ARMY, MARINE CORPS, NAVY, AND AIR FORCE

HF-ALE

MULTI-SERVICE TACTICS, TECHNIQUES, AND PROCEDURES FOR HIGH FREQUENCY-AUTOMATIC LINK ESTABLISHMENT (HF-ALE) RADIOS

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AIR LAND SEA APPLICATION CENTER

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MULTI-SERVICE TACTICS, TECHNIQUES, AND PROCEDURES

FOREWORD

This publication has been prepared under our direction for use by our respective commands and other commands as appropriate.

BARBARA G. FAST.
Major General, US Army
Deputy Director/Chief of Staff,
Army Capabilities Integration Center

ANDREW W. O'DONNELL JR.
Brigadier General, US Marine Corps
Director Capabilities Development Directorate
Marine Corps Combat Development Command

CARLTON B. JEWETT
Rear Admiral, US Navy
Commander
Navy Warfare Development Command

ALLEN G. PECK
Major General, US Air Force
Commander
Headquarters Air Force Doctrine
Development and Education Center

DAVID T. GLENN
RDML, U.S. Coast Guard
Assistant Commandant for Command, Control, Communications,
Computers and Information Technology

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PREFACE

1. Purpose

This consolidated reference will assist joint forces in utilizing high frequency radios as a supplement/alternative to overburdened satellite communications systems for over-the-horizon communications.

2. Scope

This publication describes multi-Service tactics, techniques, and procedures for basic high frequency-automatic link establishment (HF-ALE) radio operations. The contents of this publication are directed at the operator level. It does not delve into technical aspects of HF-ALE operations beyond that necessary for effective tactical use of the equipment.

3. Applicability

a. This publication provides commanders and their staffs unclassified guidance to simplify planning of HF-ALE radio procedures. It provides access to information on multi-Service communication systems to commanders and staffs conducting home station training or preparing for interoperability training.

b. The United States (US) Army, Marine Corps, Navy, Air Force, and Coast Guard approved this multi-Service publication for use. This publication applies to the Active Army, the Army National Guard/Army National Guard of the United States, and the United States Army Reserve, unless otherwise stated.

4. Implementation Plan

Participating Service command offices of primary responsibility (OPRs) will review this publication, validate the information and, where appropriate, reference and incorporate it in Service manuals, regulations, and curricula as follows:

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5. User Information

a. The U.S. Army Training and Doctrine Command (TRADOC), Headquarters Air Force Doctrine Center (AFDC), USCG, and the Air Land Sea Application (ALSA) Center developed this publication with the joint participation of the approving Service commands. ALSA will review and update this publication as necessary.

b. This publication reflects current joint and Service doctrine, command and control organizations, facilities, personnel, responsibilities, and procedures. Changes in Service protocol, appropriately reflected in joint and Service publications, will likewise be incorporated in revisions to this document.

c. We encourage recommended changes for improving this publication. Key your comments to the specific page and paragraph and provide a rationale for each recommendation. Send comments and recommendations directly to—

Army

Commander, US Army Training and Doctrine Command
ATTN: ATFC-EJ
Fort Monroe VA 23651-1067
DSN 680-3951 COMM (757) 788-3951
E-mail: doctrine.monroe@us.army.mil

Marine Corps

Commanding General
US Marine Corps Combat Development Command
ATTN: C42
330 Russell Road, Suite 318A
Quantico, VA 22134-5021
DSN 278-6233/6234 COMM (703) 784-6233/6234
E-mail: deputydirectordoctrine@mccdc.usmc.mil

Navy

Commander, Navy Warfare Development Command
ATTN: N5
686 Cushing Road
Newport RI 02841-1207
DSN 948-1070/4201 COMM (401) 841-1070/4201
E-mail: alsapubs@nwdc.navy.mil

Air Force
Commander, Air Force Doctrine Development and Education Center ATTN: DDJ 155 North Twining Street Maxwell AFB AL 36112-6112 DSN 493-2640/2256 COMM (334) 953-2640/2256 E-mail: afdc.ddj@maxwell.af.mil
Coast Guard
Commandant (CG-621) US Coast Guard 2100 2nd Street, S.W. Washington, D.C. 20593-0001 Comm: (202) 475-3547 E-mail: robert.l.kennedy@uscg.mil
ALSA
Director, ALSA Center 114 Andrews Street Langley AFB VA 23665-2785 DSN 575-0902 COMM (757) 225-0902 E-mail: alsa.director@langley.af.mil

SUMMARY OF CHANGES

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Multi-Service Tactics, Techniques, and Procedures for High Frequency-Automatic Link Establishment (HF-ALE) Radios

This revision, dated September 2007—

- Updates US Customs name change.
- Updates current operating stations (Keflavik, Iceland now closed).
- Updates the management of military frequencies with the National Telecommunications and Information Administration.
- Updates all figures and tables.
- Updates references.
- Revises terms and definitions IAW JP 1-02, *DOD Dictionary of Military and Associated Terms.*

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COMDTINST M2000.7A	**US Coast Guard Washington, DC**

20 November 2007

HF-ALE
MULTI-SERVICE TACTICS, TECHNIQUES, AND PROCEDURES FOR HIGH FREQUENCY-AUTOMATIC LINK ESTABLISHMENT (HF-ALE) RADIOS

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EXECUTIVE SUMMARY

HF-ALE

Multi-Service Tactics, Techniques, and Procedures for High Frequency-Automatic Link Establishment (AF-ALE) Radios

The military standard HF-ALE radio is widely deployed throughout the US military and provides a viable alternative to overburdened satellite communication systems. Automatic link establishment (ALE) is an improvement to high frequency (HF) radio that allows establishment of considerably clearer over-the-horizon voice communications and robust data transmissions. This publication establishes common tactics, techniques, and procedures to allow HF-ALE users to maximize use of HF-ALE radios in the inventory, as well as new HF-ALE radios currently being acquired.

Chapter I High Frequency

Chapter one provides an overview of HF radio operations, discussing propagation of radio waves in the atmosphere to include factors affecting atmospheric ionization, frequency and path optimization, and propagation prediction techniques.

Chapter II Automatic Link Establishment

Chapter two provides an overview of ALE, a communication system that permits HF radio stations to call and link on the best HF channel automatically without operator assistance. This chapter describes how ALE systems select the best frequency by making use of recently measured radio channel characteristics stored in a memory matrix and by constantly scanning through assigned frequencies to listen for calls. System limitations are also discussed.

Chapter III ALE Parameters

Chapter three discusses common parameters required for all radios in the network, the contrast between settings required for different vendor equipment, and factors such as type and number of radios in the network. Communications security, electronic protection, and linking protection are also covered.

Chapter IV Multi-Service ALE Network

Chapter four considers multi-Service ALE network operations. This chapter highlights the detailed planning and coordination required at multiple echelons within a joint force to achieve effective communications among joint users of HF-ALE compatible radios. The functions and responsibilities of joint forces, Services, and key personnel, with respect to HF-ALE operations are described, to include HF-ALE addressing and data distribution.

Chapter V Individual Service Communications Staff Office and Radio Operator Guidance

Chapter five provides guidance to each Service's radio operators and HF radio network coordinator on how to create and operate in a joint HF-ALE voice network. This chapter describes the network details provided by the JFC J6, what should be done with this information, and key points to consider when implementing the network into a previously established HF communications architecture. These guidelines are also applicable to operating in civil nets.

PROGRAM PARTICIPANTS

This revision comprised a worldwide review without holding any Joint Working Groups due to only administrative changes. The following commands and agencies participated in the revision of this publication:

Army

US Army Training and Doctrine Command, Army Capabilities Integration Center, Fort Monroe, VA

Marine Corps

Marine Corps Development Command, Quantico, VA

Navy

Commander, Navy Warfare Development Command, Newport, RI

Air Force

Headquarters, Air Force Doctrine Center, Maxwell Air Force Base, AL

Coast Guard

US Coast Guard (CG-621), Washington, DC

Department of Homeland Security

United States Customs and Border Protection, NW Washington, DC

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Chapter I
HIGH FREQUENCY

1. Overview

High frequency (HF) is a term used to describe the 1.6 to 30 megahertz (MHz) portion of the radio spectrum. This frequency range can provide both short-range and long-haul communications. However, it is also greatly influenced by the Earth's atmosphere. To communicate effectively in the HF spectrum, it is necessary to understand radio propagation and how the Earth's atmosphere affects this frequency range.

2. Propagation

Propagation describes how radio signals radiate outward from a transmitting source. A radio transmitter's antenna emits radio waves much like the wave motion formed by dropping a stone in a pool of water. This action is simple to imagine for radio waves that travel in a straight line in free space. The true path radio waves take, and how the Earth's atmosphere affects these waves, is more complex.

3. Earth's Atmosphere

The Earth's atmosphere is divided into three separate regions. The layers are the troposphere, the stratosphere, and the ionosphere. Most of the Earth's weather takes place in the troposphere, which extends from the Earth's surface to about 10 miles up. The weather variations in temperature, density, and pressure have a great effect on the propagation of radio waves. The stratosphere, which extends from roughly 10 to 30 miles up, has little effect on radio wave propagation. The ionosphere, which extends from 30 to approximately 375 miles up, contains up to four cloud-like layers of electrically charged ions. It is this region and its ionized layers that enable radio waves to be propagated great distances. The ionosphere, and how it affects radio wave propagation, is discussed on page I-3.

4. Types of Propagation

There are two basic modes of propagation: ground waves and sky waves. Ground waves travel along the surface of the Earth and are used primarily for short-range communications. Sky waves, reflected by the ionosphere, are "bounced" or reflected back to Earth and provide a long-haul communications path, as well as short-range (0 to 180 miles or 300 kilometers [km]) communication in mountainous terrain.

a. Ground Waves. Ground waves consist of three components: surface waves, direct waves, and ground-reflected waves.

(1) Surface Waves. Surface waves travel along the surface of the Earth, reaching beyond the horizon. Eventually, surface wave energy is absorbed by the Earth. The effective range of surface waves is largely determined by the frequency and conductivity of the surface over which the waves travel. Bodies of water and flat land have the least amount of absorption, while desert and jungle areas have the greatest. For a given complement of equipment, the range may extend from 200 to 250 miles over a conductive, all-sea-water path. Over arid, rocky, nonconductive terrain, however, the range may drop to less than 20 miles, even with the same equipment. If terrain is mountainous, the radio frequency signal

will be reflected rather than continuing along the Earth's surface, thus significantly reducing range. Absorption also increases with an increase in frequency. When trying to communicate using surface wave energy, use the lowest possible frequency.

(2) Direct Waves. Direct waves, also known as (AKA) line-of-sight (LOS) waves, travel in a straight line, becoming weaker as distance increases. They may be bent, or refracted, by the atmosphere; this extends their useful range slightly beyond the horizon. Transmitting and receiving antennas must be able to "see" each other for LOS communications to take place; therefore, antenna height is critical in determining range. Any obstructions (such as mountains or buildings) between the two antennas can block or reduce the signal using LOS communications. At higher frequencies, reception is optimized by matching the polarization/antenna position of the radios.

(3) Ground-Reflected Waves. Ground-reflected waves are the portion of the propagated wave that is reflected from the surface of the Earth between the transmitter and receiver.

b. Sky Waves. Sky waves are radiated upward, making beyond LOS communications possible. At certain frequencies, radio waves are refracted (or bent), returning to Earth hundreds or thousands of miles away. Depending on frequency, time of day (TOD), and atmospheric conditions, a signal can bounce several times before reaching a receiver. Near vertical incident sky waves (NVIS) are useful for short-range non-LOS communication at distances up to 200 miles. NVIS are reflected off the ionosphere at steep take-off angles. At such steep take-off angles, however, some of the HF energy penetrates the ionosphere and is lost. Usually, the HF band is used for sky wave propagation. Radio communications that use sky wave propagation depend on the ionosphere to provide the signal path between the transmitting and receiving antennas. Understanding sky wave propagation requires knowledge of the effects of the ionosphere and solar activity on HF radio propagation and a familiarization with the techniques used to predict propagation and select the best frequencies for a particular link at a given time. Using sky waves can be tricky, since the ionosphere is constantly changing. Several different computer programs are available to aid in the prediction of frequencies for the best propagation. Figure I-1 shows the different propagation paths for HF radio waves.

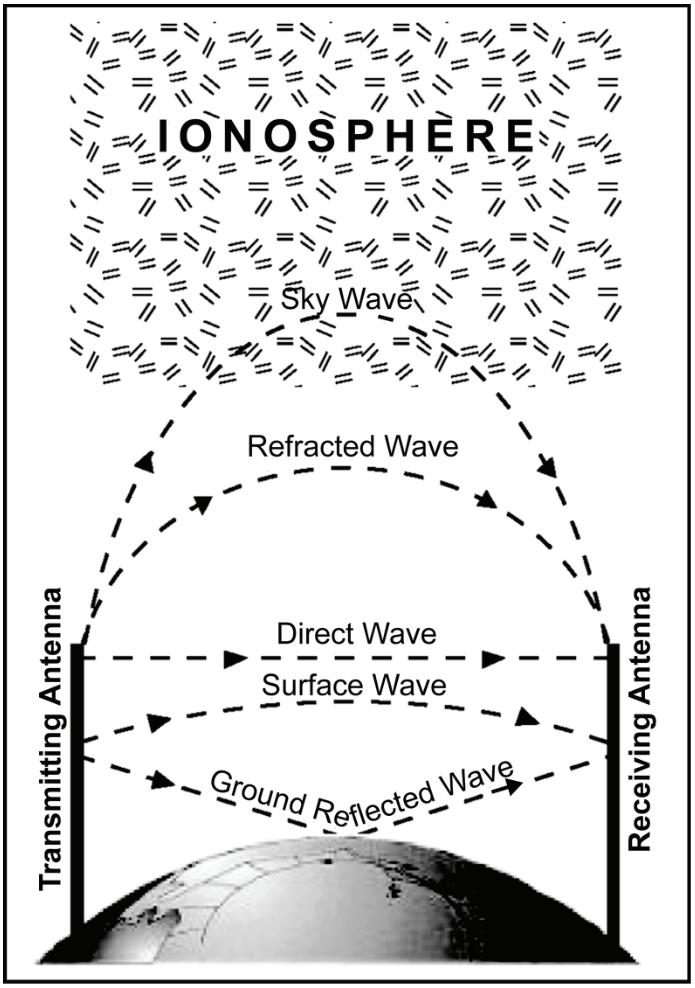

Figure I-1. Propagation Paths for HF Radio Waves

5. Ionosphere: Nature's Satellite

a. The ionosphere is a region of electrically charged particles or gases in the Earth's atmosphere, extending from approximately 50 to 600 km (30 to 375 miles) above the Earth's surface. Ionization—the process in which electrons are stripped from atoms and produce electrically charged particles—results from solar radiation. When the ionosphere becomes heavily ionized, the gases may even glow and be visible. This phenomenon is known as Northern and Southern Lights.

b. Why is the ionosphere important in HF radio? This blanket of gases is like nature's satellite, making most beyond LOS radio communications possible. When radio waves strike these ionized layers, depending on frequency, some are completely absorbed, others are refracted so they return to the Earth, and still others pass through the ionosphere into outer space. Absorption tends to be greater at lower frequencies, and increases as the degree of ionization increases. Figure I-2 shows the angle at which sky waves enter the ionosphere, AKA the incident angle.

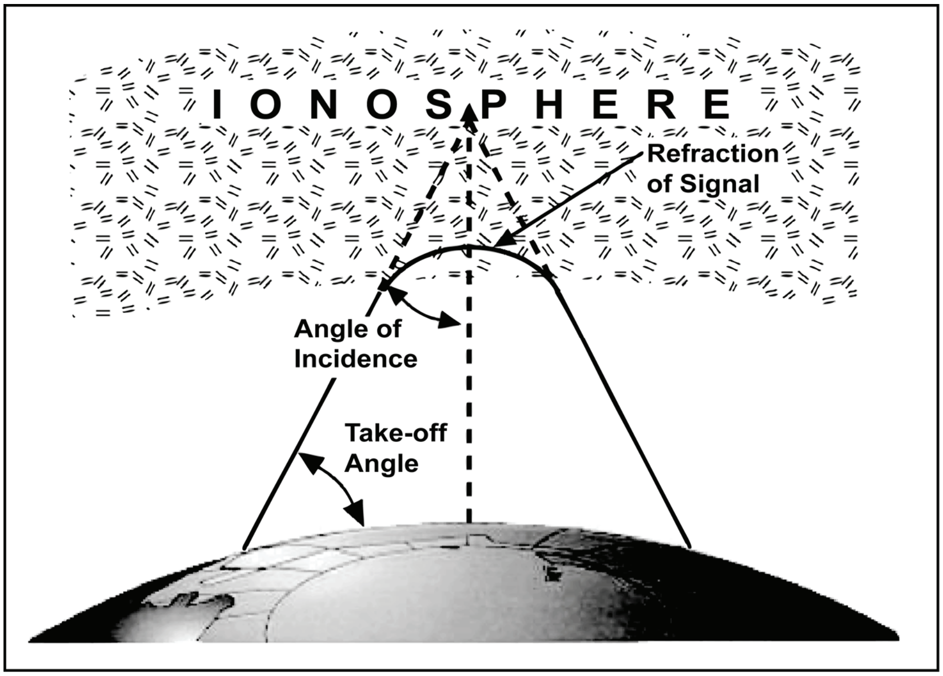

Figure I-2. Incident Angle

c. Incident angle is determined by wavelength (such as frequency) and the type and orientation of the transmitting antenna. Like a billiard ball bouncing off a rail, a radio wave reflects from the ionosphere at the same angle at which it hits the ionosphere. Thus, the incident angle is an important factor in determining communications range. Communications with a distant station requires a greater incident angle, while communications with a nearby station requires a lesser incident angle.

d. The incident angle of a radio wave is critical. If the incident angle is too nearly vertical and the electro-motive force of the transmitted signal is relatively small in that direction, the radio waves will pass through the ionosphere without being refracted back to Earth. If the incident angle is too great, the radio waves will be absorbed by the lower layers before reaching the more densely ionized upper layers. In turn, the incident angle must be sufficient to bring the radio wave back to Earth, yet not so great that it will lead to absorption.

6. Layers of the Ionosphere

a. Within the ionosphere, there are four layers of varying ionization (as illustrated in figure I-3). Since ionization is caused by solar radiation, the higher layers of the ionosphere tend to be more electrically dense, while the lower layers (protected by the outer layers) experience less ionization. Of these layers, the first, discovered in the early 1920s by Sir Edward Victor Appleton, was designated “E” for electric waves. Later, “D” and “F” were discovered and noted by these letters. The letters A, B, and C will be used to designate future discoveries.

