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Minimum Aviation System Performance Standards: Required Navigation Performance for Area Navigation

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Prepared by SC-227

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FOREWORD

This report was prepared by RTCA Special Committee 227 (SC-227) and EUROCAE Working Group 85(WG-85) and approved by the RTCA Program Management Committee (PMC) on June 23, 2022 and as ED-75E by the council on June 23, 2022.

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 Standards Development Organization 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.

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1 PURPOSE AND SCOPE

1.1 Introduction

The International Civil Aviation Organization (ICAO) recognized a need for dramatic improvements to the existing air navigation system. The ICAO Special Committee of Future Air Navigation Systems (FANS) developed a new concept expressed in terms of communication, navigation, surveillance and air traffic management (CNS/ATM). It was intended to be an evolutionary means of achieving improvements in the global air navigation system. To obtain the benefits of the CNS/ATM concept, aircraft need to achieve accurate, repeatable and predictable navigation performance. This is referred to as Required Navigation Performance (RNP).

The FANS concept evolved further into specific ATM modernization programs in the United States, Europe and other countries. All of these programs relied on both RNAV and RNP to enable the operational improvements needed for improved capacity, efficiency, safety, environment and global interoperability. However, the implementations led to differences in the operational applications, aircraft requirements and associated authorizations, causing confusion in the aviation community e.g. the designation of RNP 10 which through its own terms could be seen as RNAV 10.

The ICAO Performance Based Navigation (PBN) Study Group (SG) was formed after increasing misunderstanding, confusion and feedback resulted from States implementing RNAV and RNP operations in ways that differed from the original applications. The differences were significant in terms of the operational assumptions, mitigation of operational issues, management and assurance of the aircraft capabilities, etc., that could impede global interoperability and safety. The PBN SG's primary task was to create information to clarify RNAV and RNP, provide guidance to aid implementation, and harmonize and better specify area navigation and RNP, all in the development of the ICAO PBN Manual. The navigation specifications and other material in the manual are the result of the PBN SG efforts. One of the strong influences on the PBN Manuals information and guidance was the RTCA RNP RNAV Minimum Aviