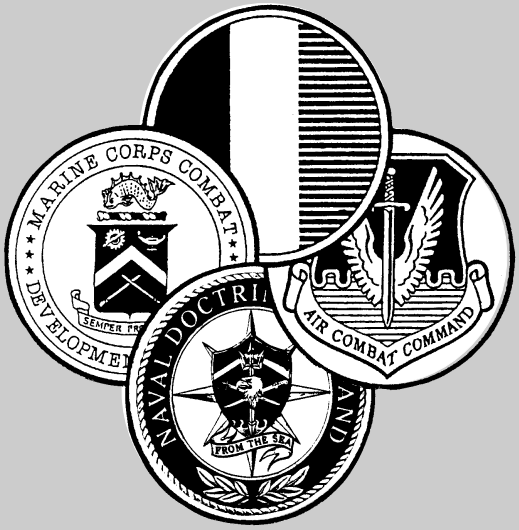
ARMY, MARINE CORPS, NAVY, COMBAT AIR FORCES



TALK II-SINCGARS

MULTISERVICE COMMUNICATIONS PROCEDURES FOR THE SINGLE-CHANNEL GROUND AND AIRBORNE RADIO SYSTEM

FM 11-1
MCRP 6-2.2.2
NDC TACMEMO 3-13.1
ACCPAM 33-154
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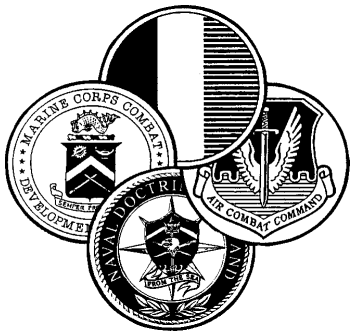
AIR LAND SEA APPLICATION CENTER

MAY 1996

MULTISERVICE TACTICS, TECHNIQUES, AND PROCEDURES

Marine Corps: PCN 14400000700



FOREWORD

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

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The procedures in this publication are authorized for use throughout the Combat Air Forces as indicated below.

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PREFACE

1. Scope

This publication describes the basic Single-channel Ground and Airborne Radio Systems (SINCGARSs) owned and operated by each of the services, explaining the basic characteristics and capabilities, operating modes, and frequency hopping net operation procedures for each radio and service subsystem. It also explains multiservice operational procedures for using SINCGARS radios in joint operations; sets forth responsibilities of key joint and service agencies and individuals, and establishes planning and execution procedures for SINCGARS frequency hopping radio operations in joint environments.

2. Purpose

This publication standardizes joint operational procedures for the very high frequency-frequency modulation (VHF-FM) frequency hopping system, SINCGARS.

3. Application

This publication applies to the Army, Navy, Air Force (Combat Air Forces) and Marine Corps. It may also be used by multiservice and service component forces to conduct SINCGARS training and operations. Procedures herein may be modified to fit specific theater command and control procedures and allied and foreign national electromagnetic spectrum management requirements.

4. Implementation Plan

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

Army. The Army will incorporate the procedures in this publication in US Army doctrine and training publications as directed by the commander, US Army Training and Doctrine Command. Distribution is in accordance with DA Form 12-11E.

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5. User Information

a. The TRADOC-MCCDC-NDC-ACC 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. 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 recommendation directly to—

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c. 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.

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MCRP 6-2.2.2 — Marine Corps Combat Development Command, Quantico, Virginia

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29 May 1996

TALK II - SINCGARS

Multiservice Communications Procedures for the Single-channel Ground and Airborne Radio System

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Multiservice Communications Procedures for the Single-channel Ground and Airborne Radio System (SINCGARS)

Overview

To fight together and win on the modern battlefield, tactical air, land, and sea forces need an effective command, control, and communications (C3) system. Technological improvements in enemy jamming and electronic collection and exploitation seriously challenge the effectiveness of friendly tactical communications. With the development and fielding of SINCGARS-operative radios, the capabilities of sophisticated, complex enemy jammers have to a great extent been neutralized.

The worldwide operational need for a very high frequency-frequency modulation (VHF-FM) radio resistant to electronic attack (EA) is mandated by the requirement that Army, Marine Corps, Navy, and Combat Air Forces be capable of performing multiservice air, land, and sea operations in any theater. Such a capability is necessary to ensure successful combat operations. SINCGARS radios, with their single-channel and jam resistant features, provide interoperable communications between surface and airborne command and control assets. SINCGARS is replacing most of the existing tactical VHF-FM radios in the Department of Defense (DOD) inventory.

This publication standardizes procedures for the multiservice operation of SINCGARS. It addresses both physical and electronic interservice transfer of SINCGARS electronic protection (EP) information and communications security (COMSEC) keys necessary for jam resistant and secure operations. This publication, developed in conjunction with the contractors of the SINCGARS equipment, will enhance equipment and procedural interoperability.

This publication provides the approved TRADOC, MCCDC, Navy and Combat Air Forces multiservice SINCGARS communication procedures. It also provides procedures to effect interservice communications and enhance friendly operations in an electronic warfare (EW) environment.

SINCGARS Variants and Key Systems

The services have developed their own versions of SINCGARS radios to meet their needs. The Army has one airborne, one manpack, and six vehicular versions in both integrated COMSEC (ICOM) and non-integrated COMSEC (non-ICOM) models. The Air Force, Navy, and Marines will use the Army version of the manpack and vehicular radio. Likewise, the services have developed the necessary support equipment. The Army will use the Revised

Battlefield Electronic Communications-electronics Operating Instructions System (RBECS). The Marine Corps will use portions of RBECS to support SINCGARS net management functions. RBECS, or modifications thereof, will be integrated into ground units to enhance the communications process. The Air Force Key Data Management System (AFKDMS) supports the AF SINCGARS radios. For airborne users, the Navy will use the AN/ARC-210 radio and an MS-DOS PC or Tactical Air Mission Planning System (TAMPS) that will run the ARC-210 Fill Program (AFP). Navy shipboard SINCGARS will use the Army version of the SINCGARS radio and will also use RBECS. AFP allows the operator to create ARC-210 loadsets by entering single channel data, entering Have Quick data, and importing SINCGARS data in the form of an RBECS loadset files.

Effective secure communications between services is possible because all SINCGARS variants share common characteristics that permit interoperability.

Planning and Execution

The heart of this publication is the information on the planning and execution of operational procedures for employing SINCGARS. These procedures include the necessary responsibilities of the joint communications staff in managing SINCGARS in a combat zone. They also cover the availability, distribution, management of EP variables, and COMSEC keys.

Chapter I

EQUIPMENT AND OPERATIONS

1. Background

Air, land, and sea forces all require effective communications for command and control. Single-channel (SC) very high frequency (VHF) frequency modulation (FM) combat net radio systems provide the primary means of communication for command and control of a wide variety of combat forces.

Section A. SINCGARS Radios

2. Capabilities

Modern generations of combat net radio (CNR) systems are more capable and reliable than previous generations. The SINCGARS is the largest family of radios in this latest generation of combat radios. SINCGARS incorporates many features found on similar compatible radios. SINCGARS features include—

a. Frequency hopping (FH) modes.

b. Integrated communications security (ICOM).

c. Voice and data capability.

d. Built-in test (BIT).

e. Modular design.

f. Ground and airborne versions.

3. Common Characteristics

The services tailor their particular radio designs to satisfy service-unique requirements. These radios require the following common characteristics to ensure interoperability in multiple nets:

a. FH data waveform.

b. 30.000 to 87.975 megahertz (MHz) operating band.

c. SC FM operation: 30.000 to 87.975 MHz with 25 kilohertz (kHz) channel spacing (2320 channels).

d. SC FM frequency offsets (+/- 5, +/-10 kHz).

e. Compatibility with encrypted ultra high frequency (UHF) communications system (VINSON)-based (e.g., KY-57/ KY-58) communications security (COMSEC) for security of voice and data in FH and SC communication modes.

f. Use of a nonhopping, SC cue frequency for alerting a net control station (NCS) in an FH net.

g. Late net entry capabilities.

h. Electronic remote fill (ERF) capabilities:

(1) Cold start net opening (ERF of FH data over a single manual selected for net opening).

(2) FH update (ERF to update FH data during net operations).

(3) Transmission security key (TSK) for establishing an FH pattern for radios.

(4) Synchronize (sync) time.

(5) 3-digit net identification.

4. Service SINCGARS Radio Variants

All military services combat, combat support, and combat service support units

employ SINCGARS and SINCGARS FH compatible radios. There are airborne, manpack, and vehicular SINCGARS radios. Unless otherwise noted, reference to the SINCGARS radio in this document includes all SINCGARS compatible radio systems. Table I-1 lists each service's SINCGARS-compatible radios.

a. Army. The Army SINCGARS operates in the 30.000 to 87.975 MHz frequency range. Early ground versions of SINCGARS consist of a receiver-transmitter (RT-1439) supported by external COMSEC equipment assembled with other common modules into manpack and vehicular configurations. These radios are known as *non-integrated COMSEC (non-ICOM)* since they require the TSEC/KY-57 security equipment for cipher text (CT) operation. Newer production ground SINCGARS receiver-transmitters (RT-1523 series) are known as *integrated COMSEC (ICOM).* They have an internal module that performs the cipher functions; thus, they do not need the external KY-57 equipment. However on the other hand, the Army airborne SINCGARS radio (AN/ARC-201/A) requires use of the TSEC/KY-58 security equipment for CT operation. All three versions of the airborne radio handle voice; only the data bus version (RT-1478) handles data through use of a data rate adapter (DRA). Both ICOM and non-ICOM versions of the radio are operationally compatible in FH and CT operations. (See Appendix B for further details on differences between non-ICOM and ICOM radios.)

b. Air Force. The Air Force Airborne SINCGARS compatible radio (AN/ARC-222) operates SC FM and FH in the 30.000 to 87.975 MHz range and SC amplitude modulation (AM) in the 108.000 to 151.975 MHz frequency range (108.000 to 115.975 receive only). It interfaces with the KY-58 to achieve a COMSEC capability. The airborne radio interfaces with the AN/PSC-2-digital communications terminal

Table I-1. Service SINCGARS Radio Configurations

PROCURRING SERVICE	RADIO NOMENCLATURE	USING SERVICE			
		ARMY	USAF	NAVY	USMC
Airborne					
Army	AN/ARC-201A(V)	Yes		Yes#	
Navy/USMC	AN/ARC-210(V)	Yes	Yes	Yes	Yes
USAF	AN/ARC-222		Yes		
Manpack					
Army/USMC	AN/PRC-119/A	Yes	Yes	Yes	Yes
Vehicular					
Army/USMC	AN/VRC-87/A*	Yes			
	AN/VRC-87/C	Yes			
	AN/VRC-88/A	Yes			Yes
	AN/VRC-88/C	Yes			
	AN/VRC-89/A	Yes	Yes	Yes	Yes
	AN/VRC-90/A	Yes	Yes	Yes**	Yes
	AN/VRC-91/A	Yes	Yes		Yes
	AN/VRC-92/A	Yes		Yes	Yes

# Denotes ARQ-53 only.
* "/A" denotes an integrated COMSEC (ICOM) radio in addition to non-integrated COMSEC (non-ICOM) versions.
** Denotes shipboard installation.

(DCT-2) and the improved data modem (IDM) to pass data. Air Force ground units, primarily tactical air control parties (TACPs) and combat control teams (CCTs), employ the Army SINCGARS AN/VRC-89A/90A/91A (RT-1523 (ICOM) radio). The modular control equipment (MCE) facilities located at the control reporting centers (CRCs), control reporting element (CRE), and forward air control party (FACP) utilize the RT-1439 (non-ICOM) radios and interface with external COMSEC devices (KY-58).

c. Navy

(1) For shipboard applications, Navy units use the AN/VRC-90A nominally identified as an AN/ARQ-53 that replaces the AN/VRC-46. The AN/VRC-90A updates amphibious readiness groups (ARGs)/battle groups with SINCGARS electronic protection (EP) capability. The greatest number of radios exists on amphibious ships, with the largest population on command and flag-configured ships.

(2) As a related portion of the shipboard program, the Navy will field the AN/ARQ-53, based on the RT-1476/ARC-201(V), to provide a 2-channel airborne relay for over the horizon (OTH) communications.

(3) For airborne applications, Navy units use the AN/ARC-210 radio. The AN/ARC-210 operates in the 30.000 to 399.975 MHz frequency range and implements the SINCGARS and Have Quick EP modes.

d. Marine Corps. Marine Corps ground units use the same vehicular and manpack SINCGARS radios as the Army. Marine aviation units use the AN/ARC-210(V) radio.

5. Modes of Operation

SINCGARS radios offer a range of operating modes to commanders. These modes include SC plain text (PT), SC CT, FH PT, and FH CT.

a. Considerations. When establishing CNR nets, commanders must consider the mission, availability, and capabilities of CNR communications equipment, electronic attack (EA) capabilities of adversary forces, and United States (US) national security policy. SC PT operations provide ease of operation while providing little or no security or protection. FH CT operations provide message traffic security and EA (jamming and direction finding [DF]) resistant transmissions. FH CT communication protects both the message and the sender.

b. SC Mode. SINCGARS radios can store SC frequencies and offsets. SC frequencies and offsets (+/- 5 kHz or +/- 10 kHz [+/-] 5 or 10 kHz) are entered manually through the radio's front panel keypad. When operating in the FH mode, two of the SC presets are reserved for the manual and cue channels. See Appendix C for a sample communications-electronic operating instructions (CEOI)/signal operating instructions (SOI) print-out depicting manual and cue channels information. SINCGARS is voice interoperable with all SC radios operating in the SINCGARS frequency range and channel spacing.

c. FH Mode. SINCGARS radios can store FH data for unique FH nets. SINCGARS radios require four data elements to communicate in the FH mode. The FH data elements are hopsets/lockouts, net identifiers (IDs), net sync date/time, and TSK. Once FH data is loaded, the user need only move the FH channel switch to move from one FH net to another. In addition, users in nets sharing common hopsets, TSK, and sync time can also move from net to net by entering the appropriate net ID. FH data elements are discussed—

(1) Hopsets/Lockouts. The hopset is the set of frequencies (2320 frequencies minus protected frequencies) on which an FH net hops. Hopsets are electronically loaded and stored in the radio. SINCGARS radios have the capability of storing an unique

hopset in each preset FH channel. Lockouts provide frequency exclusions in conjunction with a hopset.

(2) Net IDs. The net ID is a 3-digit number from 000 to 999 that distinguishes one FH net from another when all other FH data elements are the same. Unique net IDs may be stored in each FH preset channel. Net IDs, embedded in the hopset data, are loaded electronically with a fill device or by ERF and may be changed using the keypad on the front panel of the SINCGARS receiver-transmitter (except on ARC-210 radios). Newer models of SINCGARS allow the changing of all 3 digits while earlier models only permit changing the last 2 digits.

(3) Sync Time. Sync time is required for synchronization of the frequency hops. Sync time consists of the last 2 digits of the Julian date (SINCGARS Julian date) plus a 6-digit time (hours:minutes:seconds). Each station in the FH radio net must be within (+/- 4 seconds) of the net sync time to communicate.

(4) TSK. The TSK is a generated variable that controls the pseudo-random FH pattern. A TSK must be loaded into the SINCGARS radio prior to opening an FH net. TSKs are electronically loaded into the radio with a fill device and, after net opening, TSK may be transferred by ERF.

d. Frequency Hopping-Master (FH-M) Mode. Only one radio in each FH radio net will use this mode. The FH-M radio maintains the radio net's sync time and transmits the ERF. Normally the designated NCS or alternate NCS will operate in the FH-M mode.

e. CT Communications. CT operations require a traffic encryption key (TEK). A key encryption key (KEK) is required for over-the-air rekey (OTAR). TEK and KEK are electronically loaded and stored in the radio or external security equipment.

(1) The TEK is used in CT operation and encrypts/decrypts operational voice and digital data transmissions.

(2) The KEK encrypts/decrypts TEKs and is used for OTAR of TEKs.

f. PT Operation. SINCGARS radios are also capable of PT operation (either SC or FH). When operating with radios that do not have a CT capability and/or are operating in PT, an army ground SINCGARS radio in the CT mode can monitor PT communications. A beep tone informs the SINCGARS operator that the incoming message is in PT rather than CT.

g. Voice or Data. SINCGARS radios operate in voice or data rates (bits per second) of 600, 1200, 2400, 4800, 16,000, AD1 (analog data). The AN/ARC-222 operates with voice-frequency shift keying (FSK) analog data rate of up to 1200 bits per second (bps) and at a digital data rate of 16 kilobits per second (kbps) and tactical fire direction system (TACFIRE).

Section B. SINCGARS Radio Operations

6. FH NET Operations

The joint task force (JTF) Command, Control, Communications, and Computer Systems Directorate of a joint staff (J-6) has overall responsibility for ensuring interoperability of CNR nets. All services currently have, and are continuing to deploy, SINCGARS and/or SINCGARS-compatible FH combat net radios. Forces assigned to JTFs will follow their respective service's detailed radio operator procedures within the general guidance provided in the following paragraphs.

7. Loadset Distribution (FH and COMSEC Data)

a. An army ground SINCGARS radio loadset consists of FH and COMSEC data. Designated operators may transfer FH and COMSEC data physically from device to device, transmit the data electronically, or use a combination of physical and electronic means. The lowest operational echelon

normally distributes and stores loadsets consistent with the availability of fill devices, security arrangements, and operational needs.

b. The controlling authority (CONAUTH) and JTF J-6 provide COMSEC and FH data to users. However, the CONAUTH provides only that amount necessary to satisfy operational requirements consistent with distribution capabilities. The storage of reserve loadsets at selected echelons facilitates rapid distribution, reduces risk, and minimizes the impact of loss of a storage device in the forward area.

8. Net Opening

NCS can open FH nets using either *hot* or *cold* start net opening procedures. The preferred method is *hot* start net opening. Before opening a net, the NCS must receive FH data and COMSEC.

a. Hot Start Net Opening. Each member in the net loads all FH and COMSEC data into the radio or associated KY-59/58, including sync time, and enters the net.

b. Cold Start Net Opening. Each net member loads either a cold start TSK (non-ICOM only) or their operational TSK (non-ICOM and ICOM) and the operational TEK into their radio prior to net opening. Net stations receive their ERF from their NCS on the manual channel in the FH CT modes, store it in the appropriate channel, switch over to that channel, and enter the net. NCS operators load all FH and COMSEC data, except sync time, into the radio prior to cold start net opening.

9. FH Sync Time Management

a. SINCGARS radio operators normally open and maintain their nets on ZULU time. Use of ZULU time ensures ease of FH net opening, late net entry, and commanders' ability to enter and monitor all their FH nets. NCSs manage time for their nets. To prevent FH radio nets from drifting off precise ZULU time (+/- 4 seconds), the NCS updates sync time daily to ensure cross-net communications capabilities. Each time the NCS radio transmits (in FH master mode), all radios on the net that receive the transmission are incrementally resynchronized to NCS sync time.

b. A net member can obtain precise ZULU time from any one of three methods. The model/version of SINCGARS and the available time sources (e.g., precision lightweight global positioning system (GPS) receiver (PLGR) or automated net control device [ANCD]) determine the method for loading time. Methods are—

(1) ERF (net opening and update).

