VHF Air/ground Radio Installation Guidelines
Introduction/overview

Radio communications are an important requirement for the safe and proper operation of aircraft and airlines at airports. Airport operators, station operating personnel, technicians and contractors need to be familiar with these requirements before installing VHF radio systems.

This document is only an introduction and overview of the requirements that must be met in order to install VHF air/ground radio stations at airports in a proper, acceptable and legal manner. For more information, please refer to the references listed at the end of this document.

Within the United States the Federal Communications Commission (FCC) regulates aeronautical stations which communicate with aircraft both in flight and on the ground. Radio stations used for this purpose are defined as 'Aeronautical Enroute Stations' and they make up the ground portion of the "Aeronautical Mobile Route (R) Service". The FCC rules conform to applicable statutes, international treaties, agreements and recommendations to which the United States is a party and relate to documents defined by the International Telecommunications Union (ITU) and the International Civil Aviation Organization (ICAO). The FCC has designated Aviation Spectrum Resources Incorporated (ASRI) as the single licensee for frequencies assigned under the Aeronautical Enroute Service (Subpart I, FCC RR) within the United States and it's territories with some exceptions in Alaska. These stations may be authorized for either voice or data link communications between ground sites and aircraft.

The Aeronautical Mobile Route (R) Service is reserved for communications relating to the safety and regularity of flight along national and international civil air routes. A significant portion of these frequencies are combined as networked systems and provide the airlines with required pilot to dispatcher communications. Due to heavy use of this spectrum, frequency changes involve much coordination throughout the entire coverage area with multiple operators and are only entertained as a last resort. The use and operation of these frequencies by aircraft operators is governed by the FCC. The airlines use these frequencies to meet communications requirements in the Federal Aviation Regulations (FARS) published by the Federal Aviation Administration (FAA).

Most of these frequencies at airports provide both aircraft enroute and on the ground radio coverage. Many provide FAA pre-departure communications such as clearance delivery and the current ATIS information before the aircraft can safely move. All company messages such as weight and balance, gate assignments, maintenance problems, special passenger requirements and security messages also pass over these frequencies both from the local airline office and the airline's operations and dispatch centers. In order to meet the requirements for providing these communications, radio sites must be located on or near the terminal gates and areas in which the aircraft operate. In addition, aircraft antennas normally used for operational control communications are mounted on the aircraft belly making communications difficult when the aircraft is parked at the gate unless the base station antennas are near the gate areas. Due to the many operators and networks at some airports, many radios and antennas may be required to be located within a small area. The co-location of radio station installations in common areas can present interference, reliability and coverage problems. The locations of FAA and other airport radios and communications systems can also be a factor when installing new radios. The purpose of these installation guidelines is to help prevent and mitigate these interference problems while still meeting regulatory and industry standards.

The references below provide for a more comprehensive understanding of the industry agreed upon policies and procedures. These policies should be understood before any new stations are installed. Additionally, consideration should be made during the design phase for any new airport construction or modification to maintain interference free and reliable VHF air/ground systems. Listed below are normal requirements to maintain a legal and interference free environment:

- All VHF radio stations must be licensed by the FCC (Aeronautical Enroute Stations are normally coordinated through ASRI).
- All aeronautical ground radios should be FCC Type Accepted equipment. Avoid using aircraft radios in ground based installations as these radios are not normally accept able to the FCC for ground installations.
- All transmitters must have a label on the front indicating their operating frequency.
- Radios must be located in secure areas or cabinets and should be protected from moisture and excessive heat.
- The more space between VHF air ground radio antennas the better. Sixty feet should be considered the minimum acceptable. This distance allows enough isolation for most current production transceivers. The use of cavity filters may be required if the distance cannot be maintained or when using older equipment or for closely spaced frequencies.
- Antennas should be located for the maximum line-of-sight use for approaching and departing aircraft—no obstructing buildings, towers, terrain, etc.
- Antenna installation should use only approved mounts, hardware and be properly grounded to the roof top lightning protection system.
- Tag each antenna with call sign, frequency and owner contact information. This step makes future installation surveys easier and avoids potential interference. Use weatherproof tags.
- Good quality coax or heliax transmission line should be used. Consideration for signal loss and signal leakage must be given. Example: LMR-400 coax for runs up to 60 feet, LDF4 heliax for runs up to 100 feet. Avoid transmission line runs any longer then 100 feet.
- Use good quality transmission line connectors. Avoid connectors that use ferrous metals (nickel) since they will corrode and could be the cause of later interference.
- The indoor connection should terminate at an approved lightning surge suppression device like that made by Polyphaser.
- All spare transmission lines that are installed for future use should be terminated into a 50 ohm load, labeled and weatherproofed.
- Decommissioned antennas and transmission lines should be removed.
- Radios and equipment racks should be properly grounded to the building earth ground system.
- Radios that interface to remote locations should have proper surge protection on the telephone interface lines.
- Radios used in the aeronautical service should use the minimum power needed to accomplish the mission. Normally, use 25 watts or less for enroute networked radios and 10 watts or less for on-ground or local use radios does the job.
- Bandpass cavity filters to provide additional isolation between radio systems should be used when warranted. Notch type cavity filters can be used in extreme cases.
- Many requirements for VHF radio installations also apply to airport UHF Business Radio installations.

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1. FCC: 47 CFR-Telecommunications, Part 87-Aviation Services, Subpart I-Aeronautical Enroute and Aeronautical Fixed Stations
2. FAA: Federal Aviation Regulations Part 1, 91, 119, 121, and 135.
3. The Aeronautical Frequency Committee (AFC) Manual, Chapter 3 and Appendix 6.
4. The Aviation Spectrum Resources, Inc. Aeronautical Ground Station Manual

For copies of the references or for any questions on this handout, please contact Aviation Spectrum Resources, Inc. (ASRI) at 410-266-4800 or at info@asri.aero. Also see our web site at www.asri.aero