SLOVAKIA	2003
FIJI	1994	SLOVENIA	1999
FRENCH GUIANA	1983	SOLOMON ISLANDS	1994
GAMBIA	1982	SOMALIA	1993
GEORGIA	2000	SPAIN	1992
GREECE	1983	SRI LANKA	1993
GUATEMALA	1992	SUDAN	1996
GUYANA	1998	SURINAME	1983
HAITI	1996	SYRIA	2001
HONDURAS	1998	TAIWAN	1996
HONG KONG	1991	TANZANIA	1979
HUNGARY	1997	THAILAND	1993
ICELAND	1991	TOBAGO	1988
INDIA	2000	TRINIDAD	1988
INDONESIA	1996	TRUST TERRITORY PACIFIC	1985
IRAN	2003	TURKMENISTAN	2000
IRAQ	2002	TUNISIA	1992
ISRAEL	2003	TURKEY	1993
ITALY	1992	UGANDA	1998
JAMAICA	1988	UNITED ARAB EMIRATES	2003
JAPAN	1998	URUGUAY	1990
JORDAN	2002	UZBEKISTAN	2000
KAZAKHSTAN	1999	VENEZUELA	1999
KENYA	1994	VIETNAM	1992
KOREA (NORTH)	1996	VIRGIN ISLANDS	1988
KOREA (SOUTH)	1997	WESTERN SAHARA	1992
KUWAIT	1998	YEMEN (NO/SO)	2002
LAOS	1992	YUGOSLAVIA (FORMER)	1995
LATVIA	1997	ZAIRE	1979
LEBANON	2001	ZAMBIA	2001

Table D-D-A-1. JSC Area Studies

d. HF Predictions and Propagation Studies. The JSC provides HF prediction and propagation studies to Military Departments to enable the user to determine circuit reliabilities for the most combinations of power, emission, and antennas. Additional information can be obtained from the JSC at DSN 281-2814, commercial (410) 293-2814.

e. Frequency Resource Record System (FRRS), Distributed Computer Facility (DCF), and SPECTRUM XXI. The FRRS is a frequency record-keeping system managed by the Military Communications-Electronics Board (MCEB) and used by DOD frequency managers who require frequency data and background electromagnetic environmental information. The FRRS is comprised of the Central Computer Facility (CCF) and the DCF, both located at the JSC, Annapolis, Maryland. The DCF can access the CCF and contains, among other things, one of several computer network servers worldwide operating SPECTRUM XXI server software. DOD frequency managers access the DCF using the SPECTRUM XII client software application, thus ensuring the effective and efficient use of the electromagnetic spectrum. Area combatant commands can provide information on the requirements for establishing a user account on the FRRS within their AOR. SPECTRUM XXI client software application will be the DOD standard spectrum management system and will be used at all levels of spectrum management operations (i.e., from tactical to sustaining base operations).

2. Joint Information Operations Center. JIOC was established in October of 1999. JIOC is a direct reporting command to USSTRATCOM and serves through USSTRATCOM as the principal field agency for planning IO. The JIOC supports the integration of the constituent capabilities and related activities of IO operations security (OPSEC), PSYOP, military deception, EW, destruction, and others in joint plans and operations. Direct support is provided in the following priority order: JFCs (combatant commanders, subordinate unified commanders, and JTF commanders), functional component commanders, and Service component commanders. Support is also provided to the Office of the Secretary of Defense, the Joint Staff, Military Services, USG agencies, NATO, and allied nations. For more specific information contact the JIOC Deputy Director for Operations at DSN 969-2911.

3. National Geospatial-Intelligence Agency. NGA provides Digital Terrain Elevation Data (DTED) Level-1 for use with SPECTRUM XXI Topographic Manager and Arc-Second Raster Chart digitized raster graphic (ARDG) formatted map data that is used for various engineering tools, to include the Mobile Subscriber Equipment Network Planning Terminal. NGA also produces the DOD flight information publication (FLIP), which provides a good source for worldwide communications at airport facilities. Information on NGA products may be obtained by calling the NGA Customer Help Desk at 1-800-455-0899,

commercial (314) 260-1236, DSN 490-1236, FAX (314) 260-1128, NIPRNET e-mail queries@nga.mil, Internet Home Page http://www.nga.mil.

4. US Strategic Command. USSTRATCOM publishes in message form the "Monthly Blue Space Order of Battle," which provides position and other related satellite data. For information and distribution of the Blue Space Order of Battle, contact USSTRATCOM at DSN 692-5084.

5. Air Force Space Forecaster Center and National Oceanic and Atmospheric Administration. The Air Force Space Forecaster Center, in conjunction with the National Oceanic and Atmospheric Administration, transmits a daily solar and geophysical activity summary via AUTODIN message. This message includes the 10.7-cm daily solar flux value obtained from the observatory in Ottawa, Canada. For information call DSN 560-6264/6311, commercial (719) 567-6264/6311.

6. Background Database Information and Database Support

a. Frequency Resource Record System. The FRRS CD-ROM database contains some DOD records that are assigned worldwide. The CD-ROM is classified CONFIDENTIAL. For information and distribution, contact JSC database support at DSN 281-2511, ext. 7743, or commercial (410) 573-7743.

b. Government Master File (GMF). The GMF CD-ROM database contains government frequency assignment records within the United States and its possessions (US&P) that have been assigned by the interdepartment radio advisory committee (IRAC). This CD-ROM is classified CONFIDENTIAL. For information and distribution, contact the National Telecommunications and Information Administration at (202) 482-1132.

c. Federal Communications Commission (FCC) Records. The FCC CD-ROMs contain nongovernment records within the US&P. These records are available on CD-ROM by FCC region. These records are unclassified. For information and distribution, contact JSC database support at DSN 281-2511 ext. 7743 or commercial (410) 573-7743.

d. International Telecommunications Union. The ITU CD-ROM database contains records from the International Frequency List (IFL). Nations that have notified and registered their frequency assignments with the ITU are contained on this CD-ROM. For information and distribution, contact JSC database support at DSN 281-2511, ext. 7743, or commercial (410) 573-7743.

e. NATO Frequency Management Subcommittee (FMS) and/or Master Radio Frequency List (MRFL). The MRFL database contains NATO frequency assignment records that have been converted from 14 point format to vertical

SFAF records. For information contained in the FMS and/or MRFL records, contact JSC database support at DSN 281-2511, ext. 7204, or commercial (410) 573-7204.

7. Commercial Sources. The World Radio and TV Handbook provides information on international radio and television broadcasting stations as well as amateur radio stations. This book is published by Billboard Books and is available at bookstores. For information concerning this publication, write to BPI Communications, 1515 Broadway, New York, NY, 10036.

APPENDIX E TO ENCLOSURE D

OBTAIN SPECTRUM RESOURCE

1. Overview This Appendix addresses the fundamental processes of requesting and obtaining spectrum resources to support a JTF. Once spectrum requirements have been defined, the spectrum manager must decide how to acquire the spectrum necessary to meet these requirements. This chapter outlines the processes of requesting spectrum resources, determining spectrum resources, and managing acquired spectrum resources. This section discusses host-nation (HN) considerations; coalition/combined issues are discussed in Enclosure E.

2. Getting Spectrum Resources. The electromagnetic spectrum is considered a national resource for all HNs. To obtain spectrum resources, the spectrum manager has two options: request support from the appropriate HN or determine a spectrum resource based on the defined EMB. The method will be dictated by the situation that caused the need for a JTF. For operations other than forced entry (FE), the spectrum manager must coordinate with the local HN. Portions of a FE operation utilize the second method and require more time in researching and determining the background EMB.

3. Requesting Spectrum Resources. To request spectrum support, the spectrum manager should use coordination channels established by the unified combatant commander or JTF J-5. Initial contact should be made in coordination with the J-5, as they have the resources, i.e., translators, points of contact (POC), etc. All correspondence, both written and verbal should be formal. Prior to meeting with HN representatives, the spectrum manager should review the JTF spectrum request for information that may not be released to the HN. Coordination with the JTF J-2 for foreign disclosure guidance is imperative. Classified equipment characteristics, exercise/operation objectives, the involvement of certain types of forces, and how some systems are employed are examples of unreleasable information.

a. What to provide to the HN. The HN representative should outline what information is required and in what format, frequency requests should be submitted. Details to be coordinated with the HN representative include the following: where should the spectrum manager send requests, what is the real-time need to submit requests, and how long should it take for the HN to respond to requests. POC information should include voice and fax phone numbers, mailing addresses, e-mail addresses, full names of the primary POC, and the names of any appropriate staff action officers. Some HNs prefer to use nominated candidate frequencies for evaluation, which the spectrum manager can either accept or reject, rather than to conduct an analysis. If the HN asks the spectrum manager to nominate candidate frequencies, then the spectrum manager should nominate at least a two-to-one ratio for each requirement.

(1) The JSME spectrum manager should provide an example format with the frequencies being requested, locations, time being used, station class, emission, power, and antenna gain. The spectrum manager should inform the HN of the automated spectrum management tool available and how the tool can nominate available frequency assignments. The spectrum manager should clearly state it is the JSME's intention to protect the HN's interest as well as those of the US military. If the initial meeting goes well, the HN may give the spectrum manager a larger frequency resource to manage.

(2) The spectrum manager should expect to be asked to provide follow-up information that explains how certain systems operate and why the number of frequencies is being requested. Questions from the HN should be treated with importance and answered promptly. There will be questions regarding how the spectrum manager's frequency assignment system handles specific situations. Language barriers should be considered whenever there is an information exchange; clarifying questions and answers are a part of good coordination.

b. What to Expect Back From the HN. HN responses to request for spectrum vary from country to country and depend upon the HN's internal priorities and political views. Responses will most likely be written and formal. The disadvantage to this method is trying to manually enter information into the allotment plans. Some nations are slow to respond, for example cases of humanitarian assistance, and circumstances may require the spectrum manager to make frequency assignments to support the operations before receiving authorization to transmit. Less developed countries are often least responsive and not accustomed to providing rapid responses to frequency requests.

4. Seizing Spectrum Resources

a. Forced entry operations, or any operation that is not conducted with the expressed approval of the HN, or operations conducted in countries without a functional government, all require the JTF manager to determine the available spectrum resource. The JTF EWO or EWCC, if activated, is a primary participant where spectrum will be used under such circumstances. Determining the spectrum resource without the aid of the HN requires much more research and analysis than just requesting it from an HN. Begin by considering how the HN uses the electromagnetic spectrum in the frequency bands needed by the JTF. A copy of the HN spectrum allocation table would be ideal but may not be available, leaving with only with the appropriate ITU region allocation tables. If this information is unavailable, the spectrum manager should contact the J-2 who compiled the JIPB electronic EOB, which should include similar information. Conversely, the J-2 should be contacting the JSME for information on friendly force spectrum use to include in the JIPB. For help in assessing HN spectrum use, the spectrum manager should

consider contacting the JSC Operations Division and the EWCC for assistance in developing the EMB for a specific HN. The JSC Operations Division can provide reach-back assistance to the JSME. This assistance varies upon where the JTF is operating in the world but should not be overlooked as an information source.

b. The SPECTRUM XXI spectrum occupancy plot capability can identify where, within the electromagnetic spectrum, the spectrum manager has areas to nominate. The spectrum occupancy plot provides the spectrum manager with a visual representation of spectrum use at a given location based upon the information in the assignment database. This plot is only as accurate as the information contained in the assignment database. Additionally, the plot does not consider area assignments, as they are not definable by location.

c. Once the spectrum manager determines what spectrum is available, then a comparison of what is available can be made against the specific requirement. The spectrum manager should realize coordination is almost always required with neighboring countries and should devise and present a plan for using the spectrum resource efficiently.

d. Interference reporting is critical in an FE operation, as the interference may be from indigenous spectrum-dependent systems that the JSME is not aware of and that may be susceptible to interference as well. Unintentional disruption of indigenous systems may create danger-to-life situations.

e. Determining the spectrum resource should only be performed at the JSME. Any resources obtained using this method should be placed in allotment plans and utilized or provided to subordinate units in an allotment plan format. This process controls the parameters used in determining the spectrum resource and reduces the probability of error. The JTF assignment authority is the JTF commander and since the JSME acts as the designated representative for that function, all frequency resources should be managed and validated by the JSME.

f. The idea of using known enemy frequencies as a resource can be considered, because it may be a resource that the enemy would be reluctant to jam for fear of causing interference to their own operations. While enemy operations may cause interference to the JTF operations they will also be accepting the same. Such use of enemy spectrum must be coordinated with the EWCC.

5. Managing Spectrum Resources (Allotment Plans and Internal Assignments). Documenting and tracking the available frequency resource is an ongoing task. Regardless of how the spectrum manager obtains frequency resources, a record of what is authorized must be maintained. This record is kept by identifying the resource in allotment plans. SPECTRUM XXI enables the spectrum

manager to access a resource for use in the nomination process as well as for use by the frequency scheduler.

a. Centralized spectrum management is where the JSME does not delegate assignment authority and makes all frequency assignments. Using this method of spectrum management, tracking the spectrum resource is easier as a single user of the resource. However, SPECTRUM XXI does not have a method for querying the allotment plans. The only way to locate a particular frequency is through manual searching of each allotment plan.

b. Decentralized spectrum management is performed by delegating frequency assignment authority to subordinate unit spectrum managers under specific conditions. One of these conditions is that a data exchange must be performed prior to making any frequency assignments. Another condition is that a data exchange be performed upon making a frequency assignment, or group of assignments. In this event, the spectrum manager should contact other spectrum managers and let them know that the JTF is making a large number of assignments and that they should refrain from making assignments in a specific band until a data exchange has been performed. The units delegated assignment authority must also be given a frequency source from which to make assignments.

c. The JSME must have some way to track the frequencies provided to the subordinate units that can be queried. The recommended method is to create frequency assignment records for the delegated allotment plan, identifiable by a unique SFAF entry, and load them into the assignment database. These records would be temporarily assigned and not data exchanged. When querying these records or performing an interference analysis that includes one of these records, the result will include the allotment plan records. If performing an interference analysis, notification will be made that a frequency that has been provided as a frequency resource to subordinate elements is possible source of interference. At this point, the spectrum manager should research and determine if the units provided with that spectrum resource have been performing data exchanges as required and are the cause of the interference. Ideally there will be two records, one from the allotment plan and one indicating an actual temporary assignment made by the subordinate unit.

6. <u>How to Divide Out the Resource</u>. Resources are provided based upon need, and the users should have submitted a request for spectrum that drove the need to develop a resource for them. There is more than one way to provide these units with resources and still oversee the overall resource. Providing each unit with a unique spectrum resource would allow the JSME to know exactly who has what frequency and where they are using it. This method of spectrum resource management is one of the least efficient and usually results in each unit not having enough resource to accomplish its mission. A more efficient method would be to provide each unit with a small resource of specific

frequencies and then provide the majority in a shared allotment plan, requiring that all JTF spectrum managers perform an assignment data exchange prior to making an assignment.

7. SINCGARS Hopset Generation. Frequency Resources need to be considered prior to making any assignments, a plan of how to best utilize the available spectrum resource cannot be created after making the majority of frequency assignments in a band. Typical instructions methods for JACS have the student developing the hopset after generating the JCEOI. While this facilitates the instructional process for that software it reflects poor frequency management practice and should be reordered.

a. The hopset frequencies are usually used as part of the frequency resource to generate the JCEOI cue and manual frequencies. If you do not create the hopset first, then you would have to have a completely separate frequency resource in the 30-88 MHz band for the JCEOI cue and manual frequency assignments.

b. A hopset must be created to support SINCGARS frequency hopping nets. This task involves requesting, receiving, and processing the available frequency resource provided for SINCGARS hopping. When requesting frequency resources for combat net radio you must identify a need for a frequency hopping resource as well as for your MNL cue and manual frequency requirement. While these requirements may be met by the same resource there are many possible reasons while they may not be allowed to be used by both.

c. SINCGARS is a VHF-FM frequency radio, which can be used, in the single channel or a frequency-hopping (100 hops per second) mode. The frequency-hopping (FH) mode is dependent on the electronic fill information provided by JACS generated load sets. The electronic fill information couple with time determines SINCGARS frequency hopping parameters. The JACS workstation supports the generation of SINCGARS hopsets to be used in the SINCGARS radio. A SINCGARS hopset is a set of frequencies available for frequency hopping operations. The maximum number of frequencies that the SINCGARS radio can hop on is 2,320 (30.000 to 87.975 MHz with 25 kHz separation). Hopsets are electronically loaded into the radio with a Data Transfer Device (DTD) AN/CYZ-10 fill device using the Common Tier 3 (CT3) application software. SINCGARS has the capability of storing different hopset in each one of the six FH channels.

d. Normally the size of a hopset depends on the frequencies available in a geographical region. Generally, the larger the number of frequencies and wider the distribution across the SINCGARS frequency range (30.000 to 87.975 MHz), the better SINCGARS will perform when frequency hopping. The minimum size for an effective hopset is situation dependent. Hopset performance is a

function of many factors to include interference from friendly emitters, other electromagnetic interference, and the enemy's electronic attack (EA) capability. Typically, hopsets of 700 or more frequencies, spread across the SINCGARS frequency range, will adequately support both voice and data FH operations. As the hopset size decreases, FH performance rapidly degrades, and data over FH nets may receive too many errors to be successful. Frequency managers need to understand the importance of maintaining an adequate number of frequencies, why and how lockouts are created, and to be able to request a spectrum resource that will better accommodate SINCGARS hopset creation.

e. To create the SINCGARS hopset JACS and the SINCGARS radio assumes that the radio will have the entire frequency spectrum between 30 – 87.975 MHz, all 25 kHz tunable frequencies to hop on. To reduce this frequency range to the actual authorized frequencies JACS has to create lockouts that prohibit the use of certain channels. Lockouts are computer language lists that identify those frequencies of the 2,320 in the radio that were not selected or are not available for FH. If a hopset is overly complex, the memory required to process the FH data may exceed the radio's basic channel memory capacity. The SINCGARS radio has additional memory storage space available in the form of lockout sets. Lockout sets come in two types, common and assignable, and are used to define frequency restriction imposed upon one or all of the hopsets in the radio. The SINCGARS radio can store up to eight lockout sets.

f. Common lockouts are additional memory cells that can be used when a hopset's memory requirement exceeds the channel's capacity. Common lockouts are restrictions that are common to all six channels in the radio, and are assigned to lockout series positions one through six. Lockouts L1-L6 are helpful in managing complex hopsets, since one-memory storage space influences all six E-sets. Common lockouts may be added to the radio's memory during the initial fill or during subsequent electronic remote fills (ERF's) from the NCS. The disadvantage of common lockouts is that they restrict the flexibility of the NCS to rapidly and easily transmit FH data to new units attempting to enter the net. The use of common lockouts also creates a loss of interoperability between radios that are using different common lockout sets. It is advised if possible not to use common lockouts.

g. Assignable lockouts are found in series position seven and eight (L7 and L8) of the SINCGARS radio. Assignable lockouts are useful in restricting frequencies on selected channels. Like common lockouts, assignable lockout sets restrict the NCS from easily transmitting FH data updates to outside units operating on different hopsets. Radios using different assignable lockouts may establish communication if their shared circuit does not require common or assignable lockouts.

8. Multiple Subscriber Equipment. MSE provides the tactical US Army with a secure, automatic, highly mobile, quickly deployable, survivable, tactical

communications system capable of passing data, facsimile, and voice traffic throughout the division and corps area of operations. This concept is represented in Figure D-E-1.

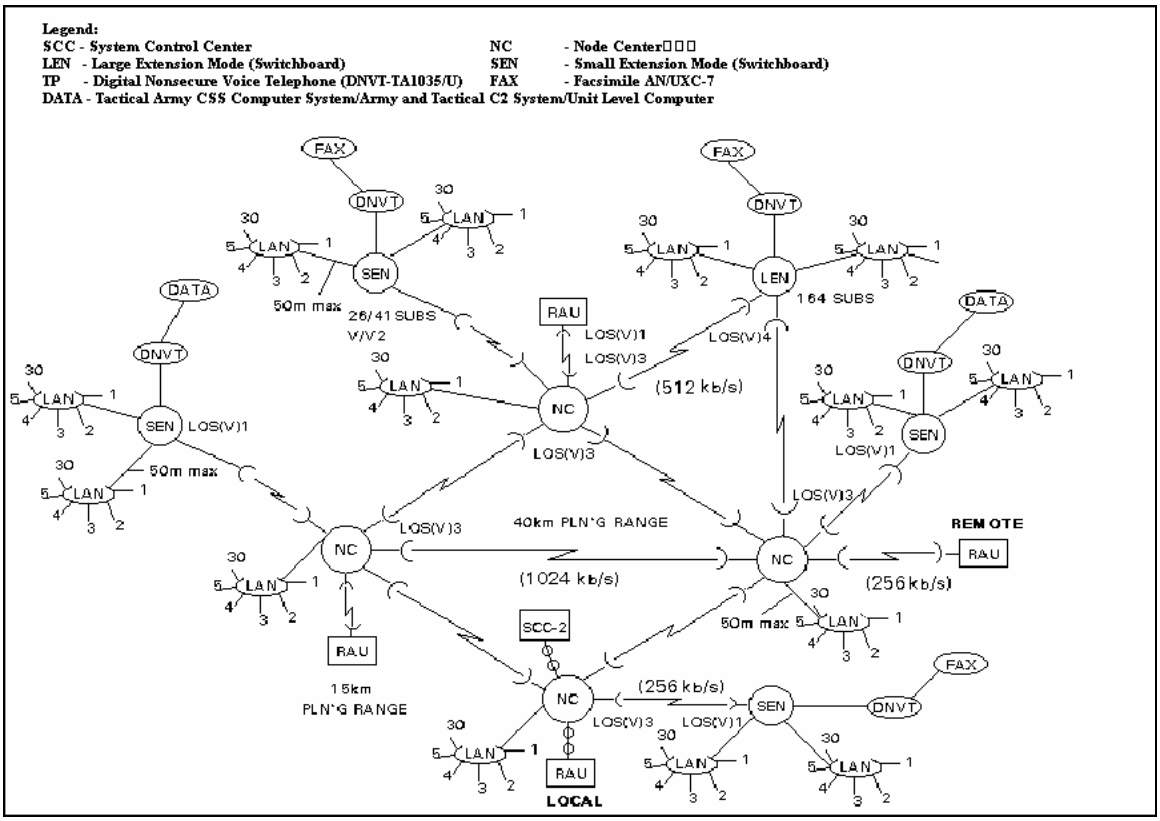

Figure D-E-1. MSE SCHEMATIC

a. MSE Characteristics. The MSE equipment requirements are integrated into five functional areas. Subscriber terminals provide the voice and data elements to interface with other functional areas of the MSE system. Mobile subscriber radiotelephone terminals (MSRT), working with the radio access unit (RAU), permit mobile and stationary users to automatically communicate secure voice and data throughout the tactical area of operations. Wire subscriber access allows non-radio users entry to the MSE system through concentrations of automatic switching equipment. Area coverage of the battlefield from mobile or fixed locations is achieved through secure automatic switching, continuous coverage, and the ability of commanders and staff to retain the same telephone number/frequency regardless of location.

b. MSE RAU/MSRT. The RAU/MSRT operates in the same frequency band as does SINCGARS, which has been found to be an interference source to the MSRT based upon proximity and relative size of the hopset. Since both the MSRT and SINCGARS are mounted upon many of the same vehicles the frequency resources for both should be deconflicted.

c. SINCGARS Hopsets. Before SINCGARS hopsets may be generated, the resource manager (RM) resources, must have been requested and created, and a CNR folder must exist within a plan. To optimize the allocation of frequencies between SINCGARS hopsets and the MSRT of MSE, the operator must consider the implications of assigning frequencies from the same VHF-FM spectrum.

d. MSRT/MSE. MSRT/MSE is very sensitive to electromagnetic interference (EMI) and attempting to use the same frequencies for SINCGARS and MSRT/MSE may not be appropriate in some operational scenarios. When frequencies are removed from the resource for MSE assignment, additional lockout words may be required to implement the remaining resource in the SINCGARS radio. These additional lockout words may require the use of common lockout.