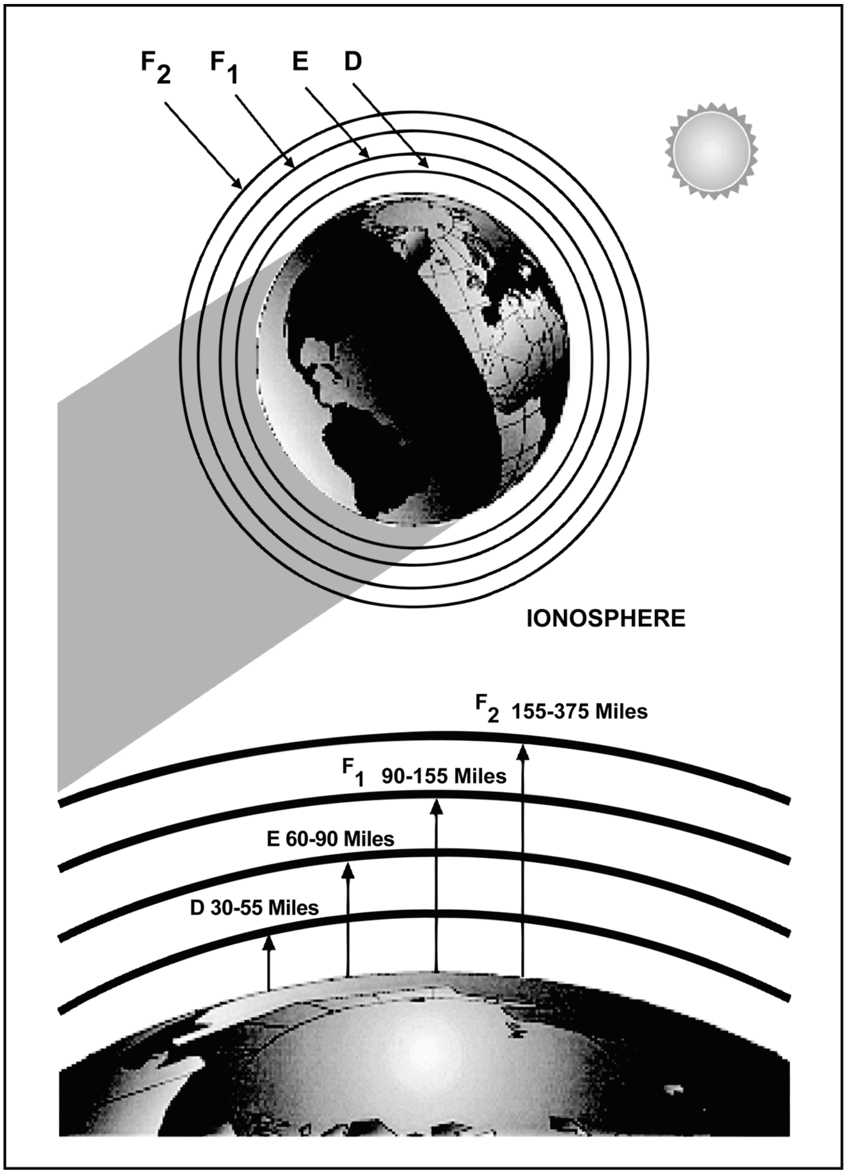

Figure I-3. Layers of the Ionosphere

b. The D layer is the lowest region affecting HF radio waves. Ionized only during the day, the D layer reaches maximum ionization when the sun is at its zenith, but dissipates quickly toward sunset.

c. The E layer reaches maximum ionization at noon. It begins dissipating toward sunset and reaches minimum activity at midnight. Irregular cloud-like formations of ionized gases occasionally occur in the E layer. These regions, known as sporadic E, can support propagation of sky waves at the upper end of the HF band and beyond. Sporadic E regions appear and disappear quickly and at irregular intervals. Therefore, they are difficult to predict. For this reason, sporadic E communications cannot be depended upon to support mission essential communications.

d. The F layer is the most heavily ionized region of the ionosphere and, therefore, the most important for long-haul communications. At this altitude, the air is thin enough so the ions and electrons recombine very slowly and this layer retains its ionized properties even after sunset.

e. In the daytime, the F layer consists of two distinct layers: F1 and F2. The F1 layer, which exists only in the daytime and is negligible in winter, is not important to HF communications.

f. The F2 layer reaches maximum ionization at noon and remains charged at night, gradually decreasing to a minimum just before sunrise.

g. During the day, sky wave reflection from the F2 layer requires wavelengths short enough to penetrate the ionized D and E layers, but not so short as to pass through the F layer. Generally, frequencies from 8 to 20 MHz will be reflected back to Earth during daytime hours and frequencies between 2 and 8 MHz will be reflected at nighttime hours. For NVIS nighttime communications, the most effective frequencies normally range between 2 and 5 MHz.

7. Factors Affecting Atmospheric Ionization

a. The intensity of solar radiation varies periodically, thereby affecting ionization. Solar radiation intensity can be predicted based on the TOD and season, and equipment adjustments made to limit or optimize ionization effects.

b. Ionization is higher during spring and summer because the hours of daylight are longer. Sky waves are absorbed or weakened as they pass through the highly charged D and E layers, in effect, reducing the communication range of most HF bands.

c. Because there are fewer hours of daylight during autumn and winter, less radiation reaches the D and E layers. Lower frequencies pass easily through these weakly ionized layers. Therefore, signals arriving at the F layer are stronger and reflected over greater distances.

d. Another longer term periodic variation results from the 11-year sunspot cycle, shown in figure I-4. Sunspots generate bursts of radiation that cause higher levels of ionization—the more, the greater the ionization. During periods of low sunspot activity, frequencies above 20 MHz tend to be unusable because the E and F layers are too weakly ionized to reflect signals back to Earth. At the peak of the sunspot cycle, however, it is not unusual to have worldwide propagation on frequencies above 30 MHz.

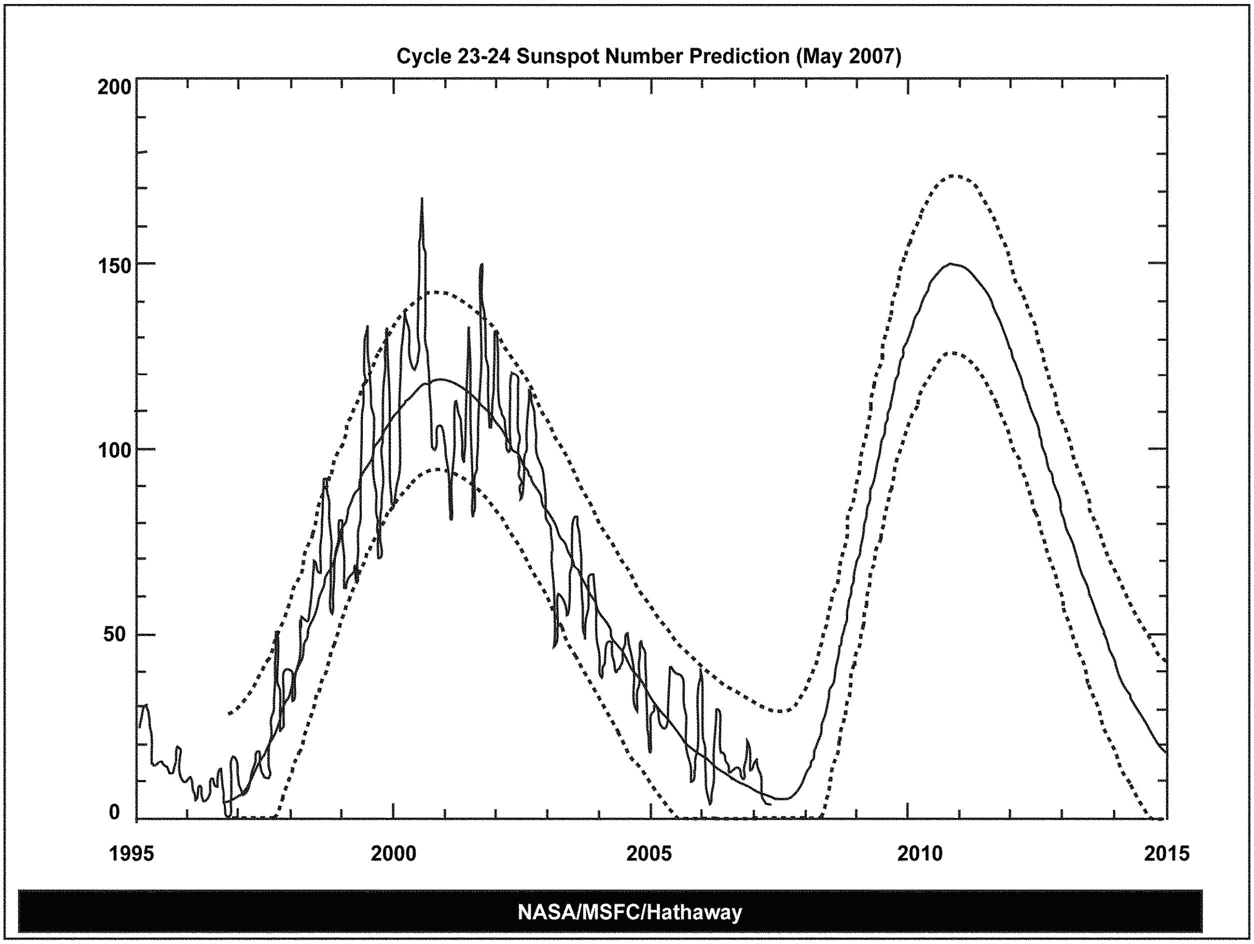

Figure I-4. 11-Year Sunspot Cycle

e. In addition to these regular variations, there is a class of unpredictable phenomena known as sudden ionospheric disturbances that can affect HF communications as well. Sudden ionospheric disturbances—random events due to solar flares—can disrupt sky wave communication for hours, or days, at a time. Solar flares produce intense ionization of the D layer, causing it to absorb most HF signals on the side of the Earth facing the sun.

f. Magnetic storms often follow the eruption of solar flares within 20 to 40 hours. Charged particles from the storms have a scattering effect on the F layer, temporarily neutralizing its reflective properties.

8. Frequency and Path Optimization

a. Because ionospheric conditions affect radio wave propagation, communicators must determine the best way to optimize radio frequencies at a particular time. The highest possible frequency that can be used to transmit over a particular path under given ionospheric conditions is the maximum usable frequency (MUF). Frequencies higher than the MUF penetrate the ionosphere and continue into space. Frequencies lower than the MUF tend to refract back to Earth.

b. As frequency is reduced, the amount of absorption of the signal by the D layer increases. Eventually, the signal is completely absorbed by the ionosphere. The frequency at which this occurs is called the lowest usable frequency. The “window” of usable frequencies, therefore, lies between the MUF and lowest usable frequency.

c. The frequency of optimum transmission (FOT) is nominally 85 percent of the MUF. Generally, the FOT is lower at night and higher during the day.

d. In addition to frequency, the route the radio signal travels must also be considered in optimizing communications. A received signal may be comprised of components arriving via several routes, including one or more sky wave paths and a ground wave path. The arrival times of these components differ because of differences in path length; the range of time differences is the multi-path spread. The effects of multi-path spread can be minimized by selecting a frequency as close as possible to the MUF. Higher frequencies are generally less susceptible to atmospheric noise so communications can also be improved by choosing frequencies as close as possible to the MUF.

9. Propagation Prediction Techniques

a. Since many of the variables affecting propagation follow repetitive cycles and can be predicted, techniques for effectively determining FOT have been developed.

b. A number of propagation prediction computer programs are available (see appendix H). One widely used and effective program is Voice of America Coverage Analysis Program (VOACAP), which predicts system performance at given times of day as a function of frequency for a given HF path and a specified complement of equipment.

c. Of course, since computerized prediction methods are based on physical calculations and historic data, they cannot account for present conditions affecting communications, such as ionospheric changes caused by random phenomena (interference and noise).

Chapter II
AUTOMATIC LINK ESTABLISHMENT

1. Overview

Automatic link establishment (ALE) is a communication system that permits HF radio stations to call and link on the best HF channel automatically without operator assistance. Typically, ALE systems make use of recently measured radio channel characteristics stored in a memory matrix to select the best frequency. The system works much like a telephone in that each radio in a network is assigned an address (similar to a call sign). When not in use, each radio receiver constantly scans through its assigned frequencies, listening for calls addressed to it.

2. ALE Linking Sequence

a. To reach a specific station, the radio operator simply enters an address, just like dialing a telephone number. The radio consults its memory matrix and selects the best available assigned frequency. It then sends out a brief digital message containing the identification (ID) of the destination. When the receiving station hears its address, it stops scanning and stays on that frequency. The two stations automatically conduct a "handshake" to confirm that a link is established, and they are ready to communicate (see figure II-I).

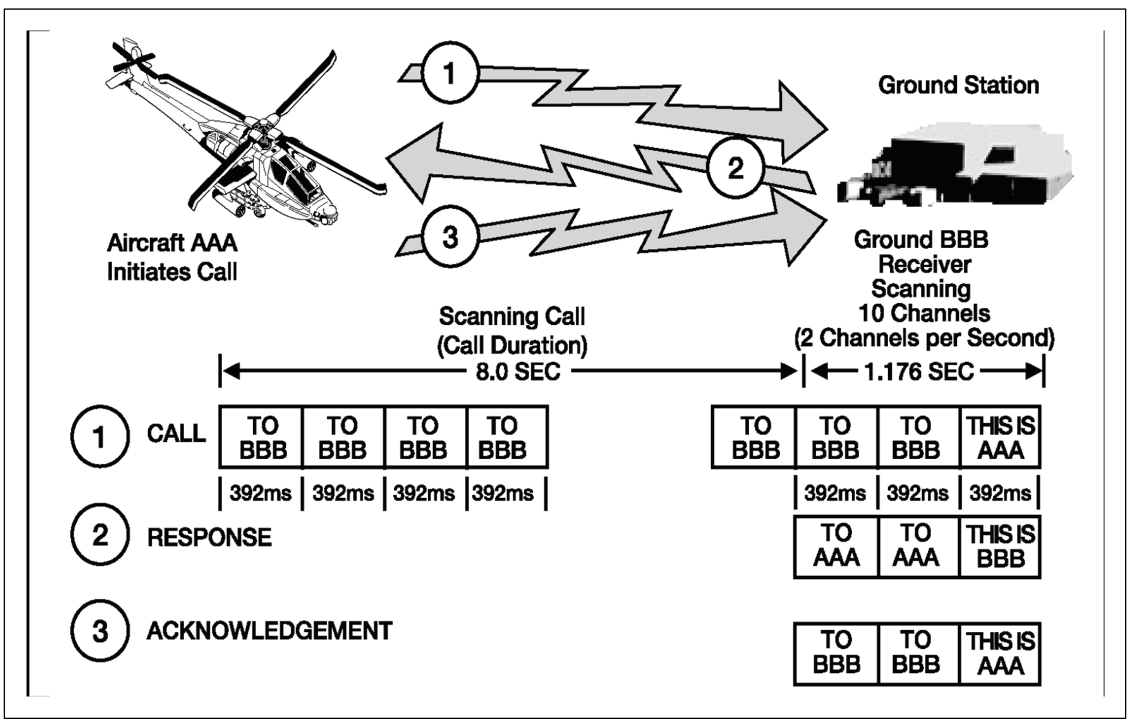

Figure II-1. ALE Linking Sequence

b. The receiving station, which has been squelched, will emit an audible alert and/or a visual indication of the ALE address of the station that called to alert the operator of an incoming call. At the conclusion of the call, either operator can "hang-up" or terminate the link; a disconnect signal is sent to the other station and they each return to the scanning mode.

c. ALE can also be used for a group of stations using the ALE net call at the same time. In this situation, each receiving station answers back to the calling station in a certain sequence, which is set up during the ALE programming. Net calls must be used somewhat judiciously, as all called stations need to be in the same propagating region as the calling station.

d. An HF communications network usually has a number of channels assigned. The ALE system has a link quality analysis (LQA) process that allows the radio to evaluate each of these channels to determine the best channel to place a call.

e. At prescribed intervals, a station can be programmed to measure the signal quality on each assigned frequency (by listening to the sounding signals from the other stations in the network). The quality scores are stored in a matrix, listed by the other stations as ID versus channel. When a call to a certain station is initiated, the radio checks the matrix to determine the best quality frequency for the call to that particular station. It then attempts to link on that frequency. If the link cannot be established on that frequency, it will try again on the next best frequency, and so on until a link is established. If a link is not established after trying all the assigned frequencies, the radio will prompt the operator that a link could not be established. Sometimes when using the HF spectrum, communications between any two points may not be possible. In these cases, it is important to be persistent in attempts to communicate and consider using another station as a relay to get a message across.

f. In the sample LQA matrix for the station headquarters (HQ) (table II-I), the channel numbers represent programmed frequencies; the numbers in the matrix are the most recent channel quality scores. In this example, scores range from 0 for the worst to 100 for the best. Actual LQA scoring varies between different vendors' equipment. A blank ("___") means the two radios could not use that channel to communicate.

Table II-1. Link Quality Analysis Matrix

Address	**Channels**				
	01	02	03	04	05
ALPHA 1	60	33	12	81	23
ALPHA 2	10	--	48	86	21
ALPHA 3	--	--	29	52	63

g. Thus, if the operator from HQ wanted to call ALPHA 3, the radio would attempt to call on channel 05, which has the highest LQA score. If not successful, it would attempt to call on the channel with the next highest score (channel 04), and so on.

h. When making multi-station calls or a net call, the radio selects the channel with the best average score among the addresses in the net call. Thus, for a net call to all the addresses in the matrix, channel 04 would be used.

3. Generations of ALE

a. Currently two generations of ALE are being used; these are commonly referred to as second generation (2G) and third generation (3G). This document primarily covers the 2G version of ALE. Military Standard (MIL-STD)-188-141A, appendix A and MIL-STD-188-141B, appendix A (updated) covers 2G ALE.

b. The newest ALE technology (3G) is primarily used in the Marine Reconnaissance community. This technology provides the following advantages over the 2G of ALE:

- Faster link setup time.
- Linking at lower signal-to-noise ratios.
- Improved network channel efficiency.
- ALE, 3G, and data traffic use the same family of high-performance serial waveforms.
- Higher throughput for short and long data messages.

c. These advantages incorporate synchronous scanning, a burst phase shift keying waveform, and a carrier sense multiple access with collision avoidance channel access procedure. MIL-STD-188-141B, appendix C, and STANAG 4538 are the applicable standards that cover the 3G of ALE.

4. Frequency Selection

a. For ALE to function properly, frequency selection is important. When selecting frequencies to use in a network, take into consideration the times of operation and distances to be communicated, power level used, type of antenna(s) used and so forth.

b. When using the above parameters, a good propagation program should also be used to determine which frequencies will propagate. Appendix H lists some of the available propagation software programs and contact information.

c. Consulting with the frequency manager early on in this process may save you a lot of work, since the manager may already have lists of approved frequencies that can be used for particular functions in given areas.