(2) Electronic fill from:

(a) ANCD (RT-1523A and B versions).

(b) GPS receivers, such as the AN/PSN-11, PLGR (RT-1523A, and RT-1523B versions).

(3) Manually, through the SINCGARS radio front panel keypad.

10. Late Net Entry

A radio loaded with all FH and COMSEC data that drifts off sync time may be resynchronized by one of four methods:

a. Automatically Load GPS ZULU Time. RT-1523/A and /B ground, ARC-210, and ARC-222 radios can receive time electronically from a GPS receiver.

b. Manually Load GPS ZULU Time. Only attempt manual if GPS time is available. Operators may enter sync time through the front panel keypad.

c. Passive Late Net Entry. The SINCGARS radio has a built-in capability to resynchronize itself when out of synchronization by more than (+/- 4 seconds) but less than (+/- 60 seconds). When the operator enables this mode, the radio is

brought into the net without further action by the operator.

d. Cue and ERF Late Net Entry. If a SINCGARS station must enter an FH CT net and has the correct TSK and TEK, the station may contact the net by changing to the cue frequency, pressing push-to-talk (PTT), and waiting for the NCS to respond. This action by the operator causes the message cue indicator to appear in the display of the NCS radio. Normally only selected NCSs, their alternate NCSs, or other designated stations will load, monitor, and respond on the cue frequency. Radios responding to cue calls should move frequently and/or remote to reduce the risk of detection by enemy direction-finding systems and subsequent targeting and attack.

11. FH Mixed Net Operation

Operate SINCGARS radios in the SC mode only when absolutely necessary. When operating with SC radios, a SINCGARS mixed-mode retransmission site/station can provide communications between a SC station/net and an FH net without requiring all stations to operate in the vulnerable SC mode. To reduce the risk of being targeted by enemy direction findings equipment, locate mixed-mode retransmission sites away from any friendly position.

Section C. Support Equipment

12. Army Equipment

a. Army Key Management System (AKMS). AKMS integrates all functions of crypto management and engineering, SOI, EP, cryptographic key generation and distribution, key accounting, and key audit trail record keeping into a total system designated the Automated COMSEC Management and Engineering System (ACMES). ACMES is a 2-phase program.

(1) ACMES (Phase I) focuses primarily on requirements for CNR frequency management, common fill device (CFD), and electronic SOI. ACMES provides users with an enhanced SOI, FH data, and COMSEC key generation capability. The ANCD provides the capability to electronically store and rapidly distribute SOI and key material. In addition, the ANCD provides radio operators the capability to load all FH and COMSEC data plus sync time into the SINCGARS radio in one simple procedure (Figure I-1). Phase I consists of two functional elements:

(a) ACMES Workstation. The workstation generates SOI and FH data and integrates COMSEC cryptographic keys. The workstation consists of the AN/GYK-33A, lightweight computer unit (LCU), a rugged desktop computer (486 processor), and the AN/CSZ-9, random data generator (RDG). The LCU, in conjunction with the RDG, generates SOI and FH data (TSK, net IDs, and hopset). The ACMES workstation replaces the AN/GYK-33 basic generation unit (BGU). Workstations with RDGs are organic to corps, divisions, and separate brigades. Workstations without RDGs are organic to subordinate brigades and separate battalions.

(b) ANCD, System Designation AN/CYZ-10. The ANCD is an electronic data storage and CFD procured by the National Security Agency (NSA) and configured by the Army with unique application revised battlefield electronics communications system (RBECS) CEOI, data transfer device (DTD) software (RDS), and keypad. The ANCD, in conjunction with the ICOM SINCGARS, performs the full range of combat net radio cryptonet support functions to include COMSEC key generation, transfer, and storage. In addition, the ANCD serves as an electronic SOI and replaces the need for most paper SOI products. The ANCD replaces the KYK-13, KYX-15, MX-18290, and MX-10579 in support of SINCGARS.

(2) ACMES (Phase II) is a follow-on system with enhanced and expanded capabilities (Figure I-2). Phase II consists of three functional elements:

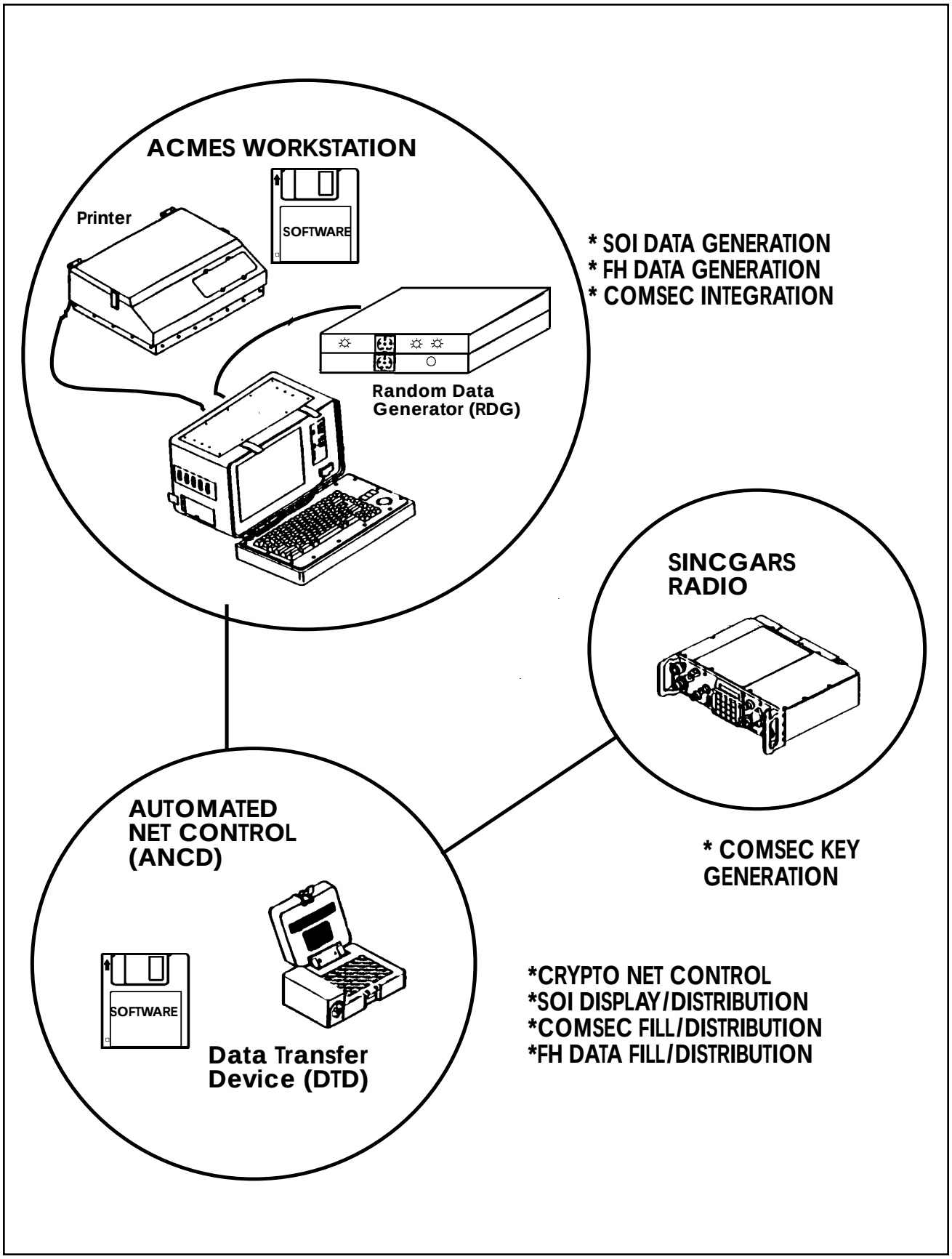

Figure I-1. ACMES Phase-I Functional Elements

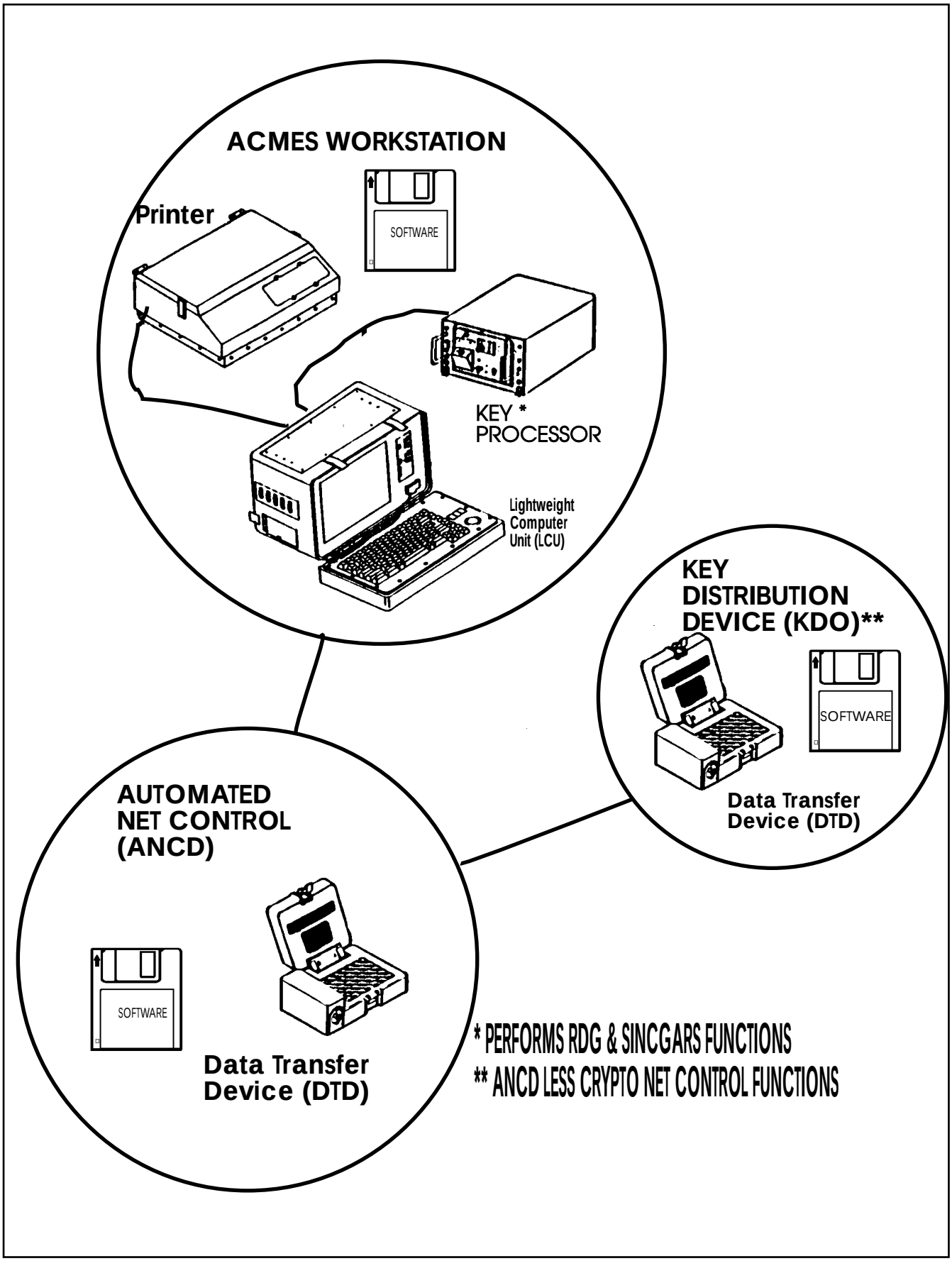

Figure I-2. ACMES Phase-II Functional Elements

(a) ACMES Workstation. The Phase-II workstation provides commanders with a fully automated capability to plan, control, and generate FH data and COMSEC keys and manage complex cryptonets. The Phase-II ACMES workstation provides cryptonet managers with the means to distribute cryptographic keys, SOI, and FH data; audit trail databases, design crypto nets; accomplish net configuration; accommodate key supersession; and manage all operational keys and SOI. This workstation is fully interoperable with all electronic key management system (EKMS) elements. A key processing equipment (KPE) will replace the RDG for FH data generation and SINCGARS and ANCD for COMSEC cryptographic key generation.

(b) ANCD. The Phase-II ANCD is a software-improved version of the Phase I.

(c) Key Distribution Device (KDD). The KDD ANCD is a limited keypad version of the DTD. Its application software can perform the tasks performed by an ANCD without NCS functions.

b. ACMES provides commanders the necessary tools to work with the widely proliferating COMSEC systems associated with the mobile subscriber equipment (MSE), echelon above corps communications (EAC comms), Joint Tactical Information Distribution System (JTIDS), Enhanced Position Location Reporting System (EPLRS), SINCGARS and other keying methods (electronic key generation, OTAR transfer, and electronic bulk encryption and transfer) being fielded by the Army.

13. Air Force Equipment

a. Air Force Key Data Management System (AFKDMS) (Figure I-3). To meet its special needs, the Air Force is developing AFKDMS. AFKDMS is composed of two subsystems: Key Distribution Management System (KDMS) personal computer (PC) subsystem and the key data system (KDS) DTD subsystem. The KDMS software is designed to manage and, to a limited extent, generate fill variables for the Air Force SINCGARS radio assets (AN/ARC-222, Army ICOM (RT-1523) and non-ICOM (RT-1429) radios). It runs on an Microsoft-disk Operating System (MS-DOS) International Business Machines (IBM)-PC compatible 80286, 80386, or 80486 computer with 640 kilobits (kb) random access memory (RAM) and 4 megabyte (MB) of extended memory. The KDMS can run from as little as 512 kb of free conventional RAM if required. To ensure interoperability with the other services in the SINCGARS mode, it incorporates the revised SINCGARS ICOM/ non-ICOM support software (RSINISS) and other selected modules from RBECS. It is menu-driven and contains on-line, context-sensitive help. The AFKDMS—

(1) Imports Army or multiservice net information from RBECS 3.5 inch diskettes provided by the joint force commander (JFC) J-6 or Army Corp units. The KDMS extracts net information by reading data elements from the RBECS files and reformats the data for use in the AFKDMS system.

(2) Provides information to establish Air Force close air support (CAS), combat search and rescue (CSAR), etc., operational nets. The AFKDMS allows the net planner to enter SC frequencies and to manage FH data for FH nets. When a baseline ground force CEOI/SOI is available, the Air Force net planner can develop Air Force unique nets for unilateral Air Force operations, including training if required. The planners can develop TSK variables if the PC has 1 MB of additional RAM and a RDG.

(3) Provides information to construct mission sets. The AFKDMS provides capability to build mission sets consisting of 20 FH nets, 20 cue frequencies, and 20 SC frequencies to provide for the primary mission and multiple contingency missions.

(4) Loads the Fill Device. The KDMS loads the DTD fill device (KDS subsystem) with multiple-load sets for the

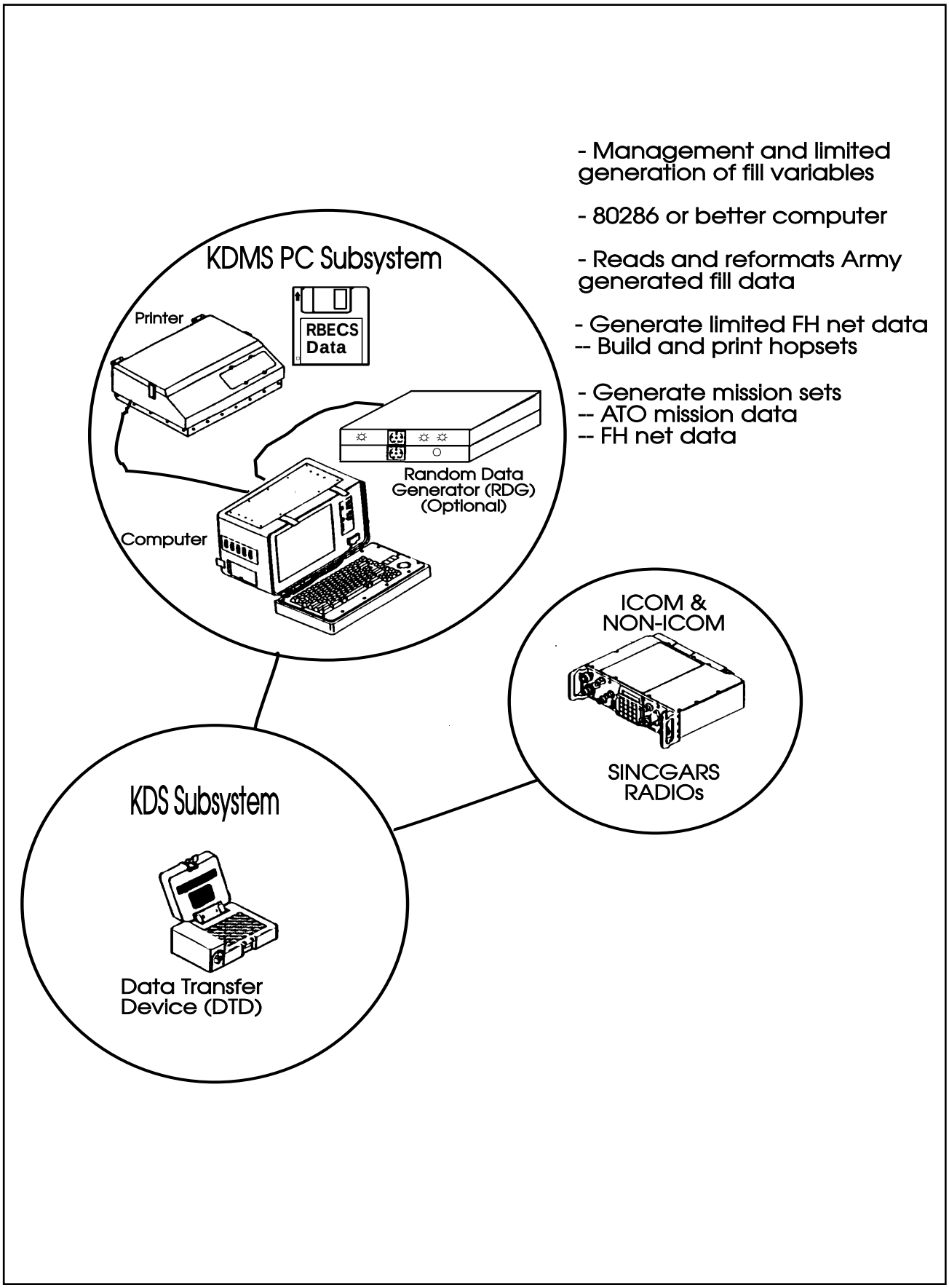

Figure I-3. AFKDMS Functional Elements

assigned aircraft and ground radio assets. The transfer of data from the PC is accomplished using Electronic DS-101 Emulation Software (EDES) and the DS-101 protocol. The KDS operator uses the KDS fill device (AN/CYZ-10) to fill designated radios using the DS-102 and modified CSESD-11 protocols.

b. Air Force Electronic Key Management System (AFEKMS) (Figure I-4). AFEKMS is a fast, flexible, and secure method of generating, managing, distributing, and auditing cryptologic materials using electronic communications and peculiar subsystem auxiliary devices. It is the San Antonio Air Logistic Center (SA-ALC) implementation of the NSA-developed EKMS. The DTD subsystem is expandable and can be used to support various Air Force communications via unique user application software (UAS) implementations. It provides cryptographic material on a wholesale level and supports TSK and COMSEC key requirements for a host of communication systems including SINCGARS. AFEKMS components include—

(1) KPE. The KPE generates, encrypts, and decrypts keys as required to support the COMSEC distribution system in accordance with (IAW) SA-ALC policy and procedures. The encrypted keys are passed to the local management device (LMD) for further transfer to the DTD.