ANNEX A TO APPENDIX E TO ENCLOSURE D

ALLOTMENT PLAN

1. An allotment plan identifies small bands or groups of frequencies within a specified spectrum-use plan for use by a specific organization or for a particular function. The use of an allotment plan enables the joint force commander to maintain overall control of spectrum use in the AOR, and at the same time decentralizes authority to the lowest level.

2. Allotment plans are normally developed for, but not limited to, HF (2-30 MHz), VHF (30-88 MHz and 118-174 MHz), and UHF (225-400 MHz) bands. The frequency allotments in each of these plans must be based upon a ratio of air, land, and sea forces for a particular operation or mission and an assessment of their spectrum requirements. Planners should consider spectrum-use restrictions when developing an allotment plan.

3. Planners obtain the spectrum-use requirements on which the allotment plan is based are from the J-2, J-3, and J-6 staff elements and components; the JCEOI net list; and any UN, allied, or coalition forces, if known. When developing an allotment plan, the developer must consider joint and/or multinational-force equipment capabilities, host-nation allocations and restrictions, RF requirements for wide area assignments, jam-resistant equipment, navigational aids, wartime reserve mode (WARM); and equipment that requires specified frequencies.

4. JFMO/JSME planners must evaluate all requirements in the allotment plan for electromagnetic compatibility (EMC) and eliminate any potential conflicts. If not all of the requirements can be satisfied, the EWCC must attempt to resolve conflicts based upon operational priorities. The EWCC will refer the situation to the J-3 if it cannot resolve the conflict.

5. The following details the steps for creating an allotment plan.

a. Is there an existing channeling plan for the frequency band?

(1) Yes. Begin development of allotment plan at paragraph 4.

(2) No. Begin development of allotment plan at paragraph 2.

b. Divide band into individual channels (uniform bandwidths or mixed).

c. Begin with all channels in the band as candidates.

d. Block known existing and/or denied frequency assignments:

(1) Allocated for other or special use, e.g., NAVAIDS (instrument landing system glide-slope).

(2) US permanent frequency assignments in AOR.

(3) IFL listings in and within interference distance of AOR.

(4) HN and/or neutral nation frequency use.

(5) US, UN, and coalition forces' specific frequency requirements.

(a) Satellite frequencies.

(b) Fixed-frequency equipment.

(c) Special frequency complements (e.g., spread-spectrum, wideband network, hopsets, etc.).

(d) Frequencies for JTF HQs and/or JCS-controlled assets.

(e) Other frequencies as required.

e. Identify US and coalition forces' spectrum-use requirements (Requirements should be presented in numbers of nets, circuits, etc., for translation into the number of frequencies required).

f. Analyze requirements for separation distances (minimum and maximum), channel size(s) and bandwidth(s) requirements.

g. Determine percentage requirements for coalition and component forces based upon requirements.

h. Prioritize links and systems to be supported in the event of insufficient spectrum resource.

i. Allot remainder of available channels to participating forces based upon percentage of requirements.

j. An allotment plan is usually conveyed to the user in a simple format that contains a listing of the frequencies derived through the (process described above) and preceded by a paragraph specifying all restrictions applying to the allotted frequencies, e.g., transmitter power, authorized emission and bandwidth, geographical location, maximum transmitter altitude, function, etc.

APPENDIX F TO ENCLOSURE D

DEVELOP THE SPECTRUM MANAGEMENT PLAN

1. Spectrum Management Plan. When the JSME is created, the development of the spectrum management plan begins. The spectrum management plan is the documented form of the spectrum management concept as it applies to the existing combatant commander's spectrum management directives, with necessary modifications as needed, to support the JTF mission. It provides guidance on how spectrum management operations are to be conducted in support of the JTF.

a. This plan provides policy guidance and direction to the JTF Services and functional components, JTF staff elements, supporting combatant commands, and adjacent JTFs. The plan becomes the basis for the spectrum management appendices included in Annex K of the OPORD.

b. The spectrum management plan should be constructed with the following considerations: clarity is essential, brevity and simplicity are also necessary; all statements should be direct and to the point. Focus on operations involving only the joint interactions; the JTF does not concern itself in how supporting organizations operate internally.

2. Structure. The purpose of this chapter is not to explain how to write part of an OPORD but rather to explain the information that must be included to accomplish the mission of providing JTF spectrum management policy and guidance to subordinate and supporting organizations and units. A recommended structure for the spectrum management plan follows:

a. An appendix, designated when the OPORD is established, to the OPORD's Annex K.

b. Seven appendices (Tabs) to Annex K, covering the following topics: Radio Frequency Interference (RFI) reporting, JCEOI, spectrum management automation systems, JRFL, spectrum request and assignment format, EW and EWCC, and assignment authority.

3. Spectrum Management Plan Appendix

a. References. The spectrum management plan should identify documented references. These references may include messages, OPLANS, CONPLANS, directives, manuals, instructions, and joint doctrine. At a minimum, these references should include the combatant commander's policy and directives concerning spectrum management operations, the JTF spectrum requirements data call message, directives to initiate planning for the JTF, and Chairman of the Joint Chiefs of Staff (CJCS) 3320 series of instructions and

manuals. The following information is a recommended format for developing the spectrum management plan.

b. Purpose. The directive should be clear and brief. This section should begin with a statement as follows: "To provide guidance for spectrum planning, request, etc." The purpose statement should focus the reader's attention to the task and should not be a generalized overview of comments or provide basic background information.

c. General. This section should contain high-level background information that highlights the importance of the JTF operation and why spectrum management support is needed. It should also address all of the major subjects that will be in both the appendix and its related appendices.

d. Responsibilities. This section delineates the responsibilities of those staff functions and the personnel participating in the operation and clarifies the scope and expected performance of the different JTF staff elements, components, the combatant commander, supporting organizations, agencies, supporting unified commands, and other JTFs. This section will be the largest since it must address so many different areas. At a minimum, the responsibilities of the combatant command JFMO should be identified.

e. Administrative – Details. This section of the appendices delineates the responsibilities of those staff functions and the personnel participating in the operation; and clarifies the scope and expected performance of the different JTF staff elements, components, the combatant commander, supporting organizations, agencies, supporting unified commands, and other JTFs. This section will be the largest since it must address so many different areas. At a minimum, the responsibilities of the combatant command JFMO should be identified. This section also provides the little details that are always asked but seldom addressed in writing. This section needs to address items like file naming conventions, control-numbering conventions, frequency of reports, etc.

f. Security Classification. Security classification is addressed in two different forms within the spectrum management plan. The first is to provide guidance on classifying information due to the content information, and the second is to properly mark and identify which SFAF line items need classification. Spectrum managers are not the classifying authority and must derive classification authority from existing sources. There is always a concern that frequency assignment records may not be protected at the appropriate level.

g. Frequency Requests and Assignments. Frequency requests and assignments are typically classified when they associate an operation, purpose, operating units, locations, or time frame. This type of information requires protection. Using this guidance, some combatant commands will not classify

the frequencies themselves but only the details of when, where, whom, and for what purpose they are used. Because most JTF operations are conducted outside the United States, foreign disclosure becomes an issue. Frequency requests without special handling codes become useless because they have to be coordinated with non-US agencies, and this coordination cannot occur until foreign disclosure has been obtained.

4. Spectrum Management Tabbed Appendices

a. Tab A - Radio Frequency Interference Reporting. This appendix should provide guidance to JTF forces for interference reporting procedures, along with additional instructions unique to the JTF AOR and unified command interference reporting policy and guidance. This guidance should compliment the procedures in CJCSM 3320.02, "Joint Spectrum Interference Reporting (JSIR) Procedures," as well as the combatant commander's guidance for reporting interference within the AOR.

b. Tab B – JCEOI. This appendix should provide guidance to JTF forces for JCEOI development, updating, distribution, and compromise procedures. This guidance should include what was published in the spectrum requirements data call message but also contain the most current information.

c. Tab C – Spectrum Management Automation Systems. This appendix should provide guidance on the use and operation of SPECTRUM XXI and other automated tools being used by the spectrum manager in support of the JTF. SPECTRUM XXI is designated the joint spectrum management system for use in a JTF. Use of SPECTRUM XXI should be mandated in the spectrum management requirements message, and this appendix should further expand upon system settings, minimum times between data exchanges, radius of mobility settings, engineering parameter defaults, etc.

d. Tab D – Joint Restricted Frequency List. This appendix should provide guidance on when and how JTF units should submit JRFL inputs. This guidance will also provide units with notice of when the JTF will publish the JRFL. This function is performed in support of the JTF information operations (IO) cell and EW deconfliction process.

e. Tab E – Assignment Authority. This appendix should provide guidance on who has assignment authority and, if decentralized spectrum management is the method of choice, what conditions must be met to make an assignment. An example would be to require the component spectrum manager perform a data exchange both before and after making assignments. There should also be specific references to frequency separation between assignments, setting for radius of mobility multiplier, types of records to include in analysis, required wording for assignments, etc.

f. Tab F – Spectrum Request Format and Required Items. This appendix should provide guidance on the spectrum request format and required data items. This information was initially published in the spectrum requirements data call message. It will be documented here as official policy and be updated with changes since the data call message was distributed.

5. Additional Appendices

a. Land Mobile Radio. Land mobile radios are handheld brick size and type radios that operate either trunked or simplex and are used in support of operations. Land mobile radios are often used by the Air Force in performing duties of aircraft maintenance, airfield control, and military police. The other Services utilize these radios to perform many mission-essential tasks. The coordination of frequencies for these radios is an ongoing task that needs to have policy and procedures defined to prevent interference.

b. SINCGARS. Most of the Service components have already established standard operating procedures for the planning and implementation of SINCGARS operations. Many of the JTF operational capabilities will revolve around how the radios are employed and configured.

c. Wireless Local Area Networks. The advances in COTS technology have ushered in many new systems that provide features thought not possible just a few years ago. The increase in wireless LAN operations has invaded many military units. The use of wireless LAN technology is troublesome in two ways. First, the frequency band used for such LAN operations operates in the low power nonlicensed spectrum of the United States. This frequency band may have other authorized users that operate with higher transmit powers and cause interference to the wireless LAN, interference that the military user would have to endure. Secondly, the security aspects of wireless LANS is questionable and often rejected by the JTF security personnel.

d. COTS Spectrum Dependent Systems. Systems ranging from physical perimeter security to wireless microphones use spectrum to accomplish missions throughout the military. The need for a documented policy in how to handle new systems, request use of existing systems, and overcome interference caused by these systems is evident in all JTFs.

e. Commercial Satellite Phones. These spectrum dependent devices that require protection from JTF systems and are often used for C2 functions. These devices are usually managed by the J-6 and do need some visibility by the JSME.

f. Commercial Cell Phones. Another spectrum dependent device that require protection from JTF systems that is usually managed by the J-6.

ANNEX A TO APPENDIX F TO ENCLOSURE D

SAMPLE SPECTRUM APPENDIXES TO ANNEX K

Following is a **sample Appendix 4** to Annex K for JTF "X" operation plan. The JFMO and/or JSME, depending on the flow of the situation, could construct this appendix. Change "JFMO and/or JSME." to reflect issuing office as required.

1. (U) REFERENCES

a. Theater Spectrum Management Manual/Regulation/Instruction

b. CJCSI 3320.01, "Electromagnetic Spectrum Use in Joint Military Operations (U)"

c. COCOM Directive 00-01, "Joint Task Force Headquarters and Standing Operating Procedures (JTF HQ SOP).(U)"

2. (U) GENERAL. This appendix provides guidance and direction for managing the spectrum to support operation JTF "X". In order to most efficiently manage the spectrum for the number of users within the AOR and make assignments to these forces, assignment authority will be centralized. The JFMO and/or JSME will coordinate all requests from the forces with the nation "X" and allies. Component spectrum managers will submit requests for frequencies, in SFAF, to the JFMO and/or JSME, and will be responsible for assignment and allotment of all spectrum assets once approved.

3. (U) CONCEPT OF SUPPORT

a. (U) All Phases. Spectrum managers of the major components operating under JTF "X" will consolidate requests from subordinate units and forward these requirements to the JFMO and/or JSME.

b. (U) Automation. The automated system used for database management will be SPECTRUM XXI. The JCEOI will be developed using JACS for JCEOI generation. Transmission of frequency requests and assignments will be electronic mail; AUTODIN/DMS message, SIPRNET, SPECTRUM XXI, PC-to-PC transfer or via diskette.

4. (U) RESPONSIBILITIES

a. (U) JFMO and/or JSME

(1) (U) Establish JTF command policy on the use and management of the spectrum.

(2) (U) In accordance with J-5 guidance, coordinate spectrum use with the host-nation and allied spectrum management authorities.

(3) (U) Serve as the senior frequency assignment coordination authority for subordinate task force units, and develop and distribute spectrum-use plans.

(4) (U) Provide representation to the EWCC.

(5) (U) Combine inputs from all JTF staff levels and components and develop a proposed JRFL for J-3 approval.

(6) (U) Maintain and publish J-3-approved JRFL.

(7) (U) In conjunction with J-6, and in coordination with the J-3, develop, publish, promulgate, and maintain the JCEOI.

(8) (U) Provide administrative and technical support for spectrum use.

(9) (U) Maintain the common database for planning, coordinating, and controlling spectrum use.

(10) (U) Implement JSIR procedures IAW CJCSI 3220.02.

(11) (U) Evaluate, analyze, and attempt to resolve interference incidents at the lowest level possible.

b. (U) JTF J-3

(1) (U) Establish net structure for developing into the JCEOI. Provide inputs to the JFMO and/or JSME.

(2) (U) Approve JRFL for publication and dissemination.

(3) (U) Resolve spectrum-use conflicts between user IAW commander's priorities (e.g., J-2 requirement to exploit vice J-6 requirement to communicate).

(4) (U) Provide frequency-input list to the EWCC for inclusion into the JRFL.

c. (U) JTF J-2

(1) (U) Provide GUARDED frequency list to the EWCC for inclusion into the JRFL.

(2) (U) Assist in the resolution of interference incidents.

d. (U) Component Commands

(1) (U) Submit spectrum requirements in SFAF format IAW MCEB PUB-7 (reference x) to the JSME. Nominate specific frequencies to be coordinated with nation "X". If coordination with nation "X" is required, each proposal must contain a releasability code in SFAF item 005.

(2) (U) Ensure users comply with their frequency assignment parameters (power, bandwidth, and location).

(3) (U) Attempt to resolve any frequency conflicts and interference incidents locally. If resolution cannot be accomplished, report to JSME for resolution.

(4) (U) Provide frequency list to the EWCC for inclusion into the JRFL.

e. (U) Deploying Units

(1) (U) Submit frequency requests in SFAF format through higher headquarters to JFMO and/or JSME.

(2) (U) Ensure only those frequencies assigned are used and comply with parameters of the assignment, e.g., power bandwidth and location.

(3) (U) Attempt to resolve any frequency conflict and interference incidents locally. If unable to resolve situation, report it IAW reference h.

5. (U) FORMAT. All frequency requests submitted will comply with SFAF as prescribed in MCEB PUB-7 (reference x). Preferably in electronic format: SPECTRUM XXI, e-mail, AUTODIN/DMS, or on floppy disk. Each frequency request must be a complete stand-alone record, not an abbreviated or parted proposal (e.g., "part I of IV," "part three same as part one except," etc.).

6. (U) SECURITY CLASSIFICATION

a. (U) Frequency requests will be classified at the lowest level possible. If classified, each SFAF item will have a classification marking (U, C, or S) before the text IAW MCEB PUB M-001-03.

b. (U) Any request that requires submission through the HN will address releasability to HN. (For example: Confidential, Releasable to Host-Nation as Confidential.)

(1) (U) TAB A: EMI Reporting

(2) (U) TAB B: JTF JCEOI Concept

(3) (U) TAB C: Spectrum-Use Planning

TAB A, "ELECTROMAGNETIC INTERFERENCE (EMI) REPORTING," TO APPENDIX 4, "SPECTRUM MANAGEMENT." TO ANNEX K, "COMMUNICATIONS TO 'XXX'"

1. (U) REFERENCES

a. (U) Theater Spectrum Management Manual/Regulation/Instruction

b. (U) CJCSI 3320.02B, "Joint Spectrum Interference Resolution"

c. (U) COCOM Directive 00-01, "Joint Task Force Headquarters and Standing Operating Procedures (JTF HQ SOP)"

2. (U) GENERAL. This Tab to Appendix 4 provides guidance and direction for reporting interference incidents encountered during Operation JTF "X".

3. (U) PROCEDURES

a. (U) Interference incidents will be reported using the enclosed format. All reports of suspected hostile interference would be submitted via secure means.

b. (U) The operator or user experiencing the interference is responsible for submitting the interference report. All interference reports submitted during this JTF operation will be coordinated through the component EW office before transmission.

c. (U) Attempt to resolve interference problems at the lowest levels possible before submitting JSIR reports to higher headquarters.

d. (U) Definitions

(1) (U) Electromagnetic Environmental Effects (E3). The impact of the electromagnetic environment upon the operational capability of military forces, equipment, systems, and platforms. It encompasses all electromagnetic disciplines, including electromagnetic compatibility and electromagnetic interference; electromagnetic vulnerability; electromagnetic pulse; electronic protection, hazards of electromagnetic radiation to personnel, ordinance, and volatile materials; and natural phenomena effects of lightning and precipitation static.

(2) Electromagnetic Compatibility (EMC). The ability of systems, equipment, and devices that utilize the electromagnetic spectrum to operate in their intended operational environments without suffering unacceptable

degradation or causing unintentional degradation because of electromagnetic radiation or response. It involves the application of sound electromagnetic spectrum management; system, equipment, and device design configuration that ensures interference-free operation; and clear concepts and doctrines that maximize operational effectiveness.

(3) (U) Electromagnetic Interference (EMI). Any electromagnetic disturbance that interrupts, obstructs, or otherwise degrades or limits the effective performance of electronics and electrical equipment. It can be induced intentionally, as in some forms of electronic warfare, or unintentionally, as a result of spurious emissions and responses, intermodulation products, and the like.

e. (U) Interference reports are submitted at a minimum to the following addresses depending on type of report:

(1) (U) For Hostile Interference

ACTION: JSME
COMBATANT COMMAND JFMO
JIOC SAN ANTONIO TX//OWS//
INFO: NSACSS FT GEORGE G MEADE MD//W9M//
DIA WASHINGTON DC//PGI-3A//
OTHER COMPONENT COMMANDS
THEATER COMBATANT COMMAND

(2) (U) Interference Involving Space Systems

ACTION: JSME
COMBATANT COMMAND JFMO
CMOC/SCC CHEYENNE MOUNTAIN AFS CO//SCC//
INFO: JSC ANNAPOLIS MD//OP/JSIR//
DISA ARLINGTON VA//DITF/UTTF// (Only for DSCS systems)
DISA WASHINGTON DC//333//
OTHER COMPONENT COMMANDS
THEATER COMBATANT COMMAND

(3) (U) Non-hostile Interference

ACTION: COMBATANT COMMAND JFMO/JSME
INFO: JSC ANNAPOLIS MD//OP/JSIR//
OTHER COMPONENT COMMANDS
THEATER COMBATANT COMMAND

f. (U) Reporting Format. To the maximum extent possible, the JSIR generation capability in SPECTRUM XXI will be used. If it is not available, then submit the following as minimum.

(1) (U) Organization affected by EMI. Point of contact (POC) information (name and telephone number). Make sure when listing a POC that individual is familiar with the problem.

(2) (U) Place name, latitude, and longitude where EMI occurred.

(3) (U) Times, dates, and periods when EMI occurred. Indicate whether the duration of the interference is continuous or intermittent, the approximate repetition rate of interference, and whether the amplitude of the interference is varying or constant. Indicate if the interference is occurring at a regular or irregular time of day.

(4) (U) Systems and equipment affected by the EMI. Affected system function, name, nomenclature, manufacturer with model number, or other system description.

(5) (U) Allocated frequency band or authorized frequency of equipment affected.

(6) (U) Station and/or equipment causing the interference and the location or call sign, if known.

(7) (U) Allocated frequency band or authorized frequency of the station and/or equipment causing the interference, if known.

(8) (U) Probable cause of interference (for example, co-channel assignment, harmonics, inter-modulation, spurious products, jamming, etc.).

(9) (U) Extent of impairment to operational capability of affected equipment. Characteristics of interference (reduced range, false targets, reduced intelligibility, data errors, etc.).

(10) (U) Corrective measures taken to resolve or work around the interference.

(11) (U) Effect of corrective measures.

(12) (U) Any additional useful remarks. Provide a clear, unstructured narrative summary on the interference and local actions that have been taken to resolve the problem.

TAB B, "JTF JCEOI CONCEPT," TO APPENDIX 4, "SPECTRUM MANAGEMENT," TO ANNEX K, "COMMUNICATIONS TO JTF 'X'"
(U) REFERENCE. JCS 182218ZOCT93

1. (U) GENERAL. This tab provides information concerning the JCEOI concept and its use during JTF "X".

2. (U) PROCEDURES

a. (U) The JCEOI is a single, comprehensive document that contains frequencies, nets, SINCGARS information, and call signs and words for all participants. To provide adequate lead-time for submission of frequency requirements for allied coordination and to design, publish, and distribute the JCEOI, the following relationships and milestones are established:

(1) (U) Submit all JCEOI data through component headquarters for consolidation and forwarding to the JTF "X" JSME for inclusion in JCEOI.

(2) (U) Inputs are required from ARFOR, NAVFOR, AFFOR, MARFOR, JSOTF, and coalition forces component headquarters.

b. (U) The desired input method for JTF JCEOI inputs are electronic format; however, as a minimum, a paper copy of the master net list, net groups, separation plans are required. Coalition forces will submit and coordinate all requirements directly to the JSME for assistance in completing input.

c. (U) To create the JCEOI the following information is required.

(1) (U) Identify radio nets that have a specific title; e.g., alternate (ALT), anti-jam(AJ), or conduct of fire (COF). Radio net titles may contain a maximum of 16 characters including spaces; e.g., 29TH INF DIV ALT. Also, identify the frequency band that radio net will operate in; e.g., HF, VHF-FM, VHF-AM, UHF, SHF, or EHF.

(2) (U) Identify radio nets requiring a fixed frequency.

(3) (U) Identify nets that require frequency separation.

(4) (U) Identify nets that can be included in a share plan.

(5) (U) Satellite net names will appear in the JCEOI but may not have frequencies due to time constraints and availability of channels.

(6) (U) HF DCS entry frequencies.

(7) (U) Frequencies to be included in the JRFL must be identified before final generation of JCEOI.

(8) (U) Nets requiring restriction codes and the restriction code definitions.

d. (U) List of all nets requiring a call sign to build the call sign vocabulary. Daily changing alphanumeric, tri-graph (letter-number-letter) call signs will be used; e.g. B3K, C9Q. The capability to provide fixed tri-graph call signs is not available.

e. (U) Identify all net groups to ensure their listing in the appropriate component layer of the JCEOI.

f. (U) Lists of unit net names. These names can contain a maximum of 16 characters including spaces, (e.g., 9th MAR TOW PLT). Net names cannot be used more than once within a component; net names must be unique.

g. (U) List of all nets requiring a call word in order to build the call word vocabulary includes fixed and daily changing call words. The JSME will deconflict the call word dictionary against any fixed call words that are requested.

h. (U) List of the suffixes that each component will use. The suffix is a two-digit number attached to a call sign or call word used to identify personnel or staff sections within a unit. The suffix vocabulary may contain a maximum of 99 assignments. There will be one master changing suffix vocabulary for the JCEOI.

i. (U) List of expander titles that the unit will use. The expander is a single letter assignment used to identify personnel within a unit. Expander vocabulary can contain a maximum of 20 expander titles. There will be one master changing expander vocabulary for the JCEOI.

j. (U) Instructions for the use of changing suffixes and/or expanders are provided in the Quick Reference pages of the JCEOI.

k. (U) The JCEOI when completed will be transmitted electronically to all component commanders. Methods of transmission can include: SIPRNET E-mail, compressed file transfer over STU-III, or download from JTF “X” web server. Coalition forces will be given paper copies.

l. (U) The JTF JCEOI will be in half-page 52-line format. The JCEOI will be generated in three (3) editions; one active edition, one reserve edition transmitted to, but not distributed below component headquarters, and a third edition to be used in case of a compromise.

