



**Commercial
Aviation
Services**

SERVICE LETTER

SERVICE ENGINEERING • BOEING COMMERCIAL AIRPLANES • P.O. BOX 3707 • SEATTLE • WASHINGTON 98124-2207

707-SL-02-002-C	DC8-SL-02-001-C
727-SL-02-003-C	DC9-SL-02-001-C
737-SL-02-008-C	C9-SL-02-001-C
747-SL-02-008-C	MD80-SL-02-001-C
757-SL-02-013-C	DC10-SL-02-001-C
767-SL-02-008-C	KC10-SL-02-001-C
777-SL-02-001-C	MD11-SL-02-001-C
717-SL-02-043-C	MD90-SL-02-001-C

ATA: 0200-05
9 March 2001

SUBJECT: PASSENGER CARRY-ON ELECTRONIC DEVICES

MODEL: 707/727/737/747/757/767/777 Series
DC-8/DC-9/C-9/MD-80/DC-10/KC-10/MD-11/MD-90 Series

APPLICABILITY: All Airplanes

REFERENCES:

- a) Radio Technical Commission for Aeronautics Document No. RTCA/DO-199, "Potential Interference to Aircraft Electronic Equipment from Devices Carried Aboard," dated 16 September 1988
- b) Federal Aviation Administration (FAA) Advisory Circular (AC) 91.21-1-1A, "Use of Portable Electronic Devices Aboard Aircraft," dated 2 October 2000
- c) Code of Federal Regulations Title 47 Part 22, "The Use of Cellular Telephones in Aircraft," dated 9 January 1992
- d) Requirements and Technical Concepts for Aviation Document No. RTCA/DO-233, "Portable Electronic Devices Carried on Board Aircraft," dated 20 August 1996
- e) Federal Aviation Regulation (FAR) 91.21, "Portable Electronic Devices"
- f) Aero Magazine Issue Number 10 Article titled, "Interference from Electronic Devices," dated March 2000

SUMMARY:

Boeing has received various reports of anomalies in airplane communication and navigation

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systems that operators suspected were caused by interference from passenger carry-on electronic devices. This service letter provides information and Boeing recommendations regarding the use of portable electronic devices (PED) on Boeing airplanes.

BACKGROUND:

Commercial transport manufacturers perform rigorous testing and analysis to ensure airplane systems are not susceptible to interference from known electromagnetic emission sources both external and internal to the airplane. However, PEDs carried on board airplanes by passengers are not required to meet the stringent electromagnetic emissions standards that are imposed on certified airborne equipment. In addition, many PEDs have shown significant radio frequency emissions in excess of allowable levels within frequency bands used for aviation communication and navigation systems. Consequently, there is concern among airplane operators as well as airframe and equipment manufacturers about the effect of electromagnetic emissions from these devices on airplane navigation, control, and communication systems.

DISCUSSION:

Since the late 1950s, there have been concerns of PEDs potentially affecting aircraft electrical and electronic systems. At that time an industry committee, Radio Technical Commission for Aeronautics (RTCA) SC-88, was established by RTCA to investigate interference to aircraft electronic equipment from PEDs. In 1963, DO-119 was released resulting in revision of the Federal Aviation Regulation (FAR) on PEDs; however, no regulatory limits were placed on the radiation emission limits of PEDs as a result of this committee. In 1983, a second RTCA committee, SC-156, was formed in response to an airline request. In 1988, DO-199 (Reference a) was released by the committee and concluded that the probability of interference is extremely low since it is necessary that eight independent conditions must occur in order for an aircraft antenna receiver system to experience susceptibility. The assumption was made that PEDs (non-intentional transmitting type) are typically low power devices and if aircraft interference can result it would most likely affect a system via a receive antenna since antenna systems are designed to receive signals in frequency bands where PEDs can emit electromagnetic energy.

In 1993, the Federal Aviation Administration (FAA) released the Reference b) Advisory Circular (AC) 91.21-1-1A. This AC provided guidance to operators regarding the use of PEDs on airplanes. The usage of cellular telephones was also addressed in the AC. Advisory Circular 91.21-1-1A advised that the Federal Communications Commission (FCC) prohibits the use of cell phones when an airplane is in the air due to concerns regarding disruption of the ground based cell systems (Reference c). The FAA concurs with this ban on in-flight cell phone usage,

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however they allow their use when an airplane is on the ground, and not moving, if authorized by the captain in command of the aircraft.

