U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

Subject: USE OF PORTABLE ELECTRONIC DEVICES ABOARD AIRCRAFT | **Date: 10/02/00** | **Initiated by: AFS-330** | **AC No: 91.21-1A** | **Change:**

1. PURPOSE. This advisory circular (AC) provides aircraft operators with information and guidance for assistance in compliance to Title 14 of the Code of Federal Regulations (14 CFR) part 91, section 91.21. Section 91.21 was established because of the potential for portable electronic devices (PED) to interfere with aircraft communications and navigation equipment. It prohibits the operation of PED's aboard U.S.-registered civil aircraft, operated by the holder of an air carrier operating certificate, an operating certificate, or any other aircraft while operating under instrument flight rules (IFR). This rule permits use of specified PED's and other devices that the operator of the aircraft has determined will not interfere with the safe operation of the aircraft in which it is operated. The recommendations contained herein are one means, but not the only means, of complying with section 91.21 requirements, pertaining to the operation of PED's.

2. CANCELLATION. AC 91.21-1, Use of Portable Electronic Devices Aboard Aircraft, dated August 20, 1993, is canceled.

3. RELATED 14 CFR SECTIONS. Section 91.21, 121.306, 125.204, and 135.144.

4. BACKGROUND. Section 91.21 (formerly 91.19) was initially established in May 1961 to prohibit the operation of portable frequency-modulated radio receivers aboard U.S. air carrier and U.S.-registered aircraft when the very high frequency omnidirectional range was being used for navigation purposes. The Federal Aviation Administration (FAA) subsequently determined that other PED's could be potentially hazardous to aircraft communication and navigation equipment, if operated aboard aircraft. Amendment 91-35 amended the scope of former section 91.19 to prohibit the use of additional PED's aboard certain U.S. civil aircraft. Earlier studies conducted by RTCA, Inc. (RTCA), Special Committee 156, Document No. RTCA/DO-199, Volumes 1 and 2, entitled "Potential Interference to Aircraft Electronic Equipment from Devices Carried Aboard," have contributed greatly to an understanding of the operational effects of PED's aboard aircraft. (See paragraph 7b for obtaining copies.)

5. DISCUSSION. Section 91.21 allows for the operation of PED's which the operator of the aircraft has determined will not interfere with the navigation or communication system of that aircraft. The determination of the effect of a particular device on the navigation and communication system of the aircraft on which it is to be used or operated must, in case of an aircraft operated by the holder of an air carrier certificate or other operating certificate, be made by that operator (i.e., certificate holder). In all other cases, a determination must be made and it may be made by the operator and/or the pilot-in-command (PIC). In some cases, the determination may be based on operational tests conducted by the operator without sophisticated testing equipment. When safely at cruise altitude, the pilot could allow the devices to be operated. If interference is experienced, the types of devices causing interference could be isolated, along with the applicable conditions recorded. The device responsible for the interference should then be turned off. If all operators collect this type of data with specific information, a large enough database could be generated to identify specific devices

causing interference. The operator may elect to obtain the services of a person or facility having the capability of making the determination for the particular electronic device and aircraft concerned. The rule as adopted was drafted to require the air carrier or commercial operator to determine whether a particular PED will cause interference when operated aboard its aircraft. Personnel specifically designated by the air carrier or commercial operator for this purpose may make this determination. For other aircraft, the language of the rule expressly permits the determination to be made by the PIC or operators of the aircraft. Thus, in the case of rental aircraft, the renter-pilot, lessee, or owner-operator could make the determination.

6. RECOMMENDED PROCEDURES FOR THE OPERATION OF PED's ABOARD AIRCRAFT.

a. If an operator allows the use of PED's aboard its aircraft, procedures should be established and spelled out clearly to control their use during passenger-carrying operations. The procedures, when used in conjunction with an operator's program, should provide the following:

(1) Methods to inform passengers of permissible times, conditions, and limitations when various PED's may be used. This may be accomplished through the departure briefing, passenger information cards, captain's announcement, and other methods deemed appropriate by the operator. The limitations, as a minimum, should state that use of all such devices (except certain inaccessible medical electronic devices, such as pacemakers) are prohibited during any phase of operation when their use could interfere with the communication or navigation equipment on board the aircraft or the ability of the flightcrew to give necessary instructions in the event of an emergency.

(2) Procedures to terminate the operation of PED's suspected of causing interference with aircraft systems.

(3) Procedures for reporting instances of suspected and confirmed interferences by a PED to the local FAA Flight Standards District Office.

(4) Cockpit to cabin coordination and cockpit flightcrew monitoring procedures.

(5) Procedures for determining acceptability of those portable electronic components to be operated aboard its aircraft. The operator of the aircraft must make the determination of the effects of a particular PED on the navigation and communication systems of the aircraft on which it is to be operated. The operation of a PED is prohibited, unless the device is specifically listed in section 91.21(b) (1) through (4). But, even if the device is specifically accepted from the general prohibition on the use of PED's, an operator may prohibit use of that PED. The use of all other PED's is prohibited by regulation, unless pursuant to section 91.21(b)(5). The operator determines that the operation of that device will not interfere with the communication or navigation system of the aircraft on which it is to be operated.

