

## Chapter 2

# Signal Support and Organization

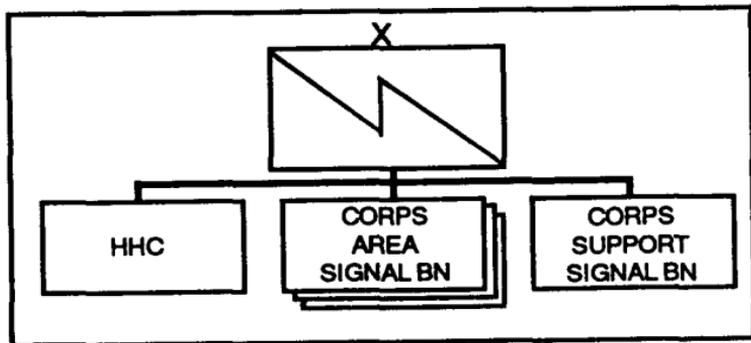
Signal support organizations exist at every echelon of the Army. Their mission is to support the commander by providing reliable and flexible communications, automation, and information services. This support is provided by signal organizations organic to the maneuver unit. At theater, there is a tailored signal command; at corps, a signal brigade; and at division, a signal battalion. In maneuver brigades and battalions, there is a signal staff officer with a section configured to the supported unit.

### Section I.

## Supporting the Corps and Division

### 2-1. Corps Signal Support

The principal signal support organization at corps is the corps signal brigade. Its mission is to provide support through the corps area common-user network. It also provides special staff and technical assistance for planning and controlling all corps signal functions and the extension of signal services to higher and adjacent commands. Figure 2-1 shows an example of the brigade structure. MSE is the principal corps common-user system which provides connectivity to subordinate divisions, adjacent units, joint and allied services, and the Defense Information Systems Network (DISN).



*Figure 2-1. Corps signal brigade.*

## 2-2. Signal Brigade Elements

The corps signal brigade commander serves as both the corps signal officer/G6 and the signal brigade commander. To help accomplish these missions, the commander has the corps signal office/G6, the corps brigade signal staff, and subordinate signal battalions.

**Corps Signal Office/G6.** The corps signal office's primary mission is to perform signal planning for the corps. The corps signal office is part of the corps staff and the assistant corps signal officer (ACSO) oversees the operation of the office. Office functions include—

- Preparing the signal annex's operation plans (OPLANs) for the corps' operations order (OPORD).
- Preparing signal estimates.
- Providing technical supervision of signal activities
- Producing signal brigade taskings based on corps requests.

- Managing all operational and contingency communications security (COMSEC) matters.
- Supervising the corps COMSEC office of record which develops COMSEC OPLANs and policies.
- Supervising the automation section (Maneuver Control System (MCS)).
- Producing tactical telephone directories and listings for corps users.
- Controlling radio frequency (RF) allocations and spectrum management for the corps.
- Coordinating signal interface with host nation and allied forces.
- Managing and controlling corps level BIS functions including the actions of the ISSO.
- Managing the corps' distribution and reproduction section.
- Maintains configuration control of all software by ensuring that the software is current, compatible and standardized.

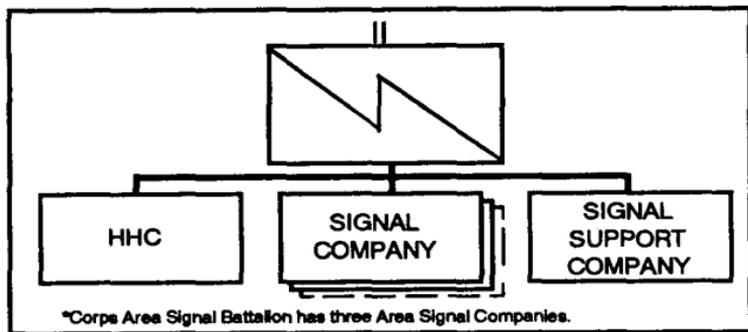
**Corps Signal Brigade Staff.** The signal brigade implements the corps communications network with the cooperation of the corps staff. The staff consists of—

- Corps signal engineering branch.
- Network control branch.
- Plans/intelligence section.
- Operations section.
- Brigade COMSEC office of record.
- Logistics section.
- Administrative section.
- Automation section.

