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Guidance on Allowing Transmitting Portable Electronic Devices (T-PEDS) on Aircraft

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FOREWORD

The original report was prepared by RTCA Special Committee 202 (RTCA SC-202) and approved by the RTCA Program Management Committee (PMC) on October 19, 2004 with a Revision A prepared, and approved on March 14, 2006. Revision B was prepared by SC-202, and approved by the PMC on December 13, 2006, and Change 1 to Revision B likewise prepared and approved on December 6, 2007.

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EXECUTIVE SUMMARY

The United States Federal Aviation Administration (FAA) requested that RTCA, Inc. form a special committee to present an up-to-date evaluation of the use of portable electronic devices (PEDs) on board civil aircraft with emphasis on intentional transmitters such as devices enabled with cellular technologies, wireless RF network devices, and other wireless-enabled devices such as personal digital assistants (PDAs). This document refers to such PEDs as transmitting PEDs, or “T-PEDs”, as distinct from non-transmitting PEDs, such as compact disk players and calculators. The overall class of PEDs includes both T-PEDs and the traditional non-transmitting PEDs.

The committee included representatives from consumer electronic device manufacturers, avionics manufacturers, aircraft manufacturers, airlines, aircraft operators, pilot and flight attendant associations, regulatory agencies, and related industry associations. The committee worked closely with other industry groups such as the Consumer Electronics Association. This work has been coordinated with EUROCAE Working Group 58. This report is also consistent with the findings and recommendations of RTCA Special Committee 159 and RTCA/DO-235A.

This report addresses the objectives of the Terms of Reference including the consideration of near-term T-PED technologies such as existing devices enabled with cellular technologies, wireless local area networks (WLANs), and wireless personal area networks (WPANs) as well as emerging PED technologies, for example active RF Identification (RFID) tags, transmitting medical devices, and picocells for devices enabled by cellular technologies for use on board aircraft. In addition, the committee has developed, with the support of national and international regulatory and standards bodies, changes to recommended RF emission limits for consumer PEDs. With the exception of human factors considerations that are applicable to all PEDs, this report concentrates on the use of T-PEDs. PEDs that do not include intentional transmitters were considered by RTCA SC-177, and the findings are contained in RTCA DO-233.

The Terms of Reference objective of providing specific guidance to mitigate the risks identified for portable electronic devices via aircraft design and certification has been addressed in RTCA/DO-307.

This document recognizes that there is a desire for immediate guidance on the use of T-PEDs, as there is known use of such devices on commercial flights today. Differences in the policies adopted by various aircraft operators, or with respect to aircraft models, are not clear to the public or, quite often, even to crewmembers.

The configuration of each aircraft is dependent on the model, the aircraft operators' requirements, and the modification status of the aircraft. Therefore, it is virtually impossible to define a single T-PED policy that fits all cases. This report does not attempt to recommend any specific policies with respect to the use of specific T-PED technologies on board aircraft while on the ground or while in flight.

This document defines and recommends a process by which aircraft operators and/or manufacturers may assess the risk of interference due to a specific T-PED technology within any aircraft type and model. The process described here is envisioned as a cooperative effort between aircraft operators, aircraft manufacturers, avionics manufactures, and T-PED manufacturers, with the aircraft operator having overall responsibility. The process will provide a means for aviation regulatory authorities, aircraft operators, aircraft manufacturers, PED manufacturers, and others as appropriate, to determine acceptable and enforceable policies and processes for the allowance of passenger and crew use of T-PEDs.

Although the process has been carefully thought out, it is a new process. Similar processes have already been implemented on a case-by-case basis to allow limited use of certain T-PED technologies on operational aircraft. Nevertheless, the aviation, T-PED, and regulatory communities will be well served by adopting the process recommended in this document and subsequently accumulating operational information for the purpose of improving this process.

At this point, there is not sufficient information to support a universal change in existing policies regarding the use of T-PEDs on board aircraft. Practical cabin and passenger-management issues dictate that guidance regarding the use or prohibition of T-PEDs needs to be applicable to large, readily identifiable classes of T-PEDs. It is impractical to establish a prohibition against a specific T-PED technology while permitting the operation of other technologies when the devices are indistinguishable to the casual observer. Such a policy recommendation could place unrealistic expectations on crewmembers and passengers.

