Chapter 9
Special Siting Considerations

9-1. Overview

The modern C^2 system uses multiple colocated radios to provide an effective communications system. The potential exists for a number of different radio sets or configurations to interfere with each other. This chapter provides procedures to minimize detrimental effects of colocated systems operating in the same frequency ranges. The interference problem is broken down into three categories:

- IHFR to IHFR.
- SINCGARS to SINCGARS.
- SINCGARS to MSRT/RAU.

IHFR effects on SINCGARS or MSRT should be minimal since IHFR operates in a frequency band separate from the other two systems. The procedures discussed here are near-term measures to ensure successful use of all three systems.

9-2. Cosite Interference

a. Active management of three possible areas can minimize interference problems:

- Spectrum sharing.
- Antenna separation.
- Network time sharing.

The communications planners and the BSM control spectrum sharing. The installer and system users directly control antenna separation and time sharing.

(1) Spectrum sharing has different parameters in each area depending on the equipment characteristics, propagation paths, and system quality. BSM is an on-going analysis process. HF sounders determine usable HF frequencies and user feedback determines quality of VHF networks. The BSM has overall responsibility to deconflict any interference problems that arise from

colocated systems. He has a frequency manager and the BECS computer to assist in arriving at that goal. The chapters on SINCGARS and IHFR cover the specific criteria for frequency management of like cosited systems.

(2) The question of when to use antenna separation and time sharing is situationally dependent and at the discretion of the individual commands. The primary concern of field users is passing of C^2 information most accurately and in minimal time. Time sharing requires active management on the part of each network NCS/NTS. The ideal situation is when both NTS radios are at the colocated site. However, that will be the exception in most cases. The networks must operate as directed networks to provide the control necessary for a time shared scenario. This is true for all types of single-channel radio networks (IHFR or SINCGARS).

b. Antenna separation followed by time sharing is the preferred method to minimize interference in all three categories. Using the two methods depends on time constraints versus information volatility. That is, if the CP is immobile for long periods of time (a field hospital or units in defensive positions), the users install the systems with maximum antenna separation. In highly mobile CPs (a battalion CP during offensive operations) , time does not permit using of remoting kits. Users must time share to retain use of both networks.

9-3. Symptoms and Solutions

The key to solving interference is identifying its source. FM 24-18 describes the steps an operator takes to identify the source of the interference. If the interference is from an external source, the operator submits a meaconing, intrusion, jamming, and interference (MIJI) feeder voice template report in accordance with FM 24-33 or FM 24-35. Cosite interference is defined to occur while both systems are in operation--either transmitting or receiving. The following remedial measures assume the operator has ruled out external interference and has identified one or several colocated radios as the source. The procedures listed here may be used in advance to minimize interference during initial installation of the radio systems.

a. IHFR to IHFR. The primary cosite problem with IHFRs will be in CPs that simultaneously monitor and transmit on several HP networks. There are few mobile radio sets that operate two HF radios at the same time.

(1) Frequency selection is done by the BSM at corps or division. It is crucial that the BSM be aware of which networks will be operating in colocated sites. This can be accomplished through direct coordination with the assistant corps signal officer (ACSO) or the ADSO and radio officer as appropriate. Frequency selection for short-term antijam (STAJ) networks must consider the operating range versus system quality.

(2) Remoting the antenna or the radio set can accomplish antenna separation. No remote siting capability exists for the AN/PRC-104( ) or AN/GRC-213( ).

(a) Antenna separation from the radio for the manpack and low-power vehicular models is limited to the 45.5 meters (150 feet) of coaxial cable supplied with the radios. Increasing the cable length with the supplied cable degrades the signal and reduces the system's range. Replacing the supplied cable with low loss RF coaxial cable can increase the distance. TC 24-24 lists the cables used for extended ranges.

(b) The high-power radio set can be remoted up to 61 meters (200 feet) by using the tactical antenna remoting kit. The remote kit moves the antenna coupler CU-2064 to the remote site to provide additional antenna separation. Remoting the high-power set requires two cables--the RF coaxial cable and the control cable for the antenna coupler. Figure 9-1 shows the remote configuration and necessary cabling. Refer to TM 11-5820-924-13 for complete installation instructions. The remote site must be grounded for proper operation and safety reasons.