### 2-3. Subordinate Signal Battalions

**Corps Area Signal Battalion.** These three battalions are responsible for providing communications coverage of a specific portion of the corps maneuver area and for installing a large extension node (LEN) to support the corps command posts (CPs). Also, the corps area signal battalion provides remote North Atlantic Treaty Organization (NATO) interface.

**Corps Support Signal Battalion.** This battalion installs a portion of the corps area network and supports large headquarters at corps. It is configured differently from the area battalions having greater wire assets. Figure 2-2 shows an example of a corps support signal battalion.



*Figure 2-2. Corps support signal battalion.*

See Appendix B for a corps MSE signal brigade equipment chart.

## 2-4. Division Signal Battalion

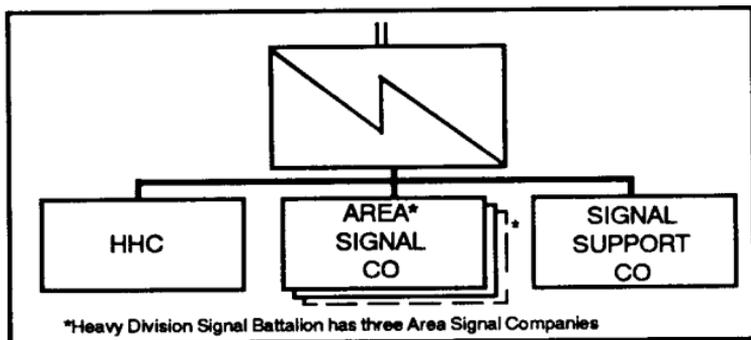
The division signal battalion is the principal signal organization supporting the division. Figure 2-3 shows the organizational structure. The battalion's primary mission is to establish a division area common-user network. The signal battalion also provides signal support and staff assistance to plan and control division communications, automation, VI, and BIS.

The division MSE network can operate as a stand-alone network or as part of the corps network. It has the same structure of interconnected node centers (NCs) and extension nodes providing service for division headquarters and major subordinate units. The network can contain gateways to adjacent units and the Defense Communications System (DCS) network.

***See Appendix B for a heavy division MSE signal battalion equipment chart.***

## 2-5. Division Signal Battalion Elements

The division signal battalion commander serves as both the division signal officer/G6 and the signal battalion commander. To help accomplish these missions, the commander has the following assets: the division signal office/G6, the division signal battalion staff, and the subordinate signal companies.



*Figure 2-3. Division signal battalion.*

**Division Signal Office/G6.** The division signal office/G6 works closely with the division G3. The ADSO supervises the division signal office. This office—

- Plans division communications operations.
- Prepares the signal annex to the division OPOD.
- Prepares the signal portion of the division standing operating procedures (SOPs).
- Plans and manages division signal automated systems.
- Prepares the division tactical telephone directory.
- Controls RF allocation and provides spectrum management.
- Acts as the primary interface between the division signal battalion and the division signal officers (BSOs).

- Coordinates signal interface with host and allied nations in stand-alone divisions.
- Prepares and distributes the division signal operation instructions (SOI).
- Coordinates for commercial and/or host nation telephone allocations.
- Requests and manages satellite access for TACSAT.
- Provides BIS to the division while in the tactical environment.
- Maintains configuration control of all software by ensuring that the software is current, compatible and standardized.

**Division Signal Battalion Staff.** The division signal battalion staff assists the commander by providing information, estimates, and recommendations. The staff prepares plans and orders and provides guidance for the design and implementation of the division's communications network. The staff consists of—

- S1 — Administrative Section.
- S2/S3 — Intelligence/Operations and Training.
- S4 — Logistics Section.
- Battalion Maintenance Officer (BMO).
  - Motor maintenance.
  - Electronic maintenance section.