TAB C, "JOINT SPECTRUM-USE PLAN." TO APPENDIX 4, "SPECTRUM MANAGEMENT," TO ANNEX K, "COMMUNICATIONS TO JTF 'X'"

1. (U) REFERENCES

a. (U) Unified command regulation or Spectrum Management Manual.

b. (U) Unified command Joint Communications-Electronics Standing Instructions.

c. (U) Other applicable directives or instructions, as appropriate.

2. (U) GENERAL. This Tab describes spectrum-use plan for operation JTF "X".

3. (U) PROCEDURES. Spectrum-Use PLAN. Subject to any limitations noted (such as power, bandwidth, hours of operation, etc.), list the frequencies authorized for use in the exercise or operation. Sort frequency authorizations according to frequency band to facilitate reference and use. The JCEOI frequency authorization information is also included in the JTF frequency plan. Present each sort list as a TAB to this appendix (Tab E and F). Use Table D-A-F-1 below as an example.

Freq. Band	Intended Use by Military Forces	Military Requirements	Conditions of Use
(a)	(b)	(c)	(d)
14-70 kHz	MARITIME MOBILE	Essential military requirement for naval communications.	
415 - 526.5 kHz	AERONAUTICAL RADIO NAVIGATION	Military requirements for tactical non-directional beacons.	
	MARITIME MOBILE	Military requirements for naval communications	
156 – 174 MHz	MOBILE, except Aeronautical Mobile	Military requirements for Sonobuoy operations at sea and in port.	Sonobuoy to be operated on a secondary basis.
	MARITIME MOBILE	Military requirements for naval communications.	To be used in accordance with RR Appendix 18.

420 – 450 MHz	RADIOLOCATION Radiolocation	Military requirements for land and naval radar and airborne radar over ocean areas.	In the interference range of the territorial waters of member's countries, radar operations must be coordinated on a national basis according to the status of the services.
4400 – 5000MHz	FIXED, MOBILE	Essential military requirements for fixed, tactical radio relay and mobile systems.	1. This is a harmonized NATO band type1. 2. This FIXED SATELLITE service will not be implemented in NATO Europe.

Table D-F-A-1. JTF Frequency Plan

APPENDIX G TO ENCLOSURE D

NOMINATE AND ASSIGN FREQUENCIES

1. Overview. The purpose of this appendix is to provide the student with an overview of items to consider when nominating and assigning frequencies. The issues identified here are for consideration when making frequency assignment decisions both within the JSME and in giving direction to subordinate units delegated frequency assignment authority.

2. Spectrum Management 101

a. The electromagnetic spectrum is a resource that is finite and has to be managed to provide the user with acceptable service. The resource is used by weapons systems, navigational aids, communications systems, and alarms. To mange this resource there are three basic principles to consider. These principles are frequency, time, and distance. Users of the spectrum cannot occupy the same frequency, at the same time, at the same location--they must be separated by one or a combination of these factors; frequency, time, or distance. Frequency plans have been used for years to maintain separation between users within a given area, like a training range, post camp or station. While this method is not necessarily the most efficient it does work well for relatively small areas. Separating frequency use by time is a method that was used with sharing a frequency between two or more users and allowing one user to occupy it for specific period of time. A variation of this method has gone high tech and is now known as frequency hopping. The last principle is distance. Separating frequency use by distance is something that was considered, prior to automation, in the estimation process. The spectrum manager knew that radio waves did not travel beyond certain distances or that terrain obstructions would limit the distance that a frequency could cause interference. A frequency could be used as long as it is geographically separated from another user on the same frequency.

b. Automation has helped greatly in providing us the ability to separate frequency use by the variables of distance, frequency, and time. While spectrum management automated systems assist us greatly in the process of deconflicting frequency assignments there will always be situations where there will be interference. This happens because spectrum management automation has to model interactions within the electromagnetic spectrum and these models do not always replicate how we are actually using the spectrum. Errors are caused by inaccurate frequency records, unique weather situations, variations on system use, and modifications to existing systems without updating the assignment. Spectrum management relies upon automation and it would not be possible to properly manage the spectrum in support of joint military operations without it. You must gain an understanding of how

automated spectrum management systems operate and then incorporate those considerations into your plan.

3. Nomination/Interference Analysis/EW Deconfliction. Spectrum management involves planning the use of the electromagnetic spectrum. To this end, frequency assignments must be made so they do not conflict or cause interference with other frequency assignments. Automated tools are available to assist the spectrum manager with the frequency nomination and assignment process.

a. Culling Environmental Records from Analysis - The environment records obtained from the frequency assignment database are culled to exclude environment systems from the interference analysis whose frequencies or geographical locations are too far removed from the proposed frequency and location to represent an interference concern. The three culling methods are: frequency cull, region or distance cull, and path loss cull.

b. Frequency Cull - When conducting an interference analysis, the user enters the geophysical and technical characteristics of the proposed system, which include the transmitter and receiver tuned frequencies. A frequency cull is conducted which eliminates any system that operates on a tuned frequency that is different from the proposed frequency by more than 10 MHz, if the frequency range is between 37 MHz to 10 GHz. For frequencies above and below this range the calculation is a percentage of the proposed frequency.

c. Region or Distance Cull - The standard 4/3 earth radio horizon formula is used to compute the culling distance, dCULL, in km: dCULL = 1.609 [(2hTRANS)0.5 +(2hCULL)0.5], where hTRANS = height of proposed station antenna, in feet, hCULL = cull height of environmental station antenna = 30,000 feet Any system separated by more than dCULL km from the proposed system is excluded from the analysis and therefore declared not to be an interference concern. 30 foot (10 meter antenna height) equates to 410 km distance cull.

d. Path Loss Cull - The third cull is the free-space path loss cull. The free-space path loss equation is a function of frequency and distance and is made in order to minimize the number of interactions that must be analyzed by computing a more time intensive path loss, e.g., TIREM, and the frequency-dependent rejection. The theory is that any interaction that passes the interference threshold at this point will most certainly meet the threshold requirement using the more time intensive analysis.

e. Interference Conflict Margin - The interference conflict margin (ICM) is a measure of the interference protection that exists between a potential interfering transmitter and a victim receiver. For each environmental interaction, an ICM is computed, which is defined as 10 times the logarithm of

the ratio of the interference power to the receiver interference threshold: Basically this is the signal strength of the interference above the receiver threshold value.

f. TIREM, which is supported by a terrain database, is employed for all path-loss calculations in the 1-MHz to 20-GHz frequency range, if terrain data is available. The TIREM model is automatically replaced by the SEM during an analysis if a radius of operation is associated with the transmitter and/or receiver station, if the terrain data needed is absent, or if there are less than three elevation points in the transmitter-receiver path profile. The free-space propagation formula is used outside the 1-MHz to 20-GHz range. The following paragraphs describe three common types of analyzes performed within the software program and the co-site algorithm.

4. Interference Noise Level (Co-Site Analysis Concerns). The interference power-level model for interference analysis considers the following spectral interactions. It is the primary model used by SPECTRUM XXI when determining interference potential for the capabilities of nomination, electronic warfare deconfliction, and interference analysis.

a. Intermodulation is created when signals from two or more transmitters mix in a nonlinear device. A “nonlinear device” could be an amplifier, a power supply, or even the junction of two dissimilar metals that behave as a diode. When signals mix, they produce additional signals (IM products) on new frequencies that are mathematically related to the original frequencies. Fortunately, the intermodulation product's signal strength tends to get weaker as the order gets higher. Interference caused by up to fifth order intermod hits is fairly common, although you might experience interference caused by thirteenth, fifteenth, or higher order products. In analog FM receivers, intermod is often recognized by loud, distorted audio, often more than one voice superimposed on another. Looking at it on a spectrum analyzer, it is often found to have FM deviation of twice normal, or more.

b. Harmonics - Second-order level: Only second-order harmonic frequencies and fundamental frequencies will be considered (e.g., a fundamental frequency of 30 MHz will generate a second-order harmonic frequency at 60 MHz). Third-order level: Only second-order and third-order harmonic frequencies and fundamental frequencies will be considered (e.g., a fundamental frequency of 30 MHz will generate a second-order harmonic frequency at 60 MHz and a third-order harmonic frequency at 90 MHz). When harmonic frequencies are analyzed, the analysis will take longer than when the harmonic emission analysis default (OFF) is used. The increase in run-time depends on a number of variables (i.e., the number of records loaded, the band chosen, the harmonic selected, and the computer processing speed).

5. Calculating Interference (Spectral Overlap). It should be emphasized that there is a major distinction between the SPECTRUM XXI Spectral Overlap and the Interference Power-Level Models. As stated before the former relies solely on the frequency and bandwidth data to declare conflicts in a region; whereas, the latter accounts for the many other technical and geophysical parameters that determine the potential coexistence of systems sharing an environment, from an electromagnetic interference standpoint. Also, the interference threshold settings are user-selectable (or automatic if enabled in the Engineering Preferences) when using the Interference Power-Level Model, which ultimately governs whether or not a conflict is declared; whereas, no user control in the conflict decision is possible when using the Spectral Overlap Model.

a. The Spectral Overlap Model, which declares conflicts only when there is spectral overlap between the interfering transmitter emission and the victim receiver bandpass. The overlap is determined from the assigned frequency and necessary bandwidth data, assuming that the emission spectrum and receiver selectivity are band-limited to the necessary bandwidth. Note that the Spectral Overlap Model is not executed if a single frequency is being analyzed for the proposed system. Furthermore, with the Spectral Overlap Model, conflicts will always be declared when there are co-channel assignments, but never when there are adjacent-channel assignments. Conversely, when using the Interference Power-Level Model, co-channel assignments do not necessarily result in conflicts (e.g., low-power interference or wideband interference truncated by the receiver selectivity); whereas, harmful adjacent-channel interference caused by realistic emission spectrum/receiver selectivity characteristics will be identified. In general, there is no way to predict if more or fewer conflicts will be declared using the Spectral Overlap Model versus using the Interference Power-Level Model.

b. The key point is that the Spectral Overlap Model and the Interference Power-Level Model represent two totally different analysis methodologies, and no inferences between them should be drawn from the results obtained using either methodology.

c. In summary, the Spectral Overlap Model can only be used to identify potential co-channel conflicts; whereas, the Interference Power-Level Model can be used to quantify potential co-channel and adjacent-channel interference.

6. Frequency Assignments. A frequency assignment is an authorization to operate a frequency-generating device at a specific location (or area), during a designated time frame, under specified parameters. We are going to discuss different types of assignments and associated terms.

a. Permanent assignments are those frequency assignments that never automatically expire and are reviewed every 5 years for currency and accuracy. It is not recommended to use permanent assignments when establishing a JTF.

b. Temporary assignments are those assignments of a short duration, MCEB Pub 7 limits to less than 5 years. It is recommended to make all JTF frequency assignments on a temporary basis.

c. Area assignments are frequency assignments that authorize use within an area that is not defined by a geographical point with or without a radius. These assignments may contain comments that describe an area in text. These assignments are normally authorized for operation within the boundaries of a country or state. SPECTRUM XXI considers an assignment to be an area assignment if it has duplicate entries in SFAF items 300/301 and 400/401. Current spectrum management automation tools cannot be used to engineer, analyze, or deconflict area assignments. Area assignments that conflict with nominated frequencies are flagged by the nomination and interference analysis process and provided to the user for manual review.

d. Mobile assignments are assignments that operate within a given area and include a geographic reference and operating radius. Mobile assignments, with a record source of FRRS or GMF, are evaluated using a modeling process named fixed and mobile logic. This logic will modify records to replicate the actual spectral interactions associated with the record being evaluated.

e. Space assignments are assignments where either the transmitter or receiver is located in space. Current spectrum management automation tools cannot be used to nominate space assignments.

f. Band assignments are assignments that the transmitting frequency changes within a given band of frequencies and/or does not remain constant. Examples of band assignments are JTIDS and certain radars. Current spectrum management automation tools cannot be used to engineer, nominate, or deconflict band assignments. Band assignments, once they are made, are considered by SPECTRUM XXI interference analysis as background emitters and are provided protection, provided band assignments have been selected in the user preferences, in the nomination process.

7. Before Nominating. Always perform a data exchange prior to nominating any frequencies; this makes sure you have the latest and most current information to base your nominations on. Like a pilot you need to review a checklist of major items prior to performing a nomination. You must know which records will be included in your analysis and how SPECTRUM XXI handles those types of records.

a. Permanent assignments and proposals are always considered unless specifically user excluded.

b. Temporary assignments and proposals both have a user option in preferences that allows them to be included or ignored.

c. Band assignments have a user option in preferences that allows them to be included or simply flagged by the nomination or interference analysis process.

d. Space assignments have a user option in preferences that allows the terrestrial interference potential to be included interference analysis process or to simply flag the frequencies that have corresponding results.

e. Delete history has a user option in preferences that allows them to be included or totally excluded from analysis (excluded by default setting).

f. User excluded records are user controlled and records are queryable once excluded.

g. Only nominate what you need. If you are using a decentralized frequency assignment method then nominating more than you need deprives others of resources needed to perform their job.

8. Nominating. Nominating requires the user to make specific decisions and choices. The first of these is to specify a number of assignments (nominations) to be performed, if you specify a number and SPECTRUM XXI cannot achieve that result then you cause SPECTRUM XXI to fall back to the spectral overlap model. Not specifying a number will result in SPECTRUM XXI nominating the maximum possible number of proposed frequencies. The maximum frequency separation capability can be used to spread frequency nominations over the frequency band if the number of frequencies being nominated is small.

9. Interference Flags. Records that contain certain IRAC record notes (SNotes), or space assignments, or area assignments, or that contain no coordinates at all are represented by a set of dashed lines (_ _ _ _). If the record contains certain SNotes, identified when an X replaces the first dash. If the record is a space assignment, the second dash is replaced with an X. If the record is an area assignment, identified when an X replaces the third dash. If the record does not contain any coordinates at all, an X replaces the fourth dash. A record could contain more than one X. An explanation of each of these conditions follows.

a. SNOTES - For assignments containing SNOTES S159, S352 or S353, the interference analysis is bypassed and these records are noted for the user in the output report.

b. SPACE - For SPACE station assignments, those records containing a transmitter or at least one receiver state country code equal to SPCE, SPA, SPCW, or SPCU, the interference analysis is bypassed and the records are flagged as potential conflicts on the output report for the user. In the frequency nomination mode, any nominated frequency that overlaps these assignments is also noted for the user. This flag can be overridden and space records will be analyzed if the option to include space records in the analysis is selected on the Engineering Preferences screen.

c. Area Assignments - Records are marked as AREA assignments if all of the following conditions are true. The transmitter state/country field (SFAF item 300 or GMF item XSC) contains the same data as the transmitter antenna location (SFAF item 301 or GMF item XAL) or the antenna location is empty. The receiver state/country field (SFAF item 400 or GMF item RSC) contains the same data as the receiver antenna location (SFAF item 401 or GMF item RAL) or the antenna location is empty. The transmitter latitude/longitude (SFAF item 303 or GMF item XLA/XLG) and the receiver latitude/longitude (SFAF item 403 or GMF item RLA/RLG) are blank.

d. Missing Coordinates - There are environmental records with blank entries for the station coordinates. These include nationwide assignments (e.g., USA state code), non-state assignments (e.g., Guam or Puerto Rico code), or state area-assignments with a text description for their respective operating region (e.g., west-southwest of Colorado). Such records cannot be processed in the region cull due to the lack of station coordinates, but these records are noted for the user, as potential conflicts in the output report. The user is given the option, via the query, to exclude records from the interference analysis. Any record so designated that could create a potential interference problem is noted for the user in the output report (USER). This option is available for SFAF mode only.

e. Band Assignments - For assignments that actually occupy a frequency band, the interference analysis is bypassed, but these records are noted in the output report if the band assignment could create a potential interference problem (BAND). Band assignments can be included in the analysis if the correct option is selected on the Engineering Preferences screen.

f. Experimental - For assignments designated as experimental, i.e., station class begins with an “X,” the interference analysis is bypassed, but the existence of experimental assignments that could create a potential interference problem are noted in the output report (EXP).

10. Interference Flags - Order of Priority. Since background assignments could fall into multiple categories, the following order of priority was developed for flagged records. The ERROR flag is checked first. If it exists, then that will be what is listed on the output. If it does not exist, the SNOTES, SPACE,

AREA, and COORDINATES flags are checked. If any exist, they will be listed on the output. The next check is the USER flag, then the BAND flag and finally the EXP flag.

11. Nomination Ranking. Nomination ranking scheme is listed below:

a. Reuse Number: The primary ranking criterion is the reuse number, which is the number of times the nominated frequency has been "reused." As assignments within the software program frequency assignment database are analyzed to determine a potentially adverse interaction with the proposed system, the maximum limits of authorized bandwidth for noninterfering assignments within set geographic limits are recorded. Each nominated discrete frequency is checked against these limits. The total number of these limits (inside of which a nominated frequency falls) is that nominated frequency's reuse number. Nominated frequencies are ranked first by reuse number, in descending order highest to lowest.

b. Edge Number: The secondary ranking criterion, the edge number, is used in cases when the reuse numbers for nominated frequencies are equal. Each nominated frequency is given an edge number corresponding to the number of times (zero, one, or two) the maximum limits of its authorized bandwidth are such that no additional adjacent nominations may be made. Nominated frequencies with equivalent reuse numbers are ranked using the edge number. This is done to ensure that nominated frequencies near the edges of largely unused frequency bands are assigned before those at the centers of these unused frequency bands.

c. Relative Signal Level: The third criterion, the relative signal level, is used in cases where both the reuse number and the edge number are equal. Nominated frequencies are ranked in order of how far the signal level of each frequency is below the interference threshold.

d. Frequency Order: The fourth criterion is used in cases where all of the above criteria are equal; thus, nominated frequencies are ranked by frequency in ascending order.

12. Frequency Assignment Strategies. Crack the "Hardest Nuts" first by identifying the proposals with: large separation criteria, larger bandwidths, located in congested geographical areas, for operation over the longest time period (duration), and those with the large numbers of frequencies needed. We recommend that you organize your task of assigning frequencies by determining which proposals will be the hardest to assign and perform those nominations first.

13. Assignment (Nomination) Processing. Each spectrum manager must devise a plan for processing frequency proposals that tracks them as they

arrive, holds them until ready for processing, and identifies them as they have been assigned. I use a simple method of processing and tracking my proposals. I deselect temporary proposals from interference analysis consideration and then turn proposals that I nominate into assignments immediately. I always change the agency serial number SFAF 102 when I deal with a proposal. I reject proposals that I use to nominate multiple assignments back to the requestor along with notification that they were assigned and provide either agency serial numbers or control numbers to track them with.

14. Limitations of SPECTRUM XXI

a. High Frequency (HF). HF proposals (2-30 MHz) are normally requested for systems utilizing skywave propagation. SPECTRUM XXI nomination and interference analysis algorithms are based upon groundwave propagation and only evaluate those environmental emitters that could interfere when operating in a groundwave configuration. Additionally there is no consideration of the ionosphere and its effect upon propagation. Since the majority of HF assignments are not groundwave or direct LOS then the nomination process only considers the collocated near-field transmitters and receivers in determining interference potential. If the user has not already limited the frequency bands to be requested the spectrum manager usually tries to identify the intended use of the system and performs an HF radio wave propagation prediction prior to nominating frequencies. SPECTRUM XXI, for HF assignments, is an analysis tool that deconflicts local interference sources only and acts as a record-keeping device.

b. Band Assignments. Proposals requesting band frequency assignments cannot be nominated from SPECTRUM XXI. Background assignments that have a frequency band in SFAF item 110 can be considered against proposed single frequency nomination analysis. The SPECTRUM XXI user can chose to include environmental band assignments in the interference/nomination analysis, this will exclude any nomination is either within the band assignment or that could cause co-channel interference. There is an in-depth explanation of this process in both the SPECTRUM XXI training manual and SPECTRUM XXI online help.

c. Space Assignments. Proposed space assignments cannot be made using SPECTRUM XXI. SPECTRUM XXI does provide the capability to protect existing space assignments, for the ground-based emitter, from future nominations. There is an in-depth explanation of this process in both the SPECTRUM XXI training manual and SPECTRUM XXI online help.

15. Assignment Authority

a. The authority to assign frequencies is based upon international law. Each country has authority over its spectrum resources. The US military

operating as guest forces must coordinate with the HN to secure spectrum resources for operational and training exercise requirements. Those spectrum resources provided to the JSME from the HN should be considered as a measure of the HN trust and treated as you any valuable resource, to include compliance to restrictions defined in your agreement with the HN. Misuse of the spectrum resources provided may result in the recall of your use, authority, to mange your own spectrum resources. There may be legal implications in the case of injury or damage to HN personnel and property. It is incumbent upon the JSME to comply with any agreements made with the HN.

b. Forced entry operations are those military actions that based on their very nature cannot be coordinated with the HN. These operations do not preclude the protection of safety-of-life frequencies. Forced entry operations also do not preclude the responsibility of managing the spectrum efficiently for the forces involved in the operation or coordinating with neighboring counties.

16. Centralized Spectrum Management. Where the JSME retains all frequency assignment authority. This makes a good planning model for designing and initiating the spectrum management plan, however becomes very workload intensive in its execution. This type of spectrum management is best suited for small operations, i.e., NEO or hostage rescue where a limited number of forces are involved.

17. Decentralized Spectrum Management. This type of spectrum management allows spectrum managers at levels to make assignments and determine how to best use the available spectrum resource and is best suited for large operations with many forces. This type of spectrum management requires knowledgeable personnel at all levels and monitoring from the JSME to be effective.

18. JSME. The JSME should try to incorporate the capabilities of the Service unique frequency assignment tools into the spectrum management process as much as possible. The Services have developed some automated spectrum management tools. The JSME should consider allowing components with automated spectrum management tools to manage the spectrum for like type systems.

19. US Army. The Army has NPT, which can manage frequency resources for tactical radio relay networks and make SINCGARS hopsets. NPT is flexible enough to assign radio relay systems for the other Services.

20. US Navy. The Navy's AESOP could be used to manage radars both on the water and on land. Additional procedures must be in place to facilitate proper coordination is performed. The JSME should place restrictions on how and when the components can make frequency assignments

APPENDIX H TO ENCLOSURE D

GENERATE A JCEOI

1. JCEOI Generation

a. Considerations. The creation of the JCEOI can be considered an art form because of the many variations that it can take. These variations come from several different external as well as JSME internal factors. The intent of this section is to make you aware of the complexity of this process and provide you with some of the questions that should be asked. Your skills at creating a JCEOI and using JACS are perishable, if not used on a day-to-day basis, and more so for the naval and air force components since they do not use this product routinely. We will now go through the process and considerations that should be made in order that the end product will be viable to the JTF. We will go through the JCEOI development process, as shown in Table D-H-1.

b. Pre-design. The end product determines how the organizational structure and requirements are entered into JACS. This pre-design phase should be accomplished at all echelons at one time or another; the JCEOI is just piecing together several subordinate master net lists to create the JCEOI. However, each echelon needs to consider the following during this initial process:

(1) A concept of the organization's unit structure

(2) An idea of the organization's communications net requirements

(3) Available types of radio equipment

(4) Interoperability requirements (within the unit and also for joint/coalition operations)

(5) Frequency requirements and any restrictions

(6) Frequency band allocations and any restrictions

(7) Special requirements the organization needs for the operation

c. Design. Most of the work for component CEOI/SOI's are done well in advance of any operation, however during the merging process that must be accomplished there are several steps that should be taken by the JSME to ensure there are no mistakes caused by lack of planning. Providing guidance to the JTF components and sub-component levels as soon as possible on JCEOI MNL design is essential. Another way to accomplish this is to establish

a pre-planned design in advance of the requirements (deliberate planning). Maintain constant contact with the J-6 communications planners because they will be in design mode as well. Knowing the proposed force structure prior to collecting MNL's, spectrum requirements, and designing the policy and procedures message will help prevent potential problem areas.

Step	Action
1	Create Mission
2	Create Plan (Coordinate)
3	Create Folders (MNL, RM, SOI)
4	Create (import as needed into) JACS MNL, Transfer/Import RBECS, or SFAF with line item 983.
5a	Create Reuse Scheme (Class/Zones) (Coordinated)
5b	Create Frequency Separation Plans (as needed)
5c	Establish Share Plan(s) (Coordinated)
6a	Conduct SOI-Freq Analysis (done at the Combatant Command, JTF, and Component levels).
6b	Create SFAF Proposals
7	Complete SFAF Proposals
7a	Import to SPECTRUM XXI
7b	Validate Proposals
7c	Follow Procedures for Frequency Proposal Requests
8*	Create/populate appropriate dictionaries
8*	Create Call Sign Share Groups/annotate MNL
8*	Create Call Word Share Groups/annotate MNL
8*	Create extract groups
8*	Create quick reference pages for extract and Master Call Sign Book
9a	Transfer/Import frequency assignments
9b	Replicate MNL from default net lines
9c	Change resource type from RAW to SOI in RM
10	Create short titles & editions – Always generate spare edition for compromise recovery
11	Select MNL lines, generate components as required
12	**Create Extract Packets**
13	Validate generated components by displaying JCEOI
14*	Export JACS database, print JCEOI packets (¼ – ½ - full page formats), export RBECS (as needed), export OPTASKCOM circuits (as needed), export to CT3 devices
14*	Verify import of RBECS files, create report of any items not transferred to RBECS, export to DTD with CT3 software.
14*	Export SFAF modification records for each time period (JSME only) update SPXXI database each day.

Step	Action
As needed	Add new nets/circuits to MNL, create new extract groups, selectively generate those nets, update edition and distribute as necessary
As needed	If component of JTF is compromised generate short-term procedure by regenerating just the compromised portion and distribute as necessary.
As needed	Those components requiring to be changed from daily changing to fixed frequency, defined as generated fixed, generate and distribute as necessary.
* Can be accomplished in any order.	

Table D-H-1. JCEOI Order of Completion

d. Classification. Classification should always be at the top of the list of concerns, because of the sensitivity of the information that spectrum managers handle. Since there are many combinations of classifications it was decided to take a general approach to the classification of individual nets. When the user initially enters a classified net by placing a two-letter classification and special handling code into the SEC CLASS, JACS then prompts the user for the declassification instructions; this is all the information that has to be entered. Standard classification needs to be determined prior to starting. You will have to use classification releasability codes so plan that before you start.

e. Mission and Plan. The user must create a mission; this name can be anything that identifies its use for the operator. The plan name; there are two concerns when naming a plan. The first concern is the name of the plan because the first four characters of the plan name are used for the agency abbreviation (identifier) portion of the agency serial number of the SFAF proposals; SPECTRUM XXI will require that those be actual characters (not numbers or spaces). The second concern is the effective date (which will be SFAF item 140) and duration (which when the duration in days is added to the effective date becomes SFAF item 141). Ensure that you extend the time period out far enough to cover the intended duration of the exercise or operation so that they do not get inadvertently sent to the delete history of your EMB database in SPECTRUM XXI.

f. The Master Net List. The MNL is the foundation of the JCEOI. The MNL is where the net, call sign, call word, and frequency requirements are identified, therefore; it also captures a portion of the frequency requirements for the JTF. Keeping the MNL organized is essential so that the JSME as well as components can quickly and easily identify the sections which contain the information that needs to be extracted is located. One method for organizing the MNL is into sections, once again, this is based on personal or command preference, however the recommended method is to design it into a hierarchical structure based on the JTF organization (e.g. combatant command, JTF,

JFACC, coalition, AFFOR, ARFOR, JFSOCC, NAVFOR, MARFOR layers). The recommended way to create a JCEOI for a JTF is having the JSME be the generation authority for the entire JCEOI thereby alleviating a lot of possible mistakes that could take place. JACS allows being able to transfer all net associated data from one terminal to another.

g. Net Unique Identifiers (NUI). The NUI is the basic characteristic for any net or circuit that is placed on the MNL. It is essential to understand that the NUI is of utmost importance because it lays the foundation for the SFAF proposal, the SFAF assignment import and replication, establishing a relationship between the requirement (the MNL) and the fulfillment of that requirement (the frequency in the resource manager), generation, and finally the modification record SFAF sent back to the SPECTRUM XXI database. Nowhere along this entire process can a NUI be changed without informing the next higher echelon in the spectrum management chain of command. If this does happen the JSME will not be able to generate those nets because of a failure between the NUI's of the MNL and the RM. JACS has certain edit checks that will identify for the user items that are needed for different net types--as follows: net name, net type, classification, frequency or frequency band, transmitter state/country, transmitter antenna location, station class, emission, power, and channel spacing.

h. Additional Fields. Although you may have just put in the most important fields, there is more work required. There are more considerations to be made before the MNL is complete; however, at this juncture the user should be primarily concerned with those that will provide SFAF proposals and allow JACS to validate the MNL, the remainder can be completed later.

(1) Net ID. If you chose a net type of CNR SINCGARS then the net will require two frequencies a CUE and a MAN channel. JACS will not allow the operator to validate the MNL until a NET ID is added. The Net ID is three digit numbers (000-999) used as an identifier for the SINCGARS nets in frequency hopping mode. Each net is operated using a different ID number. It designates the frequency within the hopset on which to start hopping. For a random number assignment, an X can be placed in the first digit location to identify a random number in that 100's series (9xx) or in all three fields to allow JACS to generate a random number from 000-999. Again this information should be a part of the initial spectrum management process message. Each command can have these organized for ease of use for subordinate units for example:

Net Number	Element Assigned
000-099	Theatre/Joint Level
100-299	Service Component Level/Corps
300-599	Service Level Units

It is important to remember this is a coordinated effort and units who are going to share the same transmission security (TRANSEC) key (TSK) must have separate NET ID's. For units who are going to have different TSKs then it doesn't matter if two units are assigned the same NET ID.

(2) Call Sign. A call sign is a unique letter-number-letter combination used to identify users on a given radio net. The only option allowed in this field is "Y" or "N" for yes or no, this tells JACS to randomly assign a call sign for this net, or if the unit desires a letter-number-letter combination can be entered giving the unit a nonchanging call sign. Units sharing the same nets can be grouped using the call sign-sharing plan later. The maximum number of unique call signs available for any JCEOI is 6,760 (due to letter number combinations available). A net is required to have a call sign even when operating in secure mode in case of a malfunction in secure equipment to prevent the enemy from gathering intelligence on that station affected. If the JCEOI contains more than the maximum number the operator must choose those nets where it would be all right if they shared a call sign with another unit because, they are not in the same net, or they will never operate within the same command structure. When this is the case the units must be placed into two different organization codes (OC), JACS automatically assigns an OC code of 1 to all new nets.

(3) Organizational Code

(a) OC are used for two purposes one which was discussed above for call sign requirements which are above 6,763, and for a JCEOI that contains more than 1000 SINCGARS NET. When a net is first entered into the MNL JACS defaults the value in this field to a number 1. OC identification is primarily used to allow assignment of identical SINCGARS net IDs in developing the JCEOI (since there is a limit imposed of 999) and in merging, printing, and exporting data, more often times than note there will be duplicates between two units utilizing SINCGARS. OCs need to be published as part of the SINCGARS standard operating procedures (SOP) in the Annex K, one example can be seen below in Table D-H-2. Notice in Table 8-2 that the JTF, NAVFOR, JFSOCC, and AFFOR are utilizing the same OC, this is due to the sum of these SINCGARS nets not being above 1000. However looking at the 2 ARFOR DIV's and the MARFOR each have a separate net ID, this could be that each of these entities want to utilize the 300 series NET IDs for their command elements or that each contain over 1000 SINCGARS nets when combined with one another.

Net Description	OC
JTF nets	1
ARFOR 55th INF DIV	2
ARFOR 56th INF DIV	3
MARFOR 33rd MEU	4
NAVFOR nets	1
JFSOCC nets	1
AFFOR nets	1

Table D-H-2. Representative OCs

(b) Organization codes are also used in a situation where more the 6,760 call signs are required. In this case the operator must ensure that nets outside this number will not be involved in operations that would create confusion when communicating on a joint net. These nets would use a call sign that will be duplicated in the first 6,760 nets, therefore creating a problem trying to identify the unit communicating on that circuit. These units would probably be apart of a lower echelon so that confusion would be averted. No matter what the OC code is JACS will attempt to provide all nets a unique call sign first before it begins to look to the OC code to start reusing call signs.

(4) Reuse Class and Zone (Reuse CL & Reuse ZN). Utilizing a frequency reuse plan should be a part of every units operating procedure especially in the 30-88 MHz range. Typically reuse is broken up into two areas, classes and zones. A good reuse plan should be developed by first placing the lowest echelon (platoon/squad) into the reuse plan; then evaluating the need to add other higher echelon nets to be added. The designers must realize this is a step-by-step process and can take time to complete. If the plan is haphazardly put together there is a high probability for interference. Selecting which nets can be put into a reuse plan is hard unless the designer knows a lot of the specifics about the unit(s) and how they communicate. Sometimes it is easier to identify which nets should not be in the reuse plan. The following is a list of nets that would not normally put into a reuse plan because of mission requirements:

(a) Command Nets

(b) Retransmission/Relay Nets

(c) Fire Control/Direction Nets

(d) Aviation Nets (30-88 MHz)

(e) Emergency/Medical Evacuation (MEDEVAC) Nets

(f) Fixed Frequency Nets

(g) Anti-Jam Nets (Non-Frequency Hopping)

1. Reuse Class. In the reuse class column, enter the class number the net is assigned to. Each class will make assignments to its nets from a different set of frequencies (from the correct NUI group), therefore class 01 uses a group of frequencies and class 02 will use another set of frequencies. There can be up to 99 classes assigned for any one JCEOI. All nets within a class must have the same NUI's. The designer must enter a zone number if a class number is assigned. The total frequency requirement for any class is equal to the number of nets in the largest zone in that same class.

2. Reuse Zone. In the reuse zone column enter the zone number the net is assigned to. A zone is a group of nets in which an assigned frequency cannot be repeated within that group for the same time period. Zones contain elements that will not share common frequencies within the same zone, but will share common frequencies with elements of other zones within the same class. The reuse planning process may be changed several times during the course of building the JCEOI, and requires constant attention to ensure that the frequency requirements and assets are in synchronization with one another. The ideal frequency plan would have a 1:1 ratio or nets to frequencies however; this is hardly ever the case on the modern battlefield. The designer must be familiar with the operation that is being conducted, the geographic regions and the unit structures and how they fight and use the frequencies. This information is critical to the designer by knowing the geographic region and the operation he may be able to share large quantities between two units separated by a mountain range. If the designer is familiar with the unit's task organization he will be able to share lower echelon units from one unit or with other units. Many units are experienced enough with the operation of SINCGARS operation to hardly ever use the cue or the manual channels (they utilize net cold start procedures – entering in the Julian date, global positioning system (GPS) time, and loadset and then entering the net without requesting an electronic remote fill) which makes these nets the best candidates for reuse plans. The reuse class separates the reuse plan into pools of available frequencies. A class will use an entirely different frequency

resource than that of another. JACS allows 99 classes and 99 zones in each class with an unlimited amount of nets in each zone. The amounts of nets placed into one zone should be very close to that of other zones because the amount of nets required for the largest zone in a class is the amount of frequencies required for the entire class. This will tell the JCEOI developer how to better improve the reuse plan, whether to add or subtract nets and which zones need to be modified. This is based on the JSME's guidance when making the initial determination for JCEOI production. The JSME should coordinate with the spectrum assignment authority and attempt to determine an estimated number of frequencies that will be received by the JTF; especially in the 30-88 MHz band.

(5) Frequency Sharing Plan. A frequency share (FRQ Share) plan should be done in conjunction with the reuse plan, since nets in a reuse plan cannot be in a share plan and visa versa. By placing one or more nets into a share plan, during the generation of the JCEOI JACS will assign the same frequency to all nets in that particular sharing group. In JACS the sharing plan must be named first and the user would go to the CEOI/SOI groups display of the MNL and utilize the FRQ Share column to add nets to that particular share plan. Nets that are candidates for sharing are; 1) nets that are separated geographically; 2) nets where the duty cycle (the time of actual transmission versus non-transmit time) is very low and 3) nets that are used for a similar purpose (such as survey nets).

2. LOADSET Generation. On the JACS workstation, the loadset is defined as the package of COMSEC keys and frequency-hopping data adequate to load all 6 channels of the SINCGARS integrated communications security (ICOM) radio. One loadset consists of COMSEC key tags, hopsets/lockouts, TSK, and net IDs. The JTF JCEOI needs a loadset that will tie the JCEOI, SINCGARS Hopset, and the cryptographic key together and provides a secure communications means. The creation of the loadset can be performed using the procedures listed in Annex A of this Appendix.

ANNEX A TO APPENDIX H TO ENCLOSURE D

JOINT NETS

The following is a list of COCOM and JTF nets that were extracted from reference m.

1. COCOM Nets

a. COCOM 1. COCOM Command Net -- Secure UHF SATCOM voice net connecting the supported COCOM, CJTF, and selected subordinates.

b. COCOM 1A. COCOM Command Net -- Secure HF-SSB voice net connecting the combatant command, CJTF, and selected subordinates.

c. COCOM 1B. COCOM Command Net -- Secure SHF SATCOM data net connecting the supported combatant command and selected subordinates.

d. COCOM 2. COCOM Mission Radio Net -- Nonsecure HF-SSB voice net supporting security assistance administrative matters.

e. COCOM 3. Command Data Net -- Secure HF data net between supported combatant command and CJTF.

f. COCOM 3A. Command Data Net -- Secure HF data net between supported combatant command and COMUSFOR (COUNTRY).

g. COCOM 3B. Command Data Net -- Secure HF data net between supported and supporting combatant commands.

h. COCOM 4. COCOM Special Intelligence Net -- Secure HF-SSB data net linking supported combatant command, CJTF, and selected special intelligence elements.

i. COCOM 5. Tactical Missile Alerting Net -- Secure UHF SATCOM voice alert broadcast net to CJTF and in-theater forces. Established upon direction of CJTF.

2. JTF Nets

a. JTF 3. Embassy Emergency and Voice Command Net -- Nonsecure HF-SSB voice net between military commanders and AMEMB in the area of the crisis.

b. JTF 3A. Embassy Emergency and Voice Command Net -- Secure VHF-FM voice net between military commanders and AMEMB in the area of the crisis.

c. JTF 3B. Embassy Emergency and Data Command Net -- Secure HF-SSB Data net between military commanders and AMEMB in area of crisis.

d. JTF 5. Out-Of-Country Net – Secure and Nonsecure UHF SATCOM voice net providing the CJTF and component headquarters with DSN access via a satellite ground entry station.

e. JTF 6. Noncombatant Evacuation Net -- Nonsecure HF-SSB voice net to link selected evacuation points and elements being evacuated.

f. JTF 6A. Noncombatant Evacuation Net -- Nonsecure HF-SSB voice net activated by CJTF or senior objective area commander to link selected evacuation points and elements being evacuated.

g. JTF 7. Joint Medical Regulation Net -- Nonsecure HF-SSB voice net linking CJTF-designated medical authorities.

h. JTF 7A. Joint Medical Regulation Net -- Nonsecure VHF-FM voice net linking CJTF-designated medical authorities.

i. JTF 8. JTF Objective Area Special Intelligence Net -- Secure HF-SSB data net linking supported combatant commander, CJTF, and selected special intelligence elements.

j. JTF 8A. JTF Objective Area Special Intelligence Voice Tactical Satellite net -- Secure UHF SATCOM between CJTF and subordinate and supporting commanders.

k. JTF 11. Joint Command Net -- Secure UHF SATCOM net for CJTF and components.

l. JTF 11A. Joint Command Net -- Secure HF-SSB voice net (backup to JTF 11).

m. JTF 12. Joint Administrative and Logistics Net -- Secure UHF SATCOM voice and FAX net connecting CJTF and subordinate forces to coordinate routing administrative and logistic requirements.

n. JTF 12A. Joint Administrative and Logistics Net -- Secure HF-SSB voice (backup to JTF 12).

o. JTF 17. Joint and Combined Search and Rescue (SAR) Net -- Nonsecure HF-SSB voice net linking SAR elements.

p. JTF 17A. Joint and Combined SAR Net -- Nonsecure UHF voice net linking the SAR elements.

q. JTF 17B. Joint and Combined SAR Net -- Nonsecure VHF-FM voice net. Links SAR elements.

r. JTF 18. JTF Communications Engineering Net -- Secure HF-SSB voice net for coordination relating to communications systems operation.

s. JTF 19. Joint Information Bureau Net -- Nonsecure HF-SSB operated in accordance with special instructions promulgated by the supported combatant command Joint Information Bureau.

t. JTF 19A. Joint Information Bureau Net -- Nonsecure VHF-FM operated in accordance with special instructions promulgated by the supported combatant command Joint Information Bureau.

u. JTF 23. JTF Objective Area Voice Command Net -- Secure VHF-FM voice command net linking JTF forward-deployed element in the objective area with designated subordinates.

v. JTF 24. Medical Evacuation Net -- Nonsecure VHF-FM voice net linking JTF units for purpose of medical evacuation.

w. JTF 24A. Medical Evacuation Net -- Secure UHF SATCOM data net between JTF field hospital and area of operation medical center.

x. JTF 70. Commander Joint PSYOP Net -- Configuration to be promulgated when activation is required.

y. JTF 75. Joint Counterintelligence Coordination Net -- Configuration to be promulgated when activation is required.

z. JTF 81. Joint Supporting Arms Coordination Net -- Secure HF-SSB voice nets for component forces to coordinate with CJTF concerning supporting arms for fire that impact outside of the task force areas of operation.

aa. JTF 81A. Joint Supporting Arms Coordination Net -- Secure VHF-FM voice nets for component forces to coordinate with CJTF concerning supporting arms for fire that impact outside of task force areas of operation.

bb. JTF 82. Naval Fire Control -- Secure or Nonsecure HF-SSB voice net used to pass mission status and relief reports from the firing ships to CTF____SACC.

cc. JTF 83. Naval Fire Support Net -- Secure HF-SSB voice net supporting requests for fire, ship assignments, and orders pertinent to execution of fires.

dd. JTF 84. Naval Fire Ground Spot Net -- Secure HF-SSB voice nets between shore fire control party (SFCP) and assigned direct support gunfire ships.

ee. JTF 84A. Naval Fire Ground Spot Net -- Secure VHF-FM voice nets between SFCP and assigned direct support gunfire ship.

ff. JTF 85. Joint Link-up Net -- Secure VHF-FM voice net to coordinate rendezvous of separate elements or the rejoining of detached elements to parent organizations (multiple discrete frequencies).

gg. JTF 86. Naval Fire Ground Spot (Expansion Net) -- Secure or nonsecure net to call for and adjust fire for units of TF ____. Assignments of SFCP Spot net to the firing ship and Support Fire Control Spot team will be made on JTF-82 by CTF _____SACC.

hh. JTF 87. Naval Fire Ground Spot (Expansion Net) -- Secure or nonsecure net to call for and adjust fire for units of TF____. Assignments of SFCP Spot net to the firing ship and SFCP Spot team will be made on JTF-82 by CTF____SACC.

ii. JTF 88. Naval Fire Ground Spot (Expansion Net) -- Secure or nonsecure net to call for and adjust fire for units of TF___. Assignment of SFCP Spot net to the firing ship and SFCP Spot team will be made on JTF-82 by CTF___SACC.

jj. JTF 89. Naval Fire Ground Spot (Expansion Net) -- Secure or nonsecure net to call for and adjust fire for units of TF___. Assignment of SFCP Spot net to the firing ship and SFCP Spot team will be made on JTF-82 by CTF___SACC.

kk. JTF 90. Naval Fire Ground Spot (Expansion Net) -- Secure or nonsecure net to call for and adjust fire for units of TF___. Assignment of SFCP Spot net to the firing ship and SFCP Spot team will be made on JTF-82 by CTF___SACC.

ll. JTF 91. Combined Forces Link-up Net -- Nonsecure VHF-FM voice net to coordinate rendezvous of separate elements or the rejoining of detached elements to parent organizations (multiple discrete frequencies).

mm. JTF 93A. NF Airspot Control -- Secure or nonsecure UHF voice net used by airborne spotter to call and adjust fire. Assignment of this net to an air spotter will be made over the Tactical Air Observation Net. Assignment of this net to the firing ships will be made on JTF 83, "Naval Fire Support." Only one fire mission at a time, per net, will be conducted.

nn. JTF 93B. NF Airspot Control -- Secure or nonsecure UHF voice net used by airborne spotter to call and adjust fire. Assignment of this net to an air spotter will be made over the Tactical Air Observation Net. Assignment of this net to the firing ships will be made on JTF 83, "Naval Fire Support." Only one fire mission at a time, per net, will be conducted.

oo. JTF-XXX. JTF Net Expansion -- JTF expansion capability for additional net designators as determined by the applicable combatant command or CJTF.