(2) LMD. The LMD is a high-end PC (i486) installed at base-level COMSEC account facilities. It is provided by the SA-ALC specifically for wholesale cryptographic material management support. The LMD interfaces with the KPE for the generation of keys.

(3) DTD. The DTD (AN/CYZ-10) is a generic key management and distribution device incorporating NSA electronic-fill data format standards and interface protocols. It is backward compatible with fielded cryptographic devices; it contains a 2-line character display and functional keyboard; and the software-configurable menus are user friendly.

(4) Electronic key distribution device (EKDD). The EKDD is a UAS DTD that services several Air Force communications systems. The Air Force ground and airborne SINCGARS radios require extensive EP fill parameters including TSKs; therefore, they require unique UAS. Currently, this application requires a separate DTD software modification, hence, a unique nomenclature KDS.

14. Navy Equipment

a. There are four major components to RBECS for the Navy in joint operations. They are the unclassified RBECS software package (including the application utility package software), computer, RDG, and DTD. Only the software, computer, and RDG are necessary to design, generate, and produce joint CEOI (JCEOI)/CEOI material (Figure I-5).

(1) The RBECS software can run on any MS-DOS based computer system with the following characteristics: MS-DOS operating system 3.30 or higher, PC/AT 386 or higher, 4 MB RAM (minimum available for program execution), 10 MB hard disk storage.

(2) The RDG is necessary to generate the JCEOI/CEOI and SINCGARS transmission security (TRANSEC) variables. The RDG consists of three components: the AN/CSZ-9 (a non-deterministic generator), the battery power pack, and its connecting cable system. The power pack requires five BA-30/"D" cell batteries for operation. The computer must have at least one serial communications port (RS232/SERIAL) available for the RDG and DTD.

(3) The DTD is a storage device which is loaded by the PC with all JCEOI/CEOI data, SINCGARS electronic counter-

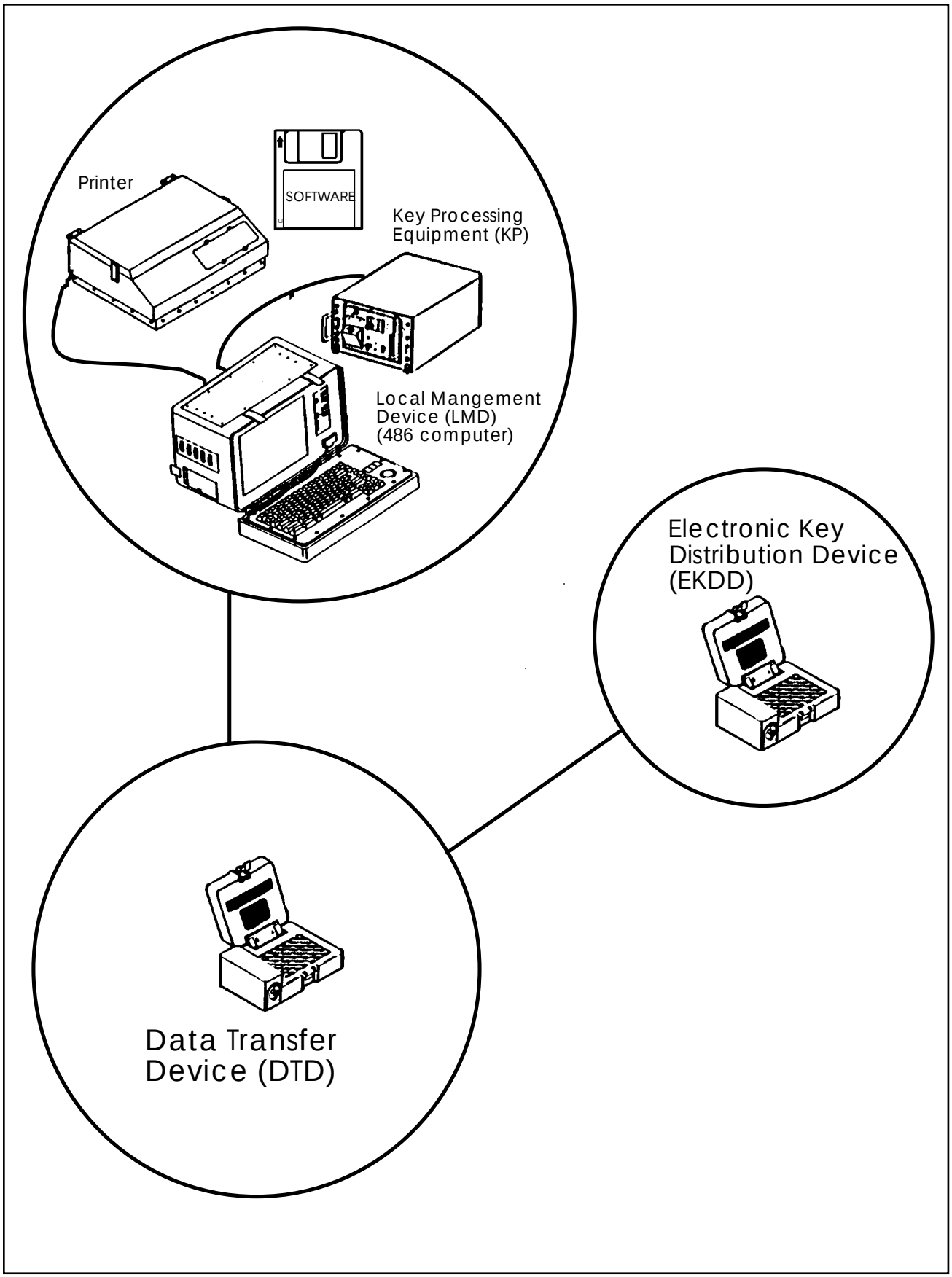

Figure I-4. AFEKMS Functional Components

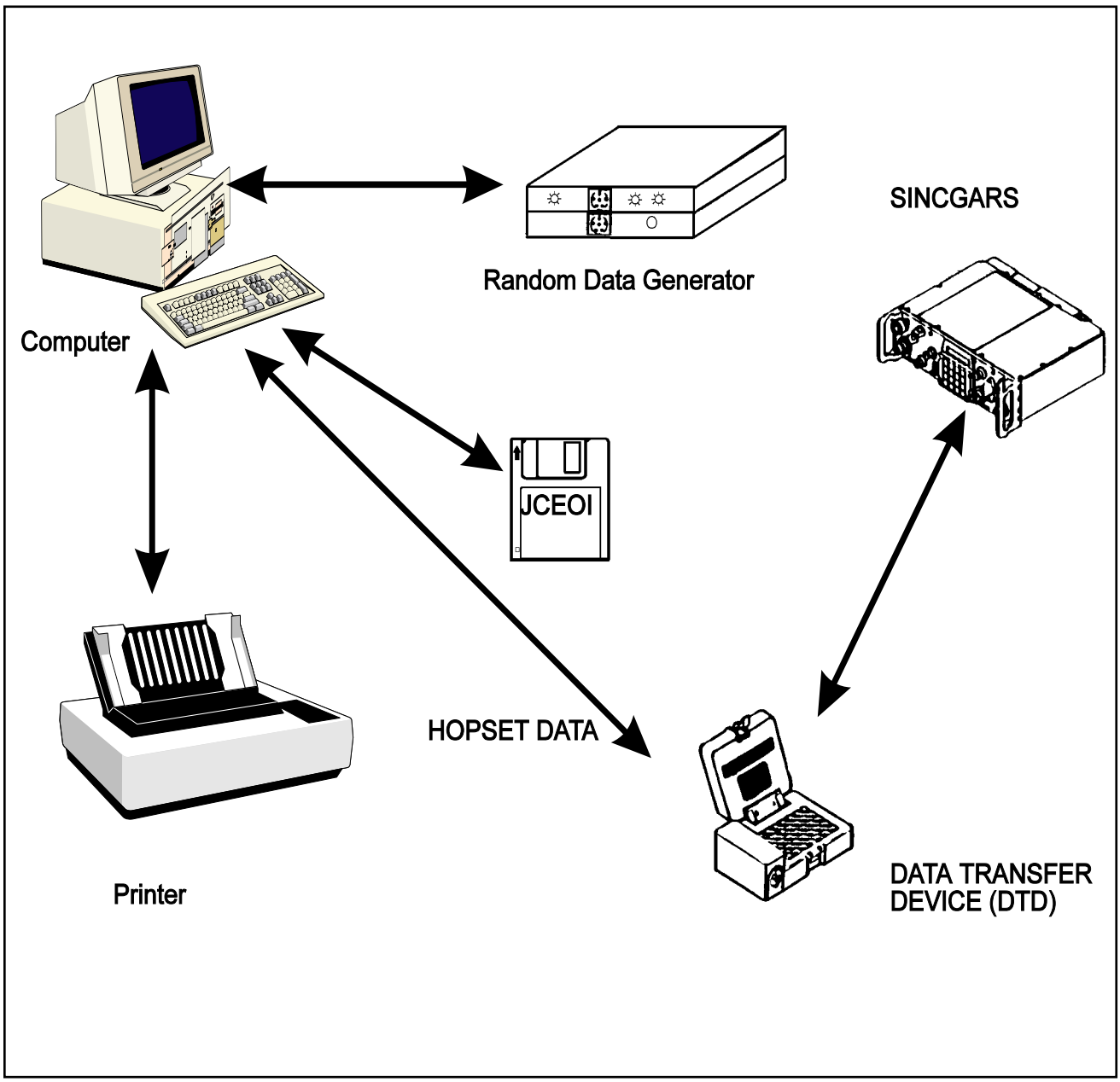

Figure I-5. Basic RBECS System

countermeasures (ECCM) data (hopsets, lockouts, etc.), and TRANSEC keys. The ANCD/DTD is also loaded with COMSEC keys (TEKs and KEKs) when used in conjunction with a SINCGARS radio RT-1523, RT-1523A, or KY-57/58 equipment. The ANCD/DTD is intended to replace the KYX-15/KYX-15A and KYX-13 devices. An ANCD/DTD can transfer data from one ANCD/DTD to another, as well as send selective data over the air via VHF-FM broadcast using SINCGARS.

b. For the ARC-210, the Navy uses the ARC-210 Fill Program (AFP) running on an MS-DOS PC or Tactical Air Mission Planning System (TAMPS) to generate an ARC-210 loadset file. The AFP user can manually enter Have Quick, single-channel, and aircraft selection data. The AFP user can also import SINCGARS loadset files from the RBECS system. The ARC-210 loadset file is loaded into an (AN-CYZ-10) DTD running consolidated single-channel radio ECCM package (CSEP) application software. The

DTD running CSEP can then load ARC-210 radio(s) using the DS-101 interface.

c. The Navy Key Management System (NKMS) provides an automated key management system for the distribution and management of encrypted key within and between the commanders in chief (CINCs)/ services IAW EKMS. NKMS is being implemented in two phases.

(1) Phase I distributed LMD installed with Automated Navy COMSEC Reporting System (ANCRS)/COMSEC Automated Reporting System (CARS) software, secure telephone unit III (STU-III) telephones, and AN/CYZ-10 to all account holders. As a part of Phase I, the software at Director Communication Security Material System (DCMS) and COMSEC material issuing office (CMIO) has also been updated.

(2) The EKMS Phase II distributes the key processor (KP), X.400 communications software, and bar code readers and updates the LMDs. Local COMSEC management software (LCMS) that allows the LMD to communicate with the KP replaces ANCRS/CARS software. Figure I-6 illustrates the major functional components of NKMS.

15. Marine Corps Equipment

a. The RBECS FH module and SOI (less call signs) module are applications software within a higher level systems planning engineering and evaluation device (SPEED) system. A third module, frequency assignment, completes the total functionality of SPEED. This module accesses multiple databases to achieve frequency deconfliction and minimize cosite interference. SPEED resides on the Fleet Marine Force end user computing equipment (FMF EUCE), AN/ UYK-83/85, and lightweight computer units at the Marine expeditionary force (MEF) and major subordinate command (MSC) levels. The Marine Corps uses the AN/CYZ-10 DTD for both COMSEC and TSK fills at all levels. SPEED produces the following two SINCGARS-related products:

(1) Classified, paper printout containing unit identification, frequencies, and call signs.

(2) FH parameters for down loading via the DOS "*shell*" into a DTD.

b. In the future, the Navy Key Distribution System (NKDS) will provide the call sign variable as well as TSK and COMSEC keys to support the SINCGARS program for the Marine Corps. The NKDS LMD loads COMSEC and TSK into the SPEED (AN/UYK-85, lightweight computer unit). NSA provides both keys, but the COMSEC custodian controls them.

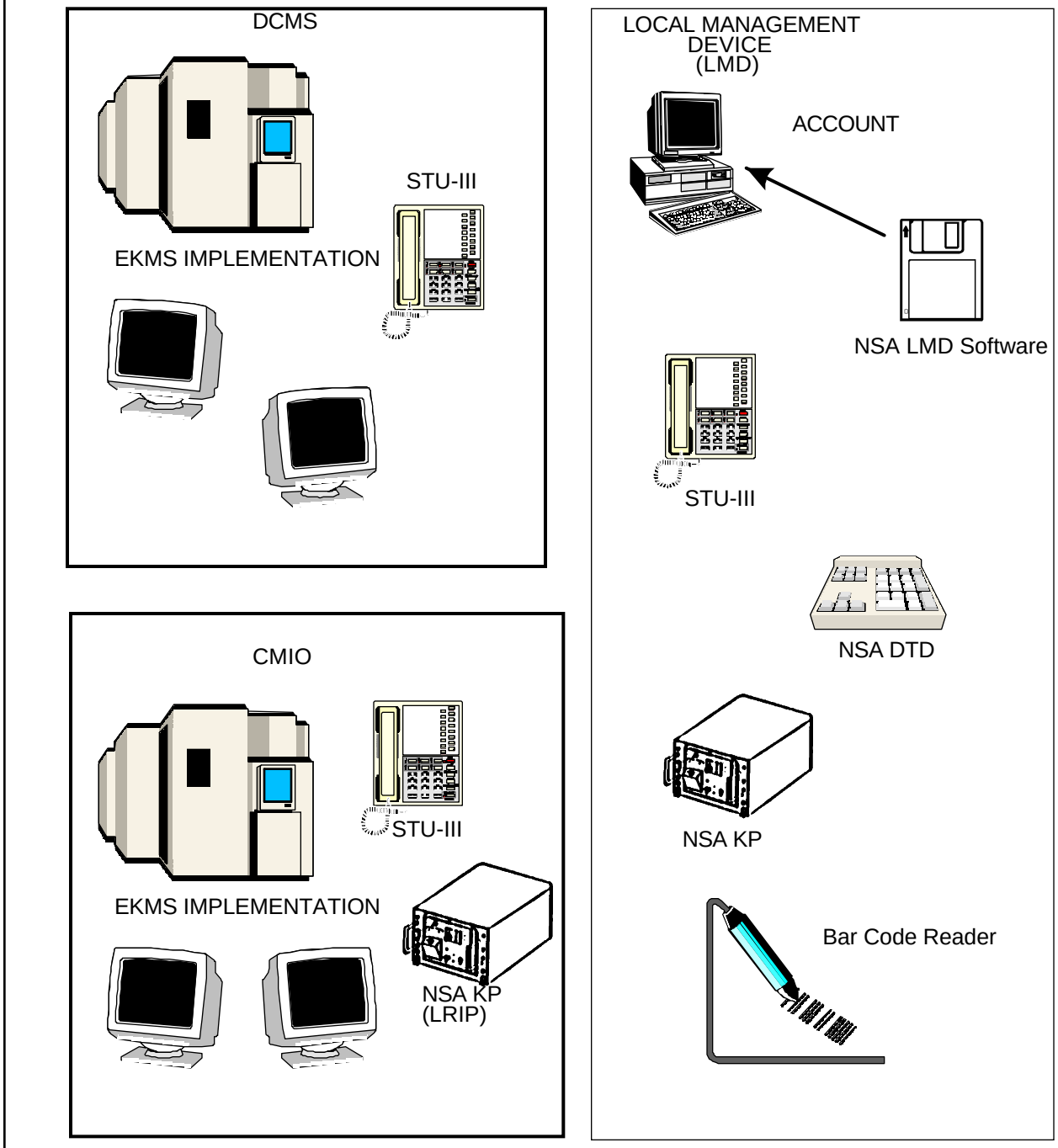

Figure I-6. NKMS Functional Components

Chapter II

MULTISERVICE OPERATIONAL PROCEDURES

1. Background

Achieving effective communications among all users of SINCGARS-compatible radios on the modern battlefield requires detailed planning and coordination at multiple echelons within a JTF. This chapter identifies joint force, service, and key personnel and describes their respective functions and responsibilities with respect to SINCGARS operation.

Section A: Responsibilities

2. Joint Chiefs of Staff (JCS)

The JCS provide 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 (MCEB).

3. Joint Force Commander (JFC)

The JFC is responsible for all facets of communications in the area of operations. The JFC delegates the authority for communications coordination to the communications or signal special staff office. Multiservice coordination maintains interoperability, establishes total force requirements, and reconciles the unique needs of each service.

4. J-6

a. The JFC's J-6 is a functionally organized staff that controls and coordinates joint signal services for all elements in the joint operation or exercise. This staff may be organized at lower levels, as required. Normally the J-6 is responsible for the following when a joint force is using SINCGARS-compatible radios:

(1) Designating and distributing joint net FH data variables.

(2) Publishing standing operating procedures (SOPs) for communications.

(3) Providing frequency management.

(4) Coordinating with host government for frequencies.

(5) Controlling COMSEC assignment and use.

(6) Establishing and assigning net ID numbers for joint nets.

b. The J-6 should publish procedures for the actions listed below in either the operation plans (OPLANs) and operation orders (OPORDs) or in a SOP:

(1) Operating in SC and FH modes.

(2) Using hopsets.

(3) Assigning and using TSK.

(4) Determining applicable dates for net configurations.

(5) Assigning of ID numbers for joint nets.

(6) Establishing common network time.

(7) Developing key management plans.

(8) Developing emergency destruction plans.

c. In joint operations, all services will use SINCGARS-compatible radio equipment in the same tactical operating areas. Frequency management must occur at the highest multiservice command level. For effective operations, a communications coordination committee should be composed

of assigned J-6 personnel and necessary augmentation personnel. The communications coordination committee should include—

(1) The COMSEC custodian and/or CEOI manager from the appropriate staff section.

(2) The special plans officer from the plans section.

(3) The host-country frequency coordinator.

(4) Frequency managers from the joint and service frequency management office.