## 2-6. Subordinate Signal Companies

**Battalion Headquarters and Headquarters Company (HHC).** The signal battalion HHC sustains the battalion when deployed through maintenance, logistics, administrative services, and management of the ACUS network.

**Area Signal Company.** The mission of each of the two area signal companies (three in a heavy division) is to provide ACUS coverage for a specific portion of the division maneuver area.

**Signal Support Company.** The mission of the signal support company which contains the division's LEN is to provide support for large CPs such as the division support command (DISCOM). The support company also has TACSAT, net radio interface (NRI), frequency modulated (FM) retransmission, and EPLRS equipment.

**Contingency Communications Package (CCP) Company.** Airborne, air assault, and light signal battalions have a contingency communications company(ies) made up of two identical platoons. Each platoon provides initial MSE and TACSAT capabilities.

**Light Contingency Communications Package (LCCP) Company.** Selected light forces have a contingency communications company made up of two platoons. The LCCP is being developed to provide selected light infantry divisions with an initial MSE capability for a contingency mission. The LCCP closely follows the

organization, concept, and functional characteristics of the airborne CCP, with the major differences exhibited at the extension sites with dismounted equipment.

## **Section II.**

### **Supporting the Maneuver Brigade/ Battalion**

#### **2-7. The Maneuver Brigade/Battalion**

Maneuver brigades are the primary element used for conducting combined arms operations. They consist of at least three infantry, armor, or mechanized battalions. In addition, the brigade may be augmented by other fighting and supporting elements, such as field artillery, air defense artillery, light infantry, engineer, aviation, and chemical units.

The maneuver battalion consists of three or more company-sized units and a headquarters company. Combat arms battalions perform tactical operations to support the brigade's mission. Battalions will normally be reinforced with other combat and combat support (CS) elements to form a task force. Maneuver battalions usually task organize to maximize combat effectiveness. Mechanized infantry and armor platoons make up company teams which comprise a battalion task force.

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Appendix A provides a communications planning guide to assist the brigade/battalion signal officer (BSO)/communications chief in planning reliable, flexible communications support for the maneuver commander.

### **2-8. The Brigade/Battalion Signal Officer**

The BSO is the signal expert to the maneuver commander. He advises the commander and staff on all signal support matters. He works for the unit executive officer (XO) and closely interacts with the S3 and other unit staff officers. As a special staff officer, the BSO—

- Provides technical staff supervision over signal support activities throughout the unit.
- Exercises OPCON of all communications assets assigned or attached to the unit.
- Prepares the signal portion of unit OPORDs, OPLANs, and SOPs.
- Coordinates with next higher echelon signal officer for additional communications support, if required.
- Identifies, coordinates, and provides for task force communication requirements.
- Works with the S2 on electronic countermeasure (ECM) threat and electronic counter countermeasure (ECCM) procedures.
- Works with the S3 on manipulative communications deception and tactical ECCM.
- Coordinates with the supporting signal unit to maintain access to the ACUS.
- Coordinates for maintenance support with the S4.

- Assumes supervisory responsibility for all COMSEC items within the unit to include accountability, distribution, destruction, and security.
- Inspects subordinate unit signal support sections.
- Regularly reviews signal prescribed load lists (PLLs) and ensures scheduled services are done on unit communications equipment.
- Plans and supervises all training for operation and maintenance of signal equipment.
- Provides organizational level COMSEC maintenance to support the unit.

The BSO must develop a routine interaction with the unit staff, and take an active role in the staff planning process. He must ensure the staff understands the capabilities and limitations of the units' organic signal assets and external support. He must take these into account when producing an OPORD, OPLAN, or SOP.

Communications must be planned early and in detail for each phase of the operation. Plan for overwhelming success and catastrophic failure in the base plan and in the contingency plans. Signal support must be integrated and synchronized to support each part of an operation on a changing battlefield. Good terrain analysis, competent asset management, and endless staff coordination produce success.