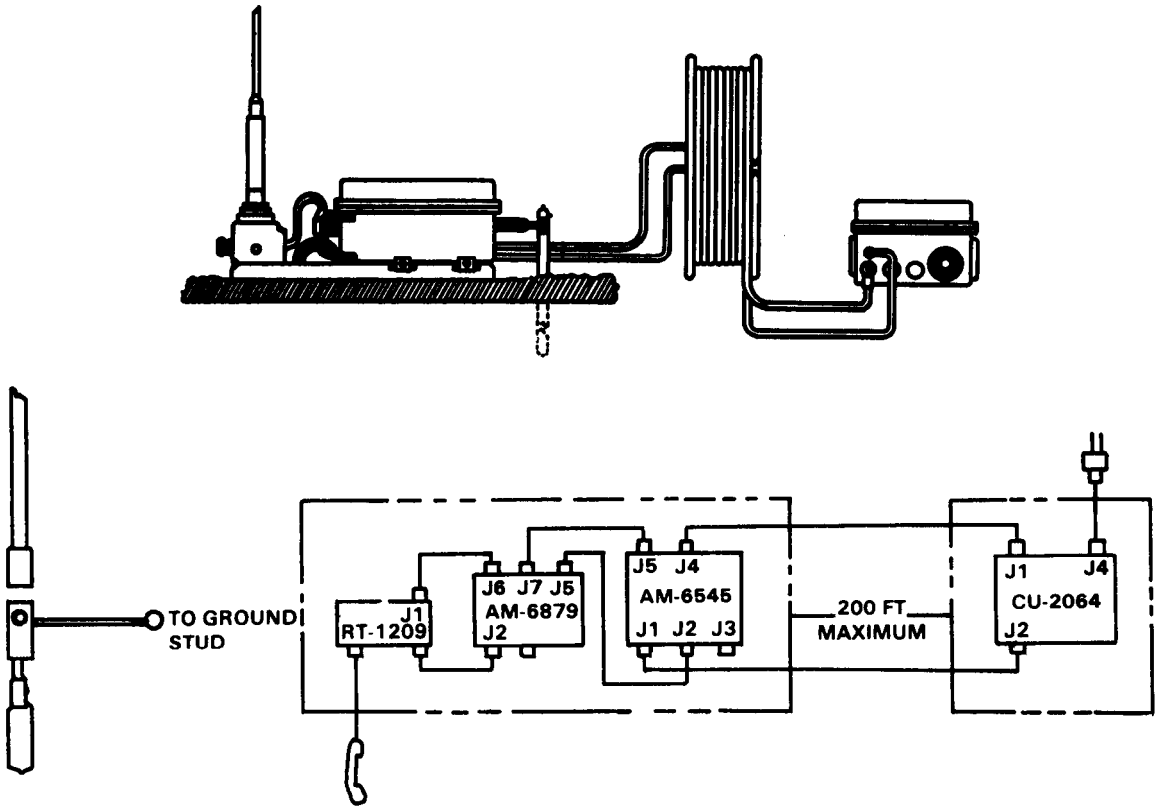

Figure 9-1. Remote configuration and cabling.

(c) Another method of antenna separation is to remote the entire radio with remote control sets. The IHFR sets can be remoted up to 3.2 kilometers (2 miles) with the AN/GRA-39C radio control group. This method is

easy to implement and gives full use of both systems. The greatest disadvantages of remoting the radio sets are as follows:

- The setup and teardown time increases.
- An operator must monitor the remote site.
- The landline is not secure.

b. SINCGARS to SINCGARS. SINCGARS cosite interference can be divided into two separate cases: single-channel and FH. The single-channel case is solved by following the guidance in Chapter 5 for frequency versus antenna separation distance. Additional information on single-channel VHF radios can be found in FM 24-2. Operators can use the same equipment and procedures to remote single-channel as discussed below for FH networks. The FH network problem is slightly more complex to address for BSM. The discussion of SINCGARS FH interference is divided into the same three areas as IHFR problems: time sharing, spectrum sharing, and antenna separation. Time sharing applies the same as the IHFR system discussed above.