5. Limitations

a. ALE is a tool that automates HF linking and frequency selection. It does not replace a properly trained HF operator. Knowledge of the specific radio equipment being used, propagation, antennas, and so forth is still essential to use ALE effectively.

b. ALE will not improve propagation. If poor propagating frequencies are used, ALE will not make them work better. ALE only works as well as the frequencies you put into it; therefore, proper frequency management is essential.

c. ALE makes the linking process more automatic, allowing a novice HF user to use the radio effectively. However, ALE in some cases takes more time than it takes two highly trained HF operators to establish a link.

d. ALE determines only the best channel to pass traffic and tries to establish a link between radios. The ALE function, in itself, does not provide data capability other than a simple automatic message display (AMD) in the ALE header signal or other equipment specific features.

e. Depending on the specific equipment used, ALE may not determine if the channel is busy with voice or data traffic before it transmits. An operator has no indication if two other stations are currently linked.

Chapter III
ALE PARAMETERS

1. Overview

Creating a network in ALE requires that a number of parameters be set the same across all radios in the network. These settings are determined by considerations such as type of radios in the network and the number of radios in the network. Due to the number of different data devices and types of data, this document does not cover the use of data in an ALE network. To show contrast between vendor equipment, a sample ALE communications plan for an AN/PRC-150(c) radio is included in appendix F (Example Radio Programming Application), and a sample communications plan for an AN/ARC-220 radio is included in appendix G (Example HF Communications Planning System (HF-CPS)).

2. ALE Parameters

The following lists some of the ALE parameters provided to users. Different equipment may contain more or fewer parameters.

(1) Address. This parameter assigns a unique call sign or address to each radio. The self address is the address assigned to the radio you are programming. The format is three to fifteen alphanumeric characters. Individual addresses are assigned to all other radios in the network.

(2) ALL Call. This parameter determines if the radio will respond to an "ALL" Call. An ALL Call attempts to link with all the ALE stations using a broadcast format. An ALL Call does not expect a response and does not designate a specific address. The letters A-L-L should not be used as a self or individual address.

(3) AMD Allowed. This parameter enables (or disables) the ability of the radio to receive AMD messages. If this is turned off, your radio will not receive and store AMD messages sent to it. (This parameter does not exist in all vendors' equipment.)

(4) ANY Call. This parameter determines if the radio will respond to an "ANY" Call. An ANY Call attempts to link with all ALE stations in the same manner as with the ALL Call, except the individual stations are expected to respond at one of 16 random intervals for linking purposes. The letters A-N-Y should not be used as a self or individual address.

(5) Auto Display AMD. This parameter enables (or disables) the ability of the radio to display a received AMD message on its front panel. If this is turned off, your radio will not display AMD messages sent to it, but will store them in memory. For this feature to work, the AMD allowed parameter must be enabled.

(6) Scan Set (AKA Channel Group or Scan List). This parameter groups individual channels together for use in an ALE network. The number of scan sets that can be created is dependent on the equipment used.

(7) Key to Call. This parameter enables or disables a feature that allows the operator to simply key the microphone to place an ALE call to the last address called. This is like last number redial on a telephone.

(8) Activity Timeout (AKA Link Timeout or Return to Scan Timeout). This parameter returns the radio from a linked state to scan if the radio has not been keyed or has not received an ALE signal for a specified period of time.

(9) Listen Before Transmit. This parameter forces the radio to monitor the channel for existing traffic before attempting an ALE call. Depending on the equipment used, the existing traffic can be an ALE handshake, voice, or data.

(10) LQA in Call. This parameter enables (or disables) a feature that forces the radio to do an LQA before attempting an ALE call.

(11) Maximum Scan Channels (AKA Call Duration). This parameter is used in ALE to determine the link call time to stations within the net. The calling station's call needs to last long enough so the receiving station(s) have time to complete their scan cycle. This parameter must be set for the worst case radio in the network. For example, all radios scan five channels except one which scans 10, all radios in the network must set Max Scan Channels to 10.

(12) Maximum Tune Time. This parameter sets the length of time the calling station waits for the target station to tune its antenna coupler and power amplifier and respond to the call. This parameter must be set for the slowest radio tune time in the network. If all radios in the network tune in 4 seconds except one, which takes 6 seconds, all radios in the network must set this parameter to 6 seconds.

(13) Net Address. This is a list of the addresses in a network. The net address requires all radios to be programmed identically. The order of all addresses in the network (including your self address) must be the same in all radios.

(14) Scan Rate (AKA Scan Minimum Dwell, 1/Scan Rate). This parameter sets the rate that the frequencies will be scanned. All radios in the network must be set at the same scan rate.

3. Channel Parameters

In addition to the ALE parameters, the radios have to be programmed with channel parameters. Depending on the equipment used, these parameters may include—

- Channel number.
- Frequency (both receive and transmit).
- Power emission.
- Modulation type (AKA emission mode).
- Automatic gain control (AGC).
- Channel bandwidth.
- Receive (RX) only (if set to YES, this channel is used just for receive only).
- Sound enable/disable.
- Sounding interval.

4. Communications Security

Communications security (COMSEC) must be programmed in all radios in the network. The planner must ensure that all stations are using compatible COMSEC devices and that the same keying material (KEYMAT) is used.

5. System Specific Parameters

Each system has specific parameters that must be programmed (such as modem settings, pre/post selector settings). This document does not cover all these settings due to the variety of different systems and different parameters.

6. Electronic Protection

When required, electronic protection (EP) must be programmed in all radios in the network. The planner must ensure that all stations are using the same transmission security key material.

7. Linking Protection

When required, linking protection (LP) must be programmed in ALE operation for all radios in the network. The planner must ensure that all stations are using the same level of LP and LP key material.

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Chapter IV
MULTI-SERVICE ALE NETWORK

1. Overview

Achieving effective communications among all users of HF-ALE compatible radios on the modern battlefield requires detailed planning and coordination at multiple echelons within a joint force. This chapter describes the respective functions and responsibilities of the joint forces, Services, and key personnel, with respect to HF-ALE operations.

2. Functions and Responsibilities

a. Joint Chiefs of Staff (JCS). The JCS provides overall guidance on joint US military frequency engineering and management. The JCS have delegated certain authority to carry out this responsibility to the Chairman of the Military Communications-Electronics Board. The Chairman of the Joint Chiefs of Staff (CJCS) reserves the authority to resolve disputes.

b. Joint Force Commander (JFC). The JFC is responsible for all facets of communications in the area of operations (AO). The JFC delegates the authority for communications coordination to the communications or signal special staff office of the Command, Control, Communications, and Computer Systems Directorate (J6).

c. Command, Control, Communications, and Computers Systems Directorate.

(1) The JFC's J6 is a functionally organized staff that controls and coordinates joint signal services for all elements in the joint operation or exercise. Normally when a joint force is using HF-ALE compatible radios, the J6 is responsible for the following:

(a) Designating and distributing joint HF-ALE operating parameters including LP.

(b) Publishing standing operating procedures (SOP) for communications.

(c) Providing frequency management for joint HF-ALE nets.

(d) Coordinating with host government for frequencies.

(e) Controlling COMSEC assignment and use.

(f) Establishing and assigning hierarchy for joint nets.

(g) Establishing and assigning user addresses for joint forces.

(h) Controlling EP assignment and use.

(2) The J6 publishes procedures for the following actions in the operation plan (OPLAN) and operation order:

(a) Operating in fixed (single-channel) or ALE modes.

(b) Using channel plans.

(c) Assigning and using traffic encryption key (TEK).

(d) Determining applicable dates for net configurations.

(e) Assigning hierarchy for joint nets.

(f) Establishing common network time.

(g) Developing key management plans.

(h) Developing emergency destruction plans.

(3) In joint operations, all Services in the same tactical operating area will use HF-ALE compatible radios. Frequency management must occur at the highest multi-Service command level. For effective operations, a communications coordination committee should be composed of assigned J6 personnel and necessary augmentation personnel. The communications coordination committee should include—

(a) Lead Service HF-ALE network coordinator.

(b) The COMSEC custodian and/or communications-electronics operating instruction (CEOI) manager from the appropriate staff section.

(c) The special plans officer from the operations directorate of a joint staff (J3) plans section.

(d) The host-country frequency coordinator.

(e) Frequency managers from the joint and Service frequency management offices.

(f) The J3 aviation officer.

(g) The J3 maritime officer.

(h) A representative from each Service/functional component command J6, C6, or Army or Marine Corps component command, control, communications, and computer systems staff officer (G6) capable of accurately representing the component requirements, capabilities, and limitations.

(4) The communications coordination committee must be identified and available prior to the execution of the OPLAN. They must be knowledgeable on Service-unique communications requirements and the operation and management of HF-ALE computer-based data management systems (such as the Joint Automated CEOI System or Revised Battlefield Electronics CEOI System, Automated Communications Engineering Software, and the Air Force Key Data Management System).

(5) The communications coordination committee works with the intelligence directorate of a joint staff (J2) and the J3 section for planning electronic warfare (EW). The J3 establishes the joint commander's electronic warfare staff (JCEWS) for planning EW operations. JCEWS normally consists of the J2, J3, EW officer, J6, and representatives from component Services.

(6) The JCEWS coordinates all EW emissions in the joint arena. After coordination is complete, the J6 publishes a joint restricted frequency list (JRFL). It specifies the frequency allocations for communication and jamming missions restricted from use by anyone except those performing the jamming mission. The JFC has final approval of the JRFL, which must be continually updated to maximize effectiveness of EW assets and communications systems. The JRFL should contain only those frequencies that, when jammed, would jeopardize the mission and endanger personnel. A JFRL that contains too many frequencies defeats the purpose of the JRFL.

(7) Working with host-nation authorities, the communications coordination committee also builds the frequency list for the channel plans. In building the list, the committee should use HF propagation tools (such as systems planning, engineering, and evaluation device [SPEED], VOACAP, Rockwell Collins propagation software [PROPMAN]).

3. Planning

a. Frequency and Network Management Responsibilities.

(1) Legal and Regulatory Principles. Both national and international regulatory bodies require effective and efficient use of the radio frequency (RF) spectrum.

(a) US National Spectrum Authority. Title 47, United States Code (U.S.C.) Section 151 et seq., The Communications Act of 1934, established separate control of federal government and non-federal government use of the RF spectrum. Under this Act, the only government agencies that assign and control the use of frequencies within the United States are National Telecommunications and

Information Administration (NTIA) and the Federal Communications Commission (FCC). NTIA assigns and regulates frequencies for federal users. The NTIA governs all federal (including military) use of the RF spectrum within the United States and its Possessions. The FCC assigns and regulates frequencies for non-federal users. Non-federal users include private citizens, companies, and state/local government users. The RF spectrum is allocated between government (federal) and non-government (civil) users with portions of the spectrum that are shared between the two. Federal users must utilize frequency bands allocated for government or shared use. A government frequency assignment may be authorized in a non-government band provided the request is coordinated and granted approval by the FCC.

(b) International Spectrum Authority. The International Telecommunication Union (ITU) is the international body responsible for international frequency allocations, worldwide telecommunications standards, and telecommunications development activities. The United States is one of the 191 member nations that comprise the ITU. International agreements signed by the President and ratified by the Senate gain treaty status. RF spectrum is a natural resource independently managed by each sovereign nation within their respective boundaries.

(2) Frequency and Network Management Abroad. The principles of international spectrum authority must be kept in mind when US military forces operate abroad. Joint force operations require frequency and network management at theater levels for interoperability. Combined operations will also require frequency and network management if allies use HF-ALE compatible radios. Inside the borders, airspace, or territorial waters of foreign countries, US forces have no independent authority to use radio frequencies. They are subject to existing international agreements. The US Department of State and theater commander coordinate these agreements with allied governments.

(a) Before obtaining RF spectrum authorization abroad, it is imperative that the commander keep in mind the principle of effective and efficient use of the spectrum in addition to other principles of international spectrum authority. For example, congestion of radio spectrum in the Republic of Korea (ROK) has become so significant that it has become increasingly difficult to assign new sole-user frequencies. The ROK Ministry of Information and Communications, as the assignment authority for all RF requirements in the ROK, manages the RF spectrum in the ROK closely and requires strong justification for permanent frequency assignments.

(b) The lesson here is that commanders must be critical in reviewing requirements and requests for new frequency assignments. Every effort should be made to share existing resources and to ensure that the continued use of currently assigned frequencies is absolutely necessary to accomplish the mission.

(3) Frequency Allocations Assignments. Frequency assignments are area dependent; thus when units change their AO, frequency planning must be addressed early to minimize disruptions in the operation. Users must approach the spectrum management process in a manner consistent with the combatant commander's policy for spectrum management. The J6 usually develops the commander's policy, which includes documents such as the OPLAN and joint communications-electronics operating instruction (JCEOI). At each level, users must identify and submit spectrum requirements to the Joint Frequency Management Office (JFMO) or Joint Spectrum Management Element (JSME) as appropriate. Users are also responsible for operating their electromagnetic radiating equipment in accordance with parameters authorized by the frequency assignment process. Due to the long lead time required to coordinate spectrum assignments, users should submit their requests for frequencies early in their planning cycle. After receiving assignments, the JFMO/JSME will generate editions to the JCEOI/signal operating instructions, print out a hard copy for issue and usage, and create frequency lists needed for operations.

(4) Network Allocations. Network allocations are mission dependent; thus when units change their AO, net planning must address and implement timely updates to minimize disruptions in the operation. The lead Service HF-ALE network manager must contact the JFMO/JSME for frequencies. The HF-ALE network manager will then validate the master address list and net assignments prior to generation. After receiving frequency assignments, the network manager will generate the required channel plan, print out both paper and electronic copy for issue and usage, and create channel plans needed for operations. (See figures IV-I and IV-II.)

Minimum Format Items
(Check w/ Frequency Manager)

005. Security Classification (UB)
010. Type of Action (N) = New
102. Serial Number
110. Frequencies - K2000-M30
113. Station Class (ML) Mobile Land
114. Emission Designator (2K80J3E)
115. Transmitter Power (in watts) (W400)
116. Power Type (P)
130. Usage Hours Per Day (1H24)
131. Percentage of Use
140. Required Date (YYYYMMDD)
141. Expiration Date (YYYYMMDD)
144. O
147. Joint Service (AF, AR)
200. Agency (USA, USN, USAF, or NSA)
204. Command (Unit)
205. SubCommand
207. Operating Unit
300. Transmitter Location, State, or Country
301. Transmitter Antenna Location
303. World Geodetic System 1948 (WGS 84) DATUM (Latitude and Longitude in Deg. Min, Sec)
340. Transmitter Equipment Nomenclature (G,AN/URC-121)
343. Transmitter Equipment Allocation Status (JF-12 number from DD 1494) (J/F 12/0XXXX)
354. Antenna Name
356. Antenna Structure Height (In Meters)
357. Antenna gain
358. Antenna Elevation
359. Antenna Feed Point Height (In Meters)
362. Antenna Orientation
363. Antenna Polarization
400. Receiver Location, State or Country
401. Receiver Antenna Location
403. World Geodetic System 1948 (WGS 84) DATUM (Latitude and Longitude in Deg. Min, Sec)
407. Path Length (In Kilometers)
440. Receiver Equipment Nomenclature (G, AN/URC-121)
443. Receiver Equipment Allocation Status (JF-12 number from DD 1494) (J/F 12/0XXXX)
454. Antenna Name
455. Antenna Structure Height (In Meters)
457. Antenna Gain
458. Antenna Elevation
459. Antenna Feed Point Height (In Meters)
462. Antenna Orientation
463. Antenna Polarization
502. Description of Requirement
511. Major Function Identifier
512. Intermediate Function Identifier
513. Detailed Function Identifier
520. Supplementary Details
702. MAJCOM Tracking Number
704. Type Service (S-Simplex, D-Duplex)
716. Usage Code (3)
803. Requester Data (Rank, Name, Telephone Number)
804. Tuning Range/Increments
805. Date Required (YYYYMMDD)
806. Host nation Nominations Acceptable (Yes or No)
910. Exercise, Mission or Project Name

Figure IV-1. Standard Frequency Action Format Example

005. UB
010. N
110. K2000-M30
113. ML
114. 2K80J3E
115. W35
140. 20010430
141. 20010530
144. O
147. AR, AF
200. USA
204. UNIT INFORMATION (SMD) COMMAND
207. UNIT INFORMATION (RS) Operating Unit
300. CA
301. FT IRWIN
303. 351500N1164000W
340. G, AN/PRC-150C
343. J/F 12/04167/6
354. WHIP
356. 6
357. 0
358. 2283
359. 6
362. ND
363. V
400. DE
401. DOVER AFB
403. 390736N0752754W
407. 6378
440. G, AN/PRC-150C
443. J/F 12/04167/6
454. LOGPERIODIC
456. 15
457. 20
458. 30
459. 15
462. R
463. V
502. REQUIRED FOR COMMAND AND CONTROL DURING ROTATION
511. GROUND OPERATIONS
512. INFANTRY
513. COMMAND AND CONTROL
520. REQUEST 3 IN EACH OF THE FOLLOWING BANDS
520/2. 2-3K, 4-5K, 6-12K, 12-15K, 15-17K, 17-18K,
520/3. 19-20K, 20-23K, 23-25K, 25-30K
702. 1-10SFG2003-0012
704. 3510
716. 3
803. SGT Jon Doe, 123-4567/4568
804. K2000-K3000/100K
805. 20010422
806. YES
910. Joint Enterprise

Figure IV-2. Standard Frequency Action Format Example for HF-ALE

b. Compatibility and Interoperability. To support HF-ALE compatibility and interoperability between all Service components, planners must coordinate with J6 and their subordinate organizations. This coordination ensures that all combat and combat support elements have the following:

(1) Equipment.

(a) Interoperability. Equipment interoperability is a major issue in network planning for HF-ALE systems. While many US forces use HF-ALE-compatible radios, the radios of allied nations may not be interoperable with MIL STD 188-141 HF-ALE. Therefore, plans should address interfaces between HF and HF-ALE capable radios or lateral placement of interoperable radios in non-ALE command posts.

(b) Cryptographic (CRYPTO) Management. The J6 should manage the use of crypto materials (key lists and devices) to ensure security and crypto interoperability at all levels. US forces may need to augment allied forces with US equipment and personnel for crypto interoperability as appropriate. Prior coordination is essential for mission accomplishment.

(2) HF-ALE Channel Plan Data.

(a) The J6 network manager is responsible for managing and generating multi-Service HF-ALE channel plan data (see figure IV-3).

