



Advisory Circular

Subject: Use of Portable Electronic Devices Aboard Aircraft

Date: 8/25/06

AC No: 91-21.1B

Initiated by: AFS-350

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 PEDs aboard U.S.-registered civil aircraft while operating under instrument flight rules (IFR). This rule permits use of specified PEDs and other devices that the operator of the aircraft has determined will not interfere with the safe operation of that aircraft. The recommendations contained herein are one means, but not the only means, of complying with section 91.21 requirements, pertaining to the operation of PEDs.

2. CANCELLATION. AC 91-21.1A, Use of Portable Electronic Devices Aboard Aircraft, dated October 2, 2000, is canceled.

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

4. BACKGROUND.

a. Section 91.21 (formerly section 91.19) was initially established in May 1961 to prohibit the operation of high-frequency omnidirectional range was being used for navigation purposes. The Federal Aviation Administration (FAA) subsequently determined that other PEDs 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 PEDs aboard certain U.S. civil aircraft. Section 91.21, 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.

b. RTCA Special Committee 156 accomplished a study of the potential for interference from PEDs and released Document No. RTCA/DO-199, volumes 1 and 2, entitled "Potential Interference to Aircraft Electronic Equipment from Devices Carried Aboard." RTCA Special Committee 177 did a further study of these devices and released Document No. RTCA/DO-233, entitled "Portable Electronic Devices Carried on Board Aircraft." The finding and conclusions from these two studies helped the FAA establish the current policy which allows the use of non-transmitting PEDS during non-critical phases of flight. In March 2003, the FAA requested that RTCA form a special committee to evaluate and develop guidance related to assess the impact and risks related to the use of

intentionally radiating PEDs (transmitting PEDs, or T-PEDs) that passengers may bring onto civil aircraft. These include mobile telephones, computers with wireless network capabilities, and other wireless-enabled devices such as Personal Digital Assistants (PDA). On October 19, 2004, RTCA released Document No. DO-294, prepared by Special Committee 202, titled "Guidance on Allowing Transmitting Portable Electronic Devices (T-PEDS) on Aircraft" (to obtain RTCA documents see paragraph 8b).

c. Other activities in this area were done by the *Consumer Electronics Association* when in October, 2004; they issued a standard practice to help manage the use of wireless devices on board aircraft that would greatly enhance the flightcrew and the flying public's ability to comply with airline policies for portable electronic devices.

5. DISCUSSION.

a. The related 14 CFR sections in paragraph 3 allow for the operation of PEDs that the operator of the aircraft has determined will not interfere with the navigation or communication system of that aircraft. In addition to the originally addressed non-transmitting PEDs, this revised AC also recognizes and provides guidance on the potential use of T-PEDS. It should be noted that the responsibility for permitting passenger use of a particular PED technology lies solely with the operator. RTCA/DO-233, current edition, provides government agencies and aircraft operators with recommendations for acceptable use of certain non-transmitting PEDs onboard aircraft. The current edition of RTCA/DO-294 identifies a process for airlines to make a determination of acceptable use of T-PEDs. The determination of an interfering effect caused by 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 by the operator and/or by the pilot-in-command (PIC). In some cases, the determination may be based on operational tests conducted by the operator without the need for sophisticated testing equipment.

b. 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 want to obtain the services of a person or facility capable of determining non-interference to the aircraft's navigation, communication, or other electronic system. Personnel specifically designated by the air carrier or commercial operator for this purpose may make this determination using the process described in RTCA/DO-294. For other aircraft, the language of the rule expressly permits the determination to be made by the Pilot in Command 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 PEDs ABOARD

AIRCRAFT. If an operator allows the use of PEDs 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:

a. Methods to inform passengers of permissible times, conditions, and limitations when various PEDs 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. For air carrier operations conducted under 14 CFR part 121 or part 135, the limitations, as a minimum, should state that use of all such devices (except certain inaccessible medical electronic devices, for example, heart 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.

b. Procedures to terminate the operation of PEDs suspected of causing interference with aircraft systems.

c. Procedures for reporting instances of suspected or confirmed interferences by a PED to a local FAA Flight Standards District Office or the FSDO that has certificate management responsibility for the air carrier.

d. Cockpit to cabin coordination and cockpit flightcrew monitoring procedures.

e. Procedures for determining non-interference acceptability of those PEDs to be operated aboard its aircraft. Acceptable PEDs should be clearly spelled out in oral departure briefings and by written material provided to each passenger to avoid passenger confusion. 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). However, even if the device is an exception from the general prohibition on the use of PEDs, an operator may prohibit use of that PED. The use of all other PEDs is prohibited by regulation, unless pursuant to section 91.21(b)(5). The operator is responsible for making the final determination 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.

f. Prohibiting the operation of any PEDs 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 is the possibility of missing significant safety announcements during important phases of flight. This prohibition is in addition to lessening the possible interference that may arise during sterile cockpit operations (below 10,000 feet).

7. CELLULAR & ONBOARD TELEPHONE SYSTEMS.

a. T-PEDs have considerations in addition to those listed in paragraph 6. These include cellular telephones, citizens band radios, remote control devices, computers with wireless network capabilities, and other wireless-enabled devices such as PDAs, etc. The Federal Communications Commission (FCC) currently prohibits the use of cell phones while airborne. Its primary concern is that a cell phone, used while airborne, would have a much greater transmitting range than a land mobile unit. Their use could result in unwanted interference to transmissions at other cell locations since the system uses the same frequency several times within a market or given operating area. Since a cell phone is capable of operating on various cellular frequencies, unwanted interference may also affect cellular systems in adjacent markets or operating areas.

b. The FAA supports this airborne restriction for other reasons of potential interference to aircraft systems and equipment. Currently, the FAA does not prohibit the use of certain cell phones in aircraft while on the ground. 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 operator. A cell phone 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 to prepare the aircraft for takeoff as per the operator's procedures. Whatever procedures an operator elects to adopt should be clearly spelled out in oral briefings prior to departure or by written material provided to each passenger.

c. Onboard telephone systems that are type accepted by the FCC as air-to-ground equipment, which have been permanently installed in the aircraft, may be permitted for use while airborne or during ground operations, provided their use does not interfere with the duties of the flightcrew or cause potential harm to the passengers. Such airborne telephone systems are installed and tested in accordance with the appropriate certification and airworthiness standards.

8. MEDICAL-PORTABLE ELECTRONIC DEVICES.

a. Medical-Portable Electronic Devices (M-PED), such as automated external defibrillators (AED), airborne patient medical telemonitoring (APMT) equipment, portable oxygen concentrators authorized by Special Federal Aviation Regulations 106, etc., should be designed and tested in accordance with section 21, Category M, of RTCA/DO-160, current edition. M-PEDs 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 during the evaluation.

b. 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-PEDs will provide evidence to the principal avionics inspector that the M-PED equipment meets the current edition of RTCA/DO-160E section 21, Category M, emission levels, or the operator must conduct the ground EMI/RFI evaluation as described above. Operators will incorporate procedures into their maintenance program to determine the M-PEDs 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 emergency use.

NOTE: For those M-PEDs using Lithium Sulfur Dioxide batteries (LiSO₂) as a power source, the batteries must be approved under Technical Standard Order C-97 and labeled accordingly. RTCA/DO-227, Minimum Operational Performance Standards for Lithium Batteries is available at:

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