This RTCA SC-202 report includes several conclusions and recommendations that can be broadly grouped and summarized as follows:

1. The process defined should be implemented on a collaborative basis involving T-PED manufacturers, aircraft manufacturers, avionics manufacturers, aircraft operators, and national and international regulatory and standards bodies to assure that any T-PED use allowance does not compromise the continued safe operation of the aircraft
2. As design efforts for advanced aircraft, avionics, and new T-PED technologies evolve, the engineering design of all elements should specifically consider means to minimize the effect of T-PED emissions on aircraft operations
3. Human factors issues will be an important consideration in the implementation of "T-PED on board" policies

Since the initial publication of RTCA/DO-294, the industry has communicated that the processes defined, while comprehensive, required streamlining for practical application and administration by the aircraft operators and national aviation authorities. To that end, the committee applied RTCA/DO-294 processes to complete an analysis of aircraft receiver susceptibility. T-PED transmitting waveforms were evaluated to establish generic test waveforms that could represent broad families of T-PED products. T-PED data was reviewed and updated to ensure consistency and establish test values. The accumulated effect of multiple T-PEDs was tabulated to facilitate calculation of test values.

Thereafter, the Test Procedure Guidance for EMC Ground Test was completely revised to take advantage of the new analyses and available data. Guidance was created to provide aircraft operators with standardized policies and procedures for T-PED use for both domestic and international flights. Finally, draft CFRs were proposed for consistent aircraft cabin briefings and signage related to PED usage. These items were included in an interim update to RTCA/DO-294 published March 2006.

A second update to DO-294 provided:

- Further data for analysis and test
- Revised conclusions and recommendations
- Further streamlined the document for easier use
- Additional guidance materials on operational, installation and certification aspects of airborne picocell systems
- Documented recommended changes to the FCC RF emission limits for consumer portable electronic devices.

This final update to the document, RTCA/DO-294C has:

1. DO-294B change 1 modifications for Tables 6-5 through 6-8 have been incorporated
2. Table 6-2 has been updated to better correspond with data and analysis done for DO-307; the “Assumed IPL” column was removed as redundant and potentially misleading
3. Typographical errors were corrected as appropriate
4. Section 9.2 Conclusions and Recommendations is revised to align with data and analysis done for DO-307
5. Appendix 10.A is updated to align conclusions, data and analysis done for DO-307
6. Added Appendix 10.B to document the results of dialog with consumer electronics manufacturers associations on alternatives for the use of portable electronic devices on aircraft

THESE DOCUMENT REVISIONS AND ADDITIONS OFFER AIRCRAFT OPERATORS PRACTICAL GUIDANCE TO EVALUATE T-PED IMMUNITY OF EXISTING AIRCRAFT, IN LINE WITH RTCA/DO-307 GUIDANCE FOR DESIGN AND CERTIFICATION OF AIRCRAFT FOR PED TOLERANCE.

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1 INTRODUCTION

Portable electronic devices (PEDs) that intentionally radiate signals¹ within the airplane fuselage are potential sources of radio frequency interference to installed aircraft systems. The primary concern is that radiated radio frequency energy can couple into aircraft control and safety systems, including very sensitive communications, navigation and surveillance equipment, thus introducing the potential to compromise normal aircraft operation. In general, the threat of such interference was not considered in the development of the RTCA and EUROCAE minimum performance standards² applying to radio receivers used for communications, navigation and surveillance functions, nor to the certification and testing of other electronic systems directly involved in the operation of the aircraft. The use of such intentionally transmitting PED devices, whose performance is not subject to the certification processes required of equipment installed on aircraft, represents a new paradigm in aircraft operation. Therefore, caution must be taken to perform careful characterization, analysis, and measurement before allowing such devices to operate on board aircraft.

As initially envisioned in the Terms of Reference (discussed in subsection 1.2) this document would have provided recommendations about specific T-PED technologies. During the preparation of the document, however, it became clear that the number and range of variables involved in such guidance was too great to permit such broadly applicable guidance to be developed. Therefore, this document recommends a process by which such characterization, analysis and measurement should be performed. These operational approval guidelines are directly applicable guidance related to use of portable electronic devices on board air carrier aircraft. Extensive appendices provide supporting data to both illustrate the process and to provide information that simplifies the effort of completing various process steps.

This document was first modified from its original published form to introduce expanded guidance to specifically assist regulators, and aircraft operators seeking operational approval for use of T-PEDs. This additional guidance takes the form of recommended aircraft test strategies, supporting analyses and aircraft operator policies to manage T-PED usage. Considerations for addressing additional T-PED technologies (such as active Radio Frequency Identification (RFID) tags, Ultra Wide Band (UWB), transmitting medical devices, and picocell technology) have also been incorporated. Clarified definitions and means of addressing the effects of intermodulation and cross-modulation are incorporated. Recommended RF emission limit changes for consumer portable electronic devices are included in this revision to the document as well.

This most recent document revision incorporates refinements in the characterization data for on-board radio receivers, and revises the recommended

¹ To simplify the discussion throughout the remainder of this report, unless clearly stated otherwise the term T-PED will be used to describe a Portable Electronic Device that contains an intentional transmitter.

² RTCA standards documents are Minimum Operational Performance Standards (MOPS) and Minimum Aviation System Performance Standards (MASPS). EUROCAE documents are generally limited to MOPS.