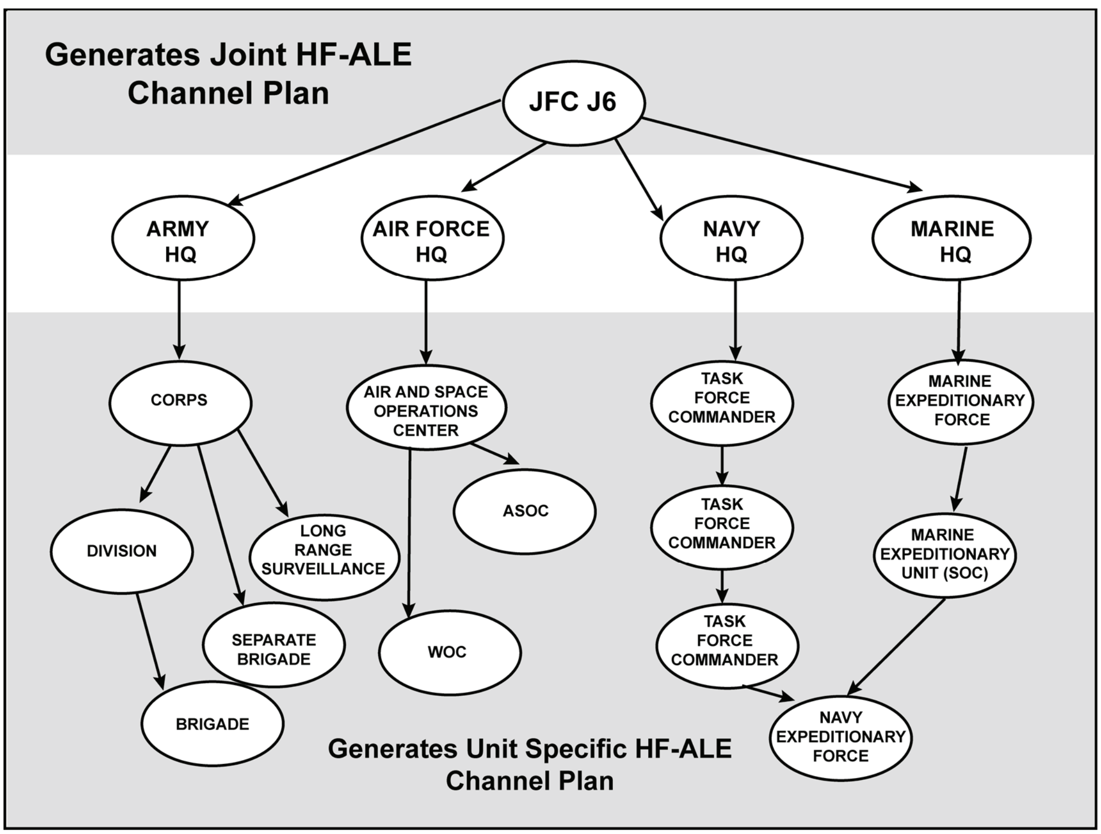

Figure IV-3. Echelons Capable of Generating HF-ALE Network Plan Data

(b) The larger the number of frequencies and wider the distribution across the HF range, the better HF-ALE will perform. The minimum size for an effective channel plan is mission-dependent. Typically, the optimal channel plan of 10 to 12 frequencies, spread across the frequency range, will adequately support both voice and data HF-ALE operations. As the number of frequencies in the channel plan decreases, the choices of LQA become limited, and may become zero. In addition, as the number of frequencies in the channel plan increases beyond the optimal number (10 to 12 frequencies), the time required to conduct LQA and establish links increases. Aggressively scrutinizing frequency selections and using the optimal number of frequencies per channel plan ensures the best possible HF-ALE performance.

(c) The use of global positioning system (GPS) Greenwich Mean Time (GMT) provides a common time reference that simplifies ALE LP operation and EP net synchronization. Use of GPS GMT with a common ALE database LP TEK and EP TEK enables operators to link quickly and frequency hop.

- Use of the GPS. Maintaining accurate time is best accomplished using the GPS. TOD server will update time in HF-ALE-compatible radios using GPS GMT time from the precise lightweight GPS receiver or other time sources.
- TOD Server. As required, J6 will establish a TOD server for joint HF-ALE nets. The J6 must coordinate this TOD server with all theater Services and echelons of command.

(d) All HF-ALE radios, whether operating in fixed, ALE, ALE with LP, or EP, will operate in the cipher text (CT) mode whenever possible. HF-ALE radios have either embedded COMSEC or an external COMSEC device. Either the National Security Agency or the JFC designates the controlling authority (CONAUTH), depending on the circumstances, for all crypto-net operations. The CONAUTH J6 provides overall staff supervision. COMSEC data includes TEK and key encryption key (KEK).

- TEK. The normal effective period for the TEK is 30 days; however, the CONAUTH may specify a shorter period or extend the period under emergency conditions.
- KEK. KEKs have an effective period of 90 days; however, the CONAUTH may authorize deviations as dictated by operations. Unit SOPs will describe routine loading of KEKs in all radios or the storing of the KEK in a fill device until needed.
- Keying Material Compromise. When substantial evidence exists of a compromise of COMSEC keying material for HF-ALE radios, the CONAUTH will take immediate action. There is a range of options including immediate implementation of new keys and, if necessary, continued use of compromised key(s) until an un-compromised key can be implemented. CONAUTH will consider the tactical situation, the time needed to distribute reserve data, and the time required to reestablish communications after COMSEC key(s) are superseded.

4. HF-ALE Data Distribution

a. General. The J6 will manage the overall distribution of the joint HF-ALE channel plan and COMSEC data throughout the AO. The channel plan will be distributed using paper, or electronically via secure means. Subordinate communications staff offices are responsible for forwarding their net requirements to their higher HQ. Staffs at each echelon must distribute data appropriately packaged for their users, whether routine or under emergency conditions, to ensure that critical communications are not disrupted. Staffs can distribute the data physically, electronically, or using a combination of both.

b. Distribution within a Joint Force Command.

(1) Responsibilities. In joint force operations, the J6 has responsibility for generating or importing the joint HF-ALE channel plans and COMSEC keys. The J6 distributes this data directly to the component communications staffs. If appropriate, the J6 can delegate the generation and distribution of the joint HF-ALE channel plans and COMSEC keys to the Service/functional components.

(2) Liaison. The J6 staff is responsible for providing the joint frequencies, HF data, HF-ALE channel plan, and any other CEOI information to the Service liaison personnel. Liaison personnel include ground liaison officers at air units, air liaison officers to ground units, and battlefield coordination elements. These individuals and units are important links to the Service or HQ they support. After receiving the HF ALE channel plan and COMSEC data from their Service or functional component, liaison personnel can distribute the data to the unit they support.

(3) Intra-theater. HF-ALE channel plans are mission dictated and cannot be prepackaged by the warfighting commanders supporting joint force operations. They are mission-specific for a wide range of standing OPLANs and contingency plans. In the mission planning stage, HF-ALE channel plans should be generated and included with the COMSEC material.

c. Distribution within Services and/Components.

(1) Army Forces (ARFOR) (see figure IV-4). The Army component CONAUTH receives and disseminates the HF-ALE channel plan, including LP, EP, and COMSEC data to subordinate echelons. Depending on the situation, the CONAUTH may be at the field Army, corps, or division level. Most often, the CONAUTH will be at the corps level.

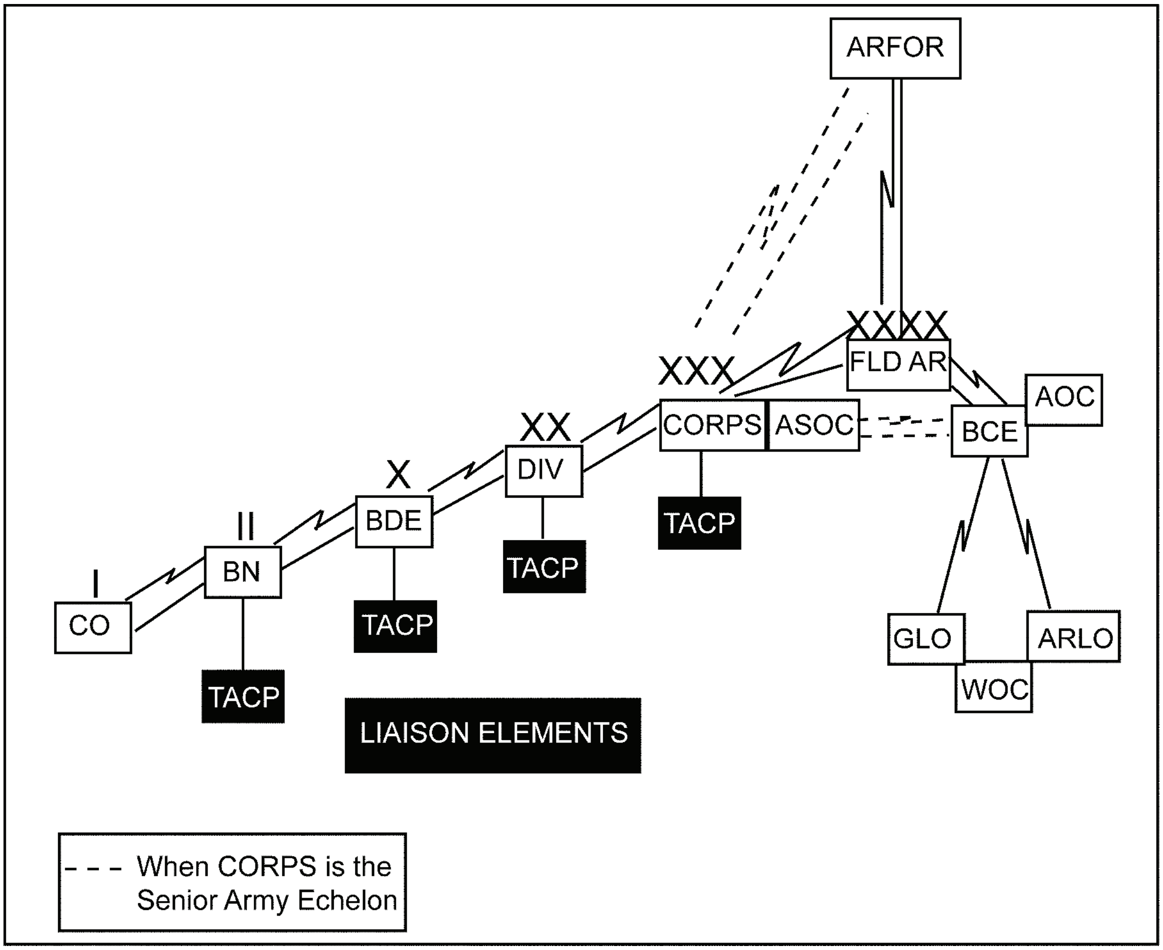

Figure IV-4. Channel Plan Data Distribution Within Army Units

(2) Marine Corps Forces (MARFOR) (see figure IV-5). The Marine Corps component CONAUTH receives and disseminates the HF-ALE channel plan and COMSEC data to subordinate echelons. Depending on the situation, the CONAUTH may be at the Marine expeditionary force (MEF), Marine expeditionary brigade, or Marine expeditionary unit. Most often, the CONAUTH will be at the MEF level.

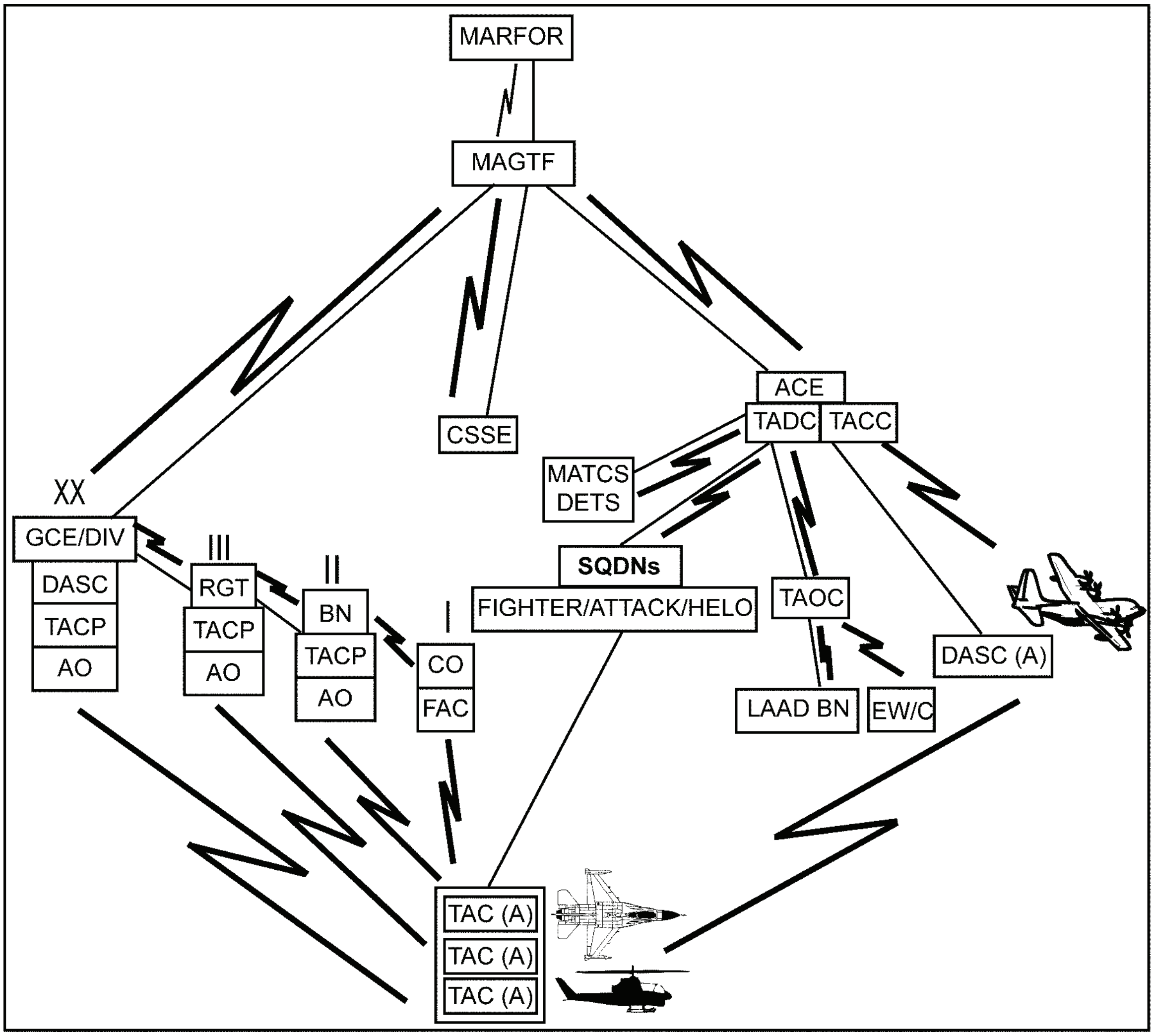

Figure IV-5. Channel Plan Data Distribution Within Marine Corps Units

(3) Navy Forces (NAVFOR) (see figure IV-6). The Naval component CONAUTH receives and disseminates the HF-ALE channel plan and COMSEC data to subordinate echelons. Most often, the CONAUTH will be at the numbered fleet, task force commander, amphibious task force commander, task group commander, carrier group commander, or task unit commander level.

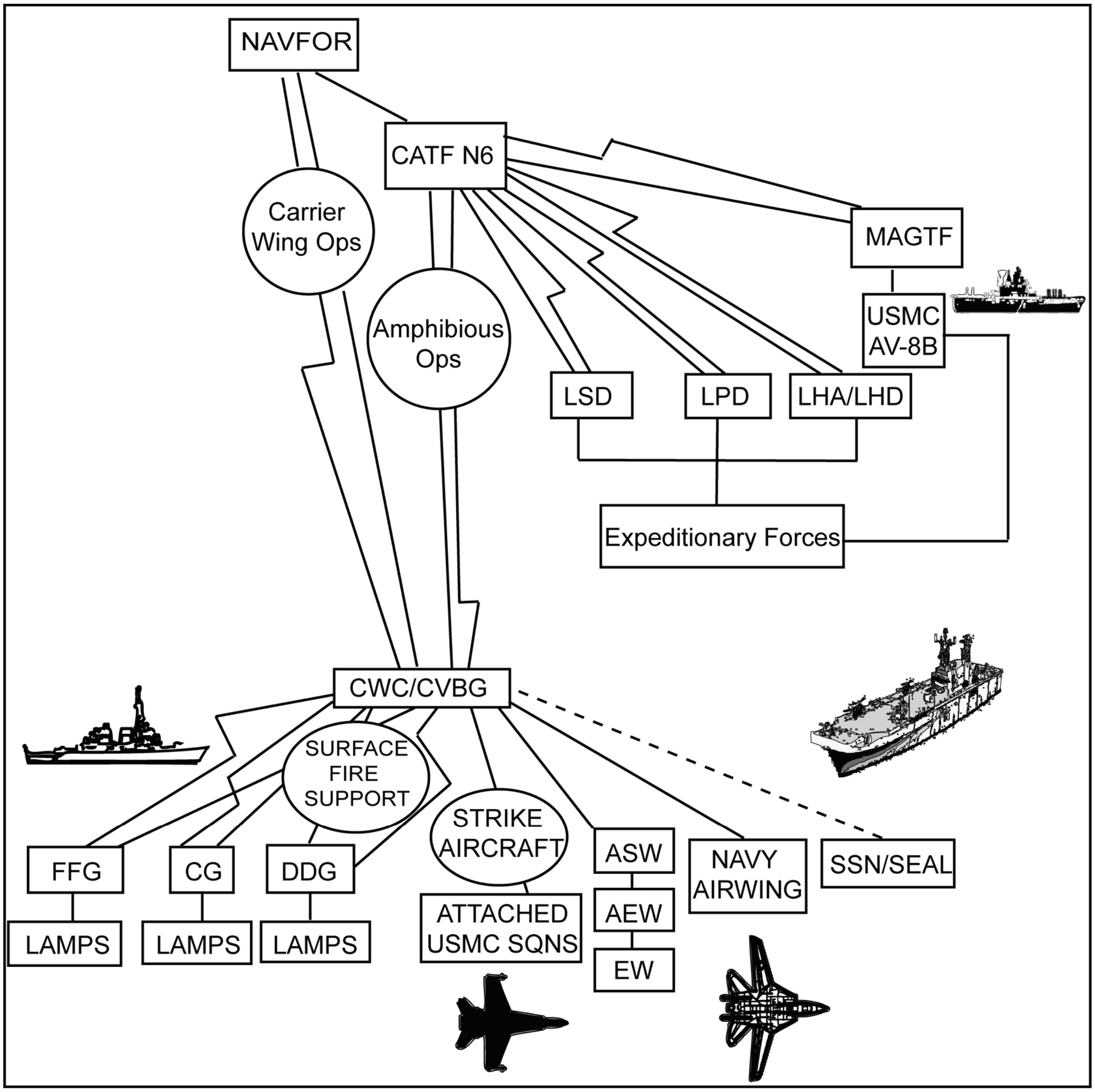

Figure IV-6. Channel Plan Distribution Within Naval Forces

(4) Air Force Forces (AFFOR) (see figure IV-7). The Air Force component CONAUTH receives and disseminates the HF-ALE channel plan and COMSEC data to subordinate echelons. Depending on the situation, the CONAUTH may be at the air expeditionary task force, major command, wing, or unit. Most often, the CONAUTH will be at the air expeditionary task force level.

