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Minimum Operational Performance Standards (MOPS) for Airborne Area Navigation Equipment Using Multi-Sensor Inputs

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F O R E W O R D

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1.0 PURPOSE AND SCOPE

1.1 Introduction

This document contains minimum operational performance standards for airborne area navigation equipment (2D and 3D) operated in the National Airspace System (NAS) using multi-sensor inputs. Performance standards for equipment operated in other airspace, such as the North Atlantic minimum navigation performance standard (MNPS), are contained in the respective guidance material for that airspace. The types and numbers of these sensors are not specifically defined in this document. An RNAV multi-sensor system is defined as an area navigation system which determines aircraft position using data derived from sensors of two or more generic types, or alternatively from VOR and/or DME facilities which may or may not include the reference station. Incorporated within these standards are equipment characteristics that should be useful to users, designers, manufacturers and installers of the equipment. This document defines the performance, functions and features for a 2D system which performs only lateral guidance and a 3D system which performs both lateral and vertical guidance. Equipment may be manufactured and tested to meet 2D or 3D requirements (or both) in the en route, terminal and approach modes (or any combination of).

Section 1.0 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 137, and forms the basis for the standards stated in Sections 2.0 through 4.0. Definitions and assumptions essential to proper understanding of this document are also provided in Section 1.0.

Section 2.0 contains the minimum performance standards for the equipment. These standards define required performance under standard operating conditions and stressed physical environmental conditions. It also details the recommended bench test procedures necessary to demonstrate compliance.

Section 3.0 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 4.0 describes the operational characteristics for equipment installations and defines conditions that will assure the operator that operations can be conducted safely and reliably in the expected operational environment.

Compliance with these standards by manufacturers, installers, and users is recommended as one means of assuring that the equipment will satisfactorily perform its intended function(s) under conditions normally encountered in routine aeronautical operations. In addition, to safely and efficiently implement area navigation as an integral element of the U. S. National Airspace System (NAS), it is mandatory that the airborne equipment be designed such that all airborne operations responding to like controller instructions will result in similar maneuvering of the aircraft, regardless of system type.

The word "equipment" as used in this document includes all components or units necessary (as determined by the equipment manufacturer or installer) for the equipment to properly perform its intended function. For example, the airborne area navigation "equipment" may include: Sensor(s), a computer unit, an input-output unit which interfaces with existing aircraft displays/systems, a control unit, a display, shock mount(s), etc. In the case of this example, all of the foregoing components or units comprise the "equipment." It should not be inferred from this example, however, that every area navigation equipment will necessarily include all of the foregoing components or units. This will depend upon the design used by the equipment manufacturer.

If the equipment implementation includes a computer software package, the guidelines contained in RTCA/DO-178, "Software Considerations in Airborne Systems and Equipment Certification," should be considered.

The equipment manufacturer should consider the criticality appropriate for installation certification in determining the level of software requirements as defined in RTCA/DO-178, equipment failure analysis, and fault monitoring to be accomplished.

It is recognized that any regulatory application of these standards is the responsibility of appropriate government agencies.

Inasmuch as the measured values of equipment performance characteristics may be a function of the measurement method, standard test conditions and methods of test are recommended in this document.

1.2 System Characteristics

An area navigation system, herein referred to as RNAV equipment, is an airborne device or combination of devices