

Glaser ✓
AFR 100-6

Communications-Electronics Activities

**GROUND ELECTROMAGNETIC INTERFERENCE AND
RADIATION HAZARDS**

This regulation states Air Force policy and responsibility for preventing or reducing unintentional electromagnetic interference (EMI) and electromagnetic radiation (EMR) hazards. It describes a Quick Fix Interference Reduction Capability (QFIRC) to meet urgent requirements in support of Air Force operational equipments.

SECTION A—OVER-ALL PROVISIONS

	Paragraph
Scope of Regulation -----	1
Terms Explained -----	2
Background -----	3
EMI and EMR Hazard Policies -----	4
Direct Communication Authorized -----	5

SECTION B—RESPONSIBILITIES

HQ USAF Responsibility -----	6
AFSC Responsibility -----	7
AFLC Responsibility -----	8
PACAF and USAFE Responsibility -----	9
Major Command Responsibility -----	10

SECTION A—OVER-ALL PROVISIONS

1. Scope of Regulation:

a. This regulation applies to Air Force activities that design, procure, produce, select sites for, install, operate, and maintain ground communications-meteorological (CEM) equipments and systems. This includes all miscellaneous ground equipments employing electrical, electromechanical, and electronic devices susceptible to or capable of creating unintentional EMI and EMR hazards.

b. This regulation does not apply to in-flight operation, ground runup, or checkout of CEM equipments on aerospace vehicles. It does not apply to electromagnetic interference resulting from deliberate jamming. Refer to AFM 100-43.

2. Terms Explained:

a. *Electromagnetic Compatibility (EMC).* The capability of CEM equipments or systems to be operated in their intended opera-

tional environment at designed levels of efficiency without causing or receiving degradation owing to unintentional EMI. EMC is the result of an engineering planning process applied during the life cycle of CEM equipments. The process involves careful consideration of frequency allocation, design, procurement, production, frequency assignment, site selection, installation, operation, and maintenance.

b. *Electromagnetic Interference (EMI).* Any electrical or electromagnetic phenomenon—manmade or natural—causing an unintentional and undesirable response, performance degradation, or complete malfunction of operational electronic equipments. EMI varies in time and degree of aggravation from a nuisance to complete destruction of mission performance. The phrase "radio frequency interference (RFI)" is used to mean the same thing.

c. *Electromagnetic Radiation (EMR) Hazards.* Those EMRs which are a potential danger to personnel by either *direct* or *indirect* action:

This regulation supersedes AFR 66-19, 24 October 1961.

OPR: AFSME

DISTRIBUTION: S

(1) Two different types of EMRs cause harmful effects by *direct* action. One type is ionizing radiation (X-rays), hereafter referred to as "X-ray hazard," and the other is radio frequency (RF) radiation, hereafter referred to as "RF hazard to personnel." X-ray frequencies are above light frequencies. *Danger exists in the near vicinity of high power transmitters.* RFs are below light frequencies. *Danger exists in the vicinity of high power transmitters and in an area illuminated by the transmitter antenna.* Direct exposure of the human body to these EMRs causes harmful biological effects in body tissues. Refer to AFR 161-8 (X-ray safety criteria) and AFM 161-7 (RF safety criteria to personnel).

(2) Only RF radiation creates an *indirect* hazard to personnel. RF radiation of sufficient power can cause combustion of flammable fuel, hereafter referred to as "RF hazard to fuel," or initiate a chain reaction in electro-explosive devices (EEDs) that detonates the main explosive material, hereafter referred to as "RF hazard to EEDs." *Danger exists in the vicinity of these potential explosions.* Refer to AFM 127-100 (RF safety criteria to EEDs) and TO 31Z-10-4 (RF safety criteria to fuel).

d. *Interference Working Group (IWG).* An Air Force group that meets, as required, to consider EMI or EMR hazard problems and to decide on action to solve them. All interested major commands and Government agencies are invited to attend.

e. *Quick Fix Interference Reduction Capability (QFIRC).* An immediate action service to reduce EMI causing unacceptable mission degradation to Air Force operational equipments. The service provides an engineering analysis of a reported EMI problem and implementation of the most acceptable solution.

3. Background:

a. EMI:

(1) The electromagnetic spectrum is a limited resource used for many different purposes. Users of the spectrum are the military, other Government agencies, and civilian activities, both domestic and foreign. All transmitters and receivers must occupy this spectrum to operate. An increase in the number of transmitters and receivers using a limited spectrum creates the problem. An increase in transmitter power and receiver sensitivity compounds the problem. Electronic equipment theoretically designed not to radiate or respond to electromagnetic

energy, such as home entertainment devices, further compounds the problem. The problem is to satisfy all users of the electromagnetic spectrum without degrading electronic equipment performance by unintentional EMI.

(2) Increased reliance on CEM equipments as critical elements of military operations requires increased emphasis on eliminating EMI.