Planning in support of maneuver operations requires the BSO to thoroughly understand the following elements in great detail: (1) The friendly maneuver plan as developed

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in staff wargaming (to include contingencies), (2) The enemy threat, both templated and actual as confirmation occurs and/or changes the enemy picture, (3) Terrain, through analysis assisted by products available in combat tactical operation centers (TOCs), (4) Equipment, the BSO must track assets carefully, must have predesignated backup equipment, and must consider other available systems from CS or combat service support (CSS) units if necessary.

The BSO must be technically proficient with all communications equipment in the unit. He must learn as much as possible about the technical features that make the equipment work, and considerations that can make it work better. ***He must exercise troubleshooting skills and ensure the equipment is regularly checked and serviced when in garrison. Before deployment, the BSO should direct a thorough communications rehearsal.***

The BSO must be tactically proficient. This requires understanding the unit's mission. He must be a proactive planner and an aggressive participant of the battle staffs wargaming, synchronization, planning/matrixes, and rehearsals. He tracks the battle closely so he can trigger moving assets against forecasted enemy or friendly events. By tracking the battle, the BSO can anticipate the unit's changing communications needs and position the command, control, communications, and computer (C<sup>4</sup>) assets in the best places to support maneuvers.

The BSO must be an aggressive trainer. He must seek to educate the users at all echelons. He must develop simple and clear explanations that combat users can quickly grasp. Command post operators from commanders to radio operators must be well-trained and capable of independent decisions.

## **2-9. Maneuver Brigade/Battalion Communications**

The brigade/battalion commander must be able to receive, process, and transmit orders rapidly. The brigade/battalion CP is highly mobile and must have a communications system that supports this mobility. Command post communications are provided by the following means:

**Organic Signal Assets.** The maneuver unit performs its own internal communications, using organic signal equipment. The maneuver unit uses the FM radio as the primary means of communication. Within the maneuver unit, there is organic terminal equipment, digital nonsecure voice terminals (DNVTs), mobile subscriber radiotelephone terminals (MSRTs), facsimile machines, and communications terminals (CTs) to enable ACUS access. The unit's assets consist primarily of CNR equipment.

**External Signal Support.** Maneuver CPs can enter the ACUS, which is accessible through radio access units (RAUs) or small extension nodes (SENs) operated by the division signal battalion. The process called dual homing, is a redundant system used to compensate for a failed link.

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It allows two SENS to link into different nodes, thereby allowing uninterrupted communications should one link fail.

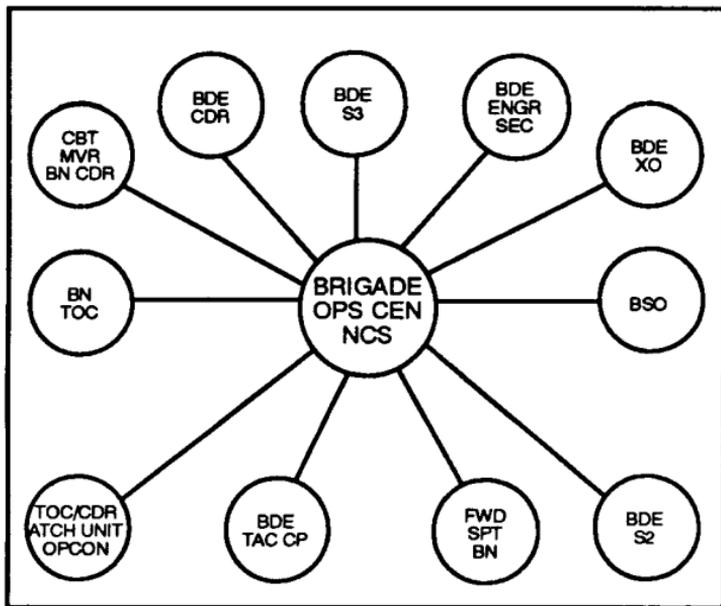
### 2-10. Combat Net Radio

CNR is the primary means of C<sup>2</sup> in the brigade/battalion. The advantage of CNR is it is easily installed and highly mobile. CNR also serves as the primary means of internal communications during movement.