3. Air Coordination Nets

a. AC 1. Joint Air Coordination Net -- Secure UHF voice net via tactical satellite linking military air control agencies for coordination of air operations within and adjacent to the objective area.

b. AC 1A. Joint Air Coordination Net -- Secure HF-SSB voice net backup to UHF satellite net. Links military air control agencies for coordination of air operations within and adjacent to the objective area.

c. AC 2. Civil Air Control Common -- Nonsecure VHF-AM voice net designated by the Federal Aviation Administration or Civil Air Route Traffic Control Center to be used by Air Force Air Traffic control functions at CTF _____ CRCs and/or CRPs for control of civil aircraft movement in and through tactical airspace.

d. AC 3. Tactical Air Traffic Control Net -- Nonsecure UHF voice net guarded by air control agencies of Navy and Marine tactical air control system (TACS) for initial report by tactical aircraft in support of CTF___ units. Also used by administrative and transient aircraft to establish contact with the applicable control agency. Circuit may also be used by Air Force forces (AFFOR) elements for TACS and COMMON initial reporting net.

e. AC 3A. Tactical Air Traffic Control Net -- Nonsecure UHF voice net guarded by all Air Force radar facilities for initial reports by tactical aircraft in support of AFFOR CRCs and/or CRPs for control of civil aircraft movement in and through tactical airspace.

f. AC 4. Tactical Air Direction Net -- Secure UHF voice net provides for direction of aircraft in the conduct of a close air support mission (multiple discrete frequencies).

g. AC 5. Fighter Air Direction, Combat Air Patrol, and Air Defense Net -- Nonsecure UHF voice net supporting aircraft mission briefs and control of combat air patrol aircraft performing air defense alert, fighter escort, and/or threat intercept missions.

h. AC 8. In-flight Report -- Nonsecure UHF voice linking tactical air control systems and aircraft.

i. AC 9. UHF Airborne Relay -- Secure or nonsecure UHF used to provide and extend point-to-point UHF voice communications between ground and surface elements.

j. AC 9A. UHF Airborne Relay – Secure or nonsecure UHF used to provide and extend point-to-point UHF datalink communications between ground and surface elements.

k. AC 10. Joint Air Support Coordination Net -- Secure HF-SSB voice net used to coordinate immediate air support.

l. AC 10A. Joint Air Support Coordination Net -- Secure VHF-FM voice net to coordinate immediate air support.

m. AC 11. Link 11 -- Secure HF netted TADIL A datalink.

n. AC 11A. Link 11 -- Secure UHF netted TADIL A datalink.

o. AC 12. Link 14 -- Secure HF-SSB receive-only broadcast providing air movement data.

p. AC 13. TADIL B -- Normally, a secure or nonsecure full duplex, HF, point-to-point link that operates with continuous transmissions in both directions, utilizing serial transmission frame characteristics.

q. AC 14. Interface Coordination Net -- Secure HF-SSB voice dual-function net (tactical weapon employment coordination and digital message and interface control).

r. AC 15. Track Supervision Net (TSN) -- Secure or nonsecure HF-SSB voice primary, assisting units entering and exiting the interface.

s. AC 15A. TSN -- Secure or nonsecure UHF voice backup, assisting units entering and exiting the interface.

t. AC 16. Datalink Coordination Net (DCN) -- Secure or nonsecure HF-SSB voice primary used to coordinate equipment supporting TADIL operations.

u. AC 16A. DCN -- Secure or nonsecure UHF voice backup used to coordinate equipment supporting TADIL operations.

v. AC 17. Voice Product Net (VPN) -- Secure UHF voice net used to forward non-digital SIGINT information to other interface subscribers.

w. AC 17A. Special Information Systems/VPN -- VINSON-Secure UHF voice net used to forward non-digital special intelligence and SIGINT information to other interface subscribers.

x. AC 18. Tactical Air Request Net -- Secure HF-SSB voice net used to request immediate air support from air control agencies.

y. AC 19. Fighter Check-In Net -- Secure or nonsecure UHF voice net used to direct joint fighter type aircraft missions.

z. AC 19A. Fighter Air Direction Net -- Nonsecure UHF voice net used to direct joint fighter type aircraft missions.

aa. AC 20. Air Traffic Control -- Nonsecure UHF voice used for air traffic control services.

bb. AC 20A. Air Traffic Control -- Nonsecure VHF-AM voice used for air traffic control services.

cc. AC 23. Tanker, Refueling, and Rendezvous Operations -- Nonsecure UHF or VHF-AM voice nets for control of rendezvous and tanker and/or tactical aircraft in-flight refueling operations (multiple discrete frequencies).

dd. AC 24. HELO Direction Net -- Nonsecure UHF voice net used to control HELO assets in the JTF operating area.

ee. AC 25. HELO Command Net -- Secure UHF voice net linking the tactical air control center with the Naval HELO support units.

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APPENDIX I TO ENCLOSURE D

GENERATING THE JOINT RESTRICTED FREQUENCY LIST

1. Overview. The JRFL is a geographically and time-oriented listing of TABOO, PROTECTED, and GUARDED functions, nets, and frequencies. The JRFL should be limited to the minimum number of frequencies necessary for friendly forces to accomplish objectives.

2. JRFL. The JRFL mission is typically performed by the JSME. J-6 should compile the JRFL based on the coordinated inputs from the operations, intelligence, and communications staffs within the command and affected subordinate commands. The J-6 should ensure that the frequency assignments of unit nets designated for inclusion as PROTECTED or TABOO on the JRFL are submitted to the J-3 for final approval prior to dissemination. The restrictions imposed by the JRFL may only be removed at the direction of the J-3 if determined that the benefit of jamming a restricted frequency surpasses the immediate criticality to friendly forces. Operations and intelligence functions must be consulted before this decision. However, the self-protection of combat aircraft and ships has priority over all controls. GUARDED, PROTECTED, and TABOO frequencies are defined as follows.

a. GUARDED. Frequencies that are adversary frequencies being exploited for combat information and intelligence. A GUARDED frequency is time-oriented in that the list changes as the adversary assumes different combat postures. These frequencies may be jammed after the commander has weighed the potential operational gain against the loss of the technical information.

b. PROTECTED. JTF frequencies used for a particular operation, identified, and protected to prevent them from being inadvertently jammed by friendly forces while active EW operations are directed against hostile forces. These frequencies are of such critical importance that jamming should be restricted unless absolutely necessary or until coordination with the using unit is made. They are generally time oriented, may change with the tactical situation, and should be updated periodically.

c. TABOO. The frequencies of such importance that it must never be deliberately jammed or interfered with by friendly forces. Normally these include international distress, CEASE BUZZER, safety, and controller frequencies. These are generally long-standing frequencies. However, they may be time oriented in that, as the combat or exercise situation changes, the restrictions may be removed to allow self-protection by friendly forces. Specifically, during crisis or hostilities, short duration jamming may be authorized on TABOO frequencies for self protection to provide coverage from unknown threats, threats operating outside their known frequency ranges, or for other reasons.

3. JRFL Production Process. See Figure D-I-1.

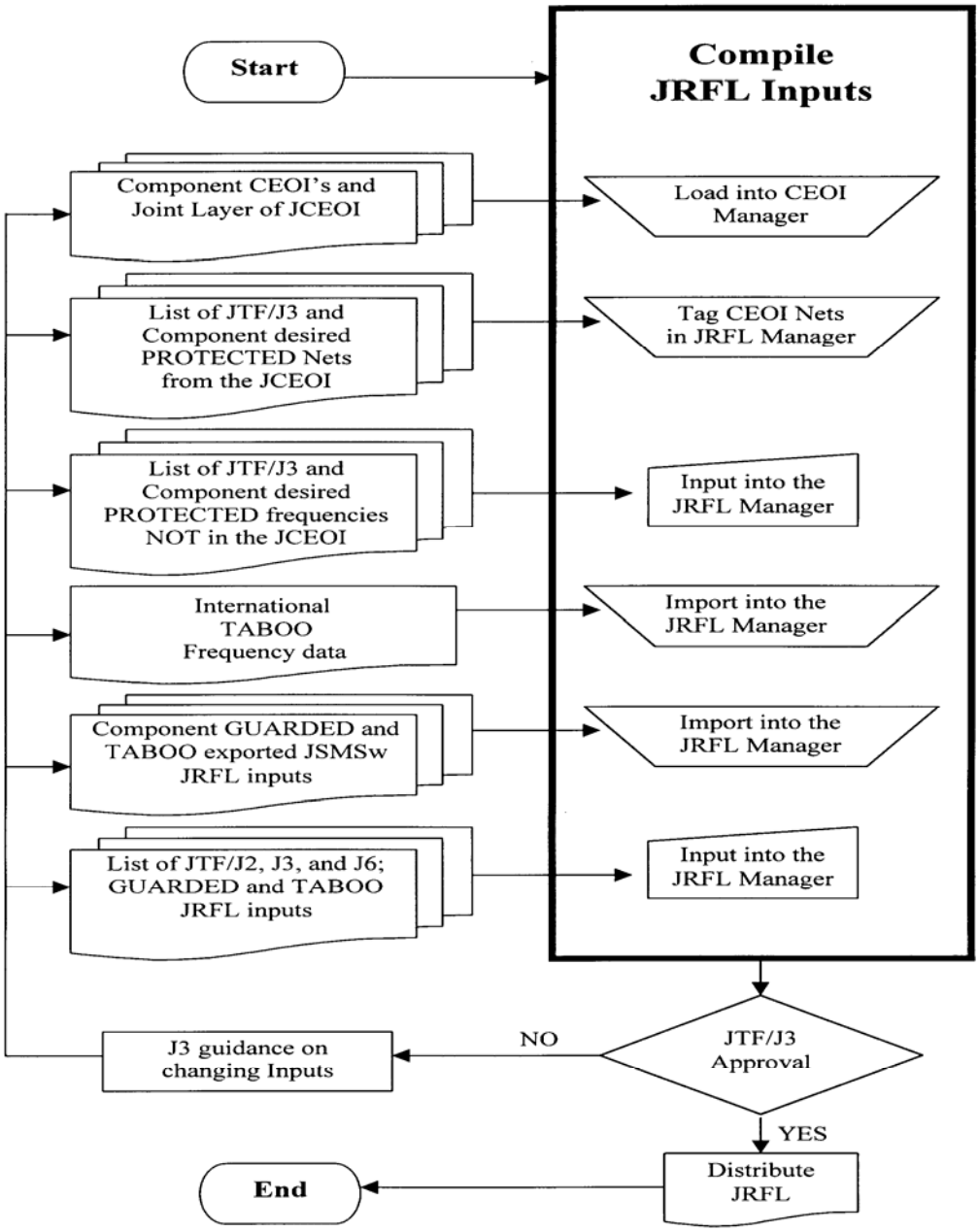

Figure D-I-1. The JRFL Process

a. Identification. The JRFL identification process begins at the unit level and works upward through component Service chain-of-command channels. The JTF staff, along with other forces, will identify to the JSME those

frequencies that will be included in the JRFL. Input to the JSME will be in the form of JCEOI nets, frequencies in the database, and frequencies identified by the various elements of the J-2, J-3, and J-6. These frequencies will be identified to the EWCC for coordination.

b. Consolidation. These frequencies, along with any frequencies similarly identified by the component forces, are consolidated by the JSME into a JRFL. All generated JCEOIs for the JTF will be provided to the JSME. Included will be listing of international TABOO frequencies. The JSME will enter all inputs into SPECTRUM XXI and generate an initial JRFL list.

c. Review and Dissemination. This initial list is taken to the EWCC for coordination and deconfliction. Once approval is received from the J-3, the JRFL is distributed; this is generally the responsibility of the J6.

4. Data Fields. The following is a list of data fields that are needed to complete the JRFL report in SPECTRUM XXI.

a. Classification. One character indicates the security classification of the JRFL.

(1) U=UNCLASSIFIED

(2) C=CONFIDENTIAL

(3) S=SECRET

b. Declassification. The declassification date for the frequencies to be protected.

c. Unit. Name of the unit to which the frequency is assigned.

d. Status. Restricted classification status followed by a slash (/) and two characters to indicate the level of restriction, A-Z and 1-9, with A1 being the highest level.

(1) T=TABOO

(2) G=GUARDED

(3) P=PROTECTED

e. Period. The time-period for which the restriction will be active. This refers to the JCEOI time-period.

f. Start Date. The date on which the restriction will begin.

g. End Date. The date on which the restriction will end.

h. Start Hour. The hour on which the restriction will begin.

i. End Hour. The hour on which the restriction will end.

j. Agency Serial. A unique agency identifier for each frequency assignment (SFAF Item 102).

k. Frequency. The frequency to be restricted.

l. Emission. The bandwidth and emission designator of the equipment (SFAF Item 114).

m. Power. The transmitter power proceeded by the unit indicator (SFAF Item 115). Unit indicators are as follows:

(1) W – watts

(2) K – kilowatts

(3) M – megawatts

(4) G – gigawatts

n. Transmitter Lat-Long. The latitude and longitude of the transmitter location in degrees, minutes, and seconds, followed by N or S for the latitude and E or W for the longitude.

o. Receiver Lat-Long. The latitude and longitude of the receiver location in degrees, minutes, and seconds, followed by N or S for the latitude and E or W for the longitude.

p. Equipment. Enter the equipment name.

q. Comments. Enter all remarks, limitations, and comments.

5. Frequency List. Listed below in Table D-I-1 are the worldwide TABOO frequency listings:

FREQUENCY	**AUTHORIZED USAGE**	**EMISSION DESIGNATOR**
K490	*GMDSS/MET AND NAV WARNINGS*	*1K24F1B*
K500	*GMDSS/DISTRESS AND CALLING*	*20K00A2A*
K518	*GMDSS/NAVTEX/MET AND NAV WARNINGS*	*1K24F1B*
K2174.5	*INTL DISTRESS/SAFETY*	*3K00J3E*
K2182	*INTERNATIONAL DISTRESS*	*6K00A3E*

FREQUENCY	AUTHORIZED USAGE	EMISSION DESIGNATOR
K2187.5	*INTL DISTRESS/SAFETY*	*3K00J3E*
K3023	*INTERNATIONAL SAR*	*6K00A3E*
K4125	*INTERNATIONAL DISTRESS AND SAFETY*	*6K00A3E*
K4177.5	*INTL DISTRESS/SAFETY*	*3K00J3E*
K4207.5	*INTL DISTRESS/SAFETY*	*3K00J3E*
K4209.5	*GMDSS/NAVTEX MET AND NAV WARNINGS*	*1K24F1B*
K4210	*INTL MARITIME NAV SAFETY*	*6K00A3A*
K5680	*INTERNATIONAL SAR*	*6K00A3E*
K6215	*INTERNATIONAL DISTRESS AND SAFETY*	*6K00A3E*
K6268	*INTL DISTRESS/SAFETY*	*6K00A3E*
K6312	*INTL DISTRESS/SAFETY*	*6K00A3E*
K6314	*INTL MARITIME SAFETY/GMDSS*	*1K24F1B*
K8291	*INTL DISTRESS/SAFETY*	*6K00A3E*
K8364	*INTL SAR/SURVIVAL CRAFT*	*6K00A3E*
K8376.5	*INTL DISTRESS/SAFETY*	*3K00J3E*
K8414.5	*INTL DISTRESS/SAFETY*	*3K00J3E*
K8416.5	*GMDSS/INTL MARITIME SAFETY*	*1K24F1B*
K12290	*INTL DISTRESS/SAFETY*	*6K00A3E*
K12520	*INTL DISTRESS/SAFETY*	*6K00A3E*
K12577	*INTL DISTRESS/SAFETY*	*6K00A3E*
K12579	*GMDSS/INTL NAVIGATION SAFETY*	*1K24F1B*
K16420	*INTL DISTRESS/SAFETY*	*6K00A3E*
K16695	*INTL DISTRESS/SAFETY*	*6K00A3E*
K16804.5	*INTL DISTRESS/SAFETY*	*6K00A3E*
K16806.5	*GMDSS/INTL MARITIME SAFETY*	*1K24F1B*
K19680.5	*GMDSS/INTL MARITIME SAFETY*	*1K24F1B*
K22376	*GMDSS/INTL MARITIME SAFETY*	*1K24F1B*
K26100.5	*GMDSS/INTL MARITIME SAFETY*	*1K24F1B*
M121.5	*INTL DISTRESS/AERONAUTICAL EMERGENCY*	*6K00A3E*
M123.1	*INTL EMERGENCY/SAR*	*6K00A3E*
M156.3	*INTL SHIP/AIRCRAFT SAR*	*25K00G3E*
M156.525	*INTL DISTRESS/SAFETY/GMDSS*	*25K00F3E*
M156.65	*INTL SAFETY OF NAVIGATION*	*25K00F3E*
M156.8	*INTL DISTRESS AND SAFETY*	*750K00F3E*
M243	*AERO EMERGENCY/INTL DISTRESS/SAR*	*6K00A3E*
M406.05	*SATELLITE EPIRB*	*100K00F3E*
M1227.6	*SATELLITE GPS DOWNLINK*	*24M00F1D*
M1544.5	*SATELLITE EPIRB FEEDER LINKS*	*1M00F1D*
M1575.42	*SATELLITE GPS DOWNLINK*	*24M00F1D*
M1646	*SATELLITE EPIRB*	*1M00F1D*

Table D-I-1. Worldwide-Restricted Frequency List

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APPENDIX J TO ENCLOSURE D

ELECTRONIC WARFARE DECONFLICTION

1. Electronic Warfare Frequency Deconfliction. Friendly, adversarial, and third party operations that use or affect the electromagnetic spectrum (communications, noncommunications, jamming) have the potential to interfere with joint force communications and other electronic systems. To counter this, the US military has established spectrum management and EW frequency deconfliction procedures. Spectrum management is composed of an entire range of technical and nontechnical processes designed to quantify, plan, coordinate, and control the electromagnetic spectrum to satisfy spectrum use requirements while minimizing unacceptable interference. EW deconfliction (distinct from EW operations) can be considered a subset of spectrum management and is defined as a systematic management procedure to coordinate the use of the electromagnetic spectrum for operations, communications, and intelligence functions. The following items are critical elements in the EW frequency deconfliction process and should be performed on a continuing basis.

a. Conflict. EW planners should be prepared to examine cases where EA missions' conflict with the JRFL or where JRFL changes might affect planned EA operations. The extent of conflict analysis depends on the tools and time available to the EW staff. Joint EWCC personnel should attempt to resolve or diffuse the conflict by working within the staff and subordinate EW units. If the deconfliction effort is successful, the operation is conducted as planned or modified. For unresolved conflicts, the J-3 remains the ultimate authority on EW frequency deconfliction.

b. Jamming. In joint operations, jamming is a form of nonlethal fire as discussed in JP 3-09, Doctrine for Joint Fire Support. As nonlethal fire, the determination to conduct jamming is made in accordance with the principles set forth in Chapter III of JP 3-09. Joint EWCCs should be familiar with the process and principles of joint fire support and provide appropriate guidance and coordination necessary to deconflict jamming with other friendly uses of the spectrum. Close, continuous coordination with component planners and with allied and coalition planners (during both the planning and execution phase of joint operations) is necessary to ensure that the jamming missions are conducted as planned and necessary while minimizing unintended disruption of the spectrum. OPLANs should include provisions for an on-station jamming control authority (JCA) that will provide real-time coordination and deconfliction of jamming efforts. The JCA does not need to be an EA asset but should be capable of monitoring the ES spectrum and assessing effects on both friendly and unfriendly forces and be in contact with EA assets to provide direction and coordination of EA efforts.

c. Disruption. When the operation is successful and the friendly EA missions do not disrupt friendly communications networks or noncommunications equipment operations, no frequency conflict occurs. However, when any disruption on a friendly frequency occurs, two actions should take place: a report of the disruption should be made as soon as possible to the J-6 spectrum manager and, if critical functions are interfered with, the controlling authority for CEASE BUZZER (an unclassified term used to terminate EA activities, including the use of EW expendables) should be contacted to evaluate the need to issue a CEASE BUZZER notification.

(1) Report of Interference. Report interference using joint spectrum interference resolution formatted messages in accordance with CJCSM 3320.02, "Joint Spectrum Interference Resolution (JSIR) Procedures." Operators should report interference through the chain-of-command to the J-6 spectrum manager by the fastest means available. As the interference reports are passed through the chain-of-command, each component with the capability should attempt to resolve the interference under its purview. Each component may not have the capability or control over that portion of the spectrum to resolve the conflict, so the report should be forwarded as quickly as possible to a level of command with the capability. Ultimately, all unresolved interference reports reach the J-6, at which time the spectrum manager should attempt to determine the cause of the interference and resolve the conflict.

(2) CEASE BUZZER Notification. For critical functions (generally those on the JRFL TABOO list), an immediate CEASE BUZZER notification should be promulgated by the JCA if the interference can be positively identified as friendly EA. The CEASE BUZZER notification is issued for the specific frequency or range only on the EW control net of the offending jammer. No acknowledgment of interference is made on the signal being jammed.

d. Resolving Interference. If the spectrum manager can determine that the disruption was caused by a source other than friendly EA, the J-6 has the option of modifying the current JCEOI or communications plans. If the spectrum manager determines that the interference was caused by friendly EA, then the report should be given to the EWCC for resolution and possible modification of the JRFL.

e. EW Deconfliction Procedures. Joint Pub 3-51, Joint Doctrine for Electronic Warfare, provides the following guidance for developing joint EW deconfliction procedures. To the extent possible, these procedures should be followed during joint, multinational, and single-Service operations and exercises. The steps involved in the EW frequency deconfliction process are as follows.

(1) Defining the Operations Concept and Critical Functions. The J-3 defines the concept of operations to include each discrete phase of the

operation. For each phase, the J-3 defines the critical mission functions that require uninterrupted communications connectivity or noncommunications operations. For example, communications with long-range reconnaissance elements or close air support assets could be crucial to preparing for transition from defense to offense. Noncommunications equipment such as identification, friend or foe systems and fire-control radars might also need protection. The J-3 provides this guidance to the joint force staff and subordinate commanders for planning.

(2) Generating the JRFL. This topic is covered in Appendix I to enclosure D.

2. SPECTRUM XXI EW Deconfliction. This capability provides the user a new method to better analyze the impact of EA operations on JTF spectrum dependant system. Currently EW deconfliction is performed by comparing EW possible targets against only the current JRFL. Since the JRFL only contains the high priority C2, weapons, and guarded spectrum dependant systems, there are many systems that will be affected without being considered by using the current method. Conversely, SPECTRUM XXI considers all frequency assignments within its database along with all nets contained in the JCEOI and the JRFL. This higher level of detail provides the EWCC planner a much better estimate of the potential fratricide that an EA mission may cause.

a. To effectively utilize the EW deconfliction capability within SPECTRUM XXI the spectrum manager must maintain a current database of all JTF spectrum use, maintain a current JCEOI file within SPECTRUM XXI, and maintain the JRFL.

b. Spectrum manager security clearance levels, usually SECRET but not TS-SCI, is one possible barrier to incorporating a spectrum manager on the EWCC planning team. Historically, spectrum managers have not had TS-SCI identified as a requirement for performing their daily mission.

c. This capability holds much potential for the EWCC and supporting the planning mission it support for the JTF.

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APPENDIX K TO ENCLOSURE D

RESOLVE INTERFERENCE

1. Overview. EMI to systems using the electromagnetic spectrum is a continuing problem in military operations. The very nature of military operations forces us to assign frequencies on a NIB. This means that the military user will be forced to accept a certain amount of interference in the course of their duties. When this interference impedes operations and hinders mission accomplishment then it is considered unacceptable and steps are taken to resolve and/or eliminate the source of the interference. Effective EMI management plays a crucial role in assuring critical information is exchanged timely and accurately, in times of war, during operations other than war, and peacetime. Effective spectrum management is crucial to obtaining and maintaining information superiority, an essential foundation of information operations. Timely and accurate identification, verification, characterization, reporting, geolocation of the source, analysis, and resolution of EMI during military operations is essential to maintaining C2 of US forces and responding to adversary EA actions. Since EMI can be caused by enemy, neutral, friendly, or natural sources it must be resolved on a case-by-case basis. Users must report all EMI regardless of the severity. It is essential that efficient, practical procedures be established to affect the reporting and resolution of EMI.

2. Causes of Interference. Radio frequency interference is always present in a military environment. It may come from a single source or a combination of many sources including natural or manmade frequency interference, poor equipment condition, improper equipment usage, frequency interference, use of unauthorized frequencies, and frequency reuse.

a. Natural Interference. Natural radio noise has two principal sources: atmospheric noise (thunderstorms) and galactic noise (stars). It is especially noticeable at night when the lower frequencies propagate farther than in the daytime. The only way to reduce this type of interference is to use a directional antenna to prevent receiving the interference from all directions. However, this will not eliminate the noise coming from the direction of the received signal. Use of a higher frequency will also help, although if a sky wave circuit is used, care must be exercised not to pick the highest frequency at which the signal will be refracted to Earth by the ionosphere (i.e., the critical frequency).

b. Manmade Interference. Most manmade interference comes from electrical sources such as power generators, alarm systems, power lines, auto ignition, fluorescent lighting, faulty electrical relay contacts, and electrified railroads. Manmade interference also includes enemy jammers. The key to combating this form of interference is to isolate communications equipment from manmade interference.

c. Frequency Interference and Intermodulation. This type of interference is caused primarily by two radio transmitters using the same frequency, or frequencies so close to each other that the emission bandwidths overlap, which is considered co-channel interference. When this condition occurs and the radios are in close proximity interference is the result.