(5) The aviation officer from the Operations Directorate of a joint staff (J-3) office.

d. The communications coordination committee should be identified and available before execution of the operations plan. They must be knowledgeable on service-unique communications requirements and the operation and management of SINCGARS computer-based data management systems (RBECS, AFKDMS, etc.) and fill devices.

e. The communications coordination committee coordinates with the Intelligence Directorate of a joint staff (J-2) and the J-3 section for planning electronic warfare (EW). The J-3 establishes the joint commander's electronic warfare staff (JCEWS) for planning EW operations. JCEWS normally consists of the J-2, J-3, electronic warfare officer (EWO), J-6, and representatives from component services.

f. The JCEWS coordinates all EW emissions in the joint arena. After coordination, the J-6 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; the JRFL requires continual updates to maximize effectiveness of EW assets and communications systems.

g. Working with host-nation authorities, the communications coordination committee also builds the frequency list for the mission sets. To do so, the committee should use RBECS software to produce a SINCGARS data set complete with COMSEC key and FH data (hopset/lockout, TSK, and net IDs). RBECS software is recommended because it can generate CEOI and SINCGARS fill data and most of the radios will be Army versions. The KDMS will also read the RBECS diskette.

Section B. Planning

5. General

a. Frequency Management. Joint force operations require frequency management at theater levels for interoperability. Combined operations may apply if allies use SINCGARS-compatible radios. Inside the borders, airspace, or territorial waters of foreign countries, US forces have no independent authority to use radio frequencies during peacetime. They are subject to existing international agreements. The US State Department and theater CINCs coordinate these agreements with allied governments. (See Figure II-1.)

b. Frequency Allocations. Frequency allocations are area dependent and net planning must address and implement timely updates to minimize disruptions in the operation when units change their area of operation. This may be accomplished by distribution of new hopsets via ANCD and ERF procedures.

c. Reporting. Components must report their organizational and special communications needs so the J-6 can address all contingencies. The J-6 produces and transfers the CEOI electronically by paper or by data-fill devices to the users.

d. After the J-6 meets multiservice requirements, each service component representative develops a frequency listing for lower echelon distribution. The service components provide these nets and other information (frequencies, call signs, CEOI,

Figure II-1. Two-Way Planning Process

FH data, and COMSEC information) to the J-6 for management and distribution to the joint or service users.

e. The JFC J-6 coordinates with air and ground operations planners at the air operations center (AOC), battlefield coordination element (BCE), or service equivalent to allocate sufficient SINCGARS nets for essential air and ground communications. In addition, dedicated air-ground SINCGARS communication nets are identified for CAS, CSAR, airlift, and other missions that are critically dependent on effective interservice communications. Once identified, the appropriate staff publishes these essential nets in the air tasking order (ATO) and makes them available to aircrews and controlling agencies. For FH operations, assignment of an undistributed TSK makes a net *dedicated*.

f. To support SINCGARS compatibility and interoperability between all tasked mission aircraft and ground elements, air and ground planners must, prior to operations, coordinate with J-6 and component subordinate levels to ensure all combat and combat support elements have the following as an appropriate tasking order listing:

(1) Cue and manual frequencies, net IDs for all SINCGARS-compatible radio nets needed for command and control.

(2) Authentication procedures for accessing all essential SINCGARS-compatible radio nets.

g. In addition to normal staff communications planning, it is important to generate and store in a secure manner sufficient COMSEC keys, FH data, and CEOI information to ensure that these items are readily available to meet contingency requirements. To the extent feasible, such generation should be performed prior to the start of an operation.

6. Equipment

a. Deconfliction. Planning must include provisions to prevent interference between collocated radios operating in the same frequency band. The potential for interference exists in both SC and FH modes. The J-6 planners must consider and assess the cosite interference by other FH systems such as MSE. When planning the CEOI, the J-6 staff must consider the types of radios available in subordinate or allied units, cryptographic equipment, key lists, and frequency allocations available from the host nation for the particular area of operations. Additionally, plans and decisions must comply with applicable International Standardization Agreements (ISAs).

b. Interoperability. Equipment interoperability is a major issue in network planning for VHF systems. The planning must cover FH, if applicable, and SC modes of operations. While many US forces use SINCGARS-compatible radios, the radios of allied nations may not be interoperable with SINCGARS. Therefore, plans should address interfaces between SC and FH radios or lateral placement of interoperable radios in allied command posts. In retransmission mode, SINCGARS radios will automatically provide communications linkage between FH and SC radios or nets.

c. Cryptographic Management. The J-6 should manage the use of cryptographic materials (key lists and devices) to ensure security and interoperability at all levels. US forces may need to augment allied forces with US equipment and personnel for interoperability as appropriate. Prior coordination is essential for mission accomplishment.

7. SINCGARS Loadset Data

a. FH Data. The J-6 is responsible for managing and generating multiservice FH data. Normally, that authority is delegated to service components and subordinate commands. Responsive and flexible FH communications require decentralized control with FH and COMSEC data generated at the lowest possible levels (Figure II-2). However, for CAS, the Army generates and passes data to the Air Force.

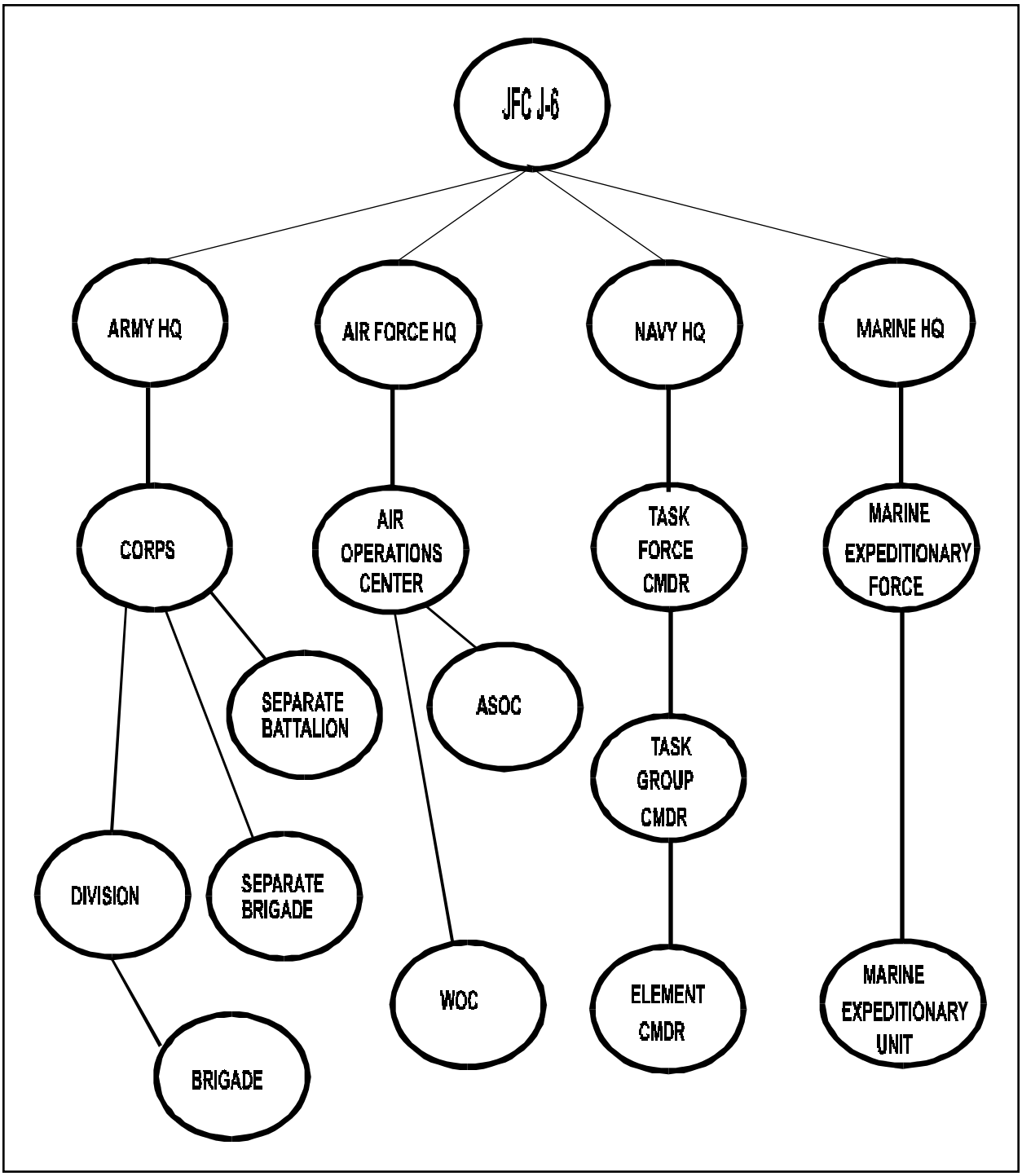

Figure II-2. Echelons Capable of Generating FH Data

(1) Hopsets and Lockouts. Service components will generally assign unique hopsets at the corps or service equivalent level but seldom below the division level. To maximize the effectiveness of CNR FH, hopsets should utilize the largest possible number of frequencies in the SINCGARS frequency range. This FH range and the user frequency requirements determine the generation and assignment of hopsets. Once the frequency manager generates a hopset, the frequency manager then manages SINCGARS radio nets by assigning TSKs and net IDs. If a force changes task

organization or moves across an area in which a hopset is being used, the required hopset should be passed to the moving unit via the most expedient means available (e.g., ANCD).

(a) The larger the number of frequencies and wider the distribution across the SINCGARS frequency range, the better SINCGARS will perform when FH. The minimum size for an effective hopset is situation-dependent. Hopset performance is a function of many factors to include interference from friendly emitters, other electromagnetic interference, and the enemy's EA capability. Typically hopsets of 1200 or more frequencies, spread across the frequency range, will adequately support both voice and data FH CNR operations in a heavy division. As hopset size decreases, FH performance rapidly degrades. FH data performance is particularly sensitive to hopset size. In addition, as hopset size decreases, frequency spread becomes critical for providing effective FH data. Aggressively scrutinizing frequency restrictions and using the largest possible number of frequencies per hopset ensures the best possible CNR FH performance.

(b) To obtain sufficient numbers of frequencies, J-6 frequency managers will scrutinize and limit the number of restricted frequencies in the SINCGARS frequency range. With an optimum hopset, the limited range of CNR communications, and the SINCGARS FH SPEED, most single-channel users can effectively share frequencies with SINCGARS with no discernible effect. The widest possible application of common hopsets provides ease of operation and frequency management.

(c) Search and rescue (SAR), CSAR, CAS, joint air attack team (JAAT), joint suppression of enemy air defenses (J-SEAD) missions, and mobile FH nets require special consideration in planning by J-6s. Detailed prior planning is essential to ensure the units have correct FH and COMSEC data needed to communicate with local forces. In addition, mobile forces conducting operations over large geographic areas require one or more hopsets that incorporate all of the frequency restrictions imposed across the entire area of operations.

(d) The SINCGARS radio is capable of storing an unique hopset, as well as all other FH and COMSEC data, in each channel preset. In developing hopsets for SINCGARS equipped units operating near urban areas or in foreign countries, particularly in peacetime, frequency managers may encounter numerous frequency restrictions in the SINCGARS frequency range. To obtain an acceptably large enough hopset may require the use of discrete frequencies, or groups of frequencies, found between various restricted frequencies across the frequency range. To define such a hopset requires lengthy electronic instructions for the radio. The RBECS operator minimizes the number of the instructions required for radio operation.

(2) TSK and Net ID. When more than one unit shares a common hopset (e.g., corps, theater, or task force), the J-6 will assign TSKs and allocate net IDs. When the number of FH nets exceeds the number of available net IDs (normally all 1000 per TSK), the J-6 will assign additional TSKs. Any echelon generating unique TSKs will usually assign net ID. Net IDs have no effective period and need not change unless otherwise required. Operational TSKs have an effective period of 30 days. (See Table II-1.)

(3) Sync Time. SINCGARS radios operate on precise ZULU time (2-digit Julian date and hours: minutes: seconds [+/- 4 seconds]). Sync time is a variable only in the sense that time passes and Julian dates change. Using ZULU time provides the commander ease of FH net opening, late net entry, and commander's monitoring. Use of ZULU time in conjunction with a common hopset, TSK, and TEK enables operators to readily enter different nets by simply changing the net ID using the radio's front panel keypad.

(a) Use of GPS. Maintaining accurate time is best accomplished using GPS. All NCSs will update time in

Table II-1. COMSEC/FH Data Distribution within a Corps/Theater

(CORPS) HOPSET I TEK 1 TSK A		
(1st Division)	**(2d Division)**	**(3d Division)**
Hopset I TEK 2 TSK B	Hopset I TEK 3 TSK C	Hopset I TEK 4 TSK D

SINCGARS-compatible radios using GPS time from PLGR or other time sources.

(b) Time Hacks. As required, J-6 will establish a daily theater time hack for SINCGARS NCS system net station time (NST). The hour that J-6 chooses to pass this time hack each day will depend on the needs of all users of SINCGARS-compatible radios. The J-6 must coordinate this time hack with all theater services and echelons of command. An NCS can distribute this time hack using dual SINCGARS-compatible radios if the J-6 approves. The J-6 will establish the procedures for passing time hacks via this SINCGARS "*net NST*" method.

(c) Active Nets. Most tactical procedures require radio checks from the NCS to net members at a minimum of every 24 hours, which is sufficient to maintain accurate radio and net time.

(d) Manual Setting. Radio operators may manually enter time into most SINCGARS-compatible radios using the key pad and the *TIME* key. Operators update sync time by contact with their NCS (FH-M function), receipt of an ERF, reloading time using an ANCD or PLGR, or manually changing the sync time in the radio by use of the keypad.

(4) Julian Date. SINCGARS radios require a 2-digit Julian date. For example, 1 July in a nonleap year, day 182, is Julian date 82 for SINCGARS. Operators must base all times and dates on ZULU time. When a normal form of date (e.g., day, month, year) is entered into an ANCD or PLGR, the data is automatically converted to a 2-digit Julian date suitable for SINCGARS use. The only time the Julian date must be changed is 1 January each year.

b. COMSEC Data. All combat net radios, whether SC or FH capable, will operate in the CT mode whenever possible. SINCGARS radios have either integrated COMSEC or can use an external COMSEC device (non-ICOM). The JFC normally designates the CONAUTH for all cryptonet operations, and the J-6 will provide overall staff supervision. COMSEC data include TEK and KEK.

(1) TEK. The normal effective period for the TEK is 30 days; however, the CONAUTH may extend the period under emergency conditions.

(2) KEK. KEKs have an effective period of 90 days. Unit SOPs will describe routine loading of KEKs in all radios or the storing of the KEK in a fill device until needed. An advantage of storing the KEK, rather than keeping it loaded in the radio, is six rather than five channels are available for operational use.

c. Keying Material Compromise. When substantial evidence exists of a compromise of COMSEC keying material for SINCGARS 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 uncompromised key can be implemented. In addition to the supersession of COMSEC key(s), the CONAUTH will normally supersede compromised TSK(s). CONAUTH will consider the tactical situation, the time needed to distribute

reserve data, and the time required to re-establish communications after supersession.

Section C. SINCGARS Data Distribution

8. General

The J-6 will manage the overall distribution of FH and COMSEC data throughout the area of operations. FH data will be distributed using RBECS loadset format files. COMSEC data will be distributed via service component COMSEC SOPs. FH and COMSEC data are merged in the ANCD and distributed to operators as a loadset. A loadset is a total package of all FH and COMSEC data. The operator needs to place all six channels of an FH radio into operation. Staffs at each echelon must distribute data appropriately packaged for their users, whether routine or under emergency conditions, to ensure critical combat communications are not disrupted. Staffs can distribute the data electronically, physically, or use a combination of both.

9. Physical Distribution

Physical distribution is the most secure means for disseminating FH and COMSEC data. It is the primary distribution method for ground units at lower echelons. Units equipped with the ANCD can readily distribute loadsets in a single transaction from ANCD to ANCD and subsequently load their radios in one transaction. Units not equipped with the ANCD require a combination of devices in several transactions to distribute the loadset (Table II-2). Besides the ANCD, other distribution and fill devices include—

a. MX-18290, FH fill devices (FH data only).

b. KYK-13, common fill device (COMSEC data only).

c. MX-10579 (non-ICOM only).

d. Any GPS receiver (including AN/PSN-11 PLGR [precise ZULU time only)].

10. Electronic Distribution

There are a number of techniques available to electronically disseminate COMSEC and FH data to widely-dispersed forces. Distribute COMSEC data only by using NSA-approved methods, including the KG-84A/C, OTAR, and STU-III telephone. Electronic distribution methods for FH data include ERF and electronic file transfer. Communications paths for electronic file transfer include telephone modem, local network area (LAN) or wide area network (WAN), satellite communications (SATCOM), etc. When using OTAR, there is an inherent risk of losing communications with stations that are not active on the net at the time, or for whatever reason they fail to receive the OTAR.