(3) Because of economical considerations, it is necessary to collocate Air Force CEM facilities with the facilities of other military Services and nonmilitary Government services, such as FAA and NASA. Also, by agreement, Air Force and foreign Government CEM facilities may be collocated.

b. *EMR Hazards.* Potential radiation hazards to personnel by *direct* and *indirect* action are created by using high power transmitting equipment. Awareness of hazard situations and corrective actions to avoid these situations must be taken for the health and well-being of personnel.

c. *Non-installation, relocation, or removal of CEM equipments* may be the only solution to complex interference or hazard problems. CEM equipments include both transmitters and receivers with associated antennas.

4. EMI and EMR Hazard Policies:

a. *EMI.* Air Force policy for preventing or reducing EMI is to:

(1) Assure, to the maximum practicable extent, the *prevention* of EMI from and/or to CEM equipments before they become operational; eliminate or reduce EMI from and/or to CEM equipments after they become operational. The goal is to have CEM equipments that will not suffer operational degradation in an electromagnetic environment owing to the absence of appropriate means for achieving EMC.

(2) Maintain effective EMI reduction specifications, standards, and practices throughout all Air Force working levels of design, procurement, production, site selection, installation, operation, and maintenance of CEM equipments.

(3) Provide guidance and cooperation at Air Force working levels to reduce mutual EMI to acceptable levels between Air Force electronic equipments and other military Services, nonmilitary Government agencies, and civilian electronic equipments, both domestic and foreign.

(4) Deviate from normal programming and procurement procedures to provide a QFIRC service.

b. *EMR Hazards.* Air Force policy for preventing or reducing EMR hazards is to:

(1) Assure, to the maximum practicable extent, the *prevention* of EMR hazards from high power transmitters before they become operational; initiate safety protection from hazardous situations after the transmitters become operational. The goal is to have transmitters that will not create hazardous situations owing to the absence of appropriate means for achieving safety.

(2) Maintain effective EMR hazard reduction specifications, standards, and practices at all Air Force working levels of design, procurement, production, site selection, installation, operation, and maintenance of high power transmitters.

5. Direct Communication Authorized. Direct communication is authorized between Air Force activities and between Air Force activities and other military Services, Government agencies, and civilian activities handling EMI and EMR hazard matters.

SECTION B—RESPONSIBILITIES

6. HQ USAF Responsibility. HQ USAF:

a. Publishes Air Force safety criteria for the protection of personnel from direct and indirect EMR hazards.

b. Provides advice and guidance to major commands working toward resolving EMI and EMR hazard matters.

c. Assists major commands in coordinating with other military Services, nonmilitary Government agencies, civilian activities, and all higher authorities, both domestic and foreign, in resolving EMI and EMR hazard matters.

7. AFSC Responsibility. AFSC:

a. Establishes, incorporates, and promulgates specifications and standards for research, development, and production of CEM equipments and systems to reduce unintentional EMI. Designs CEM equipments (transmitters, receivers, and antennas) for optimum suppression of EMI emission and optimum rejection of EMI responses.

b. Establishes, incorporates, and promulgates specifications and standards for research, development, and production of high power transmitters to assure that X-ray and RF hazards to personnel are adequately suppressed. Develops Air Force safety criteria to eliminate the danger of overexposure to personnel from X-ray and RF EMR hazards.

c. Develops Air Force safety criteria to eliminate the danger of fuel combustion by RF EMRs.

d. Develops Air Force safety criteria to eliminate the danger of initiating EEDs by RF EMRs.

e. Provides AFLC and GEEIA with an engineering solution, on an emergency basis, when the solution to an EMI problem is beyond their technical capability. This includes design and development of the required interference reduction devices.

8. AFLC Responsibility. AFLC:

a. Provides the necessary management direction; establishes funding procedures and other services to maintain an EMC office and a QFIRC service within GEEIA.

b. Accomplishes reduction of EMI and EMR hazards for all CEM equipments and systems in the operational phase of systems management.

c. Assures that CEM equipments purchased "off-the-shelf" to satisfy Air Force requirements are designed to suppress and reject unintentional EMI.

d. Provides, through AFLC Medical Service, the following services for all major commands, except PACAF and USAFE. The medical service:

(1) Performs pre-evaluation of X-ray hazards before and measurements after installation of high power transmitters.

(2) After transmitter installation, prepares and distributes standard operating procedures for safe control of X-ray and RF hazards to personnel during the operating life of the equipment.