**Nets.** Combat nets are formed by functions, such as operations or logistics, and contain specific groups of users within the unit. The structure of a net depends on the existing situation, command guidance, and available equipment. Figure 2-4 shows a typical command/operations FM net.

**Net Supervision.** The BSO is responsible for ensuring that the users know how to operate the system. This includes—

- Ensuring unit personnel remain proficient on CNR.
- Ensuring all unit radio operators are familiar with proper FM net procedures, antijam plans, and retransmission operations.
- Monitoring FM net discipline and making corrections as necessary.



*Figure 2-4. Typical command/operations FM net.*

**Range Extension Systems.** To overcome terrain obstacles or distances between stations, range extension systems are employed. Depending on the situation, some units may have an augmented/transferred range extension system. These include single or multichannel systems, additional FM retransmission systems, HF radio systems, or other expedient methods, such as radio power amplifiers and long-range antennas. The BSO can also take steps to accomplish range extensions by ensuring that FM antennas such as the OE-254, AS-2259, or GRA-50 are employed.

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Users must understand FM retransmission operations in order to use them effectively.

***See FM 24-18 for additional information on tactical single-channel radio communications techniques to include installing field expedient antennas.***

The BSO is responsible for planning and preparation of retransmission/relay teams being employed throughout the battlefield and provides food and logistical support; except, MSE system maintenance and repair, which is performed by the signal battalion. There are several key factors that facilitate success. They are—

- Integration and synchronization of activities on the battlefield. (See Appendix A, Figure A-9.)
- Risk analysis and waging logical bets with odds. We must plan every mission in detail and for success. (See Appendix C.)
- Analysis and use of terrain. These are both paramount when supporting a retransmission mission. Survivability, sustainment, and accessibility are all key factors when planning a site. (See Chapter 5.)

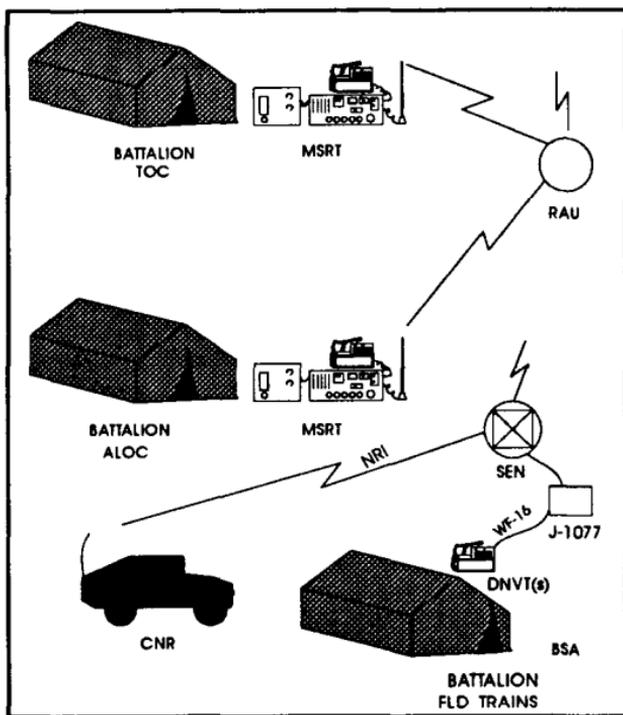
### **2-11. Area Common-User System**

The ACUS is a common-user communications system that connects all battle command elements.

**Maneuver Brigade Access.** To enable the brigade to enter the ACUS, the division signal battalion provides a SEN to each brigade's TOC and brigade support area (BSA). The SEN teams establish MSE termination sites near the brigade CPs. After the SEN team installs a 26-pair cable from the SEN switch to a J-1077, the maneuver brigade installs the brigade CP's internal wiring. In addition to ACUS access at the brigade CPs, users with MSRTs also may enter the MSE network from their vehicles. RAUs provide this service. Each RAU can process eight subscriber calls simultaneously. The maneuver brigade must also install its own LAN to access the tactical packet network (TPN). Users must also install and properly configure their own battlefield automation devices.

