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Survey of Radio Frequency (RF) Performance Standards for Aeronautical RF Systems

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FOREWORD

This document was prepared by Special Committee 242 (SC-242) jointly with EUROCAE WG-124 and approved by the RTCA Program Management Committee (PMC) on November 17, 2023 and approved by EUROCAE WG-124 on October 24, 2023.

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- 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.

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EXECUTIVE SUMMARY

This report summarizes the results of the 2022/2023 survey conducted jointly by RTCA Special Committee-242 and EUROCAE Working Group-124 (SC-242/WG-124) on the applicable RTCA and EUROCAE published standards for Radio Frequency (RF) performance that could be used for spectrum compatibility analysis with external systems. The process involved existing RTCA Special Committees and EUROCAE Working Groups, plus additional experts if the responsible committees for certain documents were no longer active. The surveys and the resulting questions raised are intended to inform the spectrum guidance document that RTCA and EUROCAE are developing, and therefore this report does not provide any guidance of its own for the development of future aviation standards.

The results of the survey found significant variation in the level and use of RF performance parameters across different systems, with older documents generally having fewer parameters. However, even the documents with the most complete RF performance characteristics would still likely require manufacturer support to ensure all necessary considerations were captured in a spectrum study. In reviewing these survey responses and producing a high-level summary for each document, many questions were raised. These questions address both system specific items and policy considerations for standards development.

It is important to recognize that to date, the purpose of RTCA and EUROCAE standards has been to provide functional and operational performance requirements in order to ensure that equipment meets its intended function. In some cases this includes the need to function in the presence of RF in adjacent bands, when those emissions could affect the intended function of the aviation equipment. In other cases, the authors may have made a determination that there was no specific need to address spectrum compatibility at the time the standard was written, and further, the authors naturally could not have anticipated all future changes to the spectrum environment. Therefore, in this report which benefits from hindsight, comments that a standard lacks RF performance requirements should not be taken as a judgement on any document's quality at the time it was written. The intent of SC-242/WG-124 is to follow this report with an additional guidance document for future RTCA/EUROCAE committees, so that future standard revisions and new standards can have a more complete set of RF compatibility requirements that are forward-looking to the extent practical.

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1 INTRODUCTION

The aviation industry is a global, mobility-based industry by its very nature, generally requiring harmonized wireless Communications, Navigation and Surveillance (CNS) applications to operate worldwide. More fundamentally, these and all other wireless technologies are dependent on access to sufficient, suitable, and appropriately protected radio frequency (RF) spectrum to maintain the required performance. RF spectrum is a scarce resource that has a limited capacity but a high level of demand that is increasing, and access to it is a critical requirement for a safe and effective global aviation industry. To maintain access to sufficient, suitable, and appropriately protected spectrum, the aviation industry must demonstrate to spectrum regulators that it is using this resource effectively and considering coexistence with other spectrum users.

Spectrum efficiency is becoming a leading consideration, and even a risk, during the process of system design and specification. RTCA and EUROCAE Minimum Aviation System Performance Standards (MASPS) and Minimum Operational Performance Standards (MOPS) are the basis for defining much of the RF performance of standardized aviation systems, yet these documents are primarily intended for system manufacturers to design, build, and certify aviation systems,[1] and not for spectrum compatibility assessments with other wireless systems. Yet, that is exactly the purpose for which aviation standards are frequently used in modern spectrum management processes in national and international proceedings.

Current system standards, that were designed with operational purposes in mind, will need to evolve to address spectrum compatibility analysis and policy decisions. Therefore, before building any future guidance that addresses new spectrum compatibility requirements for MASPS and MOPS, current RTCA/ EUROCAE aeronautical standards must be reviewed to determine a baseline for spectrum considerations. To perform this review, RTCA Special Committee-242 and EUROCAE Working Group-124 (SC-242/WG-124) jointly conducted a survey of current RTCA/ EUROCAE aeronautical standards. This report documents RF performance in current standards and identifies variations in how such performance is documented. The elements raised in this report will help develop a new guidance document to be used for the development of new or revised RTCA/EUROCAE standards for aviation wireless systems. It is intended that such work will improve aeronautical standards and ensure that aviation is better prepared for a more challenging RF spectrum environment.

1.1 Purpose and Scope of the Report

This report collects relevant information (e.g., minimum performance requirements) on current RTCA/EUROCAE aeronautical standards for aviation wireless systems and identifies variations in how such performance is documented. It is not intended to be a critical assessment of Special Committee (SC)/Working Group (WG) products or a compliance review to identify any corrections to existing RTCA/EUROCAE documents. Any trends identified as gaps in RF performance characteristics, or examples of spectrum best practice, are summarized. While this report does not propose solutions to any issues found during the course of the SC-242/WG-124 survey, the report will be considered during the development of the subsequent work by SC-242/WG-124 in developing a new document on Spectrum Guidance for the Developers of Standards for Aviation Wireless Systems.

[1] Noting that in many cases the ground or satellite component of systems do not have a corresponding MASPS/MOPS.

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