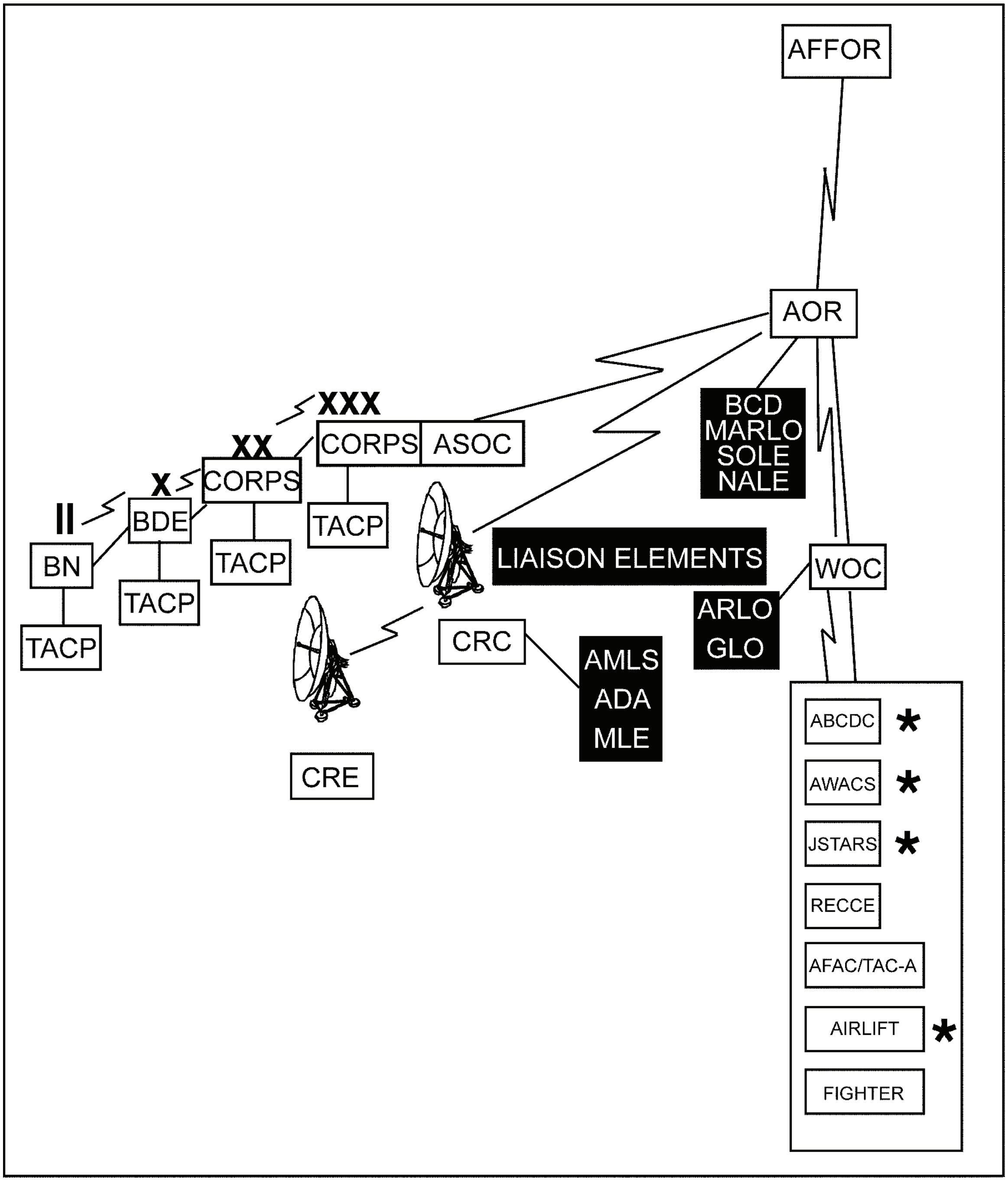

Figure IV-7. Channel Plan Data Distribution Within Air Force Units

5. HF-ALE Addressing

The HF-ALE network administrator will coordinate HF-ALE addressing in a joint environment. Three to 15 characters can be used as the HF-ALE self address depending on the system parameters. Using fewer characters in the address will optimize the speed of HF-ALE operations. However, due to operational considerations on some networks, it may be practical to use other forms of addressing techniques. In a joint HF-ALE network, an effective technique is to use the letter identifiers for the respective Service, as per table IV-1. No governing body has been identified in this document for issues or deconfliction of HF-ALE addresses. There is a potential of more than one agency/Service to have the same HF-ALE radio address (frequency deconfliction and HF-ALE radio address deconfliction are separate issues).

Note: In accordance with Department of Defense (DOD) HF-ALE concepts of operations, AF0005 through AF0009 are reserved for Mystic Star. (High-frequency single-side-band communications system that provides high frequency communications for the President, Vice President, Cabinet members, and other senior government and military officials while aboard special mission aircraft.)

Table IV-1. HF-ALE Self Addressing

	Air Force	**Army**	**Coast Guard**	**Marine Corps**	**Navy**
Self Address	AFxxxx	Rxxxxx	xxxxCG	MCxxxx	NAxxxx
Example	AF0001	R00197	1034CG	MC10	NA987
	FEMA	NATO	SOF	Homeland Security	Other
Self Address	FExxxx	NTxxxx	SFxxxx	HSxxxx	XXxxxx
Example	FE101	NT0297	SF4	HS1210	XX7345

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Chapter V
INDIVIDUAL SERVICE COMMUNICATIONS STAFF OFFICE AND RADIO OPERATOR GUIDANCE

1. Overview

This chapter provides guidance to each Service's HF radio network coordinator and radio operator on how to implement and operate in a joint HF-ALE voice network. This chapter describes the network details provided by the JFC's J6, how to use this information, and key points to consider when incorporating the network into a previously established HF communications architecture. These guidelines are also applicable to operating in civil nets.

2. General Description

The technical details are the actual HF radio settings and network architecture. The operational details are the rules for operating within the network. This information is broken into three sections: (1) overall plan information, (2) technical details, and (3) network SOPs. If any of the information is not provided or is incomplete or unclear, the network manager or operator should ask for complete details or clarification from the source that provided the original information. A graphical representation of the network architecture is shown in figure V-1. The following information amplifies ALE parameters discussed in chapter III.

a. Overall Plan Information. The overall plan includes information such as how the entire HF-ALE network is set up, purpose of network, architecture, and type of network. Information to be included in the overall plan includes, but is not limited to—

(1) Joint HF-ALE network users.

(2) Fixed station locations (if applicable).

(3) Voice, data, or both.

(4) Operational windows.

(5) Encryption standard.

(6) Any unique instructions (such as North Atlantic Treaty Organization [NATO] net SOPs).

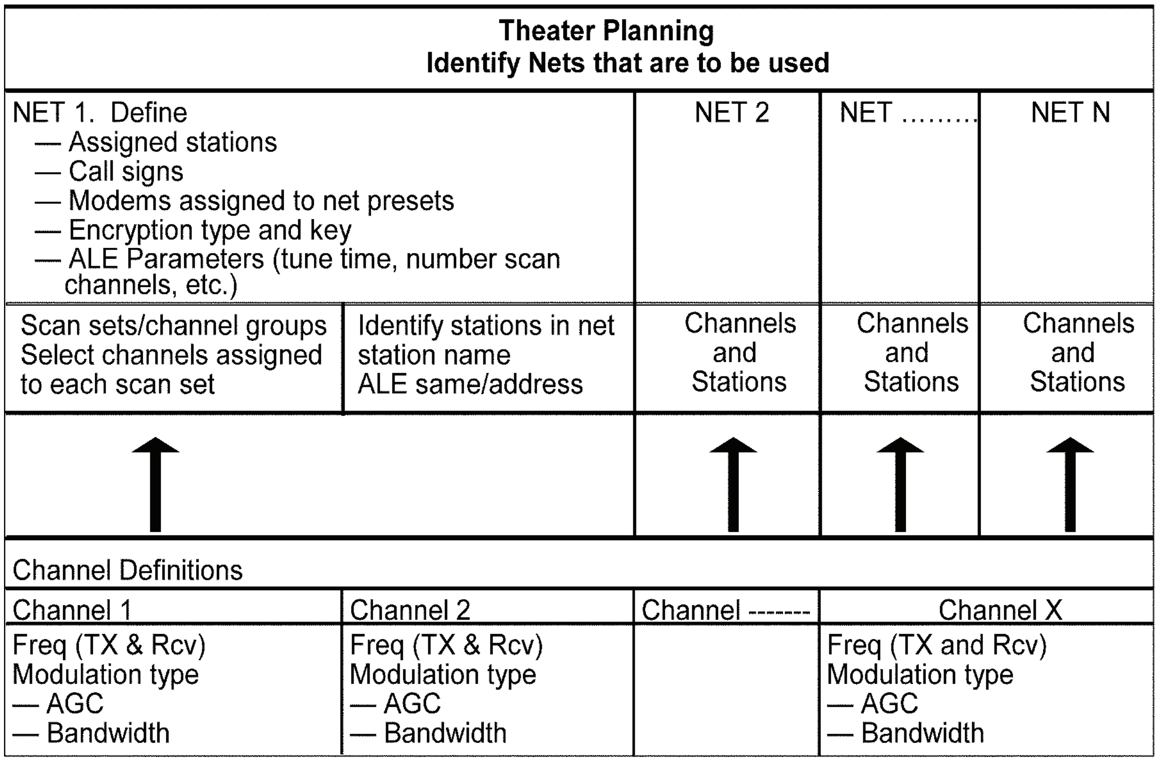

Figure V-1. Theater Network Architecture

b. Technical Details. This is a brief description of the technical parameters required to operate within the network. For many of these parameters, entering a wrong setting will mean your HF radio will not be able to link with another HF radio in the network. An example of the required information is shown in appendix F.

(1) Channel Definitions. This defines the transmit-receive parameters of each channel. The following information will be provided for each channel:

(a) Channel frequency.

(b) Channel modulation type (AKA emission mode).

(c) AGC.

(d) Bandwidth.

(e) Sound enable/disable.

(f) Sounding interval.

(2) Scan Sets (AKA channel groups, nets, or scan list). This defines how the channels are grouped together and assigns each group a name.

(3) Participating Station Identification. This section assigns ALE addresses to all expected network members and their group associations, including self addresses. Some HF-ALE radio systems require this information to be pre-loaded before it will recognize another participant. Other systems will automatically load the station's ALE address when it is heard broadcasting on the net.

(4) ALE Parameter Configuration. This is the list of ALE parameters that govern how every HF-ALE system in the network operates. A list identifying and defining the minimum parameters is provided in chapter III.

c. Network SOP. This section identifies the general rules for participating in the net. These procedures are the same as the operational procedures required for typical communications circuits. It should include items such as—

(1) Check-in/check-out procedures.

(2) Designated operating times.

(3) Type/priority of traffic.

(4) How/when network settings will be changed.

(5) Instructions for operating with non US military participants (allied/coalition forces, civilian agencies).

3. Actions Required

This paragraph describes the actions to be taken after the general, technical, and operational details are identified. First, the Service coordination staff should ensure that the available equipment is compatible with the technical and operational requirements and that all equipment is interoperable. Interoperability should include verification of COMSEC and key management.

a. Once compatibility is confirmed, the Service coordination staff should determine how the network operational requirements are to be distributed to each user. For example, if all net participants are using the same type of radio, the Service coordination staff may e-mail configuration files with all settings preloaded. If different types of equipment are used, text documents or messages listing all the settings may be required.

b. Operators must refer to their SOPs or individual equipment manuals to set the required network configurations for their specific radios.

4. Implementation Considerations

This paragraph offers insight into potential implementation issues that should be considered by the Service coordination staff or operator.

a. Impact to Current Mission Equipment Requirements. Service coordination staff and operators need to determine how to implement a joint HF-ALE network with their current inventory of equipment. This may mean adding the joint HF-ALE network into a HF system along with pre-existing ALE networks, or dedicating an HF system solely to the joint network. When making this decision, Service coordination staff and operators should consider how the joint HF-ALE network parameters might affect the pre-existing HF-ALE networks.

b. KEYMAT Management. If the joint network is added to an HF system that will be used in other HF-ALE networks, the Service coordination staff and operator should note any differences in COMSEC (such as different KEYMAT, or different KEYMAT shift times) between the networks, and develop an implementation plan that will minimize network interruption due to these differences.

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Appendix A:
High Frequency Global Communications System

The High Frequency Global Communications System (HFGCS) is a 24-hour/7-day nonsecure network used by the President and Secretary of Defense, the DOD, and other federal departments, and allied users equipped with HF-ALE radio technology in support of command and control between aircraft/ships and associated ground stations. The system consists of 14 communication stations. Thirteen stations are remotely controlled from the Central Network Control Station (CNCS) at Andrews Air Force Base, Maryland. Radio operators at the CNCS use position consoles to control individually each remote HF global station. Figure A-1 depicts system architecture and interstation connectivity. When authorized by the HFGCS ALE network manager, joint ALE users can use the HFGCS ALE network (see appendix B).

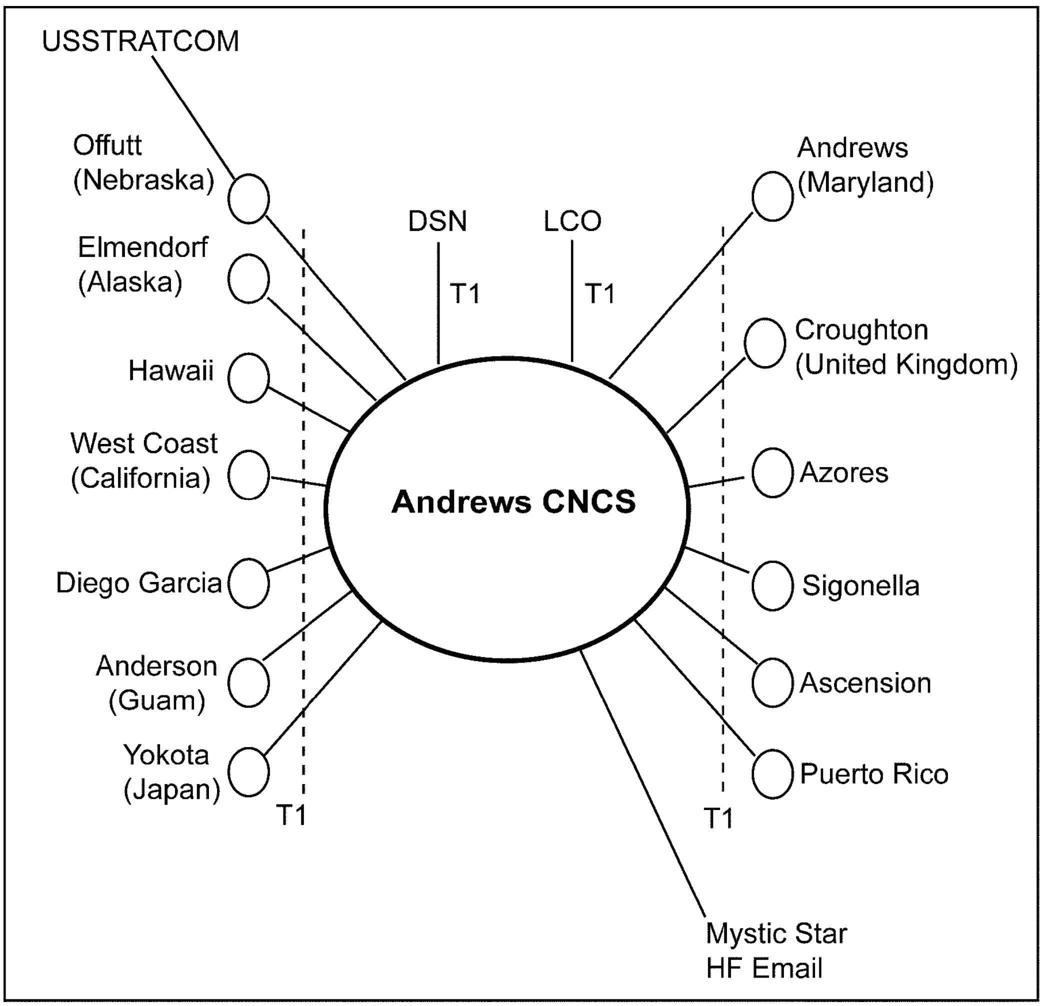

Figure A-1. Interstate Connectivity Architecture

DOD HF-ALE subject matter experts recommend the following parameters be used for interoperability and operation in the HFGCS ALE Network (see table A-1). All ALE systems configurations may not require the parameters and/or settings listed for HFGCS ALE network operation.