(1) The resolution to this problem is to either move the transmitters further apart geographically or change or separate the frequencies. Another condition that can occur is called adjacent-channel interference, this is where the emission bandwidths do not overlap but are aligned close beside each other and cause interference. Brut-force penetration is a condition where the transmit power of the interferer is so strong that it desensitizes the receiver and causes the receiver to become operationally useless, this type of interference does not have to be in the same frequency band as the victim.

(2) The interference from known sources such as generators can be greatly reduced if an antenna is positioned so that an obstacle (e.g., a hill) is between it and the source. This must be done so that the same obstacle will not block the intended radio path. If the interference is not coming from the same direction as the intended signal, then a directional antenna should be used.

d. Poor Equipment Condition and Improper Usage. The condition of radio equipment and how it is being used may result in interference. There are several steps that should be taken to lessen this possibility. These include making certain that shielded cables are used where required, ensuring connectors are properly connected to cables, and making sure that antennas within a group are as far apart as possible. All antenna leads (transmission lines), power lines, and telephone lines should be as short as possible when they are on the ground and should not cross. If lines do cross, they must cross at 90-degree angles to each other, and they must be separated from each other by standoffs. Lines threaded through the trees near an antenna serve as pipelines for interference to and from antennas. Finally, ensure that all radio equipment is grounded.

e. Use of Unauthorized Frequencies. There is one final source of frequency interference; the use of unauthorized frequencies. This practice is illegal and has the potential to disrupt a carefully engineered frequency plan, introduce interference to other frequencies and circuits, and prevent other units from fulfilling their mission. Radio operators should never use unauthorized frequencies.

f. Frequency Reuse. There are not enough radio frequencies available for all radio operators to have their own channel. When HF propagation conditions are favorable, Marines may discover that their radio frequency is being used by foreign or US military personnel in other countries. VHF FM

frequencies often have to be reused within the same operation by more than one unit. The exercise frequency manager will try to make certain that users of the same frequency are as far away as possible from each other, but some units (Marine Corps and Army, in particular) will join at some stage in the operation. When this occurs, the first common, higher headquarters should be informed to settle the problem.

3. SPECTRUM XXI Interference Analysis Capability

a. The SPECTRUM XXI interference analysis module can be used to analyze an existing frequency assignment or user-specified operating parameter for potential interference from environmental transmitters and receivers. This analysis could incorporate interference resolution by identifying possible known emitters whose authorized operating parameters could be the source of the interference. An interference analysis can also be performed on the victim's frequency assignment record by using the nomination process in the SPECTRUM XXI frequency assignment module. The interference analysis process is only as accurate as the frequency assignment database is current.

b. Using the interference analysis capability should cause you to reevaluate the parameters being used to determine interference. Unlike the nomination process that uses the same computer algorithm, when performing an interference analysis you should look at considering harmonics and intermodulation products as well as the levels needed to be evaluated. You might want to reduce the criteria set for the radius of mobility as well as using the actual location of the victim.

4. Resolving Interference. Actions to take:

a. Interference is always reported from a receiver perspective. When receiving an interference report you need to ask specific questions like: Who are you? (unit, receive frequency, location(s), impact to mission, etc).

b. Is the report coming from a unit working for, or supporting the JTF or a supporting unit, NGO, other government agencies (OGA), etc.)? If so, query the victim assignment (search on unit, frequency, location to assist you in identifying the victim record within your database), if found, and not a band assignment, tag the record and load into the proposal editor. Modify the record to the exact parameters of receive station getting interference, to include exact location, remove mobility (306/406), exact antenna height, and power levels and then perform a nomination on this proposal. If victim proposal is not found, then initiate a new proposal (requirement) and go no further in the interference resolution process.

c. If the report is from an authorized spectrum user, where is the interference being experienced, exactly, what type of interference is it, how

severe is the problem? Has the user attempted to resolve the interference locally using the checklist from the CJCSM 3320.02A, Joint Spectrum Interference Resolution (JSIR) Procedures?

d. Evaluate the interference analysis results and research identified conflicts starting with the records with the highest interference conflict margin (ICM) values as they are the most likely interfere. As you eliminate the higher value ICM proceed to records with lower ICM values and then to the flagged records until you locate the actual emitter causing the interference.

e. If no interference source is identified then you need to identify what forces are deployed in the area where interference is occurring. Bootleg frequency use or unknown users in the area will cause this problem, NGO, OGA, are two very likely possibilities.

EMI CHARACTERIZATION AND RESOLUTION AT THE LOCAL LEVEL JSIR EMI CHECKLIST		
STEP	**ACTION**	**COMP Y/N**
001	Start a log and collect as much information as possible.	
002	Record what interference sounds like. If appropriate measurement equipment is available, an attempt should be made to quantify the characteristics of the interference signal. These characteristics include the interfering source's center frequency, bandwidth, relative amplitude, modulation, and direction of interference, time of occurrence, and any other characteristics that can be obtained.	
003	Geographical Information	
003-01	Check with other units in the geographical area to determine the area affected.	
003-02	Verify exact location of receiver using GPS, if available.	
004	Determine interference start and stop times.	
005	Ensure affected system is operating correctly.	
005-01	Ensure all connectors are tight.	
005-02	Ensure antenna cables are in good condition.	
005-03	Have maintenance personnel ensure equipment is operating IAW technical manual specifications and frequency assignment parameters.	
006	Verify antenna is on the correct azimuth and elevation.	
007	Environment Information	

EMI CHARACTERIZATION AND RESOLUTION AT THE LOCAL LEVEL JSIR EMI CHECKLIST		
STEP	**ACTION**	**COMP Y/N**
007-01	Contact all nearby units to determine if they have recently installed any new equipment	
007-02	Check with equipment maintenance personnel to determine if the interference is the result of maintenance actions or an equipment malfunction. This should include non-RF equipment that can cause spark-type interference used to support the operation of RF equipment (e.g., thermostat-controlled devices, electric motors, welders, etc.)	
007-03	Check to see if construction is being conducted in the immediate area.	
007-04	Determine whether the natural environment is the cause of the problem; see Enclosure F.	
008	Frequency Assignment Information	
008-01	Verify through service Component or JTF spectrum manager that a valid frequency assignment and/or satellite authorization exists.	
008-02	If no assignment exists, cease transmission and request new frequency.	
008-03	If valid assignment exists, change to alternate frequency and determine if interference is present. If interference is to a satellite communications system, skip to step 9.	
008-04	If a valid assignment exists and the interference goes away after changing to an alternate frequency, submit an interference report through next higher headquarters and info JSC	
008-05	Where co-channel or adjacent channel interference is suspected (i.e., the interfering signal overlaps the operating bandwidth of the victim receiver), check with local and area frequency management personnel to determine if other locally operated equipment has been recently assigned a co-channel or adjacent channel frequency.	
009	Satellite Communications Interference for MILSATCOM	
009-01	Net Control Station should contact the supporting SSC and determine if they can identify interference on the satellite. A determination must be made at this time as to whether the interference is on the uplink or downlink of the satellite channel. If two or more users separated by 300 miles are observing the same interference, the interference is likely on the uplink.	
009-	If no interference is present on the satellite uplink frequency,	

EMI CHARACTERIZATION AND RESOLUTION AT THE LOCAL LEVEL JSIR EMI CHECKLIST		
STEP	**ACTION**	**COMP Y/N**
02	request to be switched to an alternate channel in a different part of the frequency band.	
009-03	If SSC reports a steady receive key (SRK) on the channel, have all users vacate the net.	
009-04	Once all users are off the net, contact SSC and ask if the SRK is present.	
009-05	If SRK is gone, have users re-access the net one at a time while SSC monitors; once the user that was causing the interference moves back onto the net the SRK will re-appear.	
009-06	If SRK is present, request another channel for testing. Have users move to the new channel, one at a time, while monitoring the channel.	
009-07	Once all users have moved to new channel, determine if SRK is present on the original channel.	
009-08	If SRK is present on original channel, initiate a harmful interference report.	
010	Combatant Commander or JTF will request JSC support to help resolve interference to terrestrial systems.	
011	Combatant Commander or JTF will request resources to support interference resolution to space systems.	
012	Provide feedback through the chain of command to the affected unit of actions taken and the resolution.	

Table D-K-1. JSIR EMI Checklist

5. Interference Resolution Tool Kit

a. SPECTRUM XXI Database. The SPECTRUM XXI assignment database is, by joint doctrine, the primary source of spectrum use information for the JTF. Near-real-time maintenance of this database is critical to using it as an effective tool JTF interference resolution. Additionally, failure to maintain this database will also degrade the JSME ability to make new interference-free frequency assignments.

b. Intelligence Community (J-2). Establish a partnership with the local Intelligence Community representatives. They have access to information sources (i.e., intercept databases) not typically available to the spectrum manager. They also have analyst that can assist in interpreting information that may be unfamiliar. The Intelligence Community can also task their in-theater assets, or interface with other national agencies to leverage deployed in-theater assets for local geolocation. Encourage spectrum managers at all

echelons to establish a working relationship with their intelligence counterparts.

c. EWCC. Maintain close coordination with these organizations to help facilitate both interference and EW deconfliction. Continued coordination, periodic updating, dissemination of the JRFL is the first step. Be an advocate for the education of the EWCC principles and staff on JRFL and frequency deconfliction methods and procedures. Even strict adherence to the JRFL will not totally prevent EA disruption of sensitive friendly systems. Jammer out-of-band noise and harmonic effects can easily cause unintentional disruption to systems. Using SPECTRUM XXI's EW deconfliction analysis module these potential problems can be better identified by considering jammer parameters along with the JTF electromagnetic environment. Performing an EW deconfliction analysis as a part of the EW planning and/or targeting process could allow for advance notice to the warfighter of potential fratricide.

d. In-Theater Operators and Maintainers. Incorporate the user into the interference resolution process. Typically they have the best knowledge of the local area and equipment being used. Educating them to ask questions about changes in the area, adjustments to the equipment, and checking to see if other systems locally are being affected will greatly help in identifying and reducing EMI. The maintenance community has test equipment that can validate if equipment is operating correctly and within its authorized parameters. This type of assists is invaluable when troubleshooting frequency problems with UHF SATCOM. It is always important to capture this information in the reporting process to help identify future interference problems.

e. Combatant Command J-6 and J-2. These organizations both have many assets available along with a larger situational awareness of operations that may be affecting your problem.

f. Direction Finding/Signal Characterization Equipment. Requesting assistance like this is usually considered a last resort. This type of assistance is difficult to secure and often does not produce the desired result. The first step in this direction would be to have the intelligence units and maintainers use indigenous assets to attempt to resolve the problem. Purchasing DF equipment and strategically prepositioning it on the battlefield has been attempted, but there are drawback to this approach:

(1) Who will operate the equipment? The answer to this question should dictate the type and complexity of the equipment to purchase. These skills are not within the core competencies of a spectrum manager.

(2) Cost. Test equipment is expensive and the associated accessories; antennas, cables, amplifiers, ad power supplies can become unwieldy.

(3) Frequency Range. This will be a determining factor on what systems can meet your needs.

(4) Mobility. How mobile is the system? Is that a requirement?

ANNEX A TO APPENDIX K TO ENCLOSURE D

JOINT SPECTRUM INTERFERENCE RESOLUTION PROCEDURES

1. General

a. EMI to C-E equipment is a continuing problem in all-military operations. While all spectrum users will at one time or another experience some level of EMI to their C-E systems, it is only when the degree of interference becomes unacceptable that positive action must be taken.

b. Although EMI may affect mission accomplishment, unacceptable EMI actually impedes operations. It may be caused by friendly, enemy, neutral, or natural sources. Generally, EMI must be solved on a case-by-case basis. Figure D-K-A-1 outlines procedures helpful in resolving EMI. Most interference incidents are dealt with at the lowest possible level within the JTF structure. When the cause and recipient of the interference are not within the same component force or supporting element, however, resolution becomes more difficult.

2. Resolving Spectrum-Use Conflicts

a. Spectrum-use conflicts arise as new requirements for use of the spectrum are identified, and conflicting or competing use of the spectrum should be expected. CJCSI 3220.01 states "For conflicting or competing use that affects more than one primary functional area, the EWCC examines requirements and attempts to solve the problem in coordination with the JFMO."

b. For conflicting or competing use that affects more than one primary functional area, the EWCC examines its spectrum-use requirements and attempts to resolve the problem. If resolution is not possible at this level, the EWCC elevates the matter to the JFC or that commander's designee, usually the J-3.

3. Reporting Incidents of Unacceptable EMI. Affected users will report incidents of unacceptable EMI. Various Service components are usually required and accustomed to reporting EMI incidents in a Service-prescribed format.

4. The JSIR Program. The JSIR program addresses those EMI incidents that cannot be resolved at the component or JTF level. This program is coordinated and managed by the JSC, Annapolis, Maryland. (Reference h.)

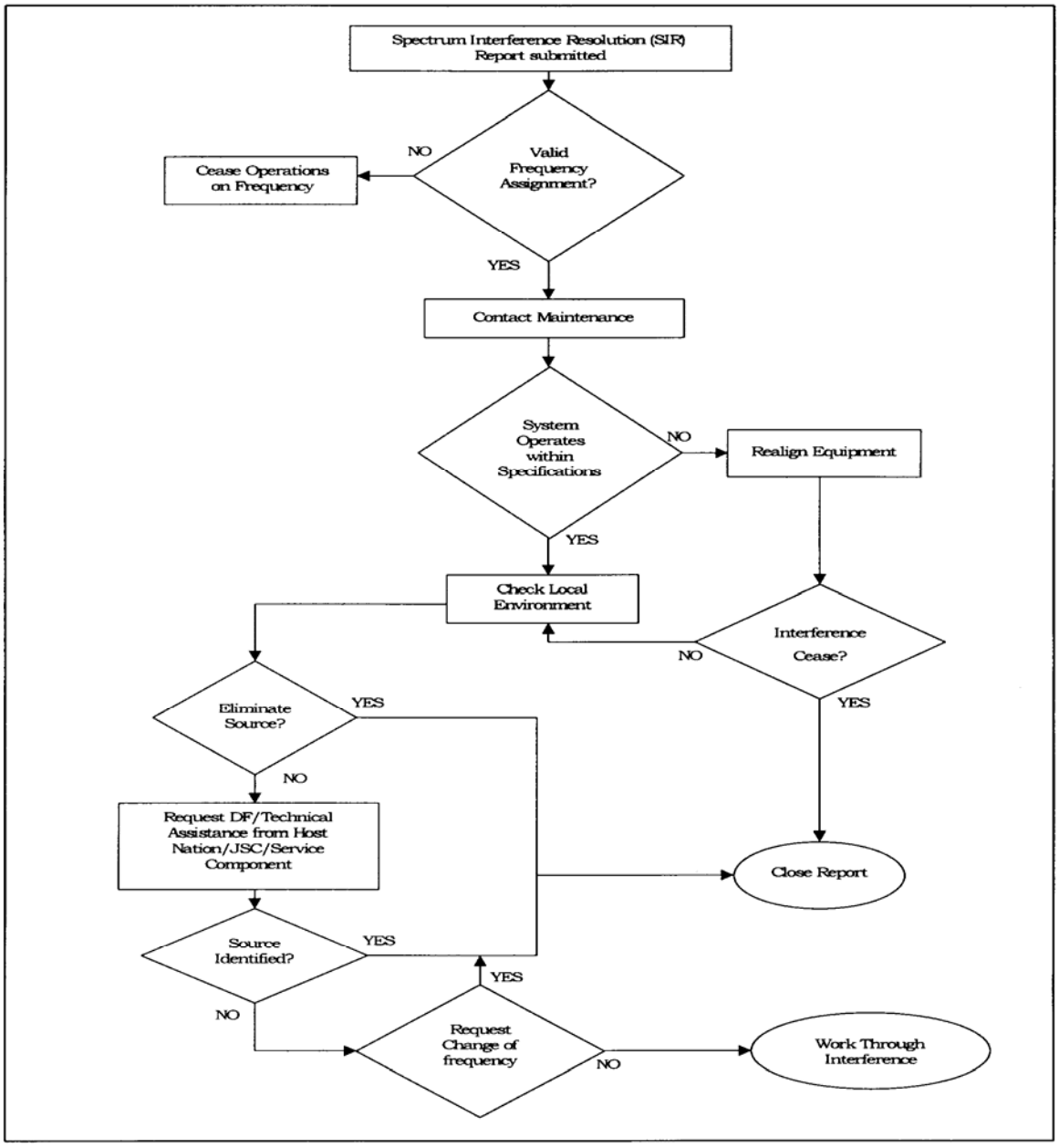

Figure D-K-A-1. Interference Resolution

a. The objective of the JSIR program is to assist the Services and combatant commanders in resolving persistent, recurring interference that cannot be resolved at the Services or combatant command levels. The JSC JSIR team is comprised of active duty personnel and JSC support services contractor personnel.

b. JSC has a 24-hour capability for receiving interference reports. USMTF messages to the JSC JSIR team can be sent to JSC ANNAPOLIS MD//OP/JSIR//. The JSIR team can also be contacted via voice mail pager at DSN 281-2511, extension 7007, or commercial (410) 573-7007. Special compartment information traffic is serviced directly through secure facsimile (FAX) and DOD Intelligence Information System and/or Joint Worldwide Intelligence Communication System in the special compartment information facility at JSC, E-mail address: jscop@nsc.dodiis.

5. Minimum Report Requirements. Information required for the JSIR team to start resolving interference is as follows:

a. The information contained in the component Service interference report.

b. System affected by the interference (nomenclature, J/F-12 number, etc.)

c. Frequency of the victim receiver.

d. Area and/or location where the interference incident occurred.

e. A description of the interference.

f. The times and dates the interference occurred.

g. A point of contact with DSN (and/or commercial number) and duty hours available to discuss the interference incident.

6. JSC JSIR Process. Upon receipt of a JSIR service request, the JSC JSIR team performs an analysis using JSC models and databases to determine the source, and works with the appropriate field activity and frequency managers to resolve interference problems.

a. The JSC JSIR team will deploy to the location of the victim organization if necessary to resolve interference problems. The JSIR team will provide the organization requesting JSIR services a message report of the results of the JSIR analysis and incorporate appropriate information into the JSIR database. This database supports both trend analysis and future interference analyses.

b. The general flow of the reporting and resolution procedures for interference to terrestrial users is depicted in Figure D-K-A-2.

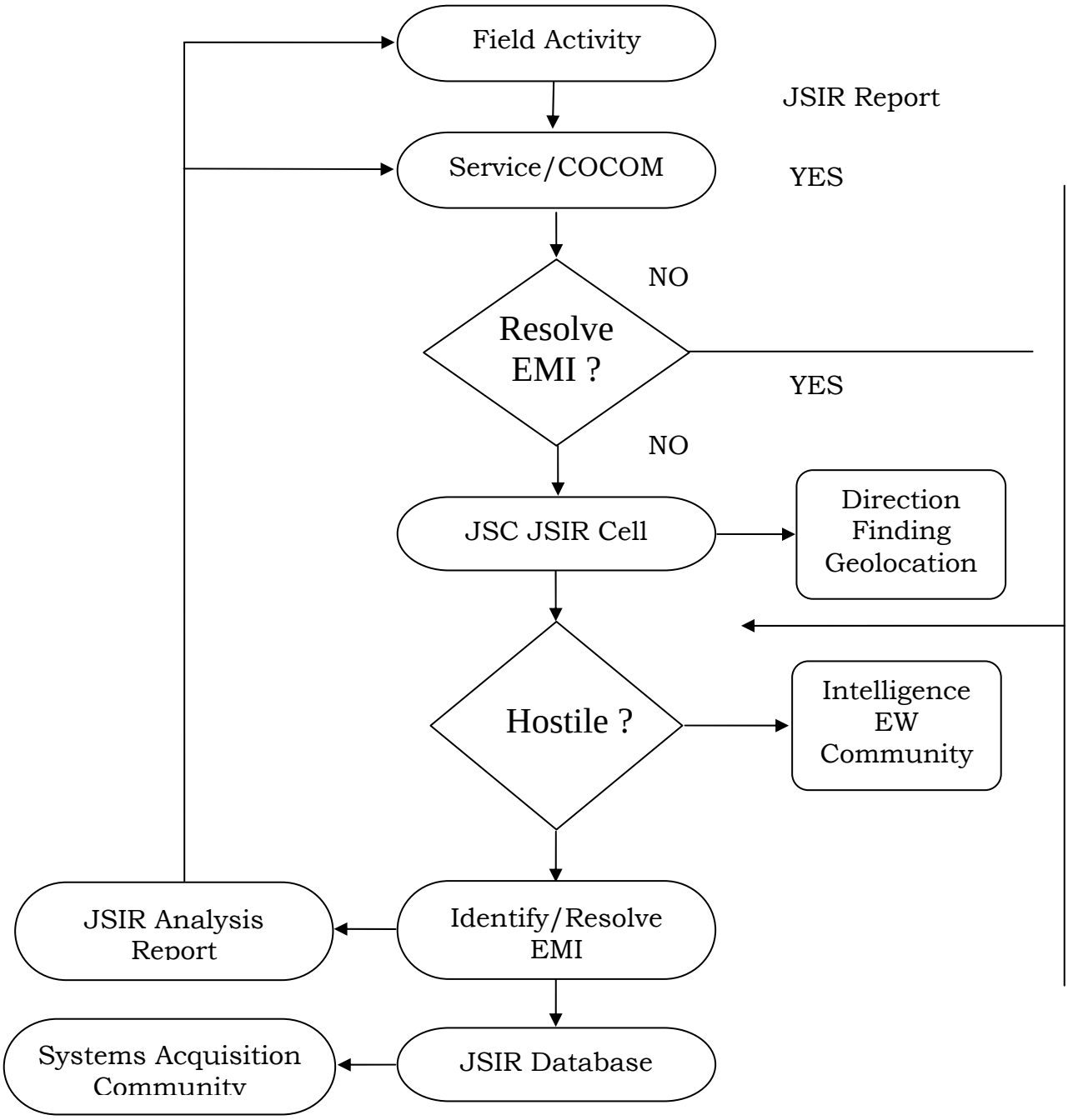

Figure D-K-A-2. Terrestrial JSIR Reporting and Resolution

c. Space-system interference reporting and resolution processes are similar to the terrestrial reporting and/or resolution path (See Figure D-K-A-3). Interference reports are forwarded up the operational chain of various space systems. Interference that cannot be resolved is ultimately reported to

Cheyenne Mountain Operations Center/Satellite Communications Control (CMOC/SCC) by USSTRATCOM component command centers. The space system is considered to include both space-based and earth segments. CMOC/SCC will forward the incident report to JSC for analysis.