11. Distribution within the JTF

a. Responsibilities. In joint force operations, the J-6 has responsibility for generating or importing the joint CEOI/SOI, COMSEC keys, and FH data. The J-6 distributes this data directly to the component communications staffs (Figure II-3). If appropriate, the J-6 can delegate the

Table II-2. Summary of Transfer Methods

FH DATA						COMSEC		SOI
TYPE OF FILL DATA	NET ID	SYNC TIME	LOCK OUT	HOP SET	TSK	TEK	KEK	SOI
Physical	Yes	Yes*	Yes	Yes	Yes	Yes	Yes	Yes
Broadcast**	Yes	Yes	Yes	Yes	Yes			
ERF	Yes	Yes	Yes	Yes	Yes			Yes
OTAR**						Yes		

*** RT-1523A and RT-1523B only.**
****AN/ARC-222 does not have these capabilities.**

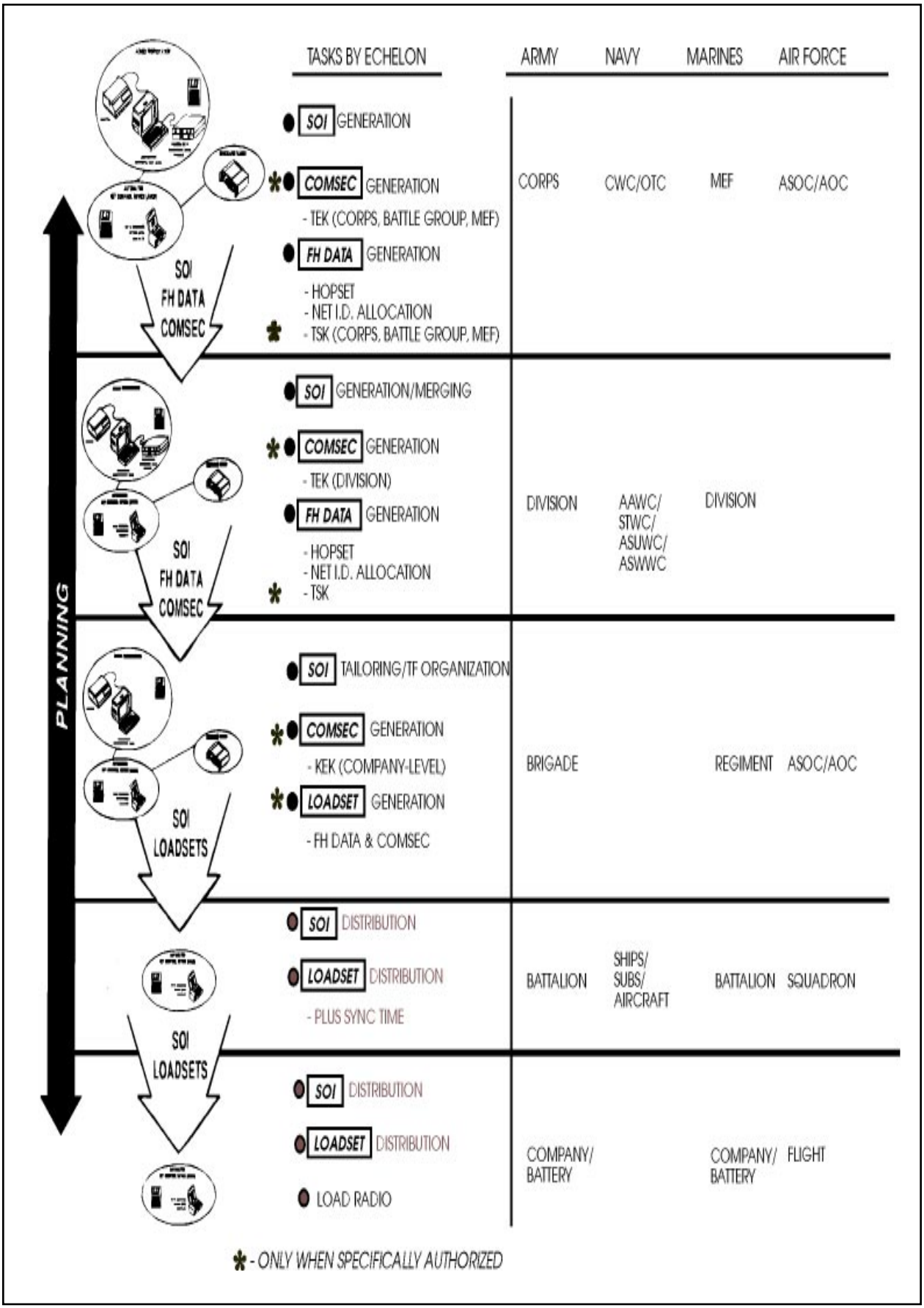

Figure II-3. Tasks By Echelons In Joint Operations

generation and distribution of FH and COMSEC data to the service components.

b. Liaison. The J-6 staff is responsible for providing the joint frequencies, SINCGARS FH data, and other CEOI to the service liaison personnel. Liaison personnel include ground liaison officers at air units, air liaison officers to ground units, BCE, air/naval gunfire liaison company (ANGLICO) teams, etc. These individuals and agencies are important links to the service or headquarters they support. Upon receiving the FH and COMSEC data from their service or functional component, liaison personnel can then distribute the data to the unit they support.

c. Intratheater COMSEC Package (ICP). ICPs are prepackaged COMSEC material, normally held by the warfighting CINCs, that are used to support JTF operations. They are theater-specific for a wide range of standing OPLANs and contingency plans. Preplanned SINCGARS FH data should be generated and included with the COMSEC material in the ICPs to result in complete, prepackaged, FH nets.

12. Distribution within Services/ Components

a. Army Forces (ARFOR). The Army component CONAUTH receives and disseminates the FH 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. (See Figure II-4 and Figure II-5.)

(1) Corps. The corps communications staff may generate and disseminate the data or may delegate those responsibilities to subordinate divisions. Specifically, the corps communications staff can generate—

(a) SOI data.

(b) COMSEC data; the corps' TEK.

(c) FH data; corps-wide hopset, net ID, corps' TSK.

(2) Division. The division will either use the data the corps generates or if authorized generate its own FH and COMSEC data. The division has the equipment and capability to—

(a) Generate and merge SOI data.

(b) Generate COMSEC data (division TEKs).

(c) Generate FH data (net IDs and division TSKs).

Generation of SOI, TEKs, TSKs, and net ID assignments normally does not occur below division/separate brigade level. Exceptionally, when authorized to do so, brigade and separate battalion LCU operators may generate TEKs to meet emergency requirements. When TEKs are generated at a lower echelon, they are forwarded through higher headquarters to the joint force land component commander (JFLCC) CONAUTH for consolidation.

(3) Brigade. The brigade receives SOI, FH, and COMSEC data from the division. The brigade is primarily responsible for SOI data and preparation of loadsets. Specifically, the brigade tailors the SOI for TACFIRE organization, generates company-level KEKs, and develops loadsets.

(4) Battalion. The battalion and its subordinate units are recipients and users of generated data. Their responsibilities are limited to distributing SOI data, distributing loadsets, to include ZULU time, and loading radios with data.

(5) Most echelons can distribute FH and COMSEC data using physical or electronic means. Time, distance, security, and urgency dictate the most appropriate means of distributing data.

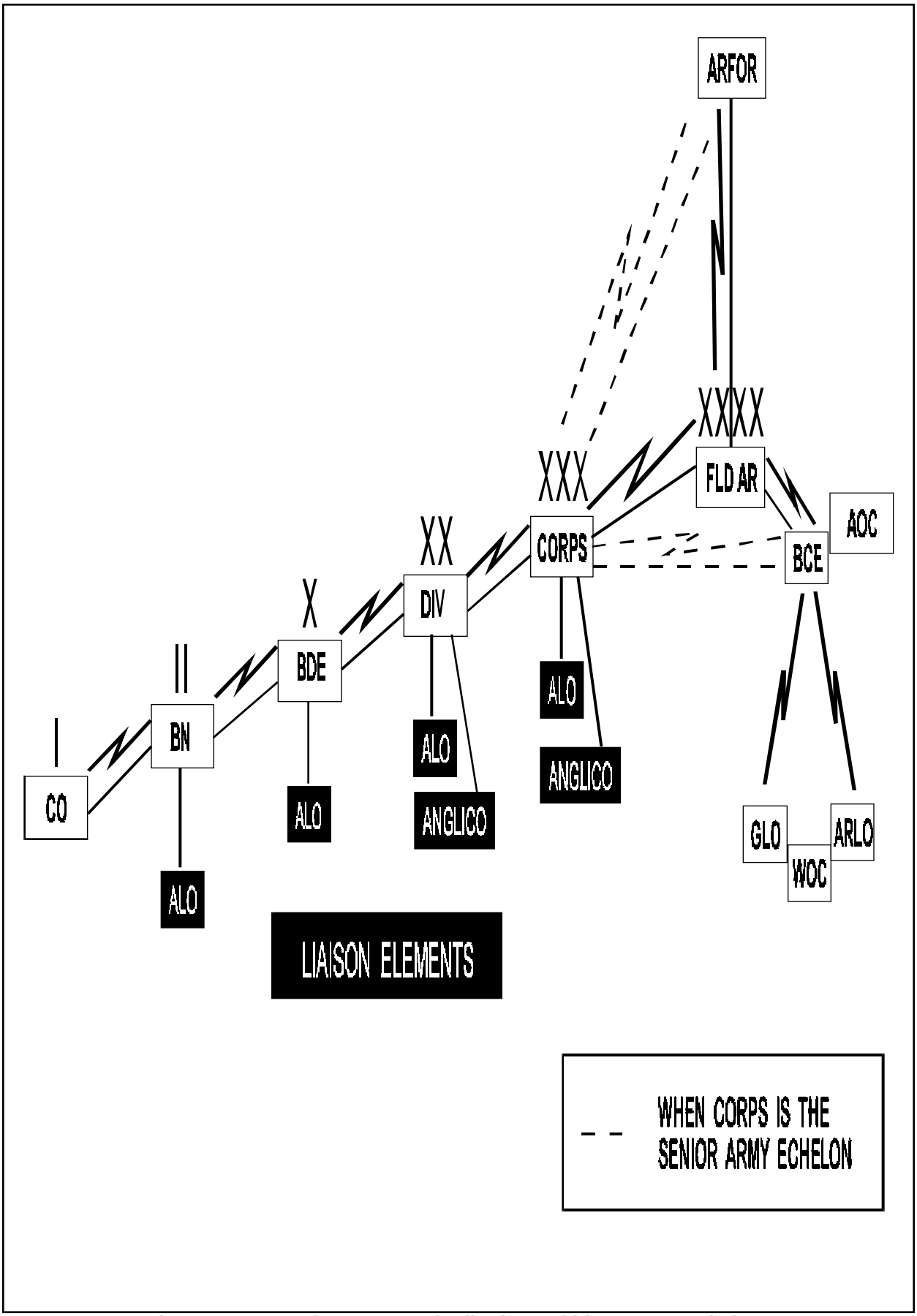

Figure II-4. Loadset Data Distribution within Army Echelons

(6) Army Contingency Planning. When Army component staffs are energized to a possible contingency, planning and operations preparation will start simultaneously. Once the task organization is identified, commanders will fine tune and determine the specific elements needed. Concurrently, J-6 frequency managers coordinate with higher level frequency managers to obtain usable frequencies. Mission specific TSKs will be generated and disseminated through RBECS managers to the supporting forces. A separate message will indicate specific TSK usage. During this time, COMSEC custodians coordinate COMSEC key needs and produce a *"COMSEC callout message"* identifying specific keys for joint, ARFOR, corps, or division use. As specific net requirements are identified by the ARFOR subordinate units, a master net list is compiled. Upon receipt of approved frequencies from J-6, the ARFOR component signal staff officer (G-6) will generate SOIs for use by Army forces. In support of joint operations, Army RBECS managers pass a list of specific units and nets to the J-6. Once the J-6 provides FH data to the G-6, the G-6 will disseminate to subordinate commands and each level will prepare loadsets. Files can be transferred back to the next higher level at this point for archives. Finalization will be effected upon receipt of the COMSEC callout message and receipt of specific TSK use message. Prepared SOIs may be passed to subordinate units by secure electronic or physical means.

b. Air Force Forces (AFFOR) (see Figure II-6).

(1) AOC. The AOC is the operations control agency for the AFFOR. As such, the AOC will provide overall management of SINCGARS net data for the Air Force components using AFKDMS. In this capacity, the AOC—

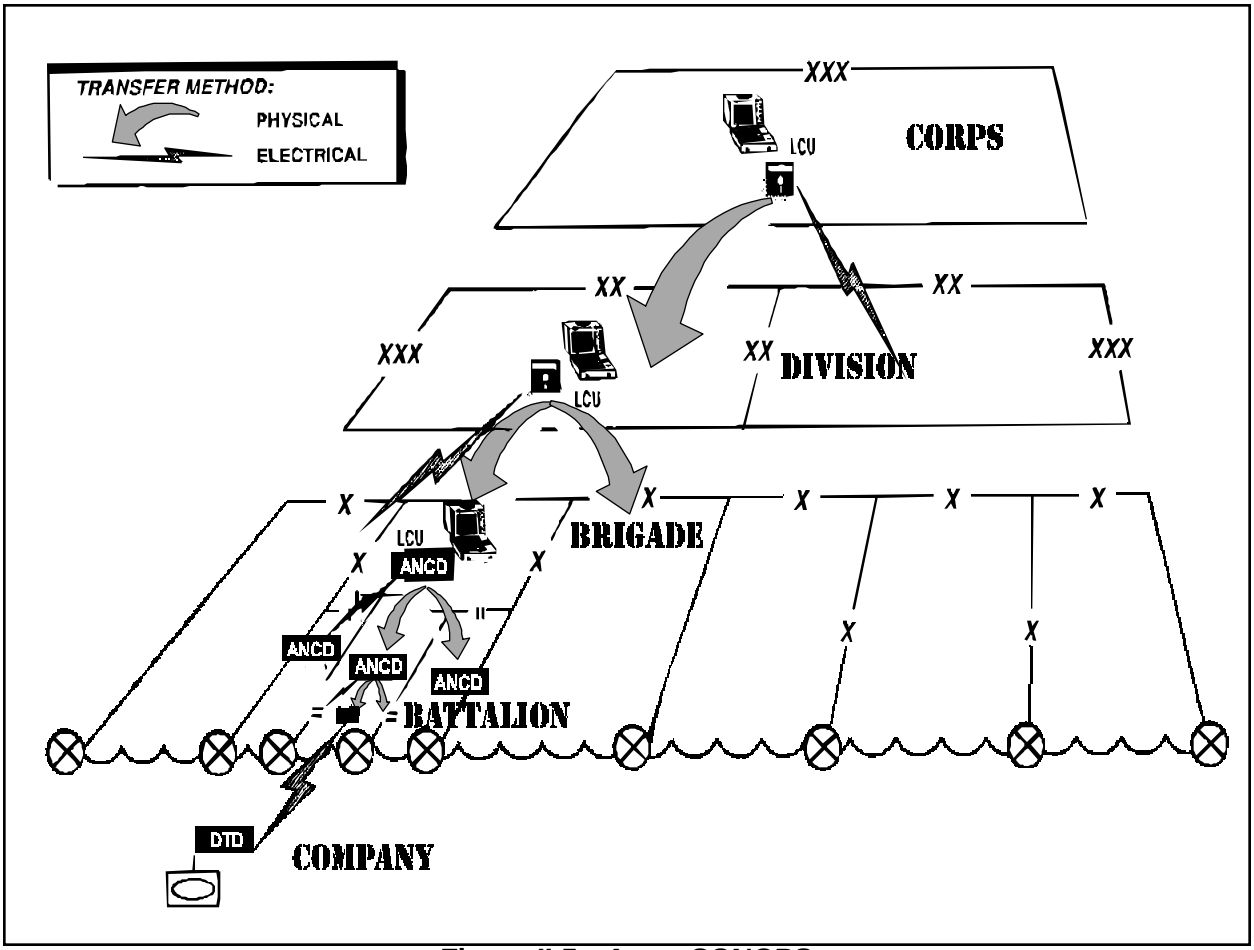

Figure II-5. Army CONOPS

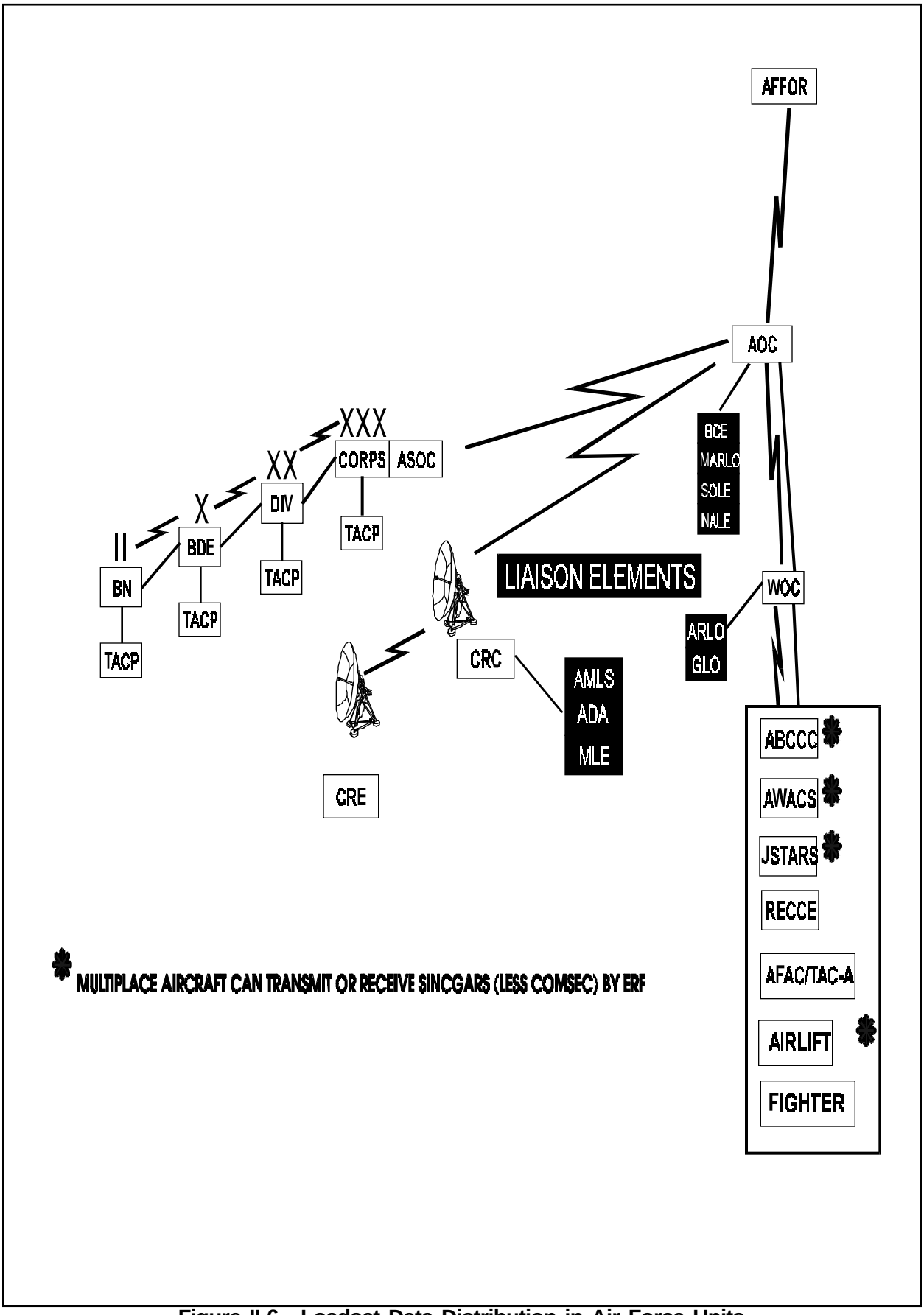

Figure II-6. Loadset Data Distribution in Air Force Units

(a) Provides the JFLCC communications staff with the total USAF SINCGARS net requirements (CAS, CSAR, J-SEAD, etc.).

(b) Receives initial CEOI/SOI, including the SINCGARS FH and associated COMSEC data, from the JFLCC and distributes to USAF users.

(c) Receives from the corps follow-on CEOI/SOI. On a scheduled periodic basis, the air support operations center (ASOC) will receive the follow-on CEOI/SOI editions directly from the corps via 3.5 inch diskettes. The ASOC will electronically transmit the SINCGARS data to the AOC via the AFKDMS, theater deployable communications, and tactical secure data communications systems.

(d) Provides guidance to USAF SINCGARS users regarding loading and employment of SINCGARS nets.

The AOC, in conjunction with generating the ATO, will identify the particular SINCGARS net data, TSKs, and COMSEC key identifiers, call signs, and call words for the specific CAS mission taskings. In addition, the SINCGARS data required by the CRC and CRE will be identified. The Contingency Theater Automated Planning System (CTAPS) running the AFKDMS will be used to manage the SINCGARS fill data identification requirements. The actual SINCGARS FH data and communications identifiers will be transferred to the wing operations center (WOC) via the wing command and control system (WCCS).

(2) CRC. The CRC will develop and distribute load sets for CRC and CRE SINCGARS assets.

(3) ASOC. The ASOC is the corps' focal point for execution of air support missions in support of US Army ground forces. In this capacity, the ASOC—

(a) Coordinates Air Force agreements with the Army for AN/CYZ-10s and SINCGARS data for all TACP SINCGARS radio assets. Currently, the Army has agreed to provide the RDS for installation on the TACP DTDs. Also there is agreement that the Army TACP support unit will provide the SINCGARS CEOI/SOI.