(3) Upon request, monitors the environment of high power transmitters to assure that permissible X-ray and RF radiation levels are not exceeded.

e. Through GEEIA:

(1) Analyzes, identifies, and initiates corrective action regarding EMI and EMR hazard problems before site selection of all Communications-Electronics Implementation Plans (CEIPs). Includes GEEIA comments regarding EMI and EMR hazards in CEIPs submitted to HQ USAF. After installation, verifies theoretical calculations by field intensity measurements. (Refer to AFMs 100-18 and 100-31 and TOs 31-1-8, 31Z-10-6, and 31Z-10-4.) GEEIA is responsible for siting problems regarding RF hazards to personnel, fuel, and EEDs according to Air Force safety criteria. It:

(a) Refers X-ray hazard siting problems to AFLC Medical Service for all commands, except PACAF and USAFE. Refers PACAF and USAFE X-ray hazard siting problems to the medical service of those commands.

(b) Refers siting problems of RF hazards to EEDs according to instructions on chart 6-1 in AFM 127-100 when the problem cannot be resolved by criteria on chart 6-1.

(2) Provides technical advice to AFSC during the acquisition phase of systems management on EMI and EMR hazard matters. (Refer to TO 31-1-8.)

(3) Develops the total QFIRC program for the Air Force.

(4) Supplies the Air Force with a QFIRC service by:

(a) Receiving and analyzing operational reports of EMI that cannot be resolved at command level.

(b) Initiating corrective action to alleviate EMI that might include certifying, acquiring, and installing interference reduction devices.

(c) Establishing and maintaining a QFIRC storage area. This requires procurement and stockpiling a reasonable quantity of interference reduction devices having solved operational EMI problems.

(5) Makes recommendations to the command-level frequency manager when the best solution to a reported EMI problem is a change of frequency.

(6) Refers those EMI problems beyond the technical capability of GEEIA to AFSC for solution.

(7) Provides IWG chairman.

(8) Provides EMI and EMR hazard evaluation to the major commands of all CEM collocations according to TO 31-1-8.

(9) Provides the Air Force with consultation and measurement survey service to analyze and resolve EMI and EMR hazard matters.

(10) Provides advice at all working levels with other military Services, nonmilitary Government agencies, and civilian users of electronic equipments, both domestic and foreign, to eliminate or reduce EMI problems. Electronic equipments include those designed not to radiate or respond to electromagnetic energy (home entertainment devices) and those designed to limit the electromagnetic radiations (industrial, scientific, and medical equipment).

(11) Refers airborne EMI and EMR hazard problems to the proper system man-

ager. Assists in resolving mutual EMI and EMR hazard problems between aerospace and ground systems.

(12) Refers to HQ USAF those EMI and EMR hazard problems beyond the capability of the major commands to resolve.

9. PACAF and USAFE Responsibility. The medical service of PACAF and USAFE:

a. Performs pre-evaluation of X-ray hazards before and measurements after installation of high power transmitters.

b. After transmitter installation, prepares and distributes standard operating procedures for safe control of X-ray and RF hazards to personnel during the operational life of the equipments.

c. Upon request, monitors the environment of high power transmitters to assure that permissible X-ray and RF radiation levels are not exceeded.

10. Major Command Responsibility. In addition to the above command responsibilities, each major command:

a. Requests GEEIA's EMC office to perform an EMI and EMR hazard evaluation of all CEIPs before selecting a site. EMI and EMR hazards should be resolved at the lowest possible command echelon before equipment installation. (Refer to AFM 100-18.)

b. Assures that operation and maintenance personnel of CEM equipments take all practicable measures to maintain low levels of EMI and EMR hazards during operational use of the equipment. EMR hazards must be maintained according to Air Force safety criteria. EMI and EMR hazard problems should be resolved at the lowest possible command echelon after the equipment is operational. (Refer to AFM 100-31.)

c. Is responsible for operational problems regarding RF hazards to personnel, fuel, and EEDs according to Air Force safety criteria. The command:

(1) Refers X-ray hazard operational problems to AFLC Medical Service for all commands, except PACAF and USAFE. Refers PACAF and USAFE X-ray hazard operational problems to the medical service of those commands.

(2) Refers operational problems of RF hazards to EEDs according to instructions on chart 6-1 in AFM 127-100 when the problem cannot be resolved using criteria on chart 6-1.

d. If it (the command) cannot resolve an operational EMI or EMR hazard problem,

follow the reporting procedures for requesting GEEIA's QFIRC service as outlined in AFM 100-31. In requesting GEEIA's QFIRC service it establishes a priority based on the Air Force priority system to assure appropriate action.

e. If RFI occurs as a result of frequency assignment, assures that problem is referred to the command-level frequency manager for action according to AFM 100-31.

f. Assures that "off-the-shelf" leased, locally and centrally procured CEM equipments are designed to suppress and reject unintentional EMI.

g. Requests an EMI and EMR hazard evaluation from GEEIA regarding a CEM collocation according to TO 31-1-8.

h. Provides representation, as necessary, at IWG meetings.

BY ORDER OF THE SECRETARY OF THE AIR FORCE

OFFICIAL

R. J. PUGH
Colonel, USAF
Director of Administrative Services

J. P. McCONNELL
General, U.S. Air Force
Chief of Staff