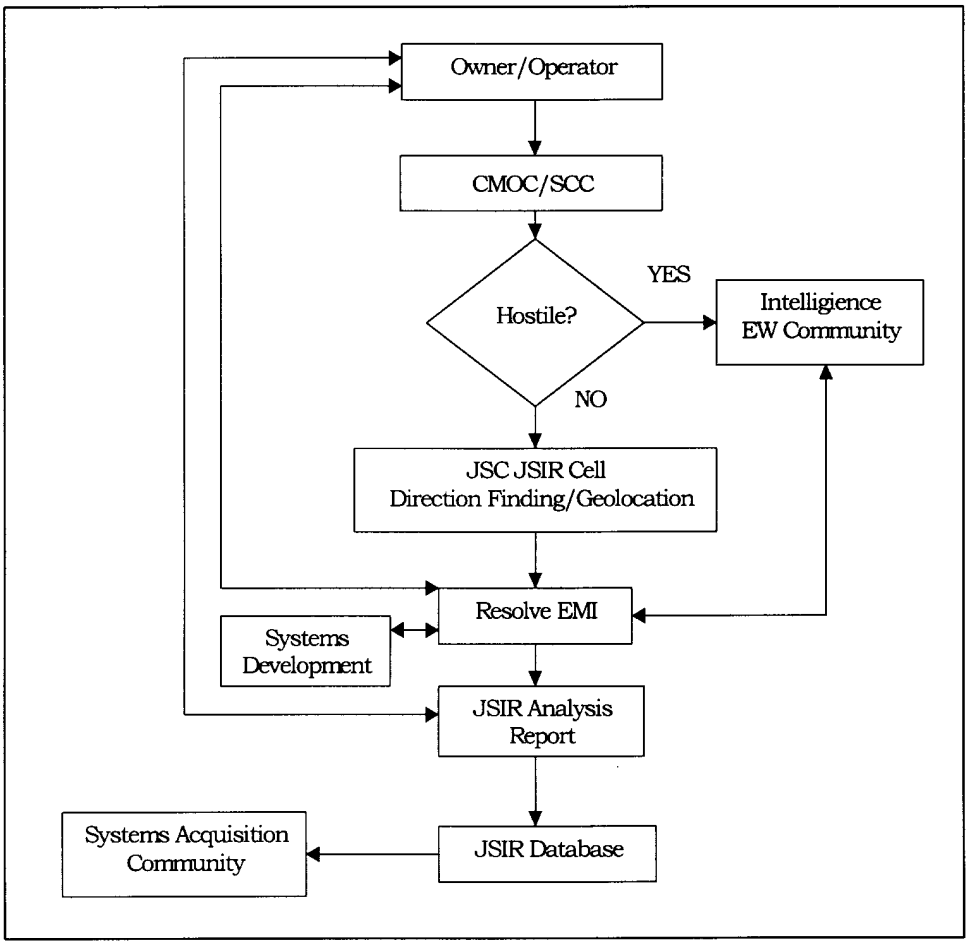

Figure D-K-A-3. Space Systems Interference Reporting and Resolution

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APPENDIX L TO ENCLOSURE D

INTERFERENCE REPORTING

1. Overview. Interference reporting provides a means to track unauthorized spectrum users, lack of proper radio procedure training, and local enforcement issues. Interference can come from sources other than the JTF and those sources may not be within your control to shutdown. If you fail to identify the source of interference, or can identify it but have no control over the interference source then you must report the interference to gain assistance in resolving it. This may precipitate reporting it through two channels at the same time, the combatant command JFMO and local HN. It may be faster, if you can assign another frequency to the net or system if the problem requires extended coordination.

2. Unified Combatant Commands and Components. The unified combatant commands and their components are responsible for developing local procedures, training, and reporting requirements in their respective AOR for resolving interference matters. In cases of EMI to terrestrial systems used outside CONUS, the command using the affected system is responsible for resolving the interference. When interference originates from one command AOR and affects another command AOR, the command responsible for the AOR where the interference source is located will support the other command. The supporting command will request HN assistance to identify the interfering source and resolve the EMI problem. The supporting command is not required to provide any resources to resolve the interference. Unified commands, subunified commands, and combined commands can directly request JSC JSIR technical support.

3. Joint Task Force. The JTF is responsible for developing local procedures and reporting procedures for resolving interference matters. In cases of EMI to terrestrial systems used by a JTF outside CONUS, the JTF using the affected system is responsible for resolving the interference. A JTF can request JSC JSIR technical support.

4. Joint Task Force Spectrum Management Element. The JSME is responsible for management of the electromagnetic spectrum and should be the focal point for EMI resolution within their JTF's AOR. The JSME is also assigned the responsibility for requesting and coordinating interference resolution support from the JSC.

5. SPECTRUM XXI Interference Reporting Capability. The SPECTRUM XXI interference report module can be used to generate an interference report to describe an interference problem and to provide information that can be used to resolve the problem. Interference reports can also be used to document a history of problems and thus can be used to identify possible causes of

subsequent interference. The SPECTRUM XXI interference report can be exported to a file for transmission to another user for importing.

6. Joint Spectrum Interference Resolution Program. To address persistent and recurring EMI problems affecting DOD systems, the Department of Defense established the JSIR Program in October 1992. The JSIR Program replaced the DOD Meaconing, Intrusion, Jamming, and Interference Program that was disestablished on 30 June 1992. The JSIR Program addresses EMI events and EA affecting the Department of Defense. The JSC coordinates and manages the program for the Joint Staff Command, Control, Communications, and Computer (C4) Systems Directorate (J-6). The program is centrally managed; however, it has a highly decentralized execution process. Each Service shares responsibility for successful execution of the JSIR Program.

a. The objective of the JSIR Program is to report and assist with the resolution of EA and recurring EMI from cradle to grave. The resolution process for EMI events is divided into three steps:

(1) Includes identification, verification, characterization, and reporting.

(2) Includes geolocation, analysis, developing courses of action, and recommendations (corrective actions).

(3) Implementation, notification to user(s), and final closure reporting. Resolution includes but is not limited to implementation of EMI corrective actions needed to regain use of the affected spectrum. However, some EMI events cease before corrective action is taken, and in other cases, the EMI corrections may not be feasible, affordable, or result in regaining the use of the spectrum.

b. The JSIR Program is built on the premise that EMI should be resolved at the lowest possible level using organic and/or other assets available to the command. If an EMI event cannot be resolved locally, it must be elevated up the chain of command with each higher level attempting resolution. If the event cannot be resolved at the combatant command, JTF, Service, or Defense agency headquarters level, then those organizations or the Joint Staff may request JSC JSIR support. CJCSM 3320.02A, Joint Spectrum Interference Resolution Procedures, identifies the following roles and responsibilities of various organizations that could be involved in resolving and reporting EMI.

(1) Joint Spectrum Center. The JSC is tasked to provide spectrum management, interference resolution, and direct support teams to the unified combatant and JTF commanders. The JSC is responsible for tracking all EMI events from the initial report of a problem through closure, and for providing ready access to this tracking information. The JSC also provides JSIR field teams to deploy to a site and trouble-shoot EMI problems. The JSC serves as

the center for EMI reporting and resolution, and in so doing has the authority to coordinate and task other involved organizations as deemed necessary to resolve EMI. The JSC will coordinate interference resolution with civil authorities when interference is CONUS-based and involves civil spectrum use. Upon receipt of a JSIR request, the JSC JSIR team will perform an in-house analysis using JSC models and databases to possibly determine the sources and will coordinate directly with the appropriate spectrum managers to resolve interference problems. When requested by a combatant command, JTF, Defense agency, Service headquarters, or the Joint Staff, the JSC JSIR team will deploy, with the approval of the geographic combatant command, to the victim's location to identify and attempt to resolve ongoing interference problems. If the interference source is determined, the JSIR team will provide the organization requesting JSIR support a message identifying the source of interference and suggested resolution actions. The results of the analysis and onsite visit will be incorporated into the JSIR database. This database supports both trend analysis and future interference analyses.

b. US Strategic Command. USSTRATCOM will assist and support EMI resolution efforts for DOD space systems. Also, USSTRATCOM will determine if an EMI event is hostile in nature and report suspected acts of hostility to combatant commanders and national-level command authorities. Additionally, each USSTRATCOM component is responsible for reporting and resolving EMI events within their established scope and responsibilities. USSTRATCOM resources include the Global SATCOM Support Center and Regional SATCOM Support Centers, which are both dedicated to supporting military satellite communications assets, the Joint Space Operations Center, which is dedicated to supporting global space operations, and the Joint Information Operations Center that supports IO. USSTRATCOM's Global Operations Center serves as the command's focal point for receiving and processing reports of affected and degraded space systems to the appropriate USSTRATCOM organization for resolution.

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ENCLOSURE E

SPECTRUM MANAGEMENT CONSIDERATIONS IN A MULTINATIONAL AND COALITION ENVIRONMENT

1. Introduction. Past operations, from DESERT SHIELD and DESERT STORM to ALLIED FORCE, demonstrate the need for aligning DOD spectrum management policies and procedures with those of US allied and coalition partners. US spectrum managers must be prepared to integrate US spectrum requirements into a coalition spectrum-use plan to support the mission. However, the development of specific procedures to support this requirement is made more difficult because of concise security guidance, differences in the level of training, different automation tools, support communication networks, and some language and terminology barriers. The following information is provided to highlight some areas of which the US spectrum manager must be aware when operating in a multinational and/or coalition environment.

2. Areas of Concern. US spectrum managers must be prepared to address these issues, at a minimum, when operating in a multinational and/or coalition environment:

a. Security. The JTF intelligence officer must provide foreign disclosure guidelines early enough in the operational planning phases to facilitate the flow of information. The following are some specific items to consider.

(1) Frequency Assignment Databases. Ensure the appropriate special handling code is entered in SFAF item 005.

(2) JF-12s. Some equipment information may not be releasable to all countries involved in an operation. Each JF-12 should be scrutinized to determine which countries enjoy foreign disclosure authority. If the JF-12 data cannot be released to all the countries, then that information should not be entered into the proposal or assignment that is being coded into the releasable portion of the database.

(3) Communications Networks. Due to the different communication networks that can be used to support coalition and allied operations, network security, and releasability issues need to be addressed with local security and intelligence officers at the earliest point possible to facilitate the flow of information between coalition and allied and US spectrum management functions. If an unclassified network is used, OPSEC must be addressed to determine what information can or cannot be released.

(4) Waveform Releasability. Certain software defined radio waveforms may not be releasable, all or in part, to all allied or coalition nations. Combatant command policy must specify which waveforms are releasable to which countries and for which specific purpose.

(5) Waveform Transfer. Transfer of software defined radio waveforms may be accomplished by electronic transfer device or by manual means (paper transfer). Approved methods and procedures must be delineated before allowing transfer of waveforms.

b. Personnel. Allied and coalition spectrum managers may not be trained to the same standards as US spectrum managers. They have different automation capabilities, responsibilities, and national requirements. US spectrum managers could expect to find they are the most experienced (according to US standards) and, at the same time, the lowest ranking person in the spectrum management cell. US spectrum managers can be expected to lead the overall database management effort and provide training to their allied counterparts on the US automation tools used.

c. Automation Tools

(1) SPECTRUM XXI. This software tool is the standard in the Department of Defense for maintaining the tactical frequency assignment database for contingency operations and today is readily accepted in most areas in which the United States maintains a presence. The difficulties the US spectrum manager encounters exist due to the releasability of the software. Currently SPECTRUM XXI is not releasable to any single country that has not purchased the software through the USG foreign military sales program. In other words, US spectrum managers cannot arbitrarily release the software to non-US nationals. The spectrum managers should be able to obtain guidance from their combatant command. Data standardization is very important when analyzing information contained in the database. US spectrum managers should refer to US MCEB Publication 7, combatant command publications, instructions, and JTF written procedures for specific guidance on frequency proposal formatting.

(2) JACS. This software tool is the current joint standard within the Department of Defense, and is used to develop and manage the JCEOI. Most coalition countries do not have JACS; therefore, US spectrum managers can expect to receive JCEOI inputs in various forms. They must then manually input the coalition requirements before generation of the JCEOI. JACS is a common tool that will provide interface between spectrum managers and communication planners, allowing for automated transfer of information that is easily understood by both parties.

(3) JTRS Spectrum Management Tool (JSMT). The JTRS JSMT is the software tool for the JTRS spectrum manager to deconflict the frequency resource for JTRS networks and perform all spectrum management functions to accomplish the mission. JTRS networks will be unique to the United States for many years, however, they will provide interoperability between Services and allied and coalition IP-based networks.

(4) JTRS Wideband Network Manager (JWNM). The JTRS JWNM is the software tool for the JTRS network manager to plan, manage, monitor, and reconfigure the JTRS wideband network. It will receive the JTRS wideband network spectrum resource from the JSMT and allot the spectrum for use by the JTRS wideband network. The JWNM will interface selected legacy network management programs.

d. Coordination

(1) Information Operations. The requirement for information superiority in the battlespace has increased the importance of management of spectrum use. IO encompasses the means for the JTF commander to achieve information superiority. The US spectrum manager must ensure that the appropriate contacts within the intelligence, operations, and communications branches of the coalition task force are coordinating information relevant to the IO effort. Information such as targeting data (location), offensive and defensive weapons requirements, etc., should have a direct effect on the JRFL. It is imperative the spectrum manager be made aware of all spectrum usage within the AOR for a successful IO campaign.

(2) Frequency Assignment Authority. Identification of the frequency assignment authority must be made early in the planning process. This initiates decisions that enable the development of essential processes. The resulting procedures would then be incorporated into the specific OPLAN and corresponding annexes.

3. Conclusion. Military operations outside the US&P can present a variety of challenges and sometimes-unique situations relative to spectrum management. The US spectrum manager must be flexible and able to take the lead in a coalition and allied spectrum management function. Operations involving the forces of other nations increase the difficulty of maintaining an electromagnetically compatible environment. Resolving the issues mentioned in this chapter early on would greatly aid the spectrum managers in accomplishing their tasks to support mission goals.

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ENCLOSURE F

REFERENCES

a. DODD 4630.5, 5 May 2004, "Interoperability and Supportability of Information Technology (IT) and National Security Systems (NSS)"

b. JP 3-51, "Joint Doctrine for Electronic Warfare"

c. ACP 190 US SUPP-2, "Coordination and Registration of Frequencies Used by Military Forces on Foreign Soil"

d. CEOI Sup 1, "Contingency Joint Communications-Electronics Operation Instructions (JCEOI) Supplemental Instructions"

e. JP 1-02, "Department of Defense Dictionary of Military and Associated Terms"

f. CJCSM 3150.01 Series, "Joint Reporting Structure General Instructions"

g. CJCSM 3122.01 Series, "Joint Operational Planning and Execution System, Vol. I"

h. CJCSI 3320.02 Series, "Joint Spectrum Interference Resolution" (JSIR)

i. DOD JSC HDBK-80-11-1, November 1996, "Frequency Resource Record System (FRRS) Handbook Volume I"

j. ACP 190(A), "Guide to Frequency Planning"

k. CJCSI 3210.03 Series, "Joint Electronic Warfare Policy"

l. CJCSI 3320.01 Series, "Electromagnetic Spectrum Use in Joint Military Operations"

m. CJCSI 3320.03 Series, "Joint Communications Electronic Operation Instructions (JCEOI)"

n. JP 0-2, "Unified Action Armed Forces (UNAAF)"

o. JP 1, "Joint Warfare of the Armed Forces of the United States"

p. JP 3-0, "Doctrine for Joint Operations"

q. JP 3-13, "Information Operations"

r. JP 5-00.2, “Joint Task Force (JTF) Planning Guidance and Procedures”

s. JP 6-0, “Doctrine for Command, Control, Communications, and Computers (C4) Systems Support to Joint Operations”

t. JP 6-02, “Joint Doctrine for Employment of Operational/ Tactical Command, Control, Communications, and Computer Systems”

u. AR 5-12, 1 October 1997, “Army Management of the Electromagnetic Spectrum”

v. International Telecommunication Union Radio Regulations, 2001

w. US Department of Commerce, National Telecommunications and Information Administration, “Manual of Regulations & Procedures for Federal Radio Frequency Management,” May 2003 Edition

x. Military Communications Electronics Board (MCEB) Publication 7, "Frequency Resource Record System (FRRS) Standard Frequency Action Format (SFAF)"

GLOSSARY

PART I—ABBREVIATIONS AND ACRONYMS

ACP	Allied Communications Publication
ALT	alternate
AM	amplitude modulation
AOI	area of influence
AOR	area of responsibility
ARDG	arc-second raster digitized graphic
ARFOR	Army forces
ATO	air tasking order
AUTODIN	Automatic Digital Network
BEI	background environmental information
C2	command and control
C4	command, control, communications, and computers
CAP	crisis action planning
CD-ROM	compact disk read-only memory
C-E	communications-electronics
CEOI	communications-electronics operation instructions
CJCS	Chairman Joint Chiefs of Staff
CJCSI	Chairman Joint Chiefs of Staff instruction
CJCSM	Chairman Joint Chiefs of Staff manual
CJTF	commander, joint task force
CMOC/SCC	Cheyenne Mountain Operations Center/Satellite Communications Control
COCOM	combatant command (command authority)
COMSEC	communications security
COMUSFOR	Commander, United States Forces
CONOPS	concept of operations
CONPLAN	concept plan
CONUS	continental United States
CPU	central processing unit
CRC	control and reporting center
CT3	Common Tier Level 3
CTF	combined task force
DCN	data link coordination net
DCS	Defense Communications System
DISA	Defense Information Systems Agency
DMS	defense messaging system
DOD	Department of Defense
DSN	Defense Switched Network
DSO	Defense Spectrum Office

DTD	data transfer device
DTED	digital terrain elevation data
E3	electromagnetic environmental effects
EHF	extremely high frequency
EMB	electromagnetic battlespace
EME	electromagnetic environment
EMI	electromagnetic interference
EOB	electronic order of battle
EW	electronic warfare
EWCC	electronic warfare coordination cell
FAX	facsimile
FCC	Federal Communications Commission
FLIP	flight information publication
FM	frequency modulation
FMS	frequency management sub-committee
FRRS	frequency resource record system
GB	gigabyte
GHz	gigahertz
GMF	government master file
HF	high frequency
HQ	headquarters
Hz	hertz
IA	interference analysis
IAW	in accordance with
IFL	international frequency list
IO	information operations
IP	internet protocol
IRAC	interdepartment radio advisory committee
ITU	International Telecommunications Union
J-1	Joint Staff Manpower and Personnel Directorate
J-2	Joint Staff Intelligence Directorate
J-3	Joint Staff Operations Directorate
J-4	Joint Staff Logistics Directorate
J-5	Joint Staff Plans and Policy Directorate
J-6	Joint Staff Command, Control, Communications, and Computer Systems Directorate
JACS	Joint Automated Communications-Electronics Operation Instructions (CEOI) System
JCCC	joint communications control center
JCEOI	joint communications-electronics operation instructions

JFACC	joint force air component commander
JFC	joint force commander
JFMO	Joint Frequency Management Office
JIOC	joint information operations center
JOPES	Joint Operation Planning and Execution System
JRFL	joint restricted frequency list
JSC	Joint Spectrum Center
JSIR	joint spectrum interference resolution
JSME	joint task force (JTF) spectrum management element
JSMT	joint tactical radio system (JTRS) spectrum management tool
JSOTF	joint special operations task force
JTF	joint task force
JTRS	joint tactical radio system
JWNM	joint tactical radio system (JTRS) wideband network Manager
KHz	kilohertz
LOS	line of sight
MARFOR	Marine Corps forces
MB	megabyte
MCEB	Military Communications-Electronics Board
MHz	megahertz
MNL	master net list
MRFL	master radio frequency list (NATO)
NATO	North Atlantic Treaty Organization
NAVAIDS	navigational aids
NAVFOR	Navy forces
NGA	National Geospatial-Intelligence Agency
NIPRNET	non-secure internet protocol router network
NORAD	North American Aerospace Defense Command
NSA	National Security Agency
NTIA	National Telecommunications and Information Administration
OFDM	orthogonal frequency division modulation
OPLAN	operations plan
OPORD	operations Order
OPSEC	operations security
PC	personal computer
POC	point of contact

RAM	random access memory
RR	radio regulations (ITU)
SAA	satellite access authorization
SAR	satellite access request
SATCOM	satellite communications
SCI	sensitive compartmented information
SDR	software defined radio
SFAF	standard frequency action format
SHF	super-high frequency
SIGINT	signals intelligence
SINCGARS	single channel ground and airborne radio system
SIPRNET	SECRET internet protocol router network
SMM	spectrum management manual
SSB	single side band
STU-III	secure telephone unit III
TACP	tactical air control party
TACS	tactical air control system
TADIL	tactical digital information link
TCS	transformational communications system
TPFDD	time-phased force and deployment data
TRANSEC	transmission security
TSK	transmission security key
UHF	ultrahigh frequency
UN	United Nations
US&P	United States and Possessions
USCENTCOM	United States Central Command
USEUCOM	United States European Command
USG	United States Government
USJFCOM	United States Joint Forces Command
USMTF	United States Message Text Format
USNORTHCOM	United States Northern Command
USPACOM	United States Pacific Command
USSOCOM	United States Special Operations Command
USSOUTHCOM	United States Southern Command
USSTRATCOM	United States Strategic Command
USTRANSCOM	United States Transportation Command
VHF	very high frequency

GLOSSARY

PART II -- TERMS AND DEFINITIONS

adaptive planning - Compressed and iterative planning utilizing information sharing, collaboration and parallel efforts among OSD, the Joint Staff, combatant commands, and other agencies that supports quickly changing strategic and military conditions.

alert order - 1. A crisis action-planning directive from the Secretary of Defense, issued by the Chairman of the Joint Chiefs of Staff, that provides essential guidance for planning and directs the initiation of execution planning for the selected course of action authorized by the Secretary of Defense. 2. A planning directive that provides essential planning guidance and directs the initiation of execution planning after the directing authority approves a military course of action. An alert order does not authorize execution of the approved course of action. (JP 1-02)

allocation (of a frequency band) - Entry in a table of frequency allocations of a given frequency band for the purpose of its use by one or more terrestrial or space radio communications services or the radio astronomy service under specified conditions. This term will also be applied to the frequency band concerned (from ITU RR).

area of influence - A geographical area wherein a commander is directly capable of influencing operations by maneuver or fire support systems normally under the commander's command or control. (JP 1-02)

area of interest - That area of concern to the commander, including the area of influence, areas adjacent thereto, and extending into enemy territory to the objectives of current or planned operations. This area also includes areas occupied by enemy forces who could jeopardize the accomplishment of the mission. Also called AOI. (JP 1-02)

area of responsibility - 1. The geographical area associated with a combatant command within which a combatant commander has authority to plan and conduct operations. 2. In naval usage, a predefined area of enemy terrain for which supporting ships are responsible for covering by fire on known targets or targets of opportunity and by observation. Also called AOR. (JP 1-02)

assignment (of a radio frequency or radio frequency channel) - Authorization given by an administration for a radio station to use a radio frequency or radio frequency channel under specific conditions (National Telecommunications and Information Administration Manual).

background environmental information - The combination of civilian electromagnetic communications infrastructure and the natural phenomena within an area of responsibility.

channeling plan - The plan by which frequencies within a band are to be assigned.

cognitive radio - A cognitive radio (CR) is a radio that can change its transmitter parameters based on interaction with the environment in which it operates. This interaction may involve active negotiation or communications with other spectrum users and/or passive sensing and decision-making within the radio. The majority of cognitive radios will probably be SDRs, but neither having software nor being field reprogrammable are requirements of a cognitive radio.

combatant command - A unified or specified command with a broad continuing mission under a single commander established and so designated by the President, through the Secretary of Defense and with the advice and assistance of the Chairman of the Joint Chiefs of Staff. Combatant commands typically have geographic or functional responsibilities. (JP 1-02)

combatant command (command authority) - Nontransferable command authority established by title 10 ("Armed Forces"), United States Code, section 164, exercised only by commanders of unified or specified combatant commands unless otherwise directed by the President or the Secretary of Defense. Combatant command (command authority) cannot be delegated and is the authority of a combatant commander to perform those functions of command over assigned forces involving organizing and employing commands and forces, assigning tasks, designating objectives, and giving authoritative direction over all aspects of military operations, joint training, and logistics necessary to accomplish the missions assigned to the command. Combatant command (command authority) should be exercised through the commanders of subordinate organizations. Normally this authority is exercised through subordinate joint force commanders and Service and/or functional component commanders. Combatant command (command authority) provides full authority to organize and employ commands and forces as the combatant commander considers necessary to accomplish assigned missions. Operational control is inherent in combatant command (command authority). Also called COCOM. (JP 1-02)

combatant commander - A commander of one of the unified or specified combatant commands established by the President.