(6) Prohibiting the operation of any PED's during the takeoff and landing phases of flight. It must be recognized that the potential for personal injury to passengers is a paramount consideration as well as the possibility of missing important safety announcements during these important phases of flight. This is in addition to lessening the possible interference that may arise during sterile cockpit operations (below 10,000 feet).

(7) Prohibiting the operation of any PED's aboard aircraft, unless otherwise authorized, which are classified as intentional radiators or transmitters. These devices include, but are not limited to:

(i) Citizens band radios.
(ii) Cellular telephones.
(iii) Remote control devices.

b. PED's designed to transmit have consideration in addition to paragraph 6a. There are certain devices, which by their nature and design, transmit intentionally. These include cellular telephones, citizens band radios, remote control devices, etc. The Federal Communications Commission (FCC) typically licenses these devices as land mobile devices. The FCC currently prohibits the use and operation of cellular telephones while airborne. Its primary concern is that a cellular telephone, while used airborne, would have a much greater transmitting range than a land mobile unit. This could result in serious interference to transmissions at other cell locations since the system uses the same frequency several times within a market. Since a cellular mobile telephone unit is capable of operating on all assignable cellular frequencies, serious interference may also occur to cellular systems in adjacent markets. The FAA supports this airborne restriction for reasons of potential interference to critical aircraft systems. Currently, the FAA does not prohibit use of cellular telephones in aircraft while on the ground if the operator has determined that they will not interfere with the navigation or communication system of the aircraft on which they are to be used. An example might be their use at the gate or during an extended wait on the ground, while awaiting a gate, when specifically authorized by the captain. A cellular telephone will not be authorized for use while the aircraft is being taxied for departure after leaving the gate. The unit will be turned off and properly stowed, otherwise it is possible that a signal from a ground cell could activate it. Whatever procedures an operator elects to adopt should be clearly spelled out in oral departure briefings and by written material provided to each passenger to avoid passenger confusion.

c. Telephones, which have been permanently installed in the aircraft, are licensed as air-ground radiotelephone service frequencies. In addition, they are installed and tested in accordance with the appropriate certification and airworthiness standards. These devices are not considered PED's provided they have been installed and tested by an FAA-approved repair station or an air carrier's-approved maintenance organization and are licensed by the FCC as air-ground units.

7. MANUFACTURERS' TEST CRITERIA FOR PED's.

a. Operators should use manufacturers' information, when provided, with each device that informs the consumer of the conditions and limitations associated with its use aboard aircraft.

b. All portable electronic devices should be designed and tested in accordance with appropriate emission control standards. Document Nos. RTCA/DO-160D, Environmental Conditions and Test Procedures for Airborne Equipment, and RTCA/DO-199, may constitute one acceptable method for meeting these requirements. These documents may be purchased from: RTCA Secretariat, 1140 Connecticut Avenue, NW, Suite 1020, Washington, DC 20036.

c. Medical-Portable Electronic Devices (M-PED), such as automated external defibrillators (AED), airborne patient medical telemonitoring (APMT) equipment, etc., should be designed and tested in accordance with Section 21, Category M, of RTCA document No. RTCA/DO-160D. M-PED's that test within the emission levels contained in this document, in all modes of operation (i.e., standby, monitor, and/or transient operating conditions, as appropriate), may be used onboard the aircraft without any further testing by the operator. Equipment tested and found to exceed the Section 21, Category M, emission levels are required to

be evaluated in the operator's M-PED selected model aircraft for electromagnetic interference (EMI) and radio frequency interference (RFI). All navigation, communication, engine, and flight control systems will be operating in the selected aircraft. The ground EMI/RFI evaluation should be conducted with the M-PED equipment operating, and at the various locations in the cabin where M-PED usage is expected (galley, passenger aisles, etc.). If M-PED equipment can be operated at any location in the cabin, then the worst-case locations (proximity to cable bundles, flight controls, electronic and electrical bays, antennas, etc.) should be considered. Air carriers planning to equip their aircraft with M-PED's will provide evidence to the principal FAA inspector that the M-PED equipment meets the RTCA/DO-160D Section 21, Category M, emission levels, or conducts the ground EMI/RFI evaluation described above. Operators will incorporate procedures into their maintenance program to determine the M-PED's serviceability based on the equipment manufacturers' recommendations, to include procedures for marking the date of the equipment's last inspection. Operators will establish operational procedures that require crewmembers to inform the PIC when the M-PED is removed from its storage for use.

NOTE: For those M-PED's using Lithium Sulfur Dioxide batteries ($LiSO_2$) as a power source, the batteries must be Technical Standard Order C-97 (TSO-C97) approved and labeled accordingly.

/s/
L. Nicholas Lacey
Director, Flight Standards Service