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Minimum Aviation System Performance Standard (MASPS) for Coexistence of Wireless Avionics Intra-Communication Systems within 4200-4400 MHz

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FOREWORD

This document was originally prepared by the RTCA Special Committee 236 Standards for Wireless Avionics Intra-Communication (WAIC) system within 4200-4400 MHz jointly with EUROCAE WG-96. It was approved by the RTCA Program Management Committee on June 23,2022 and the EUROCAE Council on July 19, 2022.

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EXECUTIVE SUMMARY

EUROCAE and RTCA have defined this Minimum Aviation System Performance Standard (MASPS) that applies to Wireless Avionics Intra-Communications (WAIC) systems utilizing the frequency band 4 200 - 4 400 MHz as allocated by the World Radiocommunication Conference (WRC) in 2015. Key criteria for allocation of the band by the WRC were (i) coexistence between WAIC systems and (ii) coexistence between WAIC systems and Radio Altimeters (RA), both on board neighboring aircraft.

This MASPS defines two Performance Requirements (PR) that ensure WAIC systems meet the above coexistence criteria. The first PR specifies the power spectral flux density allowed to be emitted by WAIC systems on board an aircraft. The second PR specifies tolerance of WAIC systems to Radio Frequency (RF) emissions from RA and WAIC systems from neighboring aircraft. Both PRs were developed consistent with ITU-R documentation and validated by significant work by the Aerospace Vehicle Systems Institute (AVSI), EUROCAE and RTCA organizations to understand and characterize the worst-case conditions that may be experienced during the normal course of operation of the worldwide aircraft fleet.

This MASPS then specifies metrics to verify the power flux density and interference susceptibility of WAIC systems.

Finally, this MASPS provides an acceptable means to demonstrate compliance along with corresponding pass/fail criteria.

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1 PURPOSE AND SCOPE

1.1 Introduction and Purpose of Document

This document contains Minimum Aviation System Performance Standards (MASPS) for coexistence of Wireless Avionics Intra-Communication (WAIC) systems operating within the 4200-4400 MHz radio frequency band. The term WAIC refers to a broad class of on-board wireless communication systems intended to provide data links between various aircraft functions [1]. This document provides designers of WAIC systems with guidance on how to demonstrate coexistence of WAIC systems with aircraft systems installed on board other aircraft using the same radio frequency spectrum between 4200 MHz and 4400 MHz. These other aircraft systems are radio altimeter systems (radio altimeters) and WAIC systems on board other aircraft.

The notion of WAIC was first introduced when the aviation industry requested the International Telecommunication Union (ITU) to introduce a new frequency spectrum allocation to enable operation of wireless data links on board aircraft related to safety and regularity of flight. Resolution 424 of the 2015 World Radiocommunication Conference (WRC-15) [2] defined WAIC as "radiocommunication between two or more aircraft stations located on board a single aircraft, supporting the safe operation of the aircraft". The conference added to the Table of Frequency Allocations of the Radio Regulations (RR) a new Aeronautical Mobile (Route) Service – AM(R)S – allocation in the frequency band 4200-4400 MHz, which is reserved exclusively for WAIC. Per Article 1.33 of the RR, the aeronautical mobile (R) service is reserved for communications related to safety and regularity of flight. Thus, uses not related to the safety and regularity of flight such as in-flight entertainment or passenger connectivity are expressly excluded from the scope of WAIC. The restriction of WAIC to safety and regularity of flight related uses, in the absence of existing certification guidance, has created a need to develop such guidance for this new class of aircraft systems.

The need to address WAIC coexistence performance stems from the fact that the frequency band 4200-4400 MHz also contains a preexisting allocation to the Aeronautical Radio Navigation Service – ARNS – reserved exclusively for radio altimeters [2], [3]. ITU-R studied the coexistence between WAIC and radio altimeters within ITU-R Report M.2319. In particular, emission limits were reported in Table A-1.7. The new allocation for WAIC was introduced under the condition that the use of WAIC cannot disrupt or degrade the operation of radio altimeters. Resolution 424 (WRC-15) [2], derived from ITU-R compatibility studies [9] and expressed with the Recommendation ITU-R M.2085 [10], expressly states that WAIC shall not cause harmful interference to, nor claim protection from, radio altimeters.. This in effect grants priority to the ARNS allocation used by radio altimeters. It poses a requirement on WAIC system designers to assure protection of radio altimeters, without creating any corresponding reciprocal requirement on radio altimeter designers. The purpose of this MASPS is to provide WAIC system designers with acceptable means of demonstrating such protection.

Furthermore, this document is intended to establish an acceptable means of compliance for WAIC systems in accordance with the requirements in the Standards and Recommended Practices (SARPs) for WAIC developed by the International Civil Aviation Organization (ICAO). As part of World Radiocommunication Conference 2015, Resolution 424 mandated that WAIC must comply with ICAO SARPs, which are currently in development. The crucial aspects of these SARPs are that WAIC systems:

- shall not interfere with radio altimeters on other aircraft,

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