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Minimum Operational Performance Standards for Global Positioning System / Wide Area Augmentation System Airborne Equipment

RTCA DO-229D
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Foreward

This report was prepared by Special Committee 159 (SC-159) and approved by the RTCA Program Management Committee (PMC) on December 13, 2006.

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 organizations' 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 contains minimum operational performance standards (MOPS) for airborne navigation equipment (2D and 3D) using the Global Positioning System (GPS) augmented by Satellite-Based Augmentation Systems (SBAS); which, in the U.S. is the Wide Area Augmentation System (WAAS). DO-229 only provides standards for single frequency airborne navigation equipment. A separate document will be created in the future to address standards for dual frequency equipment. These standards are intended to be applicable to other SBAS providers, such as European Geostationary Navigation Overlay Service (EGNOS) and Japan's Multi-functional Transport Satellite (MTSAT) Satellite-based Augmentation System (MSAS).

In this document, the term "shall" is used to indicate requirements. An approved design should comply with every requirement, which can be assured by inspection, test, analysis, or demonstration. The term "must" is used to identify items that are important but are either duplicated somewhere else in the document as a "shall", or are considered to be outside the scope of this document. The term "should" is used to denote a recommendation that would improve the SBAS equipment, but does not constitute a requirement.

The standards define minimum performance, functions and features for SBAS-based sensors that provide position information to a multi-sensor system or separate navigation system. They also address SBAS-based Area Navigation (RNAV) equipment to be used for the en route, terminal, and Lateral Navigation (LNAV) phases of flight. These standards are based upon a nominal allocation of the aircraft-level requirements in RTCA/DO-236B, *Minimum Aviation System Performance Standards: Required Navigation Performance for Area Navigation*, accounting for the unique issues associated with SBAS and GNSS navigation service and minimizing the need for pilot training. These standards also define performance, functions and features for equipment that satisfies the requirements for Lateral Navigation/Vertical Navigation (LNAV/VNAV), Localizer Performance without vertical guidance (LP), and Localizer Performance with Vertical guidance (LPV) instrument procedures. The standards cover SBAS-based equipment that is designed to serve combinations of the above phases of flight.

Compliance with these standards by manufacturers, installers and users is recommended as one means of assuring that the equipment will satisfactorily perform its intended functions under conditions encountered in routine aeronautical operations, and will ensure a basic compatibility with the requirements defined in RTCA/DO-236B. Manufacturers and operators who elect to comply directly with the requirements of RTCA/DO-236B as part of an aircraft certification (type certificate or supplemental type certificate) may bypass these RNAV standards, but are not expected to be eligible for a Class Gamma TSO authorization.

The regulatory application of these standards is the responsibility of appropriate government agencies. In the United States, the Federal Aviation Administration (FAA) has published a Technical Standard Order (TSO) for GPS/WAAS equipment to reference the requirements and bench test procedures in Section 2.

The word "equipment", as used in this document, includes all components or units necessary (as determined by the equipment manufacturer or installer) to properly perform its intended function. For example, the airborne "equipment" may include: sensor(s), a computer unit, an input-output unit that interfaces with existing aircraft displays/systems, a control unit, a display, shock mount(s), etc. In the case of this example, all of the