**Maneuver Battalion Access.** MSRTs are remoted in the battalion TOC and the battalion area logistics operation center (ALOC) CPs to provide ACUS access for the battalion TOC and ALOC respectively. Light and heavy units may be configured differently to meet the requirements of that unit. Figure 2-5 shows the different means the maneuver battalion can use to access the ACUS.

**Net Radio Interface.** For users without MSRTs, the signal battalion provides an NRI, so vehicles with FM single-channel radios and SINCGARS can enter the MSE system via a secure digital NRI (TSEC/KY-90).



*Figure 2-5. Battalion ACUS access.*

Six NRIs are fielded with each division and corps signal battalion, and they are located at different SENs, LENs, and force entry switches (FESs) across the corps/division area to provide the best coverage. The range of an NRI is equal to the range of the single-channel radio used in that unit.

## 2-12. Cable and Wire

Cable and wire systems provide internal communications for CP and support areas. These wire systems will be extended to subordinate systems when allowed by the tactical situation. Wire communications are used in static or defensive roles. Users are responsible for installing, operating and maintaining their subscriber terminal equipment. They also are responsible for connecting and maintaining their wire lines and LAN cables.

## 2-13. Message Traffic/Data Distribution Capabilities

**Facsimile.** User-owned tactical facsimile machines provide most internal and external mapping, overlay, OPORDs, and reporting traffic. The facsimile currently used is the AN/UXC-7/7A. The AN/UXC-7/7A can transmit one page of data in 7 to 15 seconds. The AN/UXC-7/7A can connect to either SINCGARS or 4-wire ACUS terminations. An advantage of using SINCGARS for facsimile transmission is that it can reach several users at one time.

**Communications Terminals.** The AN/UGC-144 is a formal record traffic CT. This user-owned and -operated device provides most internal and external message traffic. It can store, edit, display, transmit, receive, and print record traffic. This terminal processes in the R (general services) and Y (intelligence) communities at all echelons of the tactical communications systems. However, a separate terminal for each type of traffic must be used.

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**Couriers.** There is no formal messenger service at the corps or division level. When messenger service is required, the signal officer is responsible for determining routes and schedules. Some units use liaison officers to deliver orders, overlays and messages between CPs. The G3 is responsible for tasking units for vehicles and personnel.

**Tactical Packet Network.** The TPN is overlaid on the MSE network and uses existing trunks exclusively for data transmission. Users can connect personal computers (PCs) and LANs to the TPN from their CPs. Rather than using a direct end-to-end connection, which ties up a whole trunk, the TPN breaks up the data into “packets” and routes them along the most efficient path to their destination. When all packets arrive, the receiving packet switch reassembles the data and sends it to its destination. Each NC, LEN, SEN, CCP, and LCCP provides access to the TPN.

### 2-14. Command Post Planning

Most maneuver units operate from three facilities: the tactical CP (TAC CP), the TOC, and the unit trains.

**TAC CP.** This is where the commander fights the battle. He is assisted by the S3, the fire support officer (FSO), the air liaison officer (ALO), a representative from the S2, and the crews of the assigned vehicles. Sometimes commanders and their FSOs will break from the TAC CP and fight from a separate command group.

**TOC.** This is the primary location for the unit headquarters and is supervised by the unit's XO. The TOC's primary mission is to monitor the current battle, fight the deep battle, and plan future operations. The TOC normally consists of the S2 and S3 sections, the fire support element (FSE), the tactical air control party (TACP), the engineer element, the air defense element, and other attached elements.

**Trains.** Units have two types of trains: combat trains and field trains. The combat trains consist of the ALOC which includes the S1 and S4 section, refuel and ammunition points, aid station, and unit maintenance contact teams. The field trains consist of the Personnel and Administration Center (PAC), food service sections, company supply sections, and the maintenance section. Field trains are controlled by the HHC commander and are located within the BSA. Trains are supported by the forward support battalion under DISCOM. Both trains may be collocated, depending on the operational situation.