(b) Ensures SINCGARS net requirements for immediate CAS are correctly specified. Immediate CAS will be conducted on a uniquely-specified standing net.

(4) WOC. The WOC executes the ATO as published by the AOC. Operations personnel of tasked units configure mission sets from the SINCGARS data and the linking SINCGARS identifiers contained in the ATO (to be determined) to support the specified mission. The WOC specifically—

(a) Develops procedures for integrating the construction of mission sets into the wing mission planning process using the WCCS and the AFKDMS.

(b) Develops and implements a SINCGARS standard loading scheme.

(c) Develops and implements procedures for transfer of loadsets to the KDS (DTD) at the squadron/unit level and for subsequent loading of SINCGARS radios in specific aircraft assigned to the mission.

(5) Special Tasking Operations. Premission planning requirements for small scale contingency unilateral and interservice operations demand the operational commander provide all SINCGARS and COMSEC fill data or identifiers for Air Force assets before deployment. Physical and electronic distribution of the SINCGARS and COMSEC communications packages will be accomplished as early as possible using the best means available for the particular situation (i.e., STU-III, SATCOM, or ICP).

The employment of ERF for airborne units will only be used as a last alternative.

c. Navy Forces (NAVFOR). Distribution of FH and COMSEC data within NAVFOR is dependent on the task organization. The initial implementation of SINCGARS in the Navy is primarily intended to support amphibious warfare operations. In an amphibious battle group scenario, the communications staff of the commander, amphibious task force (CATF) will act as the deconfliction point for FH and COMSEC data received from the Marine air-ground task force (MAGTF), elements of the amphibious task force, and the composite warfare commander and carrier battle group (CVBG) commander. Figure II-7 illustrates the bottom-up flow of data to the deconfliction point and the top-down dissemination of deconflicted data to every SINCGARS equipped element involved in the operation. In a conventional CVBG scenario, the composite warfare commander (CWC)/officer in tactical command (OTC) communications' staff will act as the deconfliction point for FH and COMSEC data.

(1) The Navy component CONAUTH receives and disseminates the FH and COMSEC data to subordinate echelons. Depending on the situation, the CONAUTH may be at the CWC/OTC, or the warfare commander level. Most often, the CONAUTH will be at the CWC level.

(2) CWC/OTC. The CWC/OTC communications staff may generate and disseminate the data or may delegate those responsibilities to subordinate warfare commanders. Specifically, the CWC/OTC communications staff can generate—

(a) SOI data.

(b) COMSEC data; battle group TEK.

(c) FH data; battle group hop-set, net ID, battle groupTSK.

(3) Warfare Commanders. Warfare commanders will either use the data the CWC/OTC generates or, if authorized, generate its own FH and COMSEC data. The warfare commander has the equipment and capability to—

(a) Generate and merge SOI data.

(b) Generate COMSEC data; battle group TEKs.

(c) Generate FH data; net ID, battle group TSKs.

(4) Generation of SOI, TEKs, TSKs, and net ID assignments does not occur below the warfare commander level. When the warfare commander generates the data, it is forwarded to the CWC/OTC and/or CATF/NAVFOR for consolidation and deconfliction.

d. Marine Corps Forces (MARFOR). The Marine Corps will also use RBECS software and the AN/CSZ-9 RDG to generate, distribute, and store FH data and CEOI information. This capability will be maintained down to the regimental/group level and at the Marine expeditionary unit (MEU) command element. RBECS is loaded on all SPEED terminals, and when authorized, can be installed on any MS-DOS-based PC, 80386 or higher, with a minimum of 512K RAM. After Phase II of the NKMS is implemented, RBECS will be installed on the UNIX-based LMD. NSA will continued to generate and distribute all hard copy TEK materials until NKMS is fully operational. The AN/CSZ-9 RDG will perform all FH and CEOI data generation until the NKMS key processor is fully fielded. The Marine Corps will use the AN/CYZ-10 DTD to transfer, store, and fill both SINCGARS TEK and FH data at all levels. The AN/CYZ-10 will utilize one of two software programs, RDS to fill the RT-1523 or the CSEP to fill AN/ARC-210. Marine aircraft groups using the AN/ARC-210 radio will be required to convert RBECS loadset files into CSEP/ARC-210 data

utilizing the AFP software (AFP also allows the entry of Have Quick and single-channel data for the ARC-210). AFP software has the same hardware requirements as RBECS. (See Figure II-8.)

(1) Ashore

(a) MARFOR will receive joint FH and COMSEC data from the JTF J-6 and provide the MAGTF command element (CE) with required frequency resources.

(b) The MAGTF CE will generate MAGTF FH data, publish COMSEC data, and allocate net IDs for all MSCs and supporting units.

(c) The ground control element (GCE) will receive all joint and MAGTF FH data from the MAGTF CE. The GCE is capable of loadset generation down to the regimental level, only when directed.

(d) The aviation combat element (ACE) will receive all joint and MAGTF FH data from the MAGTF CE. It will provide loadset files for conversion for ARC-210. The ACE is capable of loadset generation down to the group level, only when directed.

(e) The MAGTF combat service support element (CSSE) will receive all joint and MAGTF FH data from the MAGTF CE. The CSSE is capable of loadset generation at the CSSE headquarters, only when directed.

(2) Afloat

(a) NAVFOR will provide the MAGTF CE with required frequency resources and joint FH data.

(b) The MAGTF CE will generate MAGTF FH data, publish COMSEC data, and allocate net IDs for all MSCs and supporting units.

(c) The GCE will receive all joint and MAGTF FH data from the MAGTF CE. The GCE is capable of loadset generation down to the regimental level, only when directed.

(d) The ACE will receive all joint and MAGTF FH data from the MAGTF CE. It will provide loadset files for ARC-210 users. The ACE is capable of loadset generation down to the group level, only when directed.

(e) The CSSE will receive all joint and MAGTF FH data from the MAGTF CE. The CSSE is capable of loadset generation at the CSSE headquarters if directed.

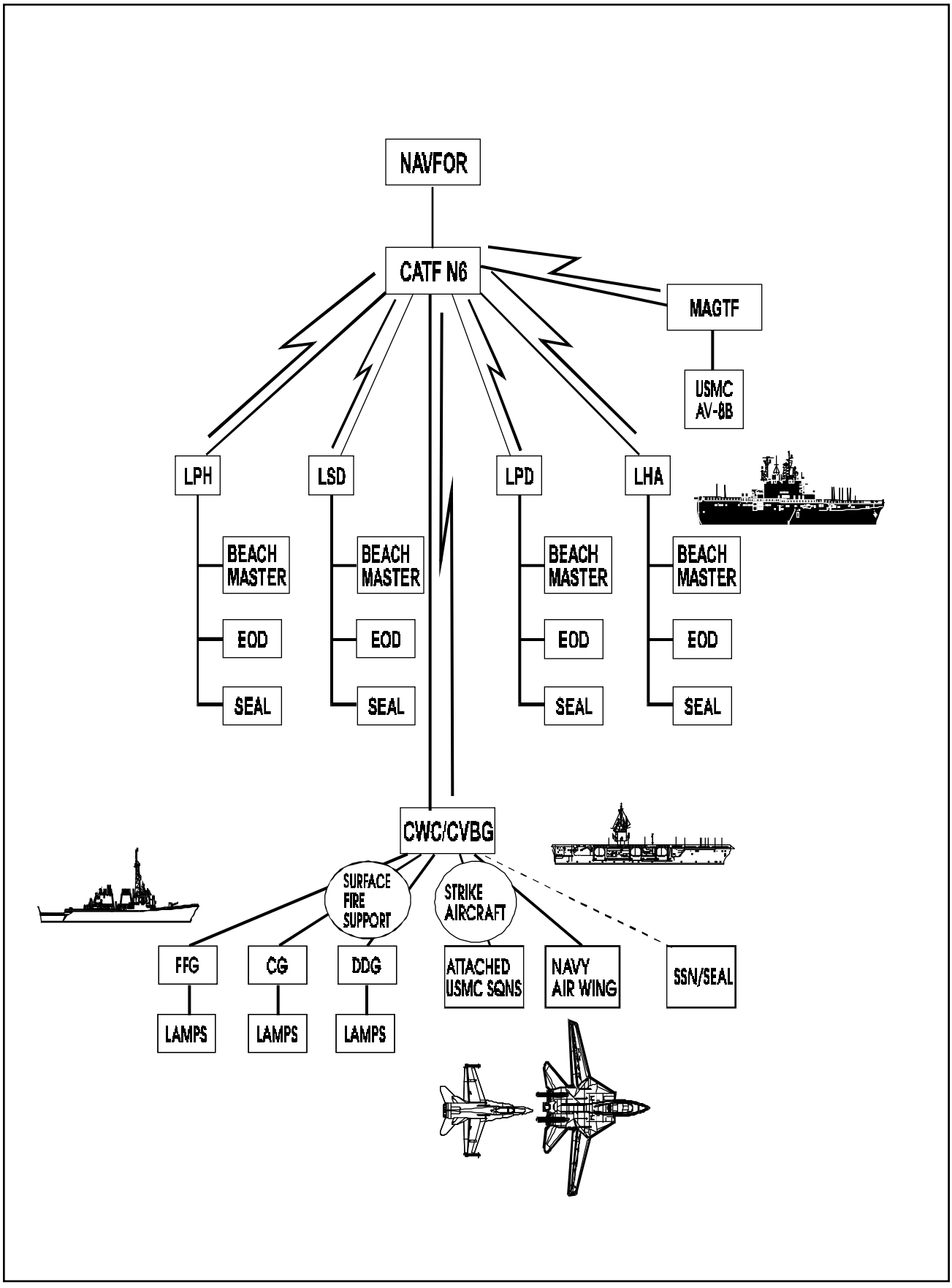

Figure II-7. Navy Conops

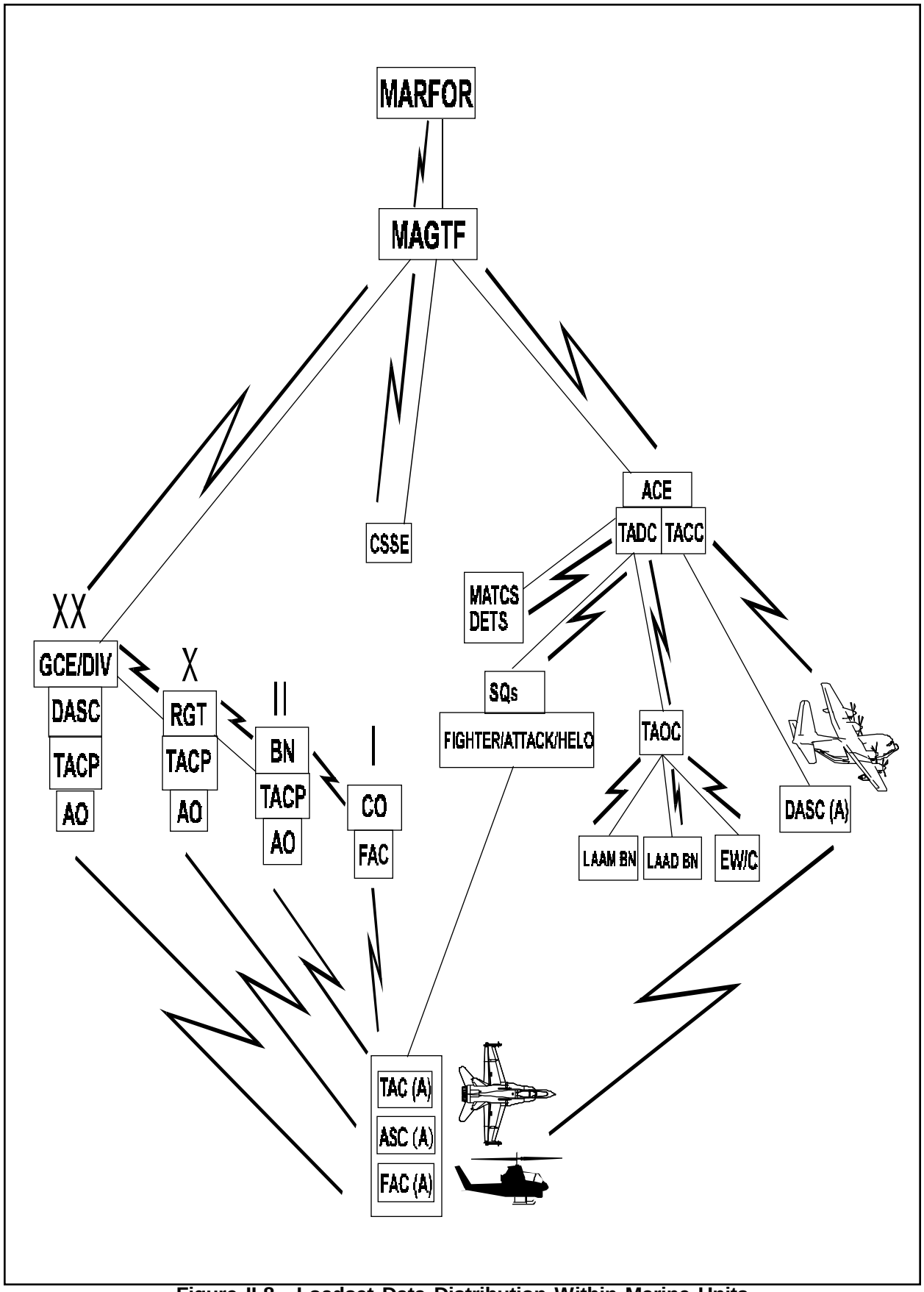

Figure II-8. Loadset Data Distribution Within Marine Units

Appendix A

SERVICE-UNIQUE SINCGARS CHARACTERISTICS AND SUPPORT EQUIPMENT

Table A-1. Army

Description	**Ground, Vehicular, and Manpack**
Vehicular, short range	Nomenclature
Vehicular, short range, dismountable	AN/VRC-87(V)
Vehicular, long/short range	AN/VRC-88(V)
Vehicular, long range	AN/VRC-89(V)
Vehicular, long/short range, dismountable	AN/VRC-90(V)
Dual vehicular, long range	AN/VRC-91(V)
Manpack	AN/VRC-92(V)
	AN/PRC-119(V)

Mission Areas:
Combat, combat support, combat service support

Service-unique Characteristics:
• 6 FH presets; 8 SC presets • TRANSEC key (1 active, 1 backup in non-ICOM; 6 active ICOM) • ECCM variable load (sequential, semiautomatic) • Multiple digital data rates • Whisper mode option • Transmit power selection options •• 500 microwatts/160 milliwatts/4 watts/50 watts • Battery life status indicator

Support Equipment:
Lightweight Computer Unit (LCU): • Microcomputer software system • Generation and maintenance of CEOI data • Contains ECCM variables for 10 radio presets • Contains other CEOI data (countersigns, pyrotechnics) • Transfers individual ECCM variables to a non-ICOM radio • Transfers all data for presets to an ICOM radio

Table A-1. Army (continued)

Airborne	
Nomenclature	Description
AN/ARC-201(V)	Airborne SINCGARS radio

Mission Area:
Air/ground communications for all Army fixed- and rotary-wing aircraft

Service-unique Characteristics:
(See characteristics of Army SINCGARS ground radios) • Transmit power selection options •• 2.5 watts / 10 watts / 40 watts • Hardened against electromagnetic pulse (EMP) • Built-in homing (amplitude) • Single-channel (SC) scanning

Support Equipment
• LCU, ANCD, and remote control head (RCH-11466/ARC-201(V) for RT-1477

Note: 1. There is no auxiliary receiver to replace the AN/VRC-12 family's R-442 receiver. An additional SINCGARS RT-1439(P)VRC or RT-1523(P)VRC must be used for this function.

2. The airborne data rate adapter, CV-3885/ARC-201(V), is compatible with TACFIRE digital message device and the airborne target handoff system and will process 600 or 1200 BPS frequency shift key (FSK) data.

Table A-2. Air Force

ARC-222 (Air Force Airborne SINCGARS Radio)	
Nomenclature	Description
AN/ARC-222	Radio set Remote mount receiver/transmitter Remote control set airborne terminal

Mission Areas:
• Close air support (CAS) • Joint air attack team (JAAT) • Airlift • Counter Air • Combat search and rescue (CSAR) • Special operations • Air traffic control

Support Equipment
• Air Force Key Data Management System (AFKDMS) •• Microcomputer software system (MS-DOS/high order language [HOL]-Ada) •• Extracts information from Army RBECS •• Adds USAF-unique data •• Builds USAF mission loadsets (frequencies, ECCM data) •• Transfers mission loadsets to fill device or radio
• Data transfer device (DTD) (AN/CYZ-10) •• Handheld fill device •• Contains multiple mission loadsets •• Transfers entire mission loadset to radio •• Interim ECCM fill capability via MX-18290/VRC

Note: The AN/ARC-222 interfaces with OA-8697/ARD automatic direction finding equipment for the AM band and the CM-482/ ARC-186 homing module for the FM band. The radio also interfaces with the AN/PSC-2 digital communications terminal (DCT) at either 16 kbps direct interface or at 1200 bps FSK via the aircraft intercommunications subsystem (intercom). The radio directly interfaces with AIC-10, AIC-18, AIC-25, AIC-6533, and AIC-6533 intercoms.

Automated fill of AN/ARC-222 radios is built around a mission set tailored to the particular weapons system's mission. The Key Data Management System (KDMS) assigns mission sets to aircraft tail numbers allocated to various mission sorties. It stores the status of each radio fill operations by tail number during the radio load and then feeds the data back to the KDMS to complete the loop.

Table A-3. Navy

ARC-210 (Navy Airborne SINCGARS Radio)	
Nomenclature	Description
RT-1556	Single channel transceiver • Have Quick • SINCGARS • Can be used with a remote control unit or a -1553.
C-11896/11897/11898	Remote control unit • Numbers correspond to different panel colors.

Mission Areas:
• Close air support (CAS) • Combat search and rescue (CSAR) • Force projection • Air support for amphibious assaults

Characteristics:
37 Single channel presets: • 25 single frequency • 5 half-duplex for SATCOM operations • 5 half-duplex for SATCOM ops with SATCOM modem • 1 SINCGARS cue channel • 1 SINCGARS cold start channel
25 Anti-Jam presets: • AJ presets can be configured to be Have Quick or SINCGARS
Frequency range: 30.000 to 399.975 MHz +/-5 kHz or +/- 10 kHz offsets; AM and FM capability
Have Quick I and Have Quick II compatibility
SINCGARS JTC3A 9001C capability including ICOM TRANSEC capability (one TRANSEC per SINCGARS preset)

Support Equipment:
MS-DOS PC running the ARC-210 fill program (AFP)
AN/CYZ-10 DTD to fill the ARC-210 via DS-101

Note: ARC-210 interfaces with GPS receivers for receipt of time-of-day.

