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Minimum Operational Performance Standards (MOPS) for Terrain Awareness and Warning Systems (TAWS) Airborne Equipment

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FOREWORD

This report was prepared by Special Committee 231 (SC-231) and approved by the RTCA Program Management Committee (PMC) on May 31, 2017

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- 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
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EXECUTIVE SUMMARY

Controlled flight into terrain (CFIT) has been a principal contributor of aircraft accidents. Beginning in the 1970s numerous studies examined the occurrence of CFIT accidents. Findings from these studies determined that high occurrences of CFIT accidents could have been reduced by a technology called a Ground Proximity Warning System (GPWS). A GPWS is a computer-based system that provides alerts to the flight crew when the aircraft is in close proximity to terrain. RTCA/DO-161A, Minimum Operational Performance Standards (MOPS) for GPWS, which discusses design and performance requirements, was published in May 1976.

Advances in terrain mapping technology permitted the development of a new type of GPWS, which provided greater situational awareness for flight crews. It was designed to help reduce the number of CFIT accidents further by providing additional information and warning to the flight crew in situations where the airplane may be inadvertently approaching terrain or a human-made obstruction. Introduced in the 1990's, Terrain Awareness and Warning Systems (TAWS) provide flight crews with earlier aural and visual warning of impending terrain, forward looking capability, and continued operation in the landing configuration – thus providing more time for the flight crew to make corrective actions. The TAWS MOPS was first published within an Appendix of a Federal Aviation Administration (FAA) Technical Standard Order (TSO-C151) in August 1999.

Subsequently, the FAA requested that RTCA Inc. form a committee to develop a MOPS for TAWS. At this point, maturity in TAWS technology, technological advancements, and decades of industry experience provided the catalyst for improvement to RTCA/DO-161A standards by convening Special Committee SC-231 to accomplish these goals.

In order to develop a consensus MOPS, the existing GPWS and TAWS requirements were reviewed, where necessary revised, and incorporated into one technology. Emphasis was placed on caution and warning alert envelopes, test conditions, environmental test conditions, flight environmental categories, and premature descent alerts.

Today, TAWS can be seen as one of the primary technologies installed in airplanes to provide situational awareness to the flight crew. The National Airspace (NAS) has benefitted from a reduction in aircraft accidents with the advent of TAWS. As this technology further evolves, it is envisioned that it will play a vital role in keeping the NAS a safe place for many years to come.

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1 PURPOSE AND SCOPE

1.1 Introduction

This document defines the Minimum Operational Performance Standards (MOPS) for a Terrain Awareness and Warning System (TAWS). These standards specify system characteristics that should be useful to designers, manufacturers, installers, and users of the Equipment.

The word "Equipment" as used herein includes all the functional components necessary to properly perform the intended function. However, all external components to the function which are cockpit or system specific, though necessary for a proper operation of the function at a system level, are out the scope of the equipment requirements (e.g., cockpit controls, cockpit indicators, cockpit display, aural systems, inputs sensors). Note that any databases (such as terrain, airport, runway) that might be required by the TAWS are not considered to be part of the Equipment as used in this document.

1.1.1 Compliance

In this document, the term "**shall**" is used to indicate a requirement for the TAWS equipment or TAWS manufacturer. The term "should" is used to denote a recommendation that would improve the TAWS equipment, but does not constitute a requirement. The term "may" is used to denote an acceptable implementation. The term "must" is used in explanatory text, installation guidance, and graphics to explain or illustrate necessary conditions. The use of the term "must" does not by itself indicate a requirement for the TAWS equipment.

1.1.2 Document Contents

Section 1 of this document provides information needed to understand the rationale for equipment characteristics and requirements stated in the remaining sections. It describes typical equipment applications and operational goals, as envisioned by the members of Special Committee 231, and establishes the basis for the standards stated in Sections 2 through 4. Definitions and assumptions essential to proper understanding of this document are also provided in this section.

Section 2 contains the minimum performance standards for the Equipment. These standards specify required performance under standard and environmental conditions. Also included are recommended bench test procedures necessary to demonstrate equipment compliance with the stated minimum requirements.

Section 3 describes the performance required of the installed equipment. Tests for the installed equipment are included when performance cannot be adequately determined through bench testing.

Section 4 describes the operational performance characteristics for equipment installations and defines conditions that will assure the equipment user that operations can be conducted safely and reliably in the expected operational environment.

1.2 System Overview

A typical TAWS is intended to provide flight crews with aural and visual alert aids aimed at reducing the risk of CFIT accident through increased terrain awareness.

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