(1) The BSM at the division or corps signal planning element performs spectrum management. The cosited radios must use hopping variables that separate the receiving and transmitting frequencies to prevent radios from locking onto the wrong signal. The easiest way to manage the systems is to use different hopsets for the colocated networks. This does not necessarily prevent all frequency collisions unless the hopsets are designed as all mutually exclusive frequencies. The two systems may also use different TSKs to keep the radio signals separate.

(2) Antenna separation requires use of one of the following remoting systems available for VHF radios:

- AN/GRA-39 radio control group.
- SRCU (works with ICOM and non-ICOM).
- HYX-57 wire line adapter.

These systems are necessary to obtain a separation of 50 meters (165 feet) or more between colocated radios. The AN/GRA-39 (Figure 9-2) provides remote control up to 3.2 kilometers (2 miles) for a controlled area. It does not encrypt the signal on the wire line, so it must be physically secured. The other two devices (SRCU and HYX-57) provide secure capability over the wire. The SRCU remotes up to 4 kilometers (2.5 miles) and the HYK-57 (Figure 9-3) up to 6.4 kilometers (4 miles). If remotes are not available, the antennas can be separated up to 14.5 meters (45 feet) using one OE-254 and associated cables or twice that distance if using two antennas. The last option is to place the colocated radios in different vehicles or areas of the CP to

provide the physical separation required. The advantages of using remotes to separate antennas are as follows:

- Remotes are easy to implement.
- Cosite interference is minimized at CPs.
- The CP has full use of both systems.

The disadvantages are that setup and teardown times increase, and the problem still exists for mobile systems. Mobile subscribers must use spectrum sharing or time sharing as discussed above.

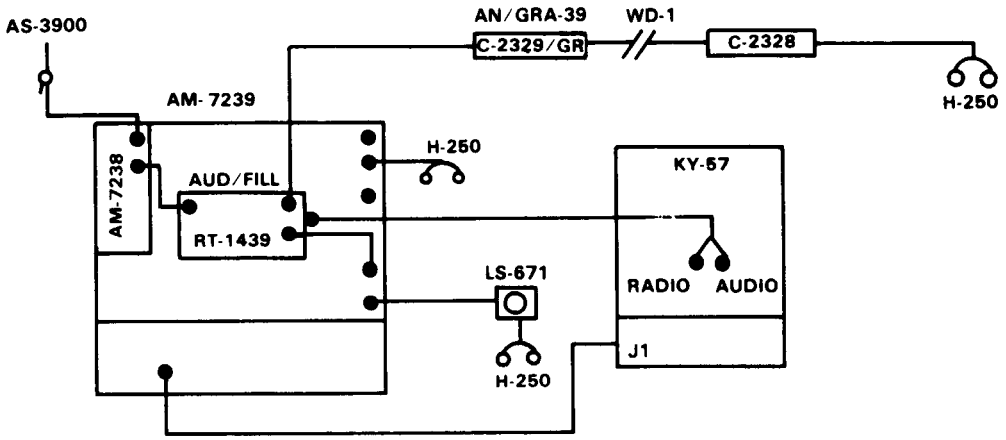

Figure 9-2. AN/GRA-39.