combined - Between two or more forces or agencies of two or more allies. (When all allies or services are not involved, the participating nations and services shall be identified, e.g., combined navies.) (JP 1-02)

combined force - A military force composed of elements of two or more Allied nations. (JP 1-02)

command and control warfare - The integrated use of operations security, military deception, psychological operations, electronic warfare, and physical destruction, mutually supported by intelligence, to deny information to, influence, degrade, or destroy adversary C2 capabilities, while protecting friendly C2 capabilities against such actions. C2 warfare is an application of information warfare in military operations and is a subset of information warfare. C2 warfare applies across the range of military operations and all levels of conflict. Also called C2W. C2W is both offensive and defensive: a. C2-attack. Prevent effective C2 of adversary forces by denying information to, influencing, degrading, or destroying the adversary C2 system. b. C2-protect. Maintain effective C2 of own forces by turning to friendly advantage or negating adversary efforts to deny information to, influence, degrade, or destroy the friendly C2 system. (JP 1-02)

communications security - The protection resulting from all measures designed to deny unauthorized persons information of value that might be derived from the possession and study of telecommunications, or to mislead unauthorized persons in their interpretation of the results of such possession and study. Also called COMSEC. Communications security includes: cryptosecurity, transmission security, emission security, and physical security of communications security materials and information. (JP 1-02)

contingency master net list - A master net list developed for an operations plan to support requirements that can reasonably be expected in an area of responsibility.

contingency planning - The development of plans for potential crises involving military requirements that can reasonably be expected in an area of responsibility. Contingency planning is normally conducted during peacetime, but may be performed under crisis action conditions. Contingency planning for joint operations is coordinated at the national level by assigning planning tasks and relationships among the combatant commanders and apportioning or allocating to them the forces and resources available to accomplish those tasks. Commanders throughout the unified chain of command may task their staffs and subordinate commands with additional contingency planning tasks beyond those specified at the national level to provide broader contingency coverage.

controlling authority - The authority that is designated to a command or individual who has the responsibility for overall protection, distribution, and documentation of a JCEOI.

crisis - An incident or situation involving a threat to the United States, its territories, citizens, military forces, possessions, or vital interests that develops rapidly and creates a condition of such diplomatic, economic, political, or military importance that commitment of US military forces and resources is contemplated in order to achieve national objectives. (JP 1-02)

deconfliction - A systematic management procedure to coordinate the use of the electromagnetic spectrum for operations, communications, and intelligence functions. This procedure minimizes possible interference issues that might arise after frequency assignment.

deployment database - The Joint Operation Planning and Execution System database containing the necessary information on forces, materiel, and filler and replacement personnel movement requirements to support execution. The database reflects information contained in the refined time-phased force and deployment data from the deliberate planning process or developed during the various phases of the crisis action planning process, and the movement schedules or tables developed by the transportation component commands to support the deployment of required forces, personnel, and materiel. (JP 1-02)

deployment planning - Operational planning directed toward the movement of forces and sustainment resources from their original locations to a specific operational area for conducting the joint operations contemplated in a given plan. Encompasses all activities from origin or home station through destination, specifically including intra-continental United States, inter-theater, and intratheater movement legs, staging areas, and holding areas. (JP 1-02)

DOD Standard Joint Communications Electronics Operation Instructions Information System - System designated by the Joint Chiefs of Staff as the standard for development and production of the JCEOI. Current standard system is JACS.

electromagnetic battlespace - The electromagnetic battlespace includes background environmental information and the hostile, friendly, UN, HN, and coalition forces EOB within the JTF AOR and AOI.

electromagnetic compatibility - The ability of systems, equipment, and devices that utilize the electromagnetic spectrum to operate in their intended operational environments without suffering unacceptable degradation or causing unintentional degradation because of electromagnetic radiation or response. It involves the application of sound electromagnetic spectrum management; system, equipment, and device design configuration that ensures interference-free operation; and clear concepts and doctrines that maximize operational effectiveness. (JP 1-02)

electromagnetic-dependent equipment - The deliberate radiation, re-radiation, alteration, suppression, absorption, denial, enhancement, or reflection of electromagnetic energy in a manner intended to convey misleading information to an enemy or to enemy electromagnetic-dependent weapons, thereby degrading or neutralizing the enemy's combat capability.

electromagnetic environment - The resulting product of the power and time distribution, in various frequency ranges, of the radiated or conducted electromagnetic emission levels that may be encountered by a military force, system, or platform when performing its assigned mission in its intended operational environment. It is the sum of electromagnetic interference; electromagnetic pulse; hazards of electromagnetic radiation to personnel, ordnance, and volatile materials; and natural phenomena effects of lightning and precipitation static. Also called EME. (JP 1-02)

electromagnetic environmental effects - The impact of the electromagnetic environment upon the operational capability of military forces, equipment, systems, and platforms. It encompasses all electromagnetic disciplines, including electromagnetic compatibility and electromagnetic interference; electromagnetic vulnerability; electromagnetic pulse; electronic protection, hazards of electromagnetic radiation to personnel, ordnance, and volatile materials; and natural phenomena effects of lightning and precipitation static. Also called E3. (JP 1-02)

electromagnetic interference - Any electromagnetic disturbance that interrupts, obstructs, or otherwise degrades or limits the effective performance of electronics and electrical equipment. It can be induced intentionally, as in some forms of electronic warfare, or unintentionally, as a result of spurious emissions and responses, intermodulation products, and the like. Also called EMI. (JP 1-02)

electromagnetic spectrum - The range of frequencies of electromagnetic radiation from zero to infinity. It is divided into 26 alphabetically designed bands. (JP 1-02)

electronic warfare - Any military action involving the use of electromagnetic and direct energy to control the electromagnetic spectrum or to attack the enemy. Also called EW. The three major subdivisions within electronic warfare are: electronic attack, electronic protection, and electronic warfare support. a. **electronic attack**. That division of electronic warfare involving the use of electromagnetic energy, directed energy, or antiradiation weapons to attack personnel, facilities, or equipment with the intent of degrading, neutralizing, or destroying enemy combat capability and is considered a form of fires. Also called EA. EA includes: 1) actions taken to prevent or reduce an enemy's effective use of the electromagnetic spectrum, such as jamming and electromagnetic deception, and 2) employment of weapons that use

electromagnetic or directed energy as their primary destructive mechanism (lasers, radio frequency weapons, particle beams). b. **electronic protection**. That division of electronic warfare involving passive and active means taken to protect personnel, facilities, and equipment from any effects of friendly or enemy employment of electronic warfare that degrade, neutralize, or destroy friendly combat capability. Also called EP. c. **electronic warfare support**. That division of electronic warfare involving actions tasked by, or under direct control of, an operational commander to search for, intercept, identify, and locate sources of intentional and unintentional radiated electromagnetic energy for the purpose of immediate threat recognition, targeting, planning and conduct of future operations. Thus, electronic warfare support provides information required for decisions involving electronic warfare operations and other tactical actions such as threat avoidance, targeting, and homing. Also called ES. Electronic warfare support data can be used to produce signal intelligence, provide targeting for electronic or destructive attack, and produce measurement and signature intelligence. (JP 1-02)

electronic warfare coordination cell - The organization established to plan and coordinate joint and allied use of electronic warfare (EW) assets and capabilities and manage the deconfliction of the electromagnetic spectrum before, during and immediately after the onset of contingencies. Functions include planning and executing the EW thread of the commander's operational campaign plan, EW targeting and managing the joint restricted frequency list. Also called EWCC.

employment planning - Planning that prescribes how to apply force and/or forces to attain specified military objectives. Employment planning concepts are developed by combatant commanders through their component commanders. (JP 1-02)

execution planning - The phase of the Joint Operation Planning and Execution System crisis action planning process that provides for the translation of an approved course of action into an executable plan of action through the preparation of a complete operation plan or operation order. Execution planning is detailed planning for the commitment of specified forces and resources. During crisis action planning, an approved operation plan or other National Command Authorities-approved course of action is adjusted, refined, and translated into an operation order. Execution planning can proceed on the basis of prior deliberate planning, or it can take place in the absence of prior planning. Also called EP. (JP 1-02)

force module - A grouping of combat, combat support, and combat service support forces, with their accompanying supplies and the required nonunit resupply and personnel necessary to sustain forces for a minimum of 30 days. The elements of force modules are linked together or are uniquely identified so that they can be extracted from or adjusted as an entity in the Joint Operation

Planning and Execution System databases to enhance flexibility and usefulness of the operation plan during a crisis. (JP 1-02)

frequency assignment - Authorization given by an administration, or other authority, for a radio station or other emitter to use a specific frequency under specified conditions.

generated joint communications electronics operation instructions - The final product of all inputs and consists of randomly generated data that was initially input into the UN-generated JCEOI. From this product a user can define output pages and revise many of the products based on requirement changes or output options.

generation authority - The authority placed upon a staff component, individual, or commands having overall responsibility for generating the JCEOI. This includes gathering all information from subordinate elements, combining requirements, changes to the original document, and for creating reserve editions.

guarded frequencies - Enemy frequencies that are currently being exploited for combat information and intelligence. A guarded frequency is time-oriented in that the guarded frequency list changes as the enemy assumes different combat postures. These frequencies may be jammed after the commander has weighed the potential operational gain against the loss of the technical information. (JP 1-02)

guaranteed bandwidth - Guaranteed bandwidth is the minimum bandwidth required to receive and transmit survival and critical network information.

host-nation support - Civil and/or military assistance rendered by a nation to foreign forces within its territory during peacetime, crisis or emergencies, or war based on agreements mutually concluded between nations. Also called HNS. (JP 1-02)

information operations - Actions taken to affect adversary information and information systems while defending one's own information and information systems. Also called IO. (JP 1-02)

integrated communications security - Systems designs that have in-line cryptographic hardware built into the system.

joint communications electronic operation instruction - A document that is created to provide the JFC the voice and data network architecture to support operations. This document provides the technical characteristics of the net. Also called JCEOI. The JCEOI contains or relates to the following subsections:
a. Call signs and call words are utilized for identifying members of a net

and/or circuit. 1) Call sign. Any combination of alphabetical characters or phonetically pronounceable characters (trigraph), which identifies a communication facility, a command, an authority, an activity or a unit; used primarily for establishing and maintaining communications. Also called CS. 2) Call word. Pronounceable words that identify a communications facility, a command, an authority, an activity, or a unit; serves the same functionality as the call sign. b. Master net list. The master net list, both generated and raw, is a basic part of all JCEOIs. As a minimum the master net list includes the circuit and/or net name, frequency or frequency band, call sign and/or call word requirements, and share group information. Also called MNL. It is usually subdivided in different sections, or layers. c. Joint layer. The inclusion of a circuit into the joint layer must meet at least one of the following requirements: 1) the net and/or circuit will be utilized by the joint force commander or joint force commanders staff for C2 of subordinate elements; 2) the joint force commander receives C2 orders on the net and/or circuit, or 3) The net and/or circuit is controlled by a single Service component and used by other Service components to coordinate support, fire control, safety or link up operations. d. Additional layers. Usually the master net list is further subdivided into other layers, such as the components, then corps, fleet, and/or wing, or further still as the generation authority directs. e. Un-generated (or raw data) JCEOI. Contains the MNL, call sign and/or call word dictionaries, index pages, reference pages, smoke and pyrotechnic signals definitions, suffix and expander pages, page definition (net groups), separation plans, share plans and reuse plans. f. Generated JCEOI. The final product of all inputs and consists of randomly generated data that was initially input into the Un-generated JCEOI. From this product a user can define output pages and revise many of the products based on requirement changes or output options. g. Revised SINCGARS Integrated Communications Security (ICOM) and/or Non-ICOM Support Software "RSINISS." Currently a module in RBECS that supports the management of resources for the SINCGARS radio when it is authorized to frequency hopping information (hopsets), loadset (is a required output to the SINCGARS radio-transmitter that includes net ID, cryptographic key identification, and loadset ID), the generation and management of the TSK (which provides the SINCGARS radio with the sequence of frequency order it is to use in frequency hopping mode), and also includes the capability to create mobile subscriber equipment radio access unit frequency pairs.

<u>joint force commander</u> - A general term applied to a combatant commander, subunified commander, or joint task force commander authorized to exercise combatant command (command authority) or operational control over a joint force. Also called JFC. (JP 1-02)

<u>joint operation planning</u> - Planning for contingencies that can reasonably be anticipated in an area of responsibility or joint operations area of the command. Planning activities exclusively associated with the preparation of operation plans, operation plans in concept format, campaign plans, and

operation orders (other than the Single Integrated Operational Plan) for the conduct of military operations by the combatant commanders in response to requirements established by the Chairman of the Joint Chiefs of Staff. Joint operation planning is coordinated at the national level to support Secretary of Defense Contingency Planning Guidance, strategic requirements in the National Military Strategy, and emerging crises. As such, it will cover joint operation planning, sustainment planning, and redeployment planning procedures. Joint operation planning is performed in accordance with formally established planning and execution procedures.

Joint Operation Planning and Execution System - A continuously evolving system that is being developed through the integration and enhancement of earlier planning and execution systems: Joint Operations Planning System and Joint Deployment System. It provides the foundation for conventional C2 by national- and theater-level commanders and their staffs. It is designed to satisfy their information needs in the conduct of joint planning and operations. Joint Operation Planning and Execution System (JOPES) includes joint operation planning policies, procedures, and reporting structures supported by communications and automated data processing systems. JOPES is used to monitor, plan, and execute mobilization, deployment, employment, and sustainment activities associated with joint operations. Also called JOPES. (JP 1-02)

joint restricted frequency list - A time and geographically-oriented listing of TABOO, PROTECTED, and GUARDED functions, nets, and frequencies. It should be limited to the minimum number of frequencies necessary for friendly forces to accomplish objectives. Also called JRFL. (JP 1-02)

joint special operations task force - A joint task force composed of special operations units from more than one Service, formed to carry out specific special operation or prosecute special operations in support of a theater campaign or other operations. The joint special operations task force may have conventional non-special operations units assigned or attached to support the conduct of specific missions. Also called JSOTF. (JP 1-02)

Joint Tactical Radio System - The JTR system will combine the functionality of numerous single function radios among the services into a single, Joint-interoperable family of radios. The JTR system will attain joint, federal agencies and public safety, combined, and allied/coalition interoperability and performance requirements. The JTR System provides tactical radio sets that may include routers, switches, and other networking components / functions integral to the set and configured to meet the diversity of host platforms. The JTR System satisfies requirements common to the three domains that coincide with operational missions and environments: airborne, maritime/fixed, and ground. The radio sets in the JTR System will be software-reprogrammable, multi-band/multi-mode capable, mobile ad-hoc network capable, and provide

simultaneous voice, data, and video communications. It provides the initial capability for the military to have an interservice, international, allied, and coalition connectivity. JTRS will provide additional network capabilities; automatic interface; enhanced frequency assignment, supportability, and HN coordination ability; common spectrum requirements; and reduced spectrum requirements by eliminating parallel and duplicate networks. JTRS provides for economy of scale; replaces numerous stovepipe systems each requiring training, spares, and life cycle costs; and interoperability with numerous legacy radios from a single platform.

joint task force - A joint force that is constituted and so designated by the Secretary of Defense, a combatant commander, a subunified commander, or an existing joint task force commander. Also called JTF. (JP 1-02)

JTR Set - A JTR set is integrated on a user's platform as a completely functional configuration of radio communications hardware and software that provides the full range of JTR system services required by the user system. The JTR set may include one or more operating components. A JTR set does not include the user's host system computer, but does provide all aspects of radio communications and network services intended for the user's host system. A JTR set includes, but is not limited to such items as receiver-transmitters; microphones and speakers, antennae; power amplifiers; batteries for dismounted sets; interconnecting cables; platform installation kits, routers and other networking components; etc.

multi-mode operation - Multi-mode operation refers to a capability to operate more than one mode on a channel, radio, or system. Multi-mode JTR sets will operate to exchange information using voice, video, or data modes.

on-the-job training - A method of military training that imparts knowledge of procedures to a trainee to accomplish a task without the trainee attending a class of formal instruction.

operational control - Transferable command authority that may be exercised by commanders at any echelon at or below the level of combatant command. Operational control is inherent in combatant command (command authority). Operational control may be delegated and is the authority to perform those functions of command over subordinate forces involving organizing and employing commands and forces, assigning tasks, designating objectives, and giving authoritative direction necessary to accomplish the mission. Operational control includes authoritative direction over all aspects of military operations and joint training necessary to accomplish missions assigned to the command. Operational control should be exercised through the commanders of subordinate organizations. Normally this authority is exercised through subordinate joint force commanders and Service and/or functional component commanders. Operational control normally provides full authority to organize

commands and forces and to employ those forces, as the commander in operational control considers necessary to accomplish assigned missions. Operational control does not, in and of itself, include authoritative direction for logistics or matters of administration, discipline, internal organization, or unit training. (JP 1-02)

operation plan - Any plan, except for the Single Integrated Operational Plan, for the conduct of military operations. Plans are prepared by combatant commanders in response to requirements established by the Chairman of the Joint Chiefs of Staff and by commanders of subordinate commands in response to requirements tasked by the establishing unified commander. Operation plans are prepared in either a complete format (OPLAN) or as a concept plan (CONPLAN). The CONPLAN can be published with or without a time-phased force and deployment data (TPFDD) file. a. OPLAN -- An operation plan for the conduct of joint operations that can be used as a basis for development of an operation order (OPORD). An OPLAN identifies the forces and supplies required to execute the [Combatant Commander's] Strategic Concept and a movement schedule of these resources to the theater of operations. The forces and supplies are identified in TPFDD files. OPLANs will include all phases of the tasked operation. The plan is prepared with the appropriate annexes, appendixes, and TPFDD files as described in the Joint Operation Planning and Execution System manuals containing planning policies, procedures, and formats. Also called OPLAN. (JP 1-02)

protected frequencies - Those friendly frequencies used for a particular operation, identified and protected to prevent them from being inadvertently jammed by friendly forces while active electronic warfare operations are directed against hostile forces. These frequencies are of such critical importance that jamming should be restricted unless absolutely necessary or until coordination with the using unit is made. They are generally time-oriented, may change with the tactical situation, and must be updated periodically. (JP 1-02)

redeployment - The transfer of forces and material to support another joint force commander's operational requirements, or to return personnel, equipment, and material to the home and/or demobilization stations for reintegration and/or out-processing. (JP 102)

Revised Battlefield Electronic Communications Electronics Operation Instructions System - Current DOD standard software used to produce a JCEOI.

secure mode - A generic term referring to a method of communications that denies information to unauthorized recipients. The channel, circuit, and/or net are secured by physical means or by the provision of on-line crypto equipment (cryptographic), as appropriate.

Service component command - A command consisting of the Service component commander and all those Service forces, such as individuals, units, detachments, organizations, and installations under that command, including the support forces that have been assigned to a combatant command or further assigned to a subordinate unified command or joint task force. (JP 1-02)

sign and countersign - A confidential word challenge and its reply.

single channel ground and airborne radio system - A specific radio that has the capability to frequency hop from 30 MHz to 88 MHz ranges. Also called SINCGARS.

software defined radio - A software radio is a radio whose channel modulation waveforms are defined in software. As adopted by the Software Defined Radio Forum, the term software defined radios (SDRs) is used to describe radios that provide software control of a variety of modulation techniques, wide-band or narrow-band operation, communications security functions (such as hopping), and waveform requirements of current and evolving standards over a broad frequency range. The frequency bands covered may still be constrained at the front-end requiring a switch in the antenna system. SDR is an enabling technology applicable across a wide range of areas within the wireless industry that provides efficient and comparatively inexpensive solutions to several constraints posed in current systems. For example, SDR-enabled user devices and network equipment can be dynamically programmed in software to reconfigure their characteristics for better performance, richer feature sets, advanced new services that provide choices to the end-user and new revenue streams for the service provider. SDR is uniquely suited to address the common requirements for communications in the military, civil, and commercial sectors.

specified command - A command that has a broad, continuing mission, normally functional, and is established and so designated by the President through the Secretary of Defense with the advice and assistance of the Chairman of the Joint Chiefs of Staff. It normally is composed of forces from a single Military Department. Also called specified combatant command. (JP 1-02)

spectrum management - Planning, coordinating, and managing joint use of the electromagnetic spectrum through operational, engineering, and administrative procedures. The objective of spectrum management is to enable electronic systems to perform their functions in the intended environment without causing or suffering unacceptable interference. (JP 1-02)

subordinate command - A command consisting of the commander and all those individuals, units, detachments, organizations, or installations that have been

placed under the command by the authority establishing the subordinate command. (JP 1-02)

supported commander - The commander having primary responsibility for all aspects of a task assigned by the Joint Strategic Capabilities Plan or other joint operation planning authority. In the context of joint operation planning, this term refers to the commander who prepares operation plans or operation orders in response to requirements of the Chairman of the Joint Chiefs of Staff. (JP 1-02)

surge bandwidth - Surge bandwidth is the maximum bandwidth allocated to the node by the network manager at any one moment.

TABOO frequencies - Any friendly frequency of such importance that it must never be deliberately jammed or interfered with by friendly forces. Normally, these frequencies include international distress, CEASE BUZZER, safety, and controller frequencies. These frequencies are generally long standing. However, they may be time-oriented in that, as the combat or exercise situation changes, the restrictions may be removed.

task force - 1. A temporary grouping of units, under one commander, formed for the purpose of carrying out a specific operation or mission. 2. A semi-permanent organization of units, under one commander, formed for the purpose of carrying out a continuing specific task. 3. A component of a fleet organized by the commander of a task fleet or higher authority for the accomplishment of a specific task or tasks. Also called TF. (JP 1-02)

telecommunication - Any transmission, emission, or reception of signs, signals, writings, images, sounds, or information of any nature by wire, radio, visual, or other electromagnetic systems. (JP 1-02)

time-phased force and deployment data - The Joint Operation Planning and Execution System database portion of an operation plan; it contains time-phased force data, non-unit-related cargo and personnel data, and movement data for the operation plan, including the following: a. In-place units; b. Units to be deployed to support the operation plan with a priority indicating the desired sequence for their arrival at the port of debarkation; c. Routing of forces to be deployed; d. Movement data associated with deploying forces; e. Estimates of non-unit-related cargo and personnel movements to be conducted concurrently with the deployment of forces; and f. Estimate of transportation requirements that must be fulfilled by common-user lift resources as well as those requirements that can be fulfilled by assigned or attached transportation resources. Also called TPFDD. (JP 1-02)

time-phased force and deployment list - A Joint Operation Planning and Execution System database located at Appendix 1 to Annex A of deliberate

plans. It identifies types and/or actual units required to support the operation plan and indicates origin and ports of debarkation or ocean area. This listing is to include both a. In-place units; and b. Units to be deployed to support the deliberate plan. Also called the TPFDL. (JP 1-02)

unified command - A command with a broad continuing mission under a single commander and composed of significant assigned components of two or more Military Departments, that is established and so designated by the President through the Secretary of Defense with the advice and assistance of the Chairman of the Joint Chiefs of Staff. Also called unified combatant command. (JP 1-02)

warning order - 1. A preliminary notice of an order or action which is to follow. 2. (DOD only) A crisis action planning directive issued by the Chairman of the Joint Chiefs of Staff that initiates the development and evaluation of courses of action by a supported commander and requests that a commander's estimate be submitted. 3. (DOD only) A planning directive that describes the situation, allocates forces and resources, establishes command relationships, provides other initial planning guidance, and initiates subordinate unit mission planning. (JP 1-02)

waveform - A waveform is the representation of a signal as a plot of amplitude versus time. In general usage, the term waveform refers to a known set of characteristics, e.g., SINCGARS or EPLRS "waveforms." In JTR system usage, the term waveform is used to describe the entire set of radio functions that occur from the user input to the RF output and vice versa. A JTR system "waveform" is implemented as a re-useable, portable, executable software application that is independent of the JTR system operating system, middleware, and hardware.

14 point format - The US European and Central Command's frequency action message format for frequency requests and assignments.