Table A-3. Navy (continued)

AN/SRC-54 (Navy Shipboard SINCGARS Radio)	
Nomenclature	Description
RT-1730/SRC (modified RT-1523B/VRC-90)	ICOM receiver-transmitter
AM-7238/VRC	50W amplifier
C-11561(C)/U	Securable remote control unit (SCRU)(Note 1)
MX-11586/SRC-54	SINCGARS ship interface unit (SIU) (Note 2)

Mission Areas:
Ship-to-ship and ship-to-shore (with and without airborne relay) tactical VHF communications for: • Naval surface fire support (NSFS) • Naval amphibious operations

Characteristics:
Basic AN/VRC-90(C) (V)/U capabilities, plus: • Single channel (SC) encryption via external crypto • Single channel AJ (FH) encryption via internal COMSEC (ICOM) • Up to 16 kbps data transmissions; interoperable with USMC AN/PSC-2A DCTs ashore • OTH operation to 50+ nautical miles via helicopter-borne relay (AN/ARQ-53) • Radio integrated into shipboard communications and control systems via Navy-developed interface unit (MX-11586/SRC-54) NOTE: Shipboard SINCGARS (AN/SRC-54) systems will replace AN/VRC-12-based VHF systems in all NSFS and amphibious ships. A similar capability will be incorporated in ships under new construction.

Support Equipment:
• AN/CYZ-10 Data transfer device (ECCM & COMSEC fill)
• Navy Key Distribution System (NKDS)
• Digital Communications Interface Terminal (data input to RT for interoperability with USMC AN/PSC-2 DC
• TSEC/KY-58 External crypto for use in single-channel (SC) operations; RT will employ ICOM for AJ (FH) operation

Notes: 1. C-11561(C)/U will provide control, operation, data input port from a remote location, for AJ (FH) operation.

2. SIU provides interface to ship's SA-2112(V) single audio system (SAS), AN/SSQ-82 multiple unit for transmission elimination (MUTE), and AN/SSQ-33B (MIL-STD-1553B Data Bus).

Table A-3. Navy (continued)

AN/ARQ-53 (Navy Shipboard SINCGARS Airborne Relay)	
Nomenclature	Description
RT-1476/ARC-201	Non-ICOM receiver-transmitter
AM-7189/ARC	50W amplifier
CN-1679/ARQ-53	Interference cancellation system

Mission Areas:

OTH 2-channel airborne relay for VHF tactical communication support of:

- Naval surface fire support (NSFS)
- Naval amphibious operations

Characteristics:

Basic AN/ARC-201A and AN/VRC-90A, plus:

- 2-Channel, automatic retransmission of
  - SC
  - FH
  - Mixed SC/FH

- Accommodates full-band hopsets with 1 percent bit-error-rate data transmissions to/from ships and shore (USMC) units

- Fully interoperable with all services' SINCGARS units

- Quick-on/quick-off mounting on CH-46 and UH-1 helicopters, using own provided antennas and platform power

- Transported/deployed from LHA and LHD vessels for employment on helicopters of choice

Support Equipment:

AN/CYZ-10 DTD or MX-18290/VRC for ECCM loading

Table A-4. Marine Corps

Nomenclature	Description
AN/PRC-119	Manpack/tactical ground • Replaces AN/PRC-77
AN/VRC-88A	Vehicle/tactical ground • Replaces AN/GRC-125/-160 series
AN/VRC-89	Vehicle/tactical ground, short range, dismountable • Replaces AN/VRC-12 series
AN/VRC-90	Vehicle/tactical ground, long range/short range
AN/VRC-90	Vehicle/tactical ground, long range
AN/VRC-91	Vehicle/tactical ground, long/short range, dismountable
AN/VRC-92A	Vehicle/tactical ground • Replaces AN/VRC-45/-49
AN/ARC-210	Aircraft/air-to-ground, air-to-air • Replaces AN/ARC-159 and AN/ARC-114

Mission Areas:
• Combat • Combat support • Close air support (CAS) • Counter-air

Support Equipment:
End user computing equipment (EUCE) Data transfer device (DTD)

Appendix B

COMPARISON OF ICOM AND NON-ICOM RADIOS

This Appendix compares and contrasts the functions, capabilities, and switchology of ICOM and non-ICOM SINCGARS radios.

Table B-1. Common Fill Devices Used With SINCGARS

Device	SINCGARS Radio					
	RT-1523	RT-1523A	RT-1523B	RT-1439	ARC-201	ARC-201A
FILL COMSEC (EMBEDDED OR EXTERNAL DEVICE) [KY-57/-58]						
1. AN/CYZ-10	Yes	Yes	Yes	Yes	Yes	Yes
2. KYK-13	Yes	Yes	Yes	Yes	Yes	Yes
3. KYX-15	Yes	Yes	Yes	Yes	Yes	Yes
FILL FH DATA						
1. AN/CYZ-10	Yes	Yes	Yes	Yes	Yes	Yes
2. MX-18290	Yes	Yes	Yes	Yes	Yes	Yes
3. MX-10579	No	No	No	Yes	Yes	No
FILL SYNC TIME						
1. AN/CYZ-10	No	Yes	Yes	No	No	No
2. AN/PSN-11 (PLGR)	No	Yes	Yes	No	No	No
FILL COMSEC/FH (EMBEDDED/EXTERNAL COMSEC) [KY-57/-58]						
AN/CYZ-10	Yes	Yes	Yes	Yes	Yes	Yes
FILL COMSEC/FH DATA/SYNC TIME						
AN/CYZ-10	No	Yes	Yes	No	No	No

Table B-2. SINCGARS Keyboard/Functional Control Switches

FUNCTION SWITCH	RT-1523 (ICOM)	RT-1439 (Non-ICOM)	ARC-201A (ICOM)	ARC-201 (Non-ICOM)
OFF	X	X	X	X
Z-FH	X	N/A	N/A	N/A
Z-A	N/A	X	X	X
REM	X	X	N/A	N/A
RXMT	X	X	X	X
SQ OFF	X	X	X	X
SQ ON	X	X	X	X
LD	X	X	X	X
LD-V	N/A	X	N/A	X
TST	X	X	N/A	N/A
TEST	N/A	N/A	X	X
STW	N/A	X	N/A	N/A
STOW	N/A	N/A	X	X
STBY	X	N/A	N/A	N/A

OFF (RT-1523)	Turns off all power to the RT, including hub. Clears all memory after 5 seconds. Used when RT is taken completely out of action.
OFF (RT-1439/ARC-201)	Turns off primary power to RT, hub remains operational. In OFF, RT draws hub power to maintain memory.
Z-FH (Zero FH), Z-A (Zero All)	When FCTN is set to this position, all FH data is cleared in 5 seconds.
REM (Remote)	Disables RT front panel controls. Used for control monitor (CM) operation with the RT 1523 and RT 1439. Used for remote control unit (RCU) with the RT 1523 only.
RXMT (Retransmit)	Puts RT into retransmit mode of operation.
SQ OFF (Squelch Off)	Puts RT into operation without squelch. Used in SC communications with radios having different squelch systems.
SQ ON (Squelch ON)	Puts RT into operation and for communication with similar radios. Prevents rushing noise in handset, headset or loudspeaker.
LD (Load)	Used for loading SC frequencies, FH data, COMSEC key data and to receive and store electronic remote fill (ERF) of FH data.
LD-V (Load Variable)	Used for loading TRANSEC variable in NON-ICOM radios only.
TST/(TEST)	Performs radio self-test. RT display shows results. When RCU is used with the RT 1523, performs self-test on RCU and RT. RCU display shows results.
STW/(STOW)	Turns off all power to the RT, including hub. Clears all memory after 5 seconds. Used when RT is taken completely out of action.
STBY/(Standby)	Turns off primary power to the RT, hub remains operational to maintain memory.

Table B-3. SINCGARS Mode Switches

MODE SWITCH	RT-1523	RT-1439	ARC-201/A
SC	X	X	X
FH	X	X	X
FH-M	X	X	X
HOM (HOMING)	N/A	N/A	X

SC (Single channel)	Put RT into SC mode.
FH (Frequency hopping)	Puts RT in FH mode.
FH-M (Frequency hopping master)	Puts RT into frequency hopping master mode. This mode is used only by the net control station (NCS) and alternate NCS. If more than one station uses this position net communication may be lost. SINCGARS OPERATORS: DO NOT USE THIS POSITION!
HOM (homing)	Puts the RT in homing mode. In this mode, the RT can receive a homing signal from a ground/airborne station. When set to HOM, the RT is automatically placed in SC mode, the communications antenna is disconnected and the left and right homing antennas are connected. The RT operating frequency is still selected by the PRESET switch. The RT and the homing radio set must be on the same frequency. When a homing signal is received, the homing instruments in the cockpit give the pilot steering, station approach and signal strength information. The RT can be used for SC operation while in HOM.

Table B-4. SINCGARS Channel Switches

Channel Switch (CHAN)	RT-1523	RT-1439	ARC-201/A
1-6	X	X	X
MANUAL (MAN)	X	X	X
CUE	X	X	X

1-6	Positions of the CHAN switch that may be loaded with one or more of the following: SC frequency, FH data, and COMSEC key.
MAN	When loaded with a SC frequency, can be used to communicate in SC and/or to perform Cold Start net opening.
CUE	When loaded with the correct CUE frequency, may be used to contact an FH radio net when you are not an active member of that net. CUE may be used in SC mode to communicate in with other SC nets.

Table B-5. SINCGARS RF Power Switches

RF POWER SWITCH	RT-1523/A/B	RT-1439	ARC-201/A
LO	X	X	N/A
M	X	X	N/A
HI	X	X	N/A
PA	X	X	N/A

LO (low)
M (medium)
HI (high)
PA (power amp)

Table B-6. Voice Transmission Maximum Planning Ranges

TYPE RADIO	RF PWR POSITION	PLANNING RANGES*
MANPACK/ VEHICULAR	LO (low) MED (medium) HI (high)	200 m - 400 m 400 m - 5 km 5 km - 10 km
VEHICULAR ONLY	PA (power amp)	10 km - 40 km

*** Vehicular radios only.**

Table B-7. Data Transmission Maximum Planning Ranges

TYPE RADIO	DATA RATE	RF PWR	PLANNING RANGES*
MANPACK/ VEHICULAR	600 - 4800 bps 16000 bps	HI HI	3 km - 5 km 1 km - 3 km
VEHICULAR ONLY	600 - 2400 bps 4800 bps 16000 bps	PA PA PA	5 km - 25 km 5 km - 22 km 3 km - 10 km

*** Vehicular radios only.**

Note: Planning ranges are based upon line of sight and are average for normal conditions. Ranges depends on location, sighting, weather, and surrounding noise level, among other factors. Use of OE-254 antenna will increase ranges for both voice and data transmissions. Enemy jamming and mutual interference conditions will degrade these ranges. In data transmissions, use of lower data rates will increase range.

Table B-8. Improved Frequency Modulation (IFM) RF Power

IFM RF POWER SWITCH	RT-1523/A/B	RT-1439	ARC-201/A
OFF	N/A	N/A	X
LO	N/A	N/A	X
NORM	N/A	N/A	X
HI	N/A	N/A	X

IFM (Improved Frequency Modulation) RF PWR	This switch is used to remotely control the output power level of the IFM power amplifier. Radio sets that DO NOT have an IFM power amplifier should keep this switch on OFF. Otherwise, RT sidetone is disabled.
OFF	The IFM power amplifier is not used and RF output is 10 watts.
LO (low)	The IFM power amplifier output is 2.5 watts.
NORM (normal)	The IFM power amplifier output is 10 watts.
HI (high)	The IFM power amplifier output is 40 watts.

Table B-9. COMSEC Switch

COMSEC SWITCH	RT-1523/A/B	RT-1439	ARC-201	ARC-201/A
PT	X	N/A	N/A	N/A
CT	X	N/A	N/A	N/A
TD	X	N/A	N/A	N/A
RV	X	N/A	N/A	N/A
Z	X	N/A	N/A	N/A

PT (plain text)	Places RT in plain text (nonsecure) mode.
CT (cipher text)	Places RT in cipher text (secure) mode.
TD (time delay)	Places RT in secure mode and to compensate for delays due to distance between communications links.
RV (receive variable)	Used when receiving remote fill of COMSEC key mark receive variable (MKRV).
Z (zero)	Used to clear COMSEC keys.

Table B-10. SINCGARS Keyboards

KEYBOARD	RT-1523/A/B	RT-1439	ARC-201	ARC-201/A
0-9	X	X	X	X
FREQ	X	X	X	X
ERF	X	N/A	N/A	X
SEND	N/A	X	X	N/A
OFST	X	X	X	X
TIME	X	X	X	X
BATT	X	X	N/A	N/A
CALL	X	X	N/A	N/A
STO	X	X	X	X
LOAD	X	N/A	N/A	X
H-LD	N/A	X	X	N/A
CLR	X	X	X	X
LOUT	X	N/A	N/A	X
L	N/A	X	X	N/A
CHG	X	X	N/A	H/A
SYNC	X	N/A	N/A	X
LE	N/A	X	X	N/A
DATA	X	N/A	N/A	N/A
CMSC	X	N/A	N/A	N/A

0-9	Used to enter numerical data such as SC frequencies, position in which data is to be stored, battery life condition, etc.
FREQ (frequency)	Used to check data in RT. Used to load and clear SC frequencies, offset SC frequencies and used in late net entry procedures.
ERF (electronic) remote fill)	Used by NCS only to transmit (send) ERF to net member RTs.
SEND	Same as above.
OFST (offset)	Used to load and /or check SC offset frequencies. Not used in FH operation.
TIME	Used to load and check RT FH sync time.
BATT (battery)	Used to check/set battery life condition on manpack RT.
CALL	Used to communicate with RCU. With RT FCTN switch set to REM and call button and handset PTT pressed, RCU displays “CALL” and alarm is heard in RCU and RT handsets.
STO (store)	Used for loading data. Transfers data from RT holding into permanent memory (like an enter key on PC keyboard).
LOAD	Used to load data into holding memory and retrieve data from permanent memory. Used with AN/CYZ 10 to load RT.
H-LD (hold-load)	Same as above.
CLR (clear)	Clears data from RT display if an error was made during loading or if data needs to be cleared from RT memory.

Table B-10. SINCGARS Keyboards (continued)

LOUT (lockout)	Used by NCS to load lockouts separately.
L (lockout)	Same as above.
CHG (change)	Used with DATA, OFST, or CMSC buttons to change current information to another available selection.
SYNC (synchronize)	Used for FH passive late net entry procedure.
LE (late entry)	Same as above.
Data	Pressing this button displays the operating data rate. Pressing CHG, when data rate is displayed allows selection of a new data rate or data off. Available data rates are (600, 1200, 2400, 4800, 16000, AD1, TF and OFF).
CMSC (COMSEC)	Pressing this button causes the COMSEC key position associated with the operating channel to be displayed.

Table B-11. SINCGARS Data Switch

DATA SWITCH	RT-1523/A/B	RT-1439	ARC-201	ARC-201/A
75, 150, 300, 600, 1.2, 2.4, 4.8, 16K	N/A	X	N/A	N/A
AD1	N/A	X	N/A	N/A
TF	N/A	X	N/A	N/A
OFF	N/A	X	N/A	N/A

DATA SWITCH	Used to match data rate of RT to external data devices Data rates 75, 150, 300, and 600 are in bits per second (bps). Data rates 1.2, 2.4, 4.8, and 16 K are in kilobits per second (kbps).
OFF	Used for normal voice communication. Should be used when no data equipment is being used.
AD1	Used with TACFIRE when communicating with stations not using a SINCGARS radio. Also used with non-TACFIRE analog data terminals.
TF	Used with TACFIRE when communicating with stations using a SINCGARS radio in SC or FH mode.

Note: For RT-1523A/B, use DATA key plus CHG key to select data rates.

Appendix C

SAMPLE CEOI/SOI (RBECS PRINTOUT)

This Appendix provides an illustration of what a typical CEOI/SOI generated by RBECS looks like on paper. The units described in this sample CEOI/SOI are notional units only.

Joint Call Sign Page

FOR OFFICIAL USE ONLY

NG001 - JTF ITEM NO: 000

UNIT:	TIME PERIODS				
	01	02	03	04	05
JCS	N4K	P5Z	W5M	H0F	P1O
JCS NEACP	O0P	W5U	A8Z	S9D	I6V
SECNAV	B5Y	TWV	MRM	J7M	Q8Z
CNO	M1O	G6T	W7G	O0A	D3H
CINC PRI	XIU	F6A	C1X	E6O	A0X
CINC SEC	X2C	Z9W	V3Q	Q2Z	X3R
CINC TER	P8H	L4I	L4G	A0E	Z6Y
CINC ALT	D1F	O5S	U3V	X4T	E3P
CINC PERS	T5T	E0P	V0J	C7N	M7U
CINC ACF A	F2M	F9E	M7O	N5H	Z7J
CINC ACF B	U9I	D3K	H4R	M5I	X6T
CINC ACF C	D2J	D1Y	W2W	I0R	E5C
CINC ACF D	P9E	V1M	T1I	R8Y	N0W
CINC ABNCP	S8S	D4F	H1A	R5X	N7L
707 (CRAF)	K9X	R7C	K7D	Z9J	C7S
707 (CRAF)	Z9W	S9B	Y5B	T9P	Z0G
727 (CRAF)	R4B	B0R	C0T	O8L	G3F
727 (CRAF)	J8G	I9H	V6L	Z9S	B6E
737 (CRAF)	X3D	E1X	H5K	Z3K	J3A

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Joint Frequency Page

FOR OFFICIAL USE ONLY

WG008 - JTF ITEM NO: 060

		TIME PERIODS: 01	02	03	04	05
CINC 1 CMD UNF						
NETWORK LAJTFC						
ISDB 251U						
UPLINK		225.000	225.000	225.000	225.000	225.000
DOWNLIN		338.975	338.975	338.975	338.975	338.975
CINC 1A CINC CMD						
HF-SSB	1	3.9999	3.9999	3.9999	3.9999	3.9999
	2	28.0000	28.0000	28.0000	28.0000	28.0000
VHF-FM	1 101	46.500	80.000	54.000	46.250	47.500
	M	50.875	53.375	54.750	46.000	52.250
	2 102	68.750	63.250	67.000	63.500	61.750
	M	81.625	67.375	68.125	86.125	84.375
	3 103	32.500	37.750	39.750	36.000	43.000
	M	32.625	36.125	33.750	36.675	32.500
	4 104	73.250	79.750	82.500	74.250	81.500
	M	74.500	71.750	75.500	76.750	79.875
	5 105	48.600	57.000	48.750	45.250	59.500
	M	59.250	46.625	59.750	48.500	59.375
	6 106	32.500	41.000	34.750	42.750	42.500
	M	32.625	36.125	33.750	36.875	35.250
	7 107	38.500	37.750	39.750	30.000	43.000
	M	31.625	36.875	31.250	39.250	32.500
	8 108	57.250	46.750	60.000	54.750	53.750
	M	57.875	49.375	49.625	59.500	59.625

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52ID 52ID_BB UNCLASSIFIED COPY ___ OF ___