Table A-1. Recommended Joint ALE Configuration Parameters

Configuration Parameters	Settings
Adaptive Sounding	Disable
Allow all calls	Enable
Allow any calls	Disable
AMD in acknowledgment	Disable
Call alert	Enable
Call duration	11 seconds
Call reject duration	30 seconds
Command LQA	Disable
Data monitor duration	60 seconds
Data monitor hang time	10 seconds
Delay power-on sounding	Disable
Initiate call with push-to-talk	Enable
Keep-alive transmission	100 seconds (if equipped)
Listen before call time	Enable
LQA degrade interval	3 minutes
LQA degrade method	1 linear
LQA maximum age	120 minutes
LQA reject threshold	1 (minimum)
LQA sounding interval	45 minutes
Maximum address characters	9
Maximum call attempts	5
Network tune time	12 seconds
Power-on in initial automatic reset	Enable
Rank order	3
Receive LQA process method	3
RCU programming	Enable
Scan minimum dwell time	500 milliseconds (2 channels/second)
Scanning between sounds	Enable

Table A-1. Recommended Joint ALE Configuration Parameters	
Sound duration	11 seconds
Sounding retry time	4 minutes
Terminate link transmission	Enable

Table A-2. Recommended Joint ALE System Parameters	
System Parameters	**Settings**
Automatic sounding	Enable
Call alert bells	3 seconds
Default verbose level	7 (MIL STD ALE)
Default waveform	MIL STD ALE
LQA output	Enable
Priority override	Disable
Return-to-scan time	120 seconds
Voice monitor duration	60 seconds

Table A-3. Recommended Joint ALE Channel Parameters	
Channel Parameters	**Settings**
Antenna direction	0
Antenna number	0
Channel number	Channel number in ascending order for each channel in the scan list
Frequency designator	Applicable designator from the frequency list
Link protection	Disabled
Receive audio mode	Voice
Receive emission mode	USB
Receive frequency	Enter in kHz
Receive only	Disable
Sound	Enable
Sound duration	11 seconds

Table A-3. Recommended Joint ALE Channel Parameters	
Sound interval	45 minutes
Transmit audio mode	Voice
Transmit emission mode	USB
Transmit frequency	Enter in kHz
Transmitter power level	Enter HIGH
Voice monitor	Disabled

**Appendix B:
Established and Proposed ALE Networks**

Established Networks

High Frequency Global Communications System (HFGCS)
Managing Agency: HQ AMC/A66G, Scott AFB IL
DSN: 779-6760/5749
Commercial: (618) 229-676005749
Web Address:
Purpose/Use: Global communications.
Voice: Yes
Data: Yes, HF Messenger
Users: DOD and others as authorized
Area of Coverage: Worldwide
Special Capabilities: Automatic phone patching
COMSEC: NSA Type 1 via KIV-7

CBP Cellular Over the Horizon Enforcement Network
Managing Agency: US Customs and Border Service (USCBP)
DSN:
Commercial: (800) 829-6336
Web Address:
Purpose/Use: Law enforcement operations coordination
Voice: Yes
Data: No
Users: USCBP mobile units and other government agency assets, as allowed
Area of Coverage: CONUS, Alaska, Hawaii, Caribbean, Central America, South America
Special Capabilities: Asset tracking via tracking and communication system (TRACS); protected phone patching via telephone to radio interface communications system (TRICS)
COMSEC: Type III Data Encryption Standard (DES) protected using VP-110 and VP-116

Shared Resources
Managing Agency: National Communications System (NCS)
DSN:
Commercial:
Web Address: http://www.ncs.gov/n3/shares/shares.htm
Purpose/Use: Supporting national security and emergency preparedness
Voice: Yes
Data: HF e-mail
Users: Open to all (contact NCS for participation)
Area of Coverage: CONUS, Alaska, Hawaii
Special Capabilities:

COMSEC:

National Guard Bureau HF E-mail
Managing Agency: National Guard Bureau
DSN:
Commercial:
Web Address:
Purpose/Use: Linking states/regions by e-mail
Voice: Yes
Data: Yes, HF E-mail
Users: State emergency operation centers
Area of Coverage: CONUS, Alaska, Hawaii, Puerto Rico, US Virgin Islands
Special Capabilities: No
COMSEC: No

Geo-Diverse Over the Horizon ALE Matrix (GOTHAM)
Managing Agency: US Coast Guard Communications Station, Kodiak, AK
DSN:
Commercial: (907) 487-5774
Web Address:
Purpose/Use: General operations asset coordination
Voice: Yes
Data: No
Users: US Coast Guard assets and other government agency assets, as allowed
Area of Coverage: Alaska
Special Capabilities: Phone patching
COMSEC: Type I-ANDVT

Proposed Network

National Emergency Response Net
Managing Agency: Federal Emergency Management Agency (FEMA)
DSN:
Commercial: (940) 898-5321
Web Address: www.FEMA.gov
Purpose/Use: National emergency coordination
Voice: Yes
Data:
Users: As assigned by FEMA
Area of Coverage: CONUS, Alaska, Hawaii, Puerto Rico, US Virgin Islands
Special Capabilities:
COMSEC: None

Appendix C:
Exclusion Band

The following frequencies are reserved for specific purposes, and should never be used in an ALE network.

- Any frequency not assigned
- 2182 kHz - International distress standard voice
- 2187.5 kHz - International distress digital selective calling
- 3023 kHz – Search & Rescue
- 4125 kHz - Distress & Safety
- 4207.5 kHz - International distress digital selective calling
- 4209.5 kHz - NAVTEX (Safety)
- 5680 kHz – Search & Rescue
- 6215 kHz – Search & Rescue
- 6312 kHz - International distress digital selective calling
- 8291 kHz - Distress & Safety
- 8414.5 kHz - International distress digital selective calling
- 12290 kHz - Distress & Safety
- 12577 kHz - International distress digital selective calling
- 16420 kHz - Distress & Safety
- 16804.5 kHz - International distress digital selective calling
- 2500 kHz - Worldwide time signal (WWV)
- 5000 kHz - Worldwide time signal (WWV)
- 10000 kHz - Worldwide time signal (WWV)
- 15000 kHz - Worldwide time signal (WWV)
- 20000 kHz - Worldwide time signal (WWV)

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Appendix D:
Joint Interoperability Test Command Certified ALE Radios and Capability Matrix

The Joint Interoperability Test Command (JITC) at Fort Huachuca, Arizona, conducts a program to perform standards conformance testing of high frequency (HF) radio systems and data modems. This testing determines their level of compliance to the requirements of Military Standard (MIL-STD)-188-141 (Interoperability and Performance Standards for Medium and High Frequency Radio Equipment), MIL-STD-188-110 (Interoperability and Performance Standards for Data Modems), and MIL-STD-188-148 [(U) Interoperability Standard For Anti-Jam (AJ) Communications in the High Frequency Band (2-30 MHz)(S)].

Testing is also being conducted at JITC to certify interoperability of each HF radio system and/or modem with other vendors' HF radio systems and/or modems in voice and data modes, while operating through various combinations of communications security (COMSEC) equipment.

A complete, updated list of all radios certified for compliance can be found at http://jitc.fhu.disa.mil/it/cert.htm.

The following is a list of the radios that have been certified for compliance as of 6 June 2006 (see table D-1).

Table D-1. Joint Interoperability Test Command Certified ALE Radios and Capability Matrix

Nomenclature	188-141A Appendix A Certification Date	188-141B Appendix B Certification Date	188-141B Appendix C Certification Date
AN/ARC-220	7/26/02	7/26/02	
RT-2200	6/7/00	6/7/00	
AN/PRC-137C	03/20/95		
AN/PRC-137F/G	11/25/98		
AN/PRC-138	03/20/00		
AN/PRC-150(C)/(RT-1694D(P)(C)/U)	07/03/02		
RT-1446/RF 7210	10/09/96		
EK-895	5/25/00		
XK-2100L	05/25/00		
Micom 2ES	8/6/03		
Micom 3	10/8/03		
Codan NGT ASR	7/15/04		
XK2900L	3/28/03	3/28/03	

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Appendix E:
Example Communications Plan

Table E-1. Channel Matrix								
Channel	**Channel Group**	**Frequency**	**Mode**	**Agc**	**Comsec**	**Bandwidth**	**Power**	**Rx Only**
01	01	03545	USB	MED	KY-99	3.0	20 W	NO
02	01	03729	USB	MED	KY-99	3.0	20 W	NO
03	01	04580	USB	MED	KY-99	3.0	20 W	NO
04	01	06100	USB	MED	KY-99	3.0	20 W	NO
05	01	09580	USB	MED	KY-99	3.0	20 W	NO
06	01	101180	USB	MED	KY-99	3.0	20 W	NO
07	01	125000	USB	MED	KY-99	3.0	20 W	NO
08	01	164900	USB	MED	KY-99	3.0	20 W	NO
09	01	169970	USB	MED	KY-99	3.0	20 W	NO
10	01	183950	USB	MED	KY-99	3.0	20 W	NO

Table E-2. Address Matrix	
Station name	**Address**
JFC	JFC001
NAVFOR	NA0987
ARFOR	R00197
MARFOR	MC0100
AFFOR	AF0001
SOF	SOF054
USCG	CG1034
NET	JTF NET

Table E-3. ALE Parameters	
Parameter	**Setting**
All calls	OFF
AMD allowed	ON
Any calls	OFF
AUTO display AMDs	ON
Key to call	OFF
Link timeout	15 (minutes)
Listen before transmit	ON
LQA in call	OFF
Maximum scan channels	10
Maximum tune time	2 (seconds)
Scan Rate	5

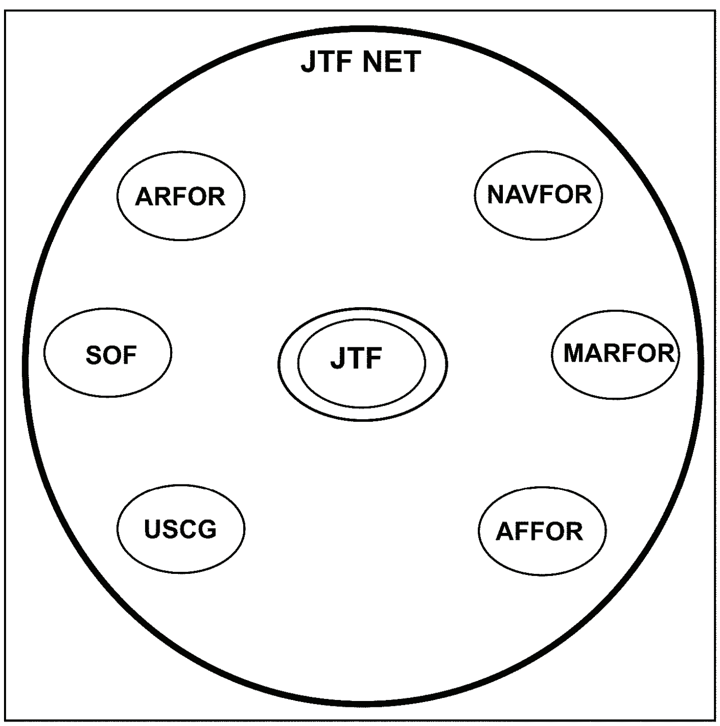

Figure E-1. Network Diagram

Appendix F:
Example Radio Programming Application

This radio programming application example was created using a Harris AN/PRC-150(C) and Harris RF-6550H radio programming application and the example communications plan from appendix E.

- Plan Name: JTF
  - Author: KAISER
  - Description: JTF COMMUNICATIONS PLAN
  - Date Generated: 12/12/2002 10:29 AM
- Station Report:
  - Station: JTF
  - Description:
  - Radio Type: AN/PRC-150C
  - Modem Type: RF-5800H-MP Internal
  - Call Sign: JTF
  - Crypto: None
  - Radio ID: 2
- Configuration:
  - Radio Silence: No
  - Audio Compression: Enabled
  - RX Noise Blanking: Disabled
  - Bypass Coupler: No
  - Squelch Level: High
  - FM Squelch Type: Tone
  - FM Deviation: 8000 Hz
  - Analog Squelch: Disabled
  - TX Power: High
- Data Port Configuration:
  - Baud Rate: 2400
  - Parity: None
  - Bits Per Char: 8
  - Stop Bits: 1
  - Port Echo: No
  - Flow Control: XONXOFF
- ALE Configuration:
  - All Calls: No
  - Any Calls: No
  - Key to Call: No
  - AMD Allowed: Yes
  - Auto Display AMDs: Yes
  - Listen Before TX: Yes

- Max Scan Channels: 10
- Link Timeout: 15 minute(s)
- Tune Time: 2 second(s)
- Scan Rate: 5 chan/sec

- Prepost Configuration:
  - Scan Rate: Force Slow Scan
  - Filter: PRE/POST ENABLED
  - RX Antenna Enabled: No
- Message Transfer Configuration:
  - ARQ Baud Rate: 2400
  - ARQ Mode: ACK
  - ARQ Interleave: LONG
  - ARQ Data Destination: RDP
  - Modem Data Destination: RDP
  - RPD Prebuffer: 425
- ARQ Configuration:
  - Threshold: 1000
- Type 1 Configuration:
  - ANDVT-BD Preamble: STAND
  - ANDVT-BD Trnseq: 6
  - Station: NAVFOR
  - Description:
  - Radio Type: AN/PRC-150C
  - Modem Type: RF-5800H-MP Internal
  - Call Sign: NAVFOR
  - Crypto: None
  - Radio ID: 3
- Configuration:
  - Radio Silence: No
  - Audio Compression: Enabled
  - RX Noise Blanking: Disabled
  - Bypass Coupler: No
  - Squelch Level: High
  - FM Squelch Type: Tone
  - FM Deviation: 8000 Hz
  - Analog Squelch: Disabled
  - TX Power: High
- Data Port Configuration:
  - Baud Rate: 2400
  - Parity: None
  - Bits Per Char: 8
  - Stop Bits: 1
  - Port Echo: No
  - Flow Control: XONXOFF

- ALE Configuration:
  - All Calls: No
  - Any Calls: No
  - Key to Call: No
  - AMD Allowed: Yes
  - Auto Display AMDs: Yes
  - Listen Before TX: Yes
  - Max Scan Channels: 10
  - Link Timeout: 15 minute(s)
  - Tune Time: 2 second(s)
  - Scan Rate: 5 chan/sec
- Prepost Configuration:
  - Scan Rate: Force Slow Scan
  - Filter: Pre/Post Enabled
  - RX Antenna Enabled: No
- Message Transfer Configuration:
  - ARQ Baud Rate: 2400
  - ARQ Mode: ACK
  - ARQ Interleave: LONG
  - ARQ Data Destination: RDP
  - Modem Data Destination: RDP
  - RPD Prebuffer: 425
- ARQ Configuration:
  - Threshold: 1000
- Type 1 Configuration:
  - ANDVT-BD Preamble: Stand
  - ANDVT-BD Trnseq: 6
  - Station: ARFOR
  - Description:
  - Radio Type: AN/PRC-150C
  - Modem Type: RF-5800H-MP Internal
  - Call Sign: ARFOR
  - Crypto: None
  - Radio ID: 4
- Configuration:
  - Radio Silence: No
  - Audio Compression: Enabled
  - RX Noise Blanking: Disabled
  - Bypass Coupler: No
  - Squelch Level: High
  - FM Squelch Type: Tone
  - FM Deviation: 8000 Hz
  - Analog Squelch: Disabled
  - TX Power: High

- Data Port Configuration:
  - Baud Rate: 2400
  - Parity: None
  - Bits Per Char: 8
  - Stop Bits: 1
  - Port Echo: No
  - Flow Control: XONXOFF
- ALE Configuration:
  - All Calls: No
  - Any Calls: No
  - Key To Call: No
  - AMD Allowed: Yes
  - Auto Display AMDs: Yes
  - Listen Before TX: Yes
  - Max Scan Channels: 10
  - Link Timeout: 15 minute(s)
  - Tune Time: 2 second(s)
  - Scan Rate: 5 chan/sec
- Prepost Configuration:
  - Scan Rate: Force Slow Scan
  - Filter: Pre/Post Enabled
  - RX Antenna Enabled: No
- Message Transfer Configuration:
  - ARQ Baud Rate: 2400
  - ARQ Mode: ACK
  - ARQ Interleave: LONG
  - ARQ Data Destination: RDP
  - Modem Data Destination: RDP
  - RPD Prebuffer: 425
- ARQ Configuration:
  - Threshold: 1000
- Type 1 Configuration:
  - ANDVT-BD Preamble: STAND
  - ANDVT-BD Trnseq: 6
  - Station: MARFOR
  - Description:
  - Radio Type: AN/PRC-150C
  - Modem Type: RF-5800 H-MP Internal
  - Call Sign: MARFOR
  - Crypto: None
  - Radio ID: 5
- Configuration:
  - Radio Silence: No
  - Audio Compression: Enabled

- RX Noise Blanking: Disabled
- Bypass Coupler: No
- Squelch Level: High
- FM Squelch Type: Tone
- FM Deviation: 8000 Hz
- Analog Squelch: Disabled
- TX Power: High

- Data Port Configuration:
  - Baud Rate: 2400
  - Parity: None
  - Bits Per Char: 8
  - Stop Bits: 1
  - Port Echo: No
  - Flow Control: XONXOFF
- ALE Configuration:
  - All Calls: No
  - Any Calls: No
  - Key to Call: No
  - AMD Allowed: Yes
  - Auto Display AMDs: Yes
  - Listen Before TX: Yes
  - Max Scan Channels: 10
  - Link Timeout: 15 minute(s)
  - Tune Time: 2 second(s)
  - Scan Rate: 5 chan/sec
- Prepost Configuration:
  - Scan Rate: Force Slow Scan
  - Filter: Pre/Post Enabled
  - RX Antenna Enabled: No
- Message Transfer Configuration:
  - ARQ Baud Rate: 2400
  - ARQ Mode: ACK
  - ARQ Interleave: LONG
  - ARQ Data Destination: RDP
  - Modem Data Destination: RDP
  - RPD Prebuffer: 425
- ARQ Configuration:
  - Threshold: 1000
- Type 1 Configuration:
  - ANDVT-BD Preamble: STAND
  - ANDVT-BD Trnseq: 6
  - Station: AFFOR
  - Description:
  - Radio Type: AN/PRC-150C

    - Modem Type: RF-5800 H-MP Internal
    - Call Sign: AFFOR
    - Crypto: None
    - Radio ID: 6
- Configuration:
    - Radio Silence: No
    - Audio Compression: Enabled
    - RX Noise Blanking: Disabled
    - Bypass Coupler: No
    - Squelch Level: High
    - FM Squelch Type: Tone
    - FM Deviation: 8000 Hz
    - Analog Squelch: Disabled
    - TX Power: High
- Data Port Configuration:
    - Baud Rate: 2400
    - Parity: None
    - Bits Per Char: 8
    - Stop Bits: 1
    - Port Echo: No
    - Flow Control: XONXOFF
- ALE Configuration:
    - All Calls: No
    - Any Calls: No
    - Key To Call: No
    - AMD Allowed: Yes
    - Auto Display AMDs: Yes
    - Listen Before TX: Yes
    - Max Scan Channels: 10
    - Link Timeout: 15 minute(s)
    - Tune Time: 2 second(s)
    - Scan Rate: 5 chan/sec
- Prepost Configuration:
    - Scan Rate: Force Slow Scan
    - Filter: Pre/Post Enabled
    - RX Antenna Enabled: No
- Message Transfer Configuration:
    - ARQ Baud Rate: 2400
    - ARQ Mode: ACK
    - ARQ Interleave: LONG
    - ARQ Data Destination: RDP
    - Modem Data Destination: RDP
    - RPD Prebuffer: 425

- ARQ Configuration:
  - Threshold: 1000
- Type 1 Configuration:
  - ANDVT-BD Preamble: STAND
  - ANDVT-BD Trnseq: 6
  - Station: SOF
  - Description:
  - Radio Type: AN/PRC-150C
  - Modem Type: RF-5800 H-MP Internal
  - Call Sign: SOF
  - Crypto: None
  - Radio ID: 7
- Configuration:
  - Radio Silence: No
  - Audio Compression: Enabled
  - RX Noise Blanking: Disabled
  - Bypass Coupler: No
  - Squelch Level: High
  - FM Squelch Type: Tone
  - FM Deviation: 8000 Hz
  - Analog Squelch: Disabled
  - TX Power: High
- Data Port Configuration:
  - Baud Rate: 2400
  - Parity: None
  - Bits Per Char: 8
  - Stop Bits: 1
  - Port Echo: No
  - Flow Control: XONXOFF
- ALE Configuration:
  - All Calls: No
  - Any Calls: No
  - Key to Call: No
  - AMD Allowed: Yes
  - Auto Display AMDs: Yes
  - Listen Before TX: Yes
  - Max Scan Channels: 10
  - Link Timeout: 15 minute(s)
  - Tune Time: 2 second(s)
  - Scan Rate: 5 chan/sec
- Prepost Configuration:
  - Scan Rate: Force Slow Scan
  - Filter: Pre/Post Enabled
  - RX Antenna Enabled: No

