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Portable Electronic Devices Carried Onboard Aircraft

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Foreword

This report was prepared by Special Committee177 (SC-177) and approved by the RTCA Technical Management Committee (TMC) on August 20, 1996.

RTCA, Incorporated is a not-for-profit corporation formed to advance the art and science of aviation and aviation electronic systems for the benefit of the public. The organization functions as a Federal Advisory Committee and develops consensus based recommendations on contemporary aviation issues. RTCA's objectives include but are not limited to:

- coalescing aviation system user and provider technical requirements in a manner that helps government and industry meet their mutual objectives and responsibilities;

- analyzing and recommending solutions to the system technical issues that aviation faces as it continues to pursue increased safety, system capacity and efficiency;

- developing consensus on the application of pertinent technology to fulfill user and provider requirements, including development of minimum operational performance standards for electronic systems and equipment that support aviation; and

- assisting in developing the appropriate technical material upon which positions for the International Civil Aviation Organization and the International Telecommunication Union and other appropriate international organizations can be based.

The organization's recommendations are often used as the basis for government and private sector decisions as well as the foundation for many Federal Aviation Administration Technical Standard Orders.

Since RTCA is not an official agency of the United States Government, its recommendations may not be regarded as statements of official government policy unless so enunciated by the U.S. government organization or agency having statutory jurisdiction over any matters to which the recommendations relate.

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Executive Summary

In response to an FAA request, RTCA Special Committee 177 (SC-177) was formed in 1992 to investigate and determine the causes of the potential interference to installed aircraft electrical and electronic systems from portable electronic devices (PEDs) carried aboard aircraft by passengers. While a small list of suspected incidents of such interference from PEDs had been generated over time, interference from a PED could not be duplicated under controlled conditions.

Government and industry personnel contributed their efforts to defining the potential interference phenomena, devising test procedures for both PEDs and aircraft and attempting to assess the risk potential from such interference events. A variety of common consumer PEDs were tested for spectral emissions in commonly used modes. This test procedure was specially devised to reflect the unique PED/aircraft interface, using test methods from FCC, CISPR, MIL Standard 462 and RTCA DO-160C test procedures. Similarly, test methods were devised to determine the path loss factors of low level signals radiated within aircraft cabins. These procedures were then used in determining the potentially interfering signal's path loss in a variety of transport category aircraft. Finally, the susceptibility to interference of installed avionics systems was tested and threshold levels determined. After analysis, the above activity yielded the information necessary to determine the probability of interference to aircraft systems from PEDs.

The intent of these activities was to provide government agencies and aircraft operators with the test methods needed to determine whether a potential for interference exists for certain PEDs, aircraft, and combinations thereof.

This work of the special committee was not to test exhaustively combinations of PEDs and aircraft systems for interference. However, sufficient data was obtained to make provisional inferences regarding the probability of interference from PEDs not designed to intentionally radiate electromagnetic energy. Test facilities available to the committee were inadequate for purposes of testing intentional radiators. However, since the intended emissions are well characterized in terms of frequency and power level, the radiated signal levels were easily derived and were used for purposes of assessing the risk of interference.

Those findings indicated that the probability of interference to installed aircraft systems from PEDs, singly or in multiples, is low at this time. However, the possibility of interference to aircraft navigation and information systems during critical phases of flight, e.g., takeoff and landing, should be viewed as potentially hazardous and an unacceptable risk for aircraft involved in passenger-carrying operations. Therefore, the committee recommends that the use of PEDs be restricted during certain critical phases of flight.

Another important factor to be taken into account is the recognition that new civil aviation system elements include satellite system capabilities. Aircraft receivers for these systems, such as those of the GPS, necessarily operate at a

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very low level of received power, and, consequently, can be more susceptible than other systems to radio frequency interference.

The rapid advancement of personal communications technology has created the potential for the inadvertent or surreptitious use of PEDs capable of producing significant levels of electromagnetic radiation. Since SC-177 was unable to test devices designed to be intentional radiators, these devices remain an unknown quantity regarding interference potential. However, since the proliferation of these devices may cause a new dimension in interference potential for aircraft, recommendations are made largely to prohibit their use and continue research into their characteristics. The use of detection devices within the aircraft cabin designed to receive potentially harmful interference from PEDs should be pursued as an additional means of minimizing the possibility of interference from these devices.

The committee made the following recommendations:

1. The FAA should modify FAR 91.21, Portable Electronic Devices 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.

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1.0 Introduction

Towards the end of the 1950s, there was increasing concern about the vulnerability of aircraft electrical and electronic systems to interference from electrical devices carried aboard by passengers. Then, as now, installed electronic devices have tests and limits for both emission and susceptibility. Radio frequency interference was occasionally reported by air crews and, as a consequence of a perceived need, RTCA's Executive Committee established Special Committee 88 (SC-88) to investigate "Interference to Aircraft Electronic Equipment from Devices Carried Aboard." On April 12, 1963, the SC-88 Report, RTCA DO-119, was approved by the Executive Committee. The FAA, which had participated in support of SC-88, revised the Federal Aviation Regulations regarding carrying of devices on board by passengers. The responsibility for assuring compliance with the new rule (FAR 91.19) remained with the operator of the aircraft. No regulatory limits were placed on the radiation emissions of portable electronic devices as a result of the recommendations of SC-88.

There were some incidents of radio frequency interference from portable devices during the decades of the 60s and 70s, but not enough to indicate a comprehensive study of the problem.

In 1983, media attention began to build on the fact that some air carriers did not permit the use of portable computers by passengers. This was a concern to some airline passengers and some computer trade publications went so far as to suggest that their readers avoid these airlines.

In late August of 1983, RTCA received a request from the Director of Quality Assurance and Chief Engineer, Eastern Airlines, to form a Special Committee to "generate a Minimum Operations Performance Standards document against which manufacturers (of computers and other portable electronic devices) marketing their products for airborne use, could test and label them as meeting this standard in a manner similar to the Underwriters Laboratory sign of approval." The RTCA Executive Committee considered this request September 23, 1983, and approved the requested committee.

The result of the work of Special Committee 156 was the publication of RTCA Document DO-199, *Potential Interference to Aircraft Electronic Equipment from Devices Carried Aboard,* approved by the RTCA Executive Committee in 1988.

1.1 Establishment Of SC-177—Terms Of Reference

On May 29, 1992, RTCA received a request from the Director of Aircraft Certification at the FAA for the establishment of an RTCA group to revisit the issue of electronic devices carried aboard. This action by the FAA was in response to language in the House Transportation Appropriations Bill that year that stated, in part:

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