RTCA, Inc.
1140 Connecticut Avenue, NW, Suite 1020
Washington, DC 20036-4001 USA

Minimum Operational Performance Standards (MOPS) for Airborne VOR Receiving Equipment Operating Within the Radio Frequency Range of 108-117.95 MHz

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Prepared by: SC-153
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RTCA, Inc.

Telephone: 202-833-9339
Facsimile: 202-833-9434
Internet: www.rtca.org

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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 VHF Omnidirectional Range (VOR) receiving equipment. 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 operations.

Any regulatory application of this document is the sole responsibility of appropriate governmental agencies.

Section 1.0 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 and establishes 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 specify the 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 3.0 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 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.

This document considers an equipment configuration consisting of: Antenna system(s), transmission lines, radio receiver, omni converter and a course deviation indication display. Additional functions and components that refer to expanded equipment capabilities are identified as optional features.

The word "system" as used in this document refers to the VOR system. It includes all portions of both the VOR ground transmitter and the VOR airborne equipment.

The word "equipment" as used in this document includes all components and units necessary for the system to properly perform

its intended function. For example, the "equipment" may include an antenna, a receiver unit, omni converter, course deviation indicator, a shock mount, etc. In the case of this example, all of the foregoing components and units comprise the "equipment." It should not be inferred from this example that each airborne VOR receiving equipment design will necessarily include all of the foregoing components or units. This will depend on the specific design chosen by the manufacturer.

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

1.2 System Overview

The VOR system consists of the VOR airborne equipment and VOR ground station transmitter operating in the frequency range of 108 to 117.95 MHz.

The ground station transmits an RF signal with two 30 Hz modulated signals. The relative phase of the two 30 Hz signals defines radial lines in space with respect to the ground station. The VOR ground station antenna is normally aligned in such a manner that its 0 degree radial agrees with the area's magnetic north. Each VOR transmitter also transmits an identifier so it can be positively identified.

The VOR airborne equipment receives, detects and presents this information in such a way that the relative bearing with respect to the ground transmitter can be determined. With this type of presentation, any bearing with respect to the ground station can be selected and flown.

1.3 Operational Applications

Airborne VOR receiver equipment is used in a variety of ways. For example, in the simplest applications, VOR receiving equipment provides course deviation indication to the pilot when flying along the routes defined by VOR ground stations (i.e. victor airways). The airborne VOR equipment may also provide bearing input into an area navigation (RNAV) computer for direct point-to-point flights. In addition, the VOR receiving equipment may provide input into horizontal situation indicators (HSI), radio magnetic indicators (RMI), flight directors or electronic flight instrumentation systems (EFIS).

It is anticipated that VORs will continue to provide navigation guidance to support both en route and terminal area flight operations. With the advent of FAA's NAS plan and the stated intent to network VORs, it is anticipated that the use of the VOR as an input sensor for a navigation computer will be even more prevalent in the future.