- Message Transfer Configuration:
  - ARQ Baud Rate: 2400
  - ARQ Mode: ACK
  - ARQ Interleave: LONG
  - ARQ Data Destination: RDP
  - Modem Data Destination: RDP
  - RPD Prebuffer: 425
- ARQ Configuration:
  - Threshold: 1000
  - Type 1 Configuration:
  - ANDVT-BD Preamble: STAND
  - ANDVT-BD Trnseq: 6
  - Station: USCG
  - Description:
  - Radio Type: AN/PRC-150C
  - Modem Type: RF-5800 H-MP Internal
  - Call Sign: USCG
  - Crypto: None
  - Radio ID: 8
- Configuration:
  - Radio Silence: No
  - Audio Compression: Enabled
  - RX Noise Blanking: Disabled
  - Bypass Coupler: No
  - Squelch Level: High
  - FM Squelch Type: Tone
  - FM Deviation: 8000 Hz
  - Analog Squelch: Disabled
  - TX Power: High
- Data Port Configuration:
  - Baud Rate: 2400
  - Parity: None
  - Bits Per Char: 8
  - Stop Bits: 1
  - Port Echo: No
  - Flow Control: XONXOFF
- ALE Configuration:
  - All Calls: No
  - Any Calls: No
  - Key to Call: No
  - AMD Allowed: Yes
  - Auto Display AMDs: Yes
  - Listen Before TX: Yes
  - Max Scan Channels: 10

- Link Timeout: 15 minute(s)
- Tune Time: 2 second(s)
- Scan Rate: 5 chan/sec
- Prepost Configuration:
- Scan Rate: Force Slow Scan
- Filter: Pre/Post Enabled
- RX Antenna Enabled: No
- Message Transfer Configuration:
- ARQ Baud Rate: 2400
- ARQ Mode: ACK
- ARQ Interleave: LONG
- ARQ Data Destination: RDP
- Modem Data Destination: RDP
- RPD Prebuffer: 425
- ARQ Configuration:
- Threshold: 1000
- Type 1 Configuration:
- ANDVT-BD Preamble: STAND
- ANDVT-BD Trnseq: 6

Table F-1. Channel Report

Channel	RX Freq	TX Freq	RX Only	Modulation	AGC	Bandwidth	Hail Key
001	3.5450	3.5450	No	USB	Medium	3000 Hz	Disabled
002	3.7290	3.7290	No	USB	Medium	3000 Hz	Disabled
003	4.5800	4.5800	No	USB	Medium	3000 Hz	Disabled
004	6.1000	6.1000	No	USB	Medium	3000 Hz	Disabled
005	9.5800	9.5800	No	USB	Medium	3000 Hz	Disabled
006	10.1180	10.1180	No	USB	Medium	3000 Hz	Disabled
007	12.5000	12.5000	No	USB	Medium	3000 Hz	Disabled
008	16.4900	16.4900	No	USB	Medium	3000 Hz	Disabled
009	16.9970	16.9970	No	USB	Medium	3000 Hz	Disabled
010	18.3950	18.3950	No	USB	Medium	3000 Hz	Disabled

Table F-2. Group Channel Report									
Group	**Mode**	**Member Channels**							
01	ALE	01 02 03 04 05 06 07 08 09 10							
Modem Preset Report:									
No Modem Presets Defined									
COMSEC Key Report:									
No COMSEC Keys Defined									
Network Report:									
Net JTF NET:		Station		ALE Self Addresses:					
AFFOR		AF0001							
ARFOR		R00197							
JTF		JTF001							
MARFOR		MC0100							
NAVFOR		NA0987							
SOF		SOF054							
USCG		USCG1034							
Net Name	**Mode**	**Preset Name**	**CH/HN**	**CT Mode**	**PT Mode**	**CryptoMode**	**COMSEC**	**Mdm**	**Preset**
JTF NET	ALE	{N/A}	{N/A}	DV24	CLR	ANDVT-HF	TEK01	00	OFF

Appendix G:
Example HF Communications Planning System

This example was created using the Rockwell Collins HF Communications Planning System (HF-CPS) Software for an ARC-220 Radio System. ALE Net 2 is based on the example communications plan from Appendix E.

Table G-1. HF Communications Planning System

Datafill =..My Documents\R00197 **User Id = Admin**	**Version = MISSIONALPHA** **Date = 3/13/2003 10:45:50 AM**
User database	= C:\HF-CPS_4.1a\Network\Network.hfu
System database	= C:\ HF-CPS_4.1a\Network\Network.hfs
Master database	= C:\ HF-CPS_4.1a\Master\sample.hfm
Operations database	= C:\ HF-CPS_4.1a\Master\Opern\sample.hfo
Radio Name	= RT-1749 S2 (AN/ARC-220)

Table G-2. Interface Version

Equipment Interface	
ID	ID
13001	2

Table G-3. System Parameters

Parameter Name	**Parameter Value**
All_Call	EN
Amd_In_Ack	EN
Any_Call	DI
Automatic_Sounding	EN
Call_Reject_Duration	20
Command_LQA	DI
Delay_Power_On_Sounding	EN
Keep_Alive_Transmission_Interval	30
LBT_Enable	DI
Link_Protection	EN
Listen_Before_Call_Time	1000
LQA_Channel_Select	Highest LQA Value
LQA_Degrade_Interval	2

Table G-3. System Parameters	
Parameter Name	**Parameter Value**
LQA_Go_Data_Threshold	23
LQA_Reject_Threshold_Level	10
Max_Address_Characters	6
Max_Call_Attempts	12
Network_Tune_Time	2
Noise_Reduction	0
Power_On_In_Iart	DI
LBC_Enable	EN
Rank_Order	Center, Alt Lower/Higher
Received_LQA_Process_Method	Lowest, 5-minute Period
Return_To_Scan_Time (Sec)	60
Rx_Only_Antenna	DI
Scan_Min_Dwell_Time	200
Terminate_Link_Transmission	EN
Time_Server_Capable	DI
LQA_Output_Enable	DI

Table G-4. Installation Parameters	
Parameter Name	**Parameter Value**
Aircraft_Identifier	R00197
Antenna_Port_Output	DI
ARC-199_1553_Cmd_Enable	DI
AXID_Fixed_ID	127
AXID_Station_ID	AN/ARC-220
Coupler_Bypass	DI
DS101_Terminal_Address	255
GPS_Posn_Config	RCVR UH
GPS_Time_Config	HAVE QUICK
Power_On_PA_Level	HI (100W)
Power_On_Squelch_Level	Level 3 (SQ3)
Power_On_Volume_Level	Level 3 (Vol 3)
Rx_Only_Antenna_Available	DI

Table G-4. Installation Parameters	
Parameter Name	**Parameter Value**
Operator_Alert_Advisory	EN
Long_Holdoff_Advisory	EN
Short_Holdoff_Advisory	EN

Table G-5. Channels

Chn Num	Xmt Freq	Xmt Mod	Xmt Pwr	No Snd	Rcv Xmt	Rev Freq	Mod	Snd Int	Voice Mon	Audio Mode
1	02.1234	US	HI	EN	DI	02.1234	US	60	DI	VO
2	03.1234	US	HI	EN	DI	03.1234	US	60	DI	VO
3	04.1234	US	HI	EN	DI	04.1234	US	60	DI	VO
4	05.1234	US	HI	EN	DI	05.1234	US	60	DI	VO
5	06.1234	US	HI	EN	DI	06.1234	US	60	DI	VO
6	07.1234	US	HI	EN	DI	07.1234	US	60	DI	VO
7	08.1234	US	HI	EN	DI	08.1234	US	60	DI	VO
8	09.1234	US	HI	EN	DI	09.1234	US	60	DI	VO
9	02.7890	US	HI	DI	DI	02.7890	US	30	DI	VO
10	03.7890	US	HI	DI	DI	03.7890	US	30	DI	VO
11	05.7890	US	HI	DI	DI	05.7890	US	30	DI	VO
30	03.5450	US	HI	DI	DI	03.5450	US	30	DI	VO
31	03.7290	US	HI	DI	DI	03.7290	US	30	DI	VO
32	04.5800	US	HI	DI	DI	04.5800	US	30	DI	VO
33	06.1000	US	HI	DI	DI	06.1000	US	30	DI	VO
34	09.5800	US	HI	DI	DI	09.5800	US	30	DI	VO
35	10.1180	US	HI	DI	DI	10.1180	US	30	DI	VO
36	12.5000	US	HI	DI	DI	12.5000	US	30	DI	VO
37	16.4900	US	HI	EN	DI	16.4900	US	30	DI	VO
38	16.9970	US	HI	EN	DI	16.9970	US	30	DI	VO
39	18.3950	US	HI	EN	DI	18.3950	US	30	DI	VO
101	06.3456	US	HI	DI	DI	06.3456	US	30	DI	VO
102	02.2345	US	HI	DI	DI	02.2345	US	30	DI	VO
103	03.2345	US	HI	DI	DI	03.2345	US	30	DI	VO

Table G-5. Channels										
Chn Num	**Xmt Freq**	**Xmt Mod**	**Xmt Pwr**	**No Snd**	**Rcv Xmt**	**Rev Freq**	**Mod**	**Snd Int**	**Voice Mon**	**Audio Mode**
121	02.7890	US	HI	DI	DI	02.7890	US	30	DI	VO
122	03.7890	US	HI	DI	DI	03.7890	US	30	DI	VO
123	04.7890	US	HI	DI	DI	04.7890	US	30	DI	VO

Table G-6. Scan Lists									
List Idx	**Call Drtn**	**Default Protocol**	**Other Prot**	**Call Address**	**Self Address**	**LP**	**Num Idx**	**Chn**	**List of Channels**
1	0	MS-ALE	EN	123TOCS	R00197	EN	1	11	1,2,3,4,5,6,7,8,9,10,11
2	0	MS-ALE	DI	JTF	R00197	DI	0	10	30,31,32,33,34,35,36,37,38,39

Table G-7. Other Addresses					
Other Rmt Adr Scan Sta Idx Other List Tune Call					
#	**Address**	**#**	**Time**	**Protocol**	**Region**
1	BDE123	0	2	MS-ALE	Zone 3
2	M21	0	2	MS-ALE	Zone 2
3	M22	0	2	MS-ALE	Zone 2
4	M23	0	2	MS-ALE	Zone 2
5	R12345	0	2	MS-ALE	Zone 1
6	R22345	0	2	MS-ALE	Zone 1
7	R32345	0	2	MS-ALE	Zone 1
8	R42345	0	2	MS-ALE	Zone 1
9	R52345	0	2	MS-ALE	Zone 1
10	R62345	0	2	MS-ALE	Zone 1
11	R72345	0	2	MS-ALE	Zone 1
12	R82345	0	2	MS-ALE	Zone 1
13	TAC123	0	2	MS-ALE	Zone 3
14	TOC123	0	2	MS-ALE	Zone 3
15	JTF001	0	2	MS-ALE	N/A
16	NA0987	0	2	MS-ALE	N/A
17	R00197	0	2	MS-ALE	N/A

Table G-7. Other Addresses					
Other Rmt Adr Scan Sta Idx Other List Tune Call					
18	MC0100	0	2	MS-ALE	N/A
19	AF0001	0	2	MS-ALE	N/A
20	SOF054	0	2	MS-ALE	N/A
21	CG1034	0	2	MS-ALE	N/A

Table G-8. Net Addresses					
Net Adr Idx	**Net Address**	**No Scan List Idx**	**Rsp Net Call**	**Fix Len Adr**	**Max Slot Used**
1	JTFNET Slot Respondent Num address	2	EN	DI	8
2	AF0001				
3	R00197				
4	JTF001				
5	MC0100				
6	NA0987				
7	SOF054				
8	USCG1034				

Table G-9. Auto Addresses					
Auto Adr Idx	**Auto Address**	**ATMP Address**	**Num Call Mode**	**Adr Station**	**Num Sta Address**
1	123TOCS	3 Priority	3	TOC123	TAC123 BDE123

Table G-10. Group Addresses
None.

Table G-11. Self Addresses				
Self Adr Idx	Scan List Idx	Indv Self Address	Idx	Net No Adr Rsp Net
1	0	R12345	0	DI
2	-1	R22345	0	DI
3	-1	R32345	0	DI
4	-1	R42345	0	DI
5	-1	R52345	0	DI
6	-1	R62345	0	DI
7	-1	R72345	0	DI
8	-1	R82345	0	DI
8	-1	R00197	0	DI

Table G-12. Modems									
----Tx--							--------------Rx---------		
	Mdm				Data	Intlv	Data	Intlv	Adap
Idx		Modem Name	Modem Mode		Rate	Length	Rate	Length	tive
1	300	148 110S	148A/110	Single Tone	BPS 300	Short	BPS 300	Short	DI
2	300	110 SHORT	110A	Single Tone	BPS 300	Short	BPS 300	Short	DI
3	2400	110 SHORT	110A	Single Tone	BPS 2400	Short	BPS 2400	Short	DI
4	1200	110 SHORT	110A	Single Tone	BPS 1200	Short	BPS 1200	Short	DI

Table G-13. LQA
None

Table G-14. AMD Messages
None

Table G-15. User Messages	
Message Index	**Message Text**
1	CROSSING PHASE LINE RED
2	CROSSING PHASE LINE BLUE
3	MISSION COMPLETE, RETURNING TO BASE
4	AIRCRAFT DOWN, POSITION REPORT TO FOLLOW

Table G-16. Dictionary	
Idx	**Word**
1	ADVANCING
2	AIRCRAFT
3	ATTACK
4	BRIDGE
5	CARGO
6	RECON
7	REPORT
8	RESTRICTED
9	RETREAT
10	ROAD

Table G-17. Linking Protection							
LP 12 LP3					**Time Auto**		
LP Idx	**LP Level**	**Key Idx**	**Key Idx**	**NTS Role**	**Time Brdc**	**Brdc Intv**	**App Link**
1	Level 3	0	1	User Station Time	DI	60	EN

Table G-18. MSLP
None

Table G-19. EP Frequency Lists	
Freq Lists	**Frequencies In MHz**
1	02.5100 02.5150 02.6100 02.6150 02.6200 02.6250 02.7200 02.7250 02.7300 02.7350 02.8000 02.8050 02.8100 02.8150 02.8200 02.8250 02.8300 02.8350 02.8400 02.8450 02.8500 02.8550 02.8600 02.8650 02.8700 02.8750 02.8800 02.8850 02.9000
2	04.0500 04.0550 04.0600 04.0650 04.0700 04.1000 04.1050 04.1100 04.1150 04.1200 04.1230 04.1260 04.1290 04.1320 04.1350 04.1380 04.1410 04.1440 04.1470 04.1500 04.1540 04.1580 04.1620 04.1660 04.1700 04.1750 04.1760 04.1800 04.1820 04.1860 04.1900 04.2000 04.2050 04.2100 04.2150 04.2200 04.2240 04.2280 04.2320 04.2360 04.2400 04.2450 04.2500 04.2550 04.2600 04.2650 04.2700 04.2750 04.2800 04.2840 04.2850 04.2880 04.2900 04.2920 04.2950 04.2960 04.3000

Table G-20. EP Channels		
Chn	**Freq Lists**	**Protocol**
1	1	148A
2	2	148A

Table G-21. EP Scansets					
Scan Set Idx	**ALE EP Net**	**NTS Role**	**KGV -10 Idx**	**Num Freq List**	**EP Channels**
1	DI	User Time Station	1	1	1
2	DI	User Time Station	1	1	2

Table G-22. System Nets					
Net Idx	**Net Type**	**Rec Idx**	**Modem Net Name**	**Context Idx**	**ID**
1	Basic Manual	121 MAN	01 ORG1	2	0
2	Basic Manual	122 MAN	O2 ORG1	2	0
3	Basic Manual	123 EMGR	VOICE MA	2	0
1	Basic Preset	101 PRE	01 ORG1	2	0
2	Basic Preset	102 PRE	02 ORG1	2	0
3	Basic Preset	103 PRE	03 ORG1	2	0

Table G-22. System Nets					
Net Idx	Net Type	Rec Idx	Modem Net Name	Context Idx	ID
1	ALE Scan	1 ALE01	R AVN	2	0
2	ALE Scan	2 ALE02	JTF NET	2	0
1	EP	1 EP01	2MEG	1	0
2	EP	2 EP02	4MEG	1	0

Table G-23. Emergency Net	
Net Type	Net Idx
ALE Scan	1

Table G-24. Data Fill Version	
Version	Date
MISSIONALPHA	3/13/2007 10:45:50

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Appendix H:
Propagation Software Programs

The Institute for Telecommunications Services HF Propagation Analysis Package
325 Broadway
Boulder, Colorado 80303
Phone: (303) 497-3640
E-mail: cbehm@its.bldrdoc.gov
Home page: http://elbert.its.bldrdoc.gov/hf.html

SPEED (Systems Planning, Engineering, and Evaluation Device)
Commanding Officer
MCTSSA (SPEED Project Officer)
Box 555171
Camp Pendleton, California 92055-5171

MARCORSYSCOM C4I Help Desk
Phone 1-800-808-7634 or 1-760-725-0553
DSN 365-0533
NIPRNET: c41.helpdesk@mctssa.usmc.mil
SIPRNET: helpdesk@mctssa.usmc.smil.mil

PROPMAN 2000
Rockwell Collins
Government Systems
400 Collins Road NE
Cedar Rapids, Iowa 52498
Phone: (800) 321-2223 or (319) 295-5100
FAX: (319) 295-4777
E-mail: response@rockwellcollins.com
Home page: www.rockwellcollins.com/gs

Joint Air Force and Army Weather Information Network (JAAWIN)
Provides accurate, relevant, and timely air and space weather information to DOD, coalition, and national users specifically: 6-Hour HF Analysis Maps; 6-Hour HF Forecast Maps; HF Tailored Products; and HF Illumination Products.
Phone: DSN 271-2586 or COMM (402) 294-2586 (select menu item "1")
Email: afwaops@afwa.af.mil
Home page: https://weather.afwa.af.mil/space.html

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Appendix I:
J6 HF-ALE Checklist

1. Receive Mission.
2. Assign lead Service ALE network controller.
3. Determine threat.
4. Establish and assign hierarchy for joint nets.
5. Establish and assign user addresses for joint forces.
6. Determine interoperability amongst forces.
7. Provide frequency management for joint HF-ALE nets.
8. Coordinate with host governments for HF frequencies.
9. Develop key management plans for COMSEC assignment and use.
10. Develop SOPs for communications.
11. Develop joint HF-ALE operating parameters.
    a. Channel Matrix
        - Frequency assignment
        - Mode
        - AGC speed
        - COMSEC assignment
        - Bandwidth
        - Power
        - Sound enable/disable
        - Sounding interval

    b. Station Name and Addresses
        - ALE Parameter Settings as appropriate
        - All call Yes/No
        - AMD Yes/No
        - Any call Yes/No
        - Link timeout duration
        - Max scan channels (AKA call duration)
        - Max tune time
        - Scan rate (AKA scan minimum dwell)
12. Develop emergency destruction plans
13. Distribute SOPs to all participants.
14. Develop plan to operationally check the network.

