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Minimum Operational Performance Standards for Traffic Alert and Collision Avoidance System II (TCAS II) Airborne Equipment

Volume 1

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Foreword

This report was prepared by Special Committee 147 (SC-147) and approved by the RTCA Technical Management Committee (TMC) on December 16, 1997.

RTCA, Incorporated is a not-for-profit corporation formed to advance the art and science of aviation and aviation electronic systems for the benefit of the public. The organization functions as a Federal Advisory Committee and develops consensus based recommendations on contemporary aviation issues. RTCA's objectives include but are not limited to:

- coalescing aviation system user and provider technical requirements in a manner that helps government and industry meet their mutual objectives and responsibilities;

- 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.

The organization's recommendations are often used as the basis for government and private sector decisions as well as the foundation for many Federal Aviation Administration Technical Standard Orders.

Since RTCA is not an official agency of the United States Government, its recommendations may not be regarded as statements of official government policy unless so enunciated by the U.S. government organization or agency having statutory jurisdiction over any matters to which the recommendations relate.

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1.0 PURPOSE AND SCOPE

1.1 Introduction

This document sets forth minimum operational performance standards for Traffic Alert and Collision Avoidance System II (TCAS II) equipment.

Note: There are three members of the TCAS family. TCAS I is a pilot warning indicator which displays proximate traffic and alerts the crew to other aircraft which may become potential near midair collision threats. TCAS II in addition provides recommended vertical escape maneuvers to the crew to avert potential near midair collisions. TCAS IV is proposed TCAS equipment that has additional capabilities beyond those of TCAS II equipment to generate resolution advisories in the horizontal plane (e.g., "TURN RIGHT," "TURN LEFT"). The equipment described by this document does not have horizontal resolution capability. In this document, TCAS I is denoted "TCAS I"; the use of the unqualified term "TCAS" refers exclusively to TCAS II; and TCAS IV either is explicitly denoted "TCAS IV" or is implicitly denoted together with TCAS II by the qualifying language "TCAS with a resolution advisory generating capability".

TCAS provides a reliable aircraft separation assurance function in traffic densities as high as 0.3 aircraft per square nautical mile (24 transponder-equipped aircraft within five nautical miles of the TCAS-equipped aircraft).

When TCAS operates in traffic densities of 0.3 transponder-equipped aircraft per square nautical mile or higher, it provides protection against collisions with other aircraft that are closing at speeds of less than 500 kt. TCAS is also capable of providing protection against aircraft closing at relative speeds of up to 1200 kt in airspace characterized by densities of less than 0.06 transponder-equipped aircraft per square nautical mile, which is equivalent to eighteen transponder-equipped aircraft within ten nautical miles of the TCAS aircraft.

In addition to the minimum standards contained in this document, several options are described herein which will allow TCAS to request and/or receive information from other MODE S-equipped aircraft. These optional features provide for the exchange of information via the proposed MODE S extended squitter or an air to air data link. The purpose for including these options in this standard is to permit a uniform minimum capability to upgrade or enhance TCAS in the future. The specific applications for these optional features and the applications' corresponding minimum operational performance characteristics are not part of these standards.

Incorporated within these standards are system characteristics that should be of value to users, designers, manufacturers, and installers. These characteristics are intended to accommodate the requirements of various users.

This document is published in two volumes. Section 1.0 of Volume I is intended to provide 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 147 and is the basis for the standards stated in the document. Definitions essential to proper understanding of this document are also provided in Section 1.0.