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ADVISORY CIRCULAR

DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION

SUBJECT: AUXILIARY TWO-WAY AIRBORNE RADIO SYSTEM INSTALLATIONS

1. PURPOSE. This advisory circular provides installation and operational guidance concerning two-way radio communication systems which are not used or intended to be used in operating or controlling an aircraft in flight (i.e., mobile telephone, citizen band, amateur radios, etc.). Although this equipment is not required or intended for the purpose of air traffic control or navigation of aircraft in the national airspace system, the equipment should meet certain installation and operational criteria if installed in a U.S. civil aircraft.

2. REFERENCES.

- a. Federal Aviation Regulations (FAR) 1, 23, 25, 27, 29, 31, 43, 65, and 91.
- b. Advisory Circulars (AC) 43.13-1A, and 43.13-2.
- c. Federal Communications Commission (FCC) Regulations Parts 89, 91, 93, 95, and 97.

3. DISCUSSION. An increasing number of two-way radio communications systems, other than those required for operation of the aircraft, are being installed in general aviation aircraft. These systems can, and do, operate on many different frequencies from medium to the upper side of the public service ultra-high frequency band. They may be amplitude modulated (AM), frequency modulated (FM), or a single sideband (SSB) or a combination of these methods of modulation. The possibilities for interference or interaction with required electronic systems installed in the aircraft are unlimited. Each installation should be carefully checked for conducted and radiated electromagnetic interference, by an appropriately certificated person, prior to the aircraft being approved for return to service.

4. INSTALLATION AND OPERATION CRITERIA.

a. Installation Criteria. Any appropriately-rated person (as specified in FAR 43.3 and FAR 65.81) may perform an aircraft alteration which consists of installation of two-way radio communications equipment. The approval of the aircraft for return to service, however, can only be given by those persons authorized in FAR 43.7 and FAR 65.85 after a suitable functional check has been performed, where applicable, to determine that the installed system will perform its intended function.

b. An antenna suitable for operation at 27 megahertz (depending on the type) can be rather large and difficult to install (see AC 43.13-2, Chapter 3). Also, penetration of a pressurized area, milled, machined or special situations may require FAA approval by Supplemental Type Certificate (STC), or by FAA Form 337, Major Repair and Alteration (Airframe, Powerplant, Propeller, or Appliance). Such installations could also require a flight test evaluation to ascertain that normal flight characteristics have not been altered.

NOTE: The operating limitations should be revised as necessary (FAR 43.5). The basis for establishing limitations should be reasonable and prudent. For example, consider the pilot workload during IFR operations and the aircraft's electrical capacity for night operations. One example is "operation of this aircraft not to be predicated on the use of this citizens band system;" or "CB operation not permitted during IFR operations."

(1) FAR 23.1309 Equipment, systems, and installations states:

"(a) Each item of equipment, when performing its intended function, may not adversely affect--

- (1) The response, operation, or accuracy of any equipment essential to safe operation; or
- (2) The response, operation, or accuracy of any other equipment unless there is a means to inform the pilot of the effect.

(b) The equipment, systems, and installations of a multiengine airplane must be designed to prevent hazards to the airplane in the event of a probable malfunction or failure.

(c) The equipment, systems, and installations of a single-engine airplane must be designed to minimize hazards to the airplane in the event of a probable malfunction or failure."

(2) FAR 23.1431 Electronic equipment states: "Radio equipment and installations must be free from hazards in themselves, in their method of operation, and in their effects on other components."

(3) Corresponding FAR Sections. The corresponding FAR sections for the different aircraft categories should be researched to determine that these installations are free from hazards. The following categories should be researched:

(a) Transport category airplanes refer to FARs 25.1301, 25.1309, and 25.1431.

(b) Normal category rotorcraft refer to FAR 27.1301.

(c) Transport category rotorcraft refer to FARs 29.1301, and 29.1431.

(d) Manned free balloons refer to FAR 31.71.

(4) FAR 43.13 Performance rules (general) states:

"(a) Each person maintaining or altering, or performing preventive maintenance, shall use methods, techniques, and practices acceptable to the Administrator. He shall use the tools, equipment, and test apparatus necessary to assure completion of the work in accordance with accepted industry practices. If special equipment or test apparatus is recommended by the manufacturer involved, he must use that equipment or apparatus or its equivalent acceptable to the Administrator."

Each person performing an alteration should complete all testing recommended by the manufacturer or required by certification rule.

"(b) Each person maintaining or altering, or performing preventive maintenance, shall do that work in such a manner and use materials of such a quality, that the condition of the aircraft, airframe, aircraft engine, propeller, or appliance worked on will be at least equal to its original or properly altered condition (with regard to aerodynamic function, structural strength, resistance to vibration and deterioration, and other qualities affecting airworthiness)."

(5) Records. The maintenance record entry should indicate that the system has been properly tested and meets the requirements of the applicable regulations. Each person approving the aircraft for return to service should comply with the provisions of FAR 43.9 regarding content, form, disposition of the record, and state that the equipment associated with the alteration will perform its intended function and meet the appropriate rules and regulations.

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c. Operation Criteria. All two-way communications systems or equipment that are to be operated on board aircraft should be operated in accordance with the applicable FCC Regulations, and it is suggested that the applicable regulation be carefully checked before installation is started. The FCC restricts the maximum altitude at which certain equipment may be operated, as well as the power output of the transmitter and types of operation that may be conducted. Any aircraft operating limitations related to the operation of the equipment or of the aircraft with the equipment installed should also be complied with.

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