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REFERENCES

Army

FM 24-24, *Signal Data References: Signal Equipment*, 29 December 1994.

Air Force

AFI 33-106, *Managing High Frequency Radios, Personal Wireless Communications Systems, and the Military Affiliate Radio System*, 09 January 2002.
AFI 33-118, *Electromagnetic Spectrum Management*, 18 July 2005.

Coast Guard

COMDTINST M2000.3C, *Telecommunications Manual (TCM)*, 7 September 1999.
COMDTINST M2000.4A, *Telecommunications Plan (TCP)*, 20 April 1988.
COMDTINST M2400.1G, *Spectrum Management Policies and Procedures*, 22 September 2006.

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GLOSSARY

PART I – ABBREVIATIONS AND ACRONYMS

Numbers

2G	second generation
3G	third generation

A

ACC	air combat command
ACE	airborne control element ((USAF); air combat element (NATO); aviation combat element (MAGTF)
Ack	acknowledgement
ADA	air defense artillery
AEW	airborne early warning; air expeditionary wing
AFB	Air Force base
AFFMA	Air Force Frequency Management Agency
AFFOR	Air Force forces
AFTTP (I)	Air Force tactics, techniques, and procedures (inter-Service)
AGC	automatic gain control
AKA	also known as
ALE	automatic link establishment
ALSA	Air Land Sea Application Center
AMC	Air Mobility Command
AMD	automatic message display
AN/ARC	Army/Navy airborne radio communications
ANDVT	advanced narrowband digital voice terminal
AN/PRC	Army/Navy portable radio communications
AO	area of operation
AOC	air and space operations center (USAF): Army Operations Center
AR	Army
ARFOR	Army forces
ARQ	automatic request-repeat
ASOC	air support operations center
ASW	antisubmarine warfare
AWACS	Airborne Warning and Control System

B

BCE	battlefield coordination element
BCT	brigade combat team
BD	black digital
BN	battalion

C

C4I	command, control, communications, computers, and intelligence

C6	communications and signals staff
CAC	current actions center
CATF	Commander, amphibious task force
CEOI	communication-electronics operating instructions
CG	guided missile cruiser
chan	channel
char	character
CJCS	Chief Joint Chiefs of Staff
clr	clear
cmdr	commander
CNCS	central network control station
co	company
COMSEC	communications security
CONAUTH	controlling authority
CONUS	continental United States
CPS	communications planning system
CRE	control reporting element
crypto	cryptographic
CSSE	combat service support element (MAGTF)
CT	cipher text
CVBG	carrier battle group

D

DASC	direct air support center
DASC (A)	direct air support center (airborne)
DES	data encryption standard
det	detachment
div	division
DOD	Department of Defense
DSN	Defense Switched Network

E

E	electric wave
e.g.	for example
EP	electronic protection
etc	etcetera (and so forth)
EW	electronic warfare

F

FAC	forward air controller
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FLD	field
FM	field manual; frequ3endy modulation
FOT	frequency of optimum transmission
freq	frequency
ft	fort

G

G6	Assistant Chief of Staff for Information Management
GCE	ground combat element (MAGTF)
GLO	ground liaison officer
GMT	Greenwich Mean Time
GPS	global positioning system

H

helo	helicopter
HF	high frequency
HF-ALE	high frequency-automatic link establishment
HFGCS	high frequency global communications system
HQ	headquarters
Hz	hertz

I

IAW	in accordance with
ID	identification
IDN	initial distribution number
i.e.	that is
ITU	International Telecommunication Union

J

J2	intelligence directorate of a joint staff
J3	operations directorate of a joint staff
J6	command, control, communications, and computer systems directorate of a joint staff
JCEOI	joint communication-electronics operating instructions
JCEWS	joint commander's electronic warfare staff
JCS	Joint Chiefs of Staff
JFC	joint force commander
JFMO	Joint Frequency Management Office
JITC	Joint Interoperability Test Command
JRFL	joint restricted frequency list
JSME	Joint Spectrum Management Element
JSTARS	Joint Surveillance Target Attack Radar System
JTF	joint task force

K

KEK	key encryption key
KEYMAT	keying material
kHz	kilohertz
km	kilometer

L

LAAD	low altitude air defense
LAMPS	light airborne multipurpose system (helicopter)
LCO	lighterage control officer
LHA	amphibious assault ship (general purpose)

LHD	amphibious assault ship (multipurpose)
LOS	line-of-sight
LP	linking protection
LPD	amphibious transport dock
LQA	link quality analysis
LSO	landing safety officer; landing signal officer

M

MAGTF	Marine air-ground task force
MAJCOM	major command
MARFOR	Marine forces
MARFORSYSCOM	Marine Corps Systems Command
MATCS	Marine air traffic control squadron
MCRP	Marine Corps reference publication
MCTSSA	Marine Corps tactical systems support activity
med	medium
MEF	Marine expeditionary force
MHz	megahertz
mil	military
MIL STD	military standard
MILSTRIP	Military Standard Requisitioning and Issue Procedures
MP	manpack
MUF	maximum usable frequency

N

N/A	not applicable
NAF	numbered air force
NATO	North Atlantic Treaty Organization
NAVFOR	Navy forces
NAVSOP	Navy standing operating procedures
NCS	National Communications System
NIPRNET	Nonsecure Internet Protocol Router Network
nm	nautical mile
NSA	National Security Agency
NTIA	National Telecommunications and Information Administration
NTTP	Navy tactics, techniques, and procedures
NVIS	near vertical incident sky wave

O

OPLAN	operation plan
op	operation

P

POC	point of contact
PROPMAN	Rockwell Collins Propagation Software ©
PT	plain text (nonsecure)
pub	publication

R

RCU	remote control unit
rcv	receive
RDP	radio data port
RECCE	reconnaissance
RF	radio frequency
rgt	regiment
ROK	Republic of Korea
RPD	radio programming data
RT	remote terminal
RX	receive; receiver

S

SATCOM	satellite communications
SEAL	sea-air-land team
sec	second
SGT	Sergeant
SIPRNET	Secret Internet Protocol Router Network
SOF	special operations forces
SOP	standing operating procedure
sqdn	squadron
SPEED	systems planning, engineering, and evaluation device
SSN	attack submarine, nuclear
STANAG	standardization agreement (NATO)

T

TAC-A	tactical air coordinator (airborne)
TACC	tactical air command center (USMC); tactical air control center (USN); tanker/airlift control center (USAF)
TACP	tactical air control party
TADC	tactical air direction center
TEK	traffic encryption key
TOD	time of day
TRACS	tracking and communication system
TRICS	telephone to radio interface communication system
trnseq	training sequence
TX	transmit

U

US	United States
USA	United States Army
USAF	United States Air Force
USB	upper side band
U.S.C	United States Code
USCBP	United States Customs and Border Protection
USCG	United States Coast Guard
USMC	United States Marine Corps
USN	United States Navy

UTM	universal transverse Mercator

V

VOACAP	Voice of America Coverage Analysis Program
VP	voice privacy
vs.	versus

W

WOC	wing operations center (USAF)
WWV	name of National Institute of Standards and Technology radio station at Fort Collins, Colorado. WWV broadcasts time and frequency information 24-hours a day, seven day a week to millions of listeners worldwide. See http://www.boulder.nist.gov/timefreq/stations/wwv.html

PART II – TERMS AND DEFINITIONS

air and space expeditionary task force — A deployed numbered air force (NAF) or command echelon immediately subordinate to a NAF provided as the US Air Force component command committed to a joint operation. Also called **AETF**. (JP 1-02)

airborne early warning —The detection of enemy air or surface units by radar or other equipment carried in an airborne vehicle, and the transmitting of a warning to friendly units. Also called **AEW**. (JP 1-02)

air expeditionary wing — A wing or wing slice placed under the administrative control of an air and space expeditionary task force or air and space task force by Department of the Air Force orders for a joint operation. Also called **AEW**. (JP 1-02)

Air Mobility Command — The Air Force component command of the US Transportation Command. Also called **AMC**. (JP 1-02)

air support operations center — An agency of a tactical air control system collocated with a corps headquarters or an appropriate land force headquarters that coordinates and directs close air support and other tactical air support. Also called **ASOC**. (JP 1-02)

amphibious transport dock — A ship designed to transport and land troops, equipment, and supplies by means of embarked landing craft, amphibious vehicles, and helicopters. Designated as **LPD**. (JP 1-02)

antisubmarine warfare — Operations conducted with the intention of denying the enemy the effective use of submarines. Also called **ASW**. (JP 1-02)

area of operation — An operational area defined by the joint force commander for land and naval forces. Areas of operation do not typically encompass the entire operational area of the joint force commander, but should be large enough for component commanders to accomplish their missions and protect their forces. Also called **AO**. (JP 1-02)

brigade — A unit, usually smaller than a division, to which groups and/or battalions and smaller units tailored to meet anticipated requirements are attached. Also called **BCT**. (JP 1-02)

carrier battle group — A standing naval task group consisting of a carrier, surface combatants, and submarines as assigned in direct support, operating in mutual support with the task of destroying hostile submarine, surface, and air forces within the group's assigned operational area and striking at targets along hostile shore lines or projecting firepower inland. Also called **CVBG**. (JP 1-02)

combat service support element — Those elements whose primary missions are to provide service support to combat forces and which are parts, or prepared to become parts of, a theater, command, or task force formed for combat operations. Also called **CSSE**. (JP 1-02)

command, control, communications, and computers — Integrated systems of doctrine, procedures, organizational structures, personnel, equipment, facilities, and communications designed to support a commander's exercise of command and control across the range of military operations. Also called **C4 systems**. (JP 1-02)

commander, amphibious task force — The Navy officer designated in the order initiating the amphibious operation as the commander of the amphibious task force. Also called **CATF**. (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**. (JP 1-02)

cryptology — The science that deals with hidden, disguised, or encrypted communications. It includes communications security and communications intelligence. (JP 1-02)

cryptosecurity — The component of communications security that results from the provision of technically sound cryptosystems and their proper use. (JP 1-02)

Defense Switched Network — Component of the Defense Communications System that handles Department of Defense voice, data, and video communications. Also called **DSN**. (JP 1-02)

detachment — 1. A part of a unit separated from its main organization for duty elsewhere. 2. A temporary military or naval unit formed from other units or parts of units. Also called **DET**. (JP 1-02)

direct air support center — The principal air control agency of the US Marine air command and control system responsible for the direction and control of air operations directly supporting the ground combat element. It processes and coordinates requests for immediate air support and coordinates air missions requiring integration with ground forces and other supporting arms. It normally collocates with the senior fire support coordination center within the ground combat element and is subordinate to the tactical air command center. Also called **DASC**. (JP 1-02)

division — 1. A tactical unit/formation as follows: A major administrative and tactical unit/formation which combines in itself the necessary arms and services required for sustained combat, larger than a regiment/brigade and smaller than a corps. A number of naval vessels of similar type grouped together for operational and administrative command, or a tactical unit of a naval aircraft squadron, consisting of two or more sections. An air division is an air combat organization normally consisting of two or more wings with appropriate service units. The combat wings of an air division will normally contain similar type units. 2. An organizational part of a headquarters that handles military matters of a particular nature, such as personnel, intelligence, plans, and training, or supply and evacuation. 3. (DOD only) A number of personnel of a ship's complement grouped together for tactical and administrative control. (JP 1-02)

electronic warfare — Military action involving the use of electromagnetic and directed energy to control the electromagnetic spectrum or to attack the enemy. Electronic warfare consists of three divisions: electronic attack, electronic protection, and electronic warfare support. Also called **EW**. (JP 1-02)

emission security — The component of communications security that results from all measures taken to deny unauthorized persons information of value that might be derived from intercept and analysis of compromising emanations from crypto-equipment and telecommunications systems. (JP 1-02)

forward air controller — An officer (aviator/pilot) and member of the tactical air control party who, from a forward ground or airborne position, controls aircraft in close air support of ground troops. Also called **FAC**. (JP 1-02)

global positioning system — A satellite constellation that provides highly accurate position, velocity, and time navigation information to users. Also called **GPS**. (JP 1-02)

ground combat element — The core element of a Marine air-ground task force (MAGTF) that is task-organized to conduct ground operations. It is usually constructed around an infantry organization but can vary in size from a small ground unit of any type, to one or more Marine divisions that can be independently maneuvered under the direction of the MAGTF commander. The ground combat element itself is not a formal command. Also called **GCE**. (JP 1-02)

ground liaison officer — An officer trained in offensive air support activities. Ground liaison officers are normally organized into parties under the control of the appropriate Army commander to provide liaison to Air Force and naval units engaged in training and combat operations. Also called **GLO**. (JP 1-02)

joint force commander — 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)

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)

landing signal officer — Officer responsible for the visual control of aircraft in the terminal phase of the approach immediately prior to landing. Also called **LSO**. (JP 1-02)

Marine expeditionary brigade — A Marine air-ground task force that is constructed around a reinforced infantry regiment, a composite Marine aircraft group, and a brigade service support group. The Marine expeditionary brigade (MEB), commanded by a general officer, is task-organized to meet the requirements of a specific situation. It can function as part of a joint task force, as the lead echelon of the Marine expeditionary force (MEF), or alone. It varies in size and composition, and is larger than a Marine expeditionary unit but smaller than a MEF. The MEB is capable of conducting missions across the full range of military operations. Also called **MEB**. See also brigade; Marine air-ground task force; Marine expeditionary force. (JP 1-02)

Marine expeditionary force — The largest Marine air-ground task force (MAGTF) and the Marine Corps' principal warfighting organization, particularly for larger crisis or contingencies. It is task-organized around a permanent command element and normally contains one or more Marine divisions, Marine aircraft wings, and Marine force service support groups. The Marine expeditionary force is capable of missions across the range of military operations, including amphibious assault and sustained operations ashore in any environment. It can operate from a sea base, a land base, or both. Also called **MEF**. (JP 1-02)

Marine expeditionary unit — A Marine air-ground task force (MAGTF) that is constructed around an infantry battalion reinforced, a helicopter squadron reinforced, and a task-organized combat service support element. It normally fulfills Marine Corps forward sea-based deployment requirements. The Marine expeditionary unit provides an immediate reaction capability for crisis response and is capable of limited combat operations. Also called **MEU**. (JP 1-02)

military standard requisitioning and issue procedures — A uniform procedure established by the Department of Defense for use within the Department of Defense to govern requisition and issue of materiel within standardized priorities. Also called **MILSTRIP**. (JP 1-02)

operation order — A directive issued by a commander to subordinate commanders for the purpose of effecting the coordinated execution of an operation. Also called **OPORD**. (JP 1-02)

operation plan — 1. Any plan, for the conduct of military operations prepared in response to actual and potential contingencies. 2. In the context of joint operation planning level 4 planning detail, a complete and detailed joint plan containing a full description of the concept of operations, all annexes applicable to the plan, and a time-phased force and deployment data. It identifies the specific forces, functional support, and resources required to execute the plan and provide closure estimates for their flow into the theater. Also called **OPLAN**. (JP 1-02)

physical security — The component of communications security that results from all physical measures necessary to safeguard classified equipment, material, and documents from access thereto or observation thereof by unauthorized persons. (JP 1-02)

precise lightweight global positioning receiver — US Army standard handheld GPS receiver, which provides advanced P/Y code positioning accuracy. Also called **PLGR**. (JP 1-02)

reconnaissance — A mission undertaken to obtain, by visual observation or other detection methods, information about the activities and resources of an enemy or potential enemy, or to secure data concerning the meteorological, hydrographic, or geographic characteristics of a particular area. Also called **RECON**. (JP 1-02)

sea-air-land team — A naval force specially organized, trained, and equipped to conduct special operations in maritime, littoral, and riverine environments. Also called **SEAL** team. (JP 1-02)

Secret Internet Protocol Router Network — Worldwide SECRET level packet switch network that uses high-speed internet protocol routers and high-capacity Defense Information Systems Network circuitry. Also called **SIPRNET**. (JP 1-02)

signal operation instructions — A series of orders issued for technical control and coordination of the signal communication activities of a command. In Marine Corps usage, these instructions are designated communication operation instructions. (JP 1-02)

special operations forces — Those active and Reserve Component forces of the Military Services designated by the Secretary of Defense and specifically organized, trained, and equipped to conduct and support special operations. Also called **SOF**. (JP 1-02)

standing operating procedure — A set of instructions covering those features of operations that lend themselves to a definite or standardized procedures without loss of effectiveness. These procedures are applicable unless ordered otherwise. Also called **SOP**. (JP 1-02)

tactical air control center — The principal air operations installation (ship based) from which all aircraft and air warning functions of tactical air operations are controlled. Also called **TACC**. (JP 1-02)

tactical air coordinator (airborne) — An officer who coordinates, from an aircraft, the actions of other aircraft engaged in air support of ground or sea forces. Also called **TAC(A)**. (JP 1-02)

tactical air direction center — An air operations installation under the overall control of the tactical air control center (afloat) or tactical air command center, from which aircraft and air warning service functions of tactical air operations in an area of concern are directed. Also called **TADC**. (JP 1-02)

transmission security – The component of communications security that results from all measures designed to protect transmissions from interception and exploitation by means other than cryptanalysis. (JP 1-02)

universal transverse Mercator grid — A grid coordinate system based on the transverse Mercator projection, applied to maps of the Earth's surface extending to 84 degrees N and 80 degrees S latitudes. Also called **UTM** grid. (JP 1-02)

wing— 1. An Air Force unit composed normally of one primary mission group and the necessary supporting organizations, i.e., organizations designed to render supply, maintenance, hospitalization, and other services required by the primary mission groups. Primary mission groups may be functional, such as combat, training, transport, or service. 2. A fleet air wing is the basic organizational and administrative unit for naval-, land-, and tender-based aviation. Such wings are mobile units to which are assigned aircraft squadrons and tenders for administrative organization control. 3. A balanced Marine Corps task organization of aircraft groups and squadrons, together with appropriate command, air control, administrative, service, and maintenance units. A standard Marine Corps aircraft wing contains the aviation elements normally required for the air support of a Marine division. 4. A flank unit; that part of a military force to the right or left of the main body. (JP 1- 02)

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20 November 2007

By Order of the Secretary of the Army:

Official:

GEORGE W. CASEY JR.
General, United States Army
Chief of Staff

JOYCE MORROW
Administrative Assistant to the Secretary of the Army
0730309

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