A third RTCA committee (designated SC-177) was established in 1992. The intent of this committee was to further investigate potential PED interference effects, develop PED test criteria, and provide recommendations for using PEDs on-board aircraft. In 1996, DO-233, was released (Reference d) with the following recommendations:

- 1) The FAA should modify FAR 91.21 so that:
 - a) The use of any PED is prohibited in aircraft during any critical phase of flight.
 - b) The use of any PED, which has the capability to intentionally transmit electromagnetic energy, is prohibited in aircraft at all times unless testing has been conducted to ascertain its safe use.
- 2) PED testing efforts should be continued by the FAA, airline industry, consumer electronics and aircraft manufacturers to expand the investigation of those devices for their potential to interfere with aircraft systems. This effort should include existing and new technology devices such as satellite communications, embedded communications devices and two-way pagers.
- 3) A public awareness campaign should be initiated by the FAA, airline industry, and aircraft and consumer electronics manufacturers to educate the flying public regarding the potential interference hazards from PED, especially those designed as intentional radiators.
- 4) Government and industry should pursue research into the design and feasibility of using devices designed to detect emissions that produce electromagnetic interference from PEDs within aircraft cabins.

Copies of the RTCA documents can be obtained from the RTCA:

RTCA Inc.
1140 Connecticut Avenue, NW, Suite 1020
Washington, DC 20036-4001, USA
Telephone: 202-833-9339
Facsimile: 202-833-9434

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BOEING ACTION:

Boeing has participated in the RTCA special committees, performed laboratory and airplane tests, provided comments on the FAA AC, and worked with airlines to evaluate specific reports of suspected PED interference. We will continue to monitor fleet activity related to PEDs and provide support for airlines to help resolve PED related issues. In some cases, Boeing has acquired the actual suspected PED from a reported event and tested the unit in the lab and on the airplane, but in all cases the reported anomaly was not repeatable.

SUGGESTED OPERATOR ACTION:

Boeing supports the recommendations of the RTCA committee SC-177 and has developed the following in addition to the above:

- 1) Any PED, which intentionally transmits radio signals, should be prohibited for use by passengers at all times while on-board airplanes. These devices include, but are not limited to cellular telephones, amateur radio transceivers, CB radios, and transmitters that control devices such as toys. An exception to this is that Boeing has no technical objection to the use of cellular phones while the airplane is parked (including during refueling) and the airline operator or pilot in command of the aircraft has given approval for such use. Operators may also choose to allow the use of wireless internet devices when an airplane is parked and pilot in command approves.
- 2) Any PED which is not an intentional transmitter of radio signals:
 - a) Should be prohibited for use during taxi, takeoff, climbout, descent, final approach, and landing. These devices include, but are not limited to laptop computers, video cameras, tape recorders, radio and TV receivers, CD and tape players, electronic entertainment devices, and electric shavers.
 - b) Should be allowed to operate during phases of flight other than taxi, takeoff, climbout, descent, final approach, and landing unless the airline operator or pilot in command of the aircraft has determined that the device should not be operated.
- 3) Operators who allow the use of PEDs should establish procedures to terminate the operation of devices suspected to be interfering with airplane systems.

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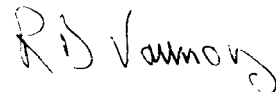
If interference is suspected from a PED, the operator should record the model and serial number of the unit(s) and all pertinent data related to the aircraft system experiencing the anomaly in detail and submit to Boeing for evaluation and data collection. If the flight crew believes a strong correlation exists between the anomaly and operation of the PED, it is suggested that the appropriate passenger information be collected for possible future purchase of the PED for investigative test purposes. Following a PED event, it is suggested that all affected airplane system be inspected for other possible causes. When appropriate, it is also recommended that flight data recorder information be retrieved for the period of time surrounding the event.

WARRANTY INFORMATION:

Boeing warranty remedies are not applicable to the subject(s) discussed in this service letter.

RELATED INFORMATION:

The Reference f) Aero magazine article provides additional information regarding the subject issue.



R. D. Vannoy
For Respective Fleet Support Chiefs

REJ:kl

Original: Dated 4 July 1993.
Revision A: Dated 23 January 1997. Revised to include 777.
Revision B: This is a general revision of the entire service letter to provide results of most recent Boeing, industry, and regulatory agency PED activities. Additional clarification regarding on-board cellular telephone usage also added. All Boeing airplane models included. This service letter supersedes AOL 8-1146, AOL 9-2227, AOL 10-2078, AOL 11-97 for Douglas Heritage Airplanes.
Revision C: Revised to include MD90, which was inadvertently left off revision B.