NG023 - 1 BDE/52ID EXTRACT TIME PERIOD 01

NET:	CALLWORD	C/S:	ID:	CUE:	MAN:
1 BDE/52 IN	EXCALIBUR	V6W			
1 BDE/52IN CMD	EXCALIBUR	V6W	0401	36.700	51.225
1 BDE/52IN RTS	EXCALIBUR	V6W	0402	59.250	76.350
1 BDE/52IN INT	EXCALIBUR	V6W	0403	41.500	37.325
1 BDE/52IN NRI	EXCALIBUR	V6W	0404	50.550	41.625
1 BDE/52IN AJ 1	EXCALIBUR	V6W	0406	50.600	42.375
1 BDE/52IN AJ 2	EXCALIBUR	V6W	0407	69.550	69.725
HHC/1 BDE/52IN	EXCALIBUR	U5C			
1 BDE/52IN A/L	EXCALIBUR	V6W	0405	55.200	57.325
AVN/1 BDE	WILEY	A6L	0692	42.750	45.575
52 IN DIV A/L	BUCKSTER	E3I	0307	39.700	33.425
1-77 IN	EQUALIZER	H7A			
1-77 IN CMD	EQUALIZER	H7A	0410	67.350	46.225
2-77 IN	EXECUTIONER	K8B			
2-77 IN CMD	EXECUTIONER	K8B	0442	45.800	70.025
1-62 AR	EAGLE	F9D			
1-62 AR	EAGLE	F9D	0474	49.500	33.975
52 IN DIV CMD	AVENGER	E3I	0300	33.250	57.275
52 IN DIV RTS 1	AVENGER	E3I	0301	54.650	57.925
DTOC/52IN SSB P	AVENGER	E3I		26.9000	
DTOC/52IN SSB A	AVENGER	E3I		6.1950	
2 BDE/52IN CMD	CENTURION	Z2K	0500	56.250	68.325
3 BDE/52IN CMD	HURRICANE	B0G	0700	43.950	70.325
4 BDE/52IN CMD	RAWHIDE	D1H	0901	33.300	57.525
DIVARTY CMD	VALIANT	U0Y	0626	70.650	55.225
DIV EARLY WARN		A7H	0999	39.400	56.925
MEDEVAC (WAR)			0000	42.650	38.925
MEDEVAC (PEACE)				35.600	

UNCLASSIFIED ITEM NO: 023

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GLOSSARY

PART I - ABBREVIATIONS AND ACRONYMS

ABCCC	airborne battlefield command and control center
ACE	aviation combat element (MAGTF)
ACMES	Automated Communications Security Management and Engineering System
ADA	air defense artillery
AFAC	airborne forward air controller
AFEKMS	Air Force Electronic Key Management System
AFFOR	Air Force forces
AFKDMS	Air Force Key Data Management System
AFP	ARC-210 Fill Device
AFR	Air Force regulation
AJ	antijam
AKMS	Army key management system
ALO	air liaison officer
ALSA	Air Land Sea Application Center
AM	amplitude modulation
AMLS	Airspace Management Liaison Section
amp	amplifier
ANCD	automated net control device
ANCRS	Automated Navy COMSEC Reporting System
ANGLICO	air/naval gunfire liaison company
AO	air officer (USMC)
AOC	air operations center
AR	Army regulation; artiliary
ARFOR	Army forces
ARG	amphibius readiness group
ARLO	air reconnaissance officer
ASC (A)	assault support coordinator-airborne
ASOC	air support operations center
ATC	air traffic control
ATO	air tasking order
AWACS	Airborne Warning and Control System
BATT	battery
BCE	battlefield coordination element
BDE	brigade
BGU	basic generation unit
BIT	built-in test
BN	battalion
BPS	bits per second
C3	command, control and communications
C3I	command, control communications intelligence
C6	combined forces communication staff
CARS	Communications Security Automated Reporting System

CATF	commander, amphibious task force
CAS	close air support
CCT	combat control team
CE	command element (MAFTF)
CEO	communications-electronics officer
CEOI	communications-electronic operating instructions
CFD	common fill device
CG	guided missile cruiser
CHAN	channel
CHG	change
CINC	commander-in-chief
CJTF	commander, joint task force
CLR	clear
CM	control monitor
cmdr	commander
CMIO	COMSEC material issuing office
CMS	COMSEC management system (Navy)
CMSC	communications security
CNR	combat net radio
CNV	crypto net variable
CO	company
COMM/NAV	communications/navigation
comms	communications
COMSEC	communications security
CONAUTH	controlling authority
CONOPS	concept of operations
CP	command post
CRC	control reporting center
CRE	control and reporting element
CRP	combat reporting point
CSAR	combat search and rescue
CSEP	consolidated single-channel radio electronic counter-countermeasures package
CSS	combat service support
CSSE	combat service support element (MAFTF)
CT	cipher text
CTAPS	Contingency Theater Automated Planning System
CTF	commander, task force
CVBG	carrier battle group
CWC	composite warfare commander
DA	Department of Army
DASC	direct air support center
DASC (A)	direct air support center-airborne
DCMS	Director Communications Security Material System
DCT	digital communications terminal
DDG	guided missile destroyer
DF	direction finding
DIV	division
DMD	digital message device
DOD	Department of Defense

DOS	Disk Operating System
DRA	data rate adapter
DTD	data transfer device (AN/CYZ-10)
EA	electronic attack
EAC	echelon above corps
ECCM	electronic counter-countemeasures
ECM	electronic countermeasures
EDES	Electronic DS-101 Emulation Software
e.g.	for example
EKDD	electronic key distribution device
EKDS	electronic key distribution system
EKMS	electronic key management system
EMP	electromagnetic pulse
EOD	explosive ordnance disposal
EP	electronic protection
EPLRS	Enhanced Position Location Reporting Systems
ERF	electronic remote fill or electronic counter-countermeasures remote fill
ESM	electronic warfare support measure
EUCE	end user computing equipment
EW	electronic warfare
EW/C	early warning/control
EWO	electronic warfare officer
FAC	forward air controller
FAC (A)	forward air controller-airborne
FACP	forward air controller post/forward air control party
FCTN	function switch
FFG	guided missile frigate
FH	frequency hopping
FH-M	frequency hopping-master
FLD	field
FLT	fleet
FM	frequency modulation; field manual
FMF	Fleet Marine Force
FMF EUCE	Fleet Marine Force end user computing equipment
FMFRP	Fleet Marine Force reference publication
FREQ	frequency
FSK	frequency shift keying
G-6	component signal staff officer
GCE	ground control element
GHz	gigahertz
GLO	ground liason officer
GPS	global positioning system
GPU	general purpose user
HELO	helicopter
HF	high frequency
HI	high

H-LD	hold-load
HOM	homing
HQ	headquarters
hz	hertz
IAW	in accordance with
IBM	International Business Machines
IDM	improved data modem
ICOM	integrated commuications security
ICP	intratheater communications security package
ID	identifier
i.e.	that is
IFM	improved frequency modulation
ISA	International Standardization Agreement
J-2	Intelligence Directorate of a joint staff
J-3	Operations Directorate of joint staff
J-6	Command, Control, Communications, and Computer Systems Directorate of a joint staff
JAAT	joint air attack team
JCEOI	joint communications-electronic operating instructions
JCEWS	joint commander's electronic warfare staff
JCS	Joint Chiefs of Staff
JD	Julian date
JFACC	joint force air component commander
JFC	joint force commander
JFCEWS	joint force commander's electronic warfare staff
JFLCC	joint force land component commander
JRFL	joint restricted frequency list
JIEO	joint interoperability electronic office
JKMS	joint key management system
JOR	joint operational requirement
JRFL	joint restricted frequency list
J-SEAD	joint suppression of enemy air defenses
J-STARS	Joint Surveillance Target Attack Radar System
JTF	joint task force
JTIDS	Joint Tactical Information Distribution System
kb	kilobits
kbps	kilobits per second
KDD	key distribution device
KDMS	Key Distribution Management System
KDS	key data system
KEK	key encryption key
kHz	kilohertz
km	kilometer
KP	key processor
KPE	key processing equipment
L	lockout
LAAM	light antiaircraft missile

LAAD	low altitude air defense (USMC)
LAMPS	light airborne multipurpose system
LAN	local network area
LCAC	landing craft, air cushion
LCC	amphibious command ship
LCMS	local communications security management software
LCU	lightweight computer unit
LD	load
LD-V	load variable
LE	late entry
LED	light emitting diode
LHA	amphibious assault ship
LMD	local management device
LO	low
LOUT	lockout
LPD	amphibious transport dock ships
LPH	amphibious assault ship
LSD	landing ship, dock
LST	landing ship tank
M	medium
MAN	manual
MAGTF	Marine air-ground task force
MARFOR	Marine Corps forces
MARLO	marine liaison officer
MATCS	Marine air traffic control squadron
MB	megabyte
MCCDC	Marine Corps Combat Development Command
MCE	modular control equipment
MCEB	Military Communications-electronics Board
MCPDS	Marine Corps Publication Distribution System
MCRP	Marine Corps Reference Publication
MD	mission day
MEB	Marine expeditionary brigade
MED	medium
MEF	Marine expeditionary force
MEU	Marine expeditionary unit
MHz	megahertz
MIL STD	military standard
MILSTRIP	Military Standard Requisitioning and Issue procedure
MKRV	mark receive variable
MLE	maritime law enforcement
MS-DOS	Microsoft-Disk Operating System
MSC	major subordinate command
MSE	mobile subscriber equipment
MUTE	Unit for Transmission Elimination
N6	Command, Control, Communications, and Computer Systems Directorate for Naval Forces
N/A	not applicable
NALE	naval and amphibious liaison element
NAVFOR	Navy forces

NAVSOP	Navy Standard Operating Procedure
NCS	net control station
NKDS	Navy Key Distribution System
NKMS	Navy Key Management System
non-ICOM	non-integrated communications
non-ICOMSEC	non-intergrated communications security
NORM	normal
NSA	National Security Agency
NSFS	naval surface fire support
NST	net station time
NST-JD	net station time-Julian date
NWP	naval warfare pamphlet
OFST	offset
OI	operating instruction
OPLAN	operations plan
OPORD	operations order
OPR	office of primary responsibility
OTAR	over-the-air rekey
OTH	over the horizon
OTC	officer in tactical command
PA	power amp
PACAF	Pacific Air Force
PC	personal computer
PCN	publication control number
PLGR	precision lightweight global positioning system receiver
PSN	packet switch node
PT	plain text
PTT	push-to-talk
RAM	random access memory
RBECS	Revised Battlefield Electronics Communications-electronic Operating Instruction System
RCH	remote control head
RCU	remote control unit
RDG	random data generator
RDS	revised battlefield electronics communications (RBECS) system data transfer device (AN/CYZ-10) (DTD) software
REC	radio electronic combat
RECCE	reconnaissance
REM	remote
RGT	regiment
RKV	remote key vehicle
RSINISS	revised SINCGARS integrated communications (ICOM) security/ non-integrated communications (non-ICOM) support software
RT	receiver transmitter
RV	receive variable
RXMT	retransmit
SAR	search and rescue

SAS	single audio system
SATCOM	satellite communications
SC	single channel
SCRU	secure remote control unit
SEAL	sea-air-land team
SINCGARS	Single-channel Ground and Airborne Radio System
SIU	ship interface unit
SOI	signal operating instructions
SOLE	special operations liaison element
SOP	standing operating procedure
SPEED	systems planning engineering and evaluation device
SQs	squadrons
SQ OFF	squelch off
SQ ON	squelch on
SQNs	squadrons
SRU	shop replaceable unit
SSN	attack submarine, nuclear
STANAG	standardization agreement
STBY	standby
STO	store
STW	stow
STU	ship interface unit
STU-III	secure telephone unit III
sync	synchronize
TAC-A	tactical air commander-airborne
TACFIRE	tactical fire direction system
TACC	tactical air control center (USN); tactical air command center (USMC)
TACP	tactical air control party
TACS	tactical air control system
TADC	tactical air direction center
TAF	tactical air forces
TAMPS	Tactical Air Mission Planning System
TAOC	tactical air operations center (USMC)
TD	time delay
TBD	to be determined
TEK	traffic encryption key
TF	TACFIRE
TIP	tactical information pamphlet
TOD	time of day
TRADOC	US Army Training and Doctrine Command
TRANSEC	transmission security
TSEC	telecommunications security
TSK	transmission security key
TST	test
UAS	user application software
UHF	ultra high frequency
US	United States

USAF	United States Air Force
USMC	United States Marine Corps
UTC	universal time, coordinated
VAC	volts, AC (alternating current)
VDC	volts, DC (direct current)
VHF	very high frequency
VHF-FM	very high frequency-frequency modulation
VINSON	Encrypted Ultra high Frequency Communications System
VRC	vehicle, radio configuration
W	watts
WAN	wide area network
WCCS	Wing Command and Control System
WOC	wing operations center
WOD	word of day
Z	zero
ZA	zero all
Z-FH	zero frequency hopping
ZULU	time zone indicator for Universal Time
#	number

PART II - TERMS AND DEFINITIONS

buffered. Temporary storage used to compensate for the difference in rates of flow and acceptance of data or time of reception.

cold start. Process to initially open a net. The net users require the same TRANSEC and manual frequency. The NCS RT should be fully loaded with all the variables.

common lockout. A collection of data words (defined in JTC3A Specification 9001) which provide net definition (frequencies) by locking out frequencies on all preset nets within the radio. See also lockout.

cold-start electronic remote fill (ERF). One process for initially opening a net. users need a common coldstart designated TRANSEC key and manual frequency for this process. Also see ERF.

cue frequency. An SC frequency listed in the CEOI; the primary means of alerting a net into which entry is desired. Users who may lack some of the necessary ECCM variables to enter an established net directly cue members of an active FH net on this frequency. Users can load the cue frequency into the radio's cue channel through the keyboard. They use the cue channel when they have missed the initial net opening and need an ERF or when they want to enter an alternate net.

ECCM variables. The electronic fill data which supports ECCM operations. This includes hopsets, net IDs, lockouts, TRANSEC key, Julian date and net sync time information. This excludes COMSEC keys, cue channels, manual channels, and single channel frequencies.

electronic fill data. The initialization parameters for the radio which are loaded via SINCGARS fill device: As a minimum, all SINCGARS radios can electronically load fill data which cannot practically be loaded manually into the RT. This includes fill data such as lockouts, hopsets, and TRANSEC key. Some SINCGARS equipment can also receive SC frequencies, cue frequencies, manual frequencies, frequency offsets, TRANSEC key "locations," COMSEC key "location", and Julian date and NST. This data is entered through the front panel.

electronic fill data tag. An alphanumeric to identify a set/subset of SINCGARS electronic fill data, used like a COMSEC short title to identify data sets for association with contents, effective periods, controlling/originating authority and regions where use is authorized.

electronic remote fill (ERF). A method of loading an RT with FH data over a radio frequency data link. The electronic remote filled data is transmitted by a radio in the FH master mode, usually the net controller. The two types of ERFs are in-net and cold start. The former is performed in an established FH net, the latter when an FH net is not available. Lockouts and hopsets with appended TRANSEC key can be electronic remote filled between two or more SINCGARS radios.

hopping sequence. The pattern of frequencies over which the radios in the net hop. The net ID and mission day (MD) and time of day (TOD) are input to the linear sequence generator. The linear sequence generator output and the TRANSEC are input to the KGV-10, whose output determines the pattern of hopping.

hopset. An FH preset; a structured set of data words which, when combined with lockout net definition data words, determine the frequencies on which a SINCGARS FH net will operate. The actual net frequencies are known as the net frequency map.

joint restricted frequency list. A time and geographical listing of prioritized frequencies essential to an operation and restricted from targeting by friendly ECM to minimize frequency conflicts between friendly units.

joint tactical informatiom distribution system (JTIDS)
A secure antijam point-to-point information distribution system used by all services to provide the *big picture*. JTIDS platforms can exchange location for friendly, hostile, and neutral platforms and navigation information. Terminals are flexible and can limit the amount of information relayed or received.

key distribution management system. Software that manages the ECCM fill variables, transmission security keys (TSKs), communication security keys (key encryption keys (KEKs), and traffic encryption keys [TEKs]) for SINCGARS-operative radios.

late net entry or **late entry (LE).** A method of joining an already operating net. LE requires the correct TRANSEC, net ID, hopset, and lockouts.

lockout. A collection of data words, defined in JTC3A Specification 9001, that provide net definition (frequencies) by excluding, or locking out, frequencies from use within the radio. The two primary types of lockout are common lockout and net selectable lockout. The former, L1 through L6, apply to all preset nets; the latter, L7 and L8 are enabled or disabled by each preset net. The frequencies excluded by the lockout data words combine with those excluded by the hopset data words. All frequencies not excluded by these combined data words makeup the selected preset net's frequency map.

manual channel frequency. A single channel frequency loaded into the manual channel in the Army's SINCGARS radio and into the "manual" preset in the AN/ARC-222. It is loaded into the manual channel by keyboard actions. The frequency is listed in the CEOI and is used for communications and ERF during cold start net opening.

mission day. Mission day of the operation corresponds to Julian date.

mission set. A block of fill data generated from Air Force KDMS for loading into a specific radio to perform a specific mission.

Net ID. A net variable unique to a particular FH net, analogous to a phone number or a single channel frequency in the SC mode. It is a three-digit number from 000 to 999. It assists in net definition since it is also used by the radio as a net ECCM parameter, which allows nets with identical hopsets, lockouts, MD/TOD, and TRANSEC key to operate on different FH nets. It is assigned by the delegated office of responsibility (JFC J6 for joint nets) using one of the computer-based net management tools: Revised Battlefield Electronic Communications-electronics Operating Instructions System (RBECS), KDMS, Navy Automatic Key Management System.

Net ID band. A group of 100 net IDs X00 to X99 accessible from a preset by the radio operator through the radio keypad.

Net ID band definition unique lockout
A group of frequencies whose use in a specific FH band of nets is excluded. The lockouts are interfaced with common lockouts and associated with a preset on the radio.

pseudorandom. A process with an extremely long period before it repeats itself. It appears to be random but is actually seed dependent.

spectrum management. For SINCGARS and RBECS, limited in scope from optimization of the frequency spectrum to include computation and assignment of those ECCM variables and SC frequencies required to operate concurrently within an assigned area of operation. Frequency co-site interference and resolution are taken into account but only after the division-corps frequency manager has identified potential conflicts to the software.

tempest. The study and control of decipherable electronic signals unintentionally emitted from equipment.

time of day. The ZULU-based time reference that can be manually entered into the radio from the front panel. Time is automatically maintained within the radio but can be updated through the reception of in-net FH messages or ERFs. For normal in-net synchronization, all stations must be within plus or minus 4 seconds of the sending radio's time. The LE mode of operation may be selected for extending the acquisition time window to plus or minus 60 seconds.

Traffic Encryption Key. A COMSEC key that encrypts normal voice and data traffic.

TRANSEC key. Similar to COMSEC key. It scrambles the hopping pattern in a pseudo-random sequence so that it looks random to anyone without the key. All members of an FH net need a common TRANSEC in order to communicate.

zeroize. An operating procedure performed to clear COMSEC or TRANSEC key from the radio's internal variable storage registers. This process ensures that all data has been removed and cannot be recovered from the radio.

ZULU Time. Formerly called Greenwich Mean Time. Also called Universal Time. A measure of time that conforms, within a close approximation, to the mean diurnal rotation of the earth and serves as the basis of civil timekeeping. Accepted by many nations and independent of time zones, it is the standard time base for TOD in SINCGARS FH nets.

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