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Minimum Operational Performance Standards (MOPS) for Traffic Alert and Collision Avoidance System II (TCASII) Hybrid Surveillance

RTCA DO-300A
March 20, 2013

Prepared by: SC-147
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FOREWORD

This report was prepared by Special Committee 147 (SC-147) and approved by the RTCA Technical Management Committee on March 20, 2013. It provides modifications to RTCA/DO-185B, *Minimum Operational Performance Standards for Traffic Alert and Collision Avoidance System II (TCAS II) Airborne Equipment* that are required to implement hybrid surveillance techniques in conjunction with the other functions of that equipment.

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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

- 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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1 PURPOSE AND SCOPE

1.1 Introduction

This document contains Minimum Operational Performance Standards for Traffic Alert and Collision Avoidance System II (TCAS II) equipment that uses hybrid surveillance. Hybrid surveillance includes both passive surveillance using the Mode S extended squitter as well as the active interrogations used in TCAS II systems built in compliance with RTCA/DO-185B. These standards specify system characteristics that should be useful to designers, manufacturers, installers and users of the equipment.

Compliance with these standards is recommended as one means of assuring that the equipment will perform its intended function satisfactorily under all conditions normally encountered in routine aeronautical operation. Any regulatory application of this document is the sole responsibility of appropriate governmental agencies.

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 operations and operation goals, as envisioned by the members of RTCA Special Committee 147 (SC-147) and EUROCAE Working Group 75 and establishes the basis for the standards stated in Sections 2 and 3. Definitions and assumptions essential to proper understanding of this document are also provided in this section.

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

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

This document considers an equipment configuration as specified in Ref. A with the following additions:

- The TCAS Processor Unit is implemented with the ability to decode the extended squitter. This was identified as an optional feature in Ref. A, §1.3.2.1. The TCAS Processor Unit must meet the additional requirements (defined in Ref. C) of a receiver that is shared between TCAS and a 1090 MHz Automatic Dependent Surveillance-Broadcast (ADS-B) receiver.

- The TCAS Processor Unit is provided own position latitude and longitude information from the aircraft and associated quality parameters.

- The TCAS Processor Unit is provided own aircraft ground speed from the aircraft.

This document considers an equipment configuration identified in the System Overview, §1.2. Operational performance standards for functions or components that refer to equipment capabilities that exceed the stated minimum requirements are identified as optional features.

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"TCAS equipment" as used herein includes all components or units necessary (as determined by the manufacturer or installer) for the equipment to perform its function properly with the exception of the Mode S transponder. It should not be inferred that each TCAS equipment design will necessarily have all components or units in separate packages. This will depend on the specific design chosen by the manufacturer.

If the equipment implementation includes a computer software package, the guidelines contained in RTCA Document No. DO-178B, *Software Consideration in Airborne Systems and Equipment Certification*, should be considered.

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c. Installed Equipment Tests

The installed equipment test procedures and their associated limits are specified in Section 3. Although bench and environmental test procedures are not included in the installed equipment test, their successful completion is a precondition to completion of the installed test. In certain instances, however, installed equipment tests may be used in lieu of bench test simulation of such factors as power supply characteristics and interference from or to other equipment installed on the aircraft. Installed tests are normally performed under two conditions:

- With the aircraft on the ground, using simulated or operational system inputs.
- With the aircraft in flight, using operational system inputs appropriate to the equipment under test.

Test results may be used to demonstrate functional performance in the intended operational environment.

1.7 Definition of Terms

Active Surveillance – The use of TCAS interrogations and subsequent replies to update or acquire a TCAS track.

Airborne Position Message – A Mode S extended squitter (DF=17) that contains aircraft position and altitude or an ADS-B report updated for position.

ADS-B Report – A report from a Ref. C compliant ADS-B report generator function which contains ICAO address, latitude, longitude, altitude, NIC, NACp, SIL, and Air/Ground information.

Crosslink Interrogation – A Mode S UF=0 interrogation with RL=1. This interrogation can be used to request the aircraft position data from another aircraft's transponder that would be included if an Airborne Position Message was squittered at that instant.

Established Track – A track that has been acquired as specified in Ref. A, §2.2.4.6.2.2.2 (Acquisition) or per §2.2.5.2 of this document, and subsequently maintained under either active or passive surveillance.

Estimated Signal Strength – The signal strength associated with an aircraft used in determining if an aircraft is above or below the Extended Hybrid Surveillance MTL.

Extended Hybrid Surveillance MTL – A signal threshold used in determining whether an aircraft qualifies for Extended Hybrid Surveillance (see §2.2.5.2.3).

Extended Hybrid Surveillance Track – A track that is being maintained with qualified Airborne Position Messages without validating active interrogations.

Extended Squitter – A long 112-bit unsolicited reply, DF=17 Mode S squitter.

Horizontal Position Integrity Bounds – Describes an integrity containment region about the reported position, within which the true position of the surveillance position reference point is assured to lie at the reported time of applicability.

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