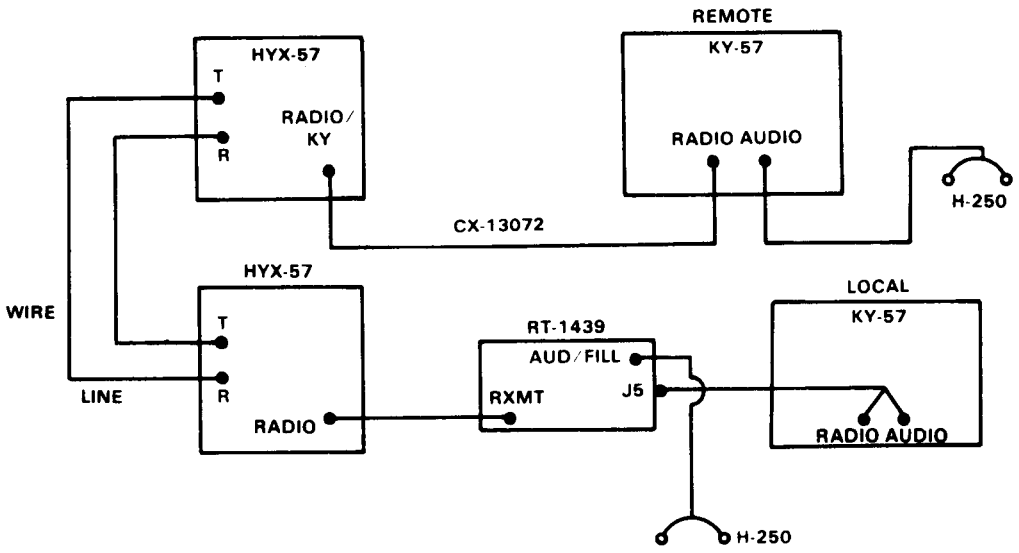

Figure 9-3. Secure remote control HYX-57.

c. SINCGARS to MSRT/RAU. The potential interference between SINCGARS and MSRT/RAU radios is a special case and possibly the most severe of the three categories. The following procedures are near-term measures to minimize the interference until a technological solution can be implemented.

(1) Chapter 7 discusses spectrum sharing. The key is for the BSM to enter the MSRT/RAU frequency pairs with applicable guard bands into the BECS computer before hopset generation.

(2) Two remoting procedures provide antenna separation for the MSRT. The procedures are:

- Using the MSRT stand-alone field kit (SAFK).
- Remoting the DSVT via field wire.

The SAFK consists of components to dismount the radio equipment from the vehicle for remote operations. A separate power source is required. A 25-foot cable from the remoted radio set connects the antenna. The DSVT can be remoted from the radio using WF-16 field wire up to 250 meters (825 feet). Operations requiring that CPs be immobile for extended time periods will use remoting. The same advantages and disadvantages apply for remoting MSRTs as for SINCGARS.

(3) Operators must use time sharing to solve the interference between mobile MSRTs and SINCGARS. Operator procedures in time sharing now are slightly different than discussed for the two CNR systems alone. The MSRT transmits continuously from the time the call is initiated to the time the caller hangs up, unlike CNR systems that only transmit during key down. The interference to the MSRT is likely to be more severe than to the CNR system. In fact, the MSRT may release the call from too much interference, but the MSRT will retain affiliation with the RAU. The user must decide which call is more important if he receives calls on both systems at the same time. The user follows the guidance below based on his decision of which call is more important.

(a) If using the CNR and the MSRT rings, tell the CNR party to “Wait Out,” then answer the MSRT. If the CNR is more important, get the number and return the MSRT call later. If not, complete the MSRT call. The CNR may be able to complete its call even through the interference from the MSRT, so the operator may not have to drop the call. The only disadtiantage is that the MSRT continues to transmit as long as the DSVT is off hook.

(b) If using the MSRT and a call comes in on the CNR for the user, tell the MSRT party to hold on (do not hang up), then answer the CNR. If the MSRT is more important, tell the CNR party to “Wait Out.” If not, complete the CNR call. If the interference on the CNR is too severe to pass accurate information, the user may have to hang up the MSRT and return the call later. Also, the MSRT may terminate the call automatically if the interference becomes too severe. Using short transmissions (less than 30 seconds) on the CNR will allow the MSRT to retain the call.

(4) If the situation requires many CNR calls or radio listening silence, the MSRT user can use call forwarding to reroute all his calls to a designated alternate. Determining the importance of incoming calls is a matter of command guidance and common sense on the user's part. A decision matrix in the unit SOP should address which system to use for situations versus the probable radio.

d. Solutions. Cosite interference is a matter of concern for planners and operators. The solutions depend on the situation and command emphasis. Solutions start from the initial allocation of frequencies and finish with the operator of the actual system on the ground. General guidance on solving the problem at the tactical level (assuming the BSM has done the best possible) is as follows:

- When time permits, use remoting kits to provide antenna separation.

- If necessary, use time sharing of the systems involved.

In all cases, the subscriber should use wire or the switched network as soon as it is available. This not only alleviates the interference problem, but it is also the best ECCM technique any operator can use.