**Site Selection.** It is crucial that the signal officer, HHC XO, and unit S3 representative take a prominent role in selecting potential CP sites for the unit. This includes going on reconnaissance of potential "jump" sites. The BSO must work with the staff to choose sites. The S3 should designate potential locations and the BSO should recommend the best location based on the requirements covered below.

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**Terrain.** Communications are difficult from low valleys, especially when using LOS antennas. Using high ground is best for radio transmissions; however, avoid extremely prominent terrain features that could be used by the enemy as target reference points. The reverse slope of a hill is ideal because it protects from direct fire and still allows for good communications.

**Accessibility.** The site should provide easy access preferably with different entrances and exits. The road should be able to handle various vehicles. Consider access during different weather conditions.

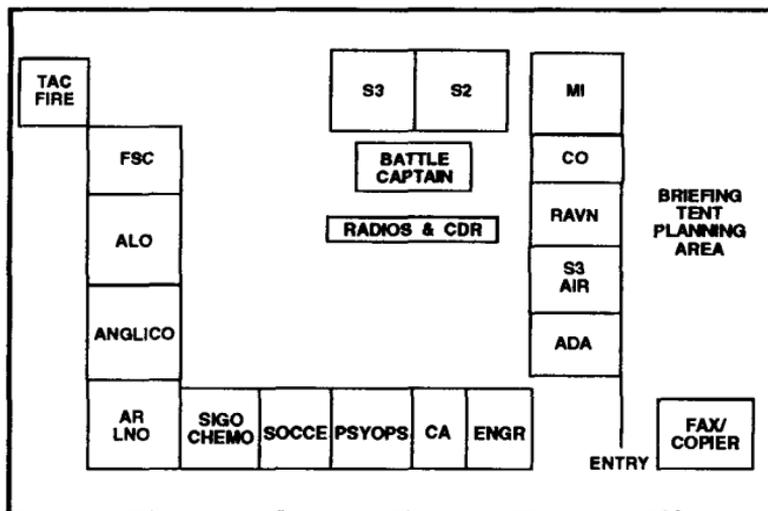
**Space.** Ensure there is enough space for the unit to set up and still have room for communications and support vehicles. Ensure the site is large enough to avoid co-site interference. Plan for a location with a cleared area nearby for a helicopter landing zone in case of required air support.

**Threat.** Consult the S2 and the chemical officer to avoid targeted enemy air assaults and high-speed avenues of approach. If possible, plan for the TAC CP and the command group to be out of enemy artillery range for that phase of the operation. Coordinate with the FSE to place “no fire zones” around all supporting signal sites in the brigade sector.

**Interference.** Locate at least 50 meters away from potential interference from power lines, commercial radio/television stations, or other electronic systems. Understand the frequency spectrum and capabilities of the

system(s) emplaced to prevent co-site interference and manage FM frequencies for correct separation.

Once a site has been chosen, and the unit moves to occupy the site, the BSO must ensure that the site is set up to avoid interference with the unit's communications systems. Figure 2-6 shows an example of a typical brigade CP layout.



*Figure 2-6. Typical brigade CP layout.*

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To avoid antenna interference,—

- Place phone lines and cables at least 12 inches away from power cables.
- Centrally locate the J-1077s and install them in the TOC, if feasible.
- Allow the SEN/multichannel team to set up first, if possible.
- Keep antennae away from power sources.
- Keep HF antennae at least 50 meters away from the CP and SINCGARS.
- Keep WF-16 and WD-1 field wire away from other communications lines that may have high RF output, such as CNR antennas and remote cables.
- Space antennae using Table 2-1 as a guide. Antennae can number up to 30 within a 200-meter radius at brigade without multiplexer. Antenna dispersal is especially critical in FM frequency hopping operations.

**Table 2-1. Antenna separation.**

FREQUENCY SEPARATION	MINIMUM DISTANCE BETWEEN ANTENNAS
10 MHZ	5 feet
7 MHZ	60 feet
4 MHZ	150 feet
2 MHZ	400 feet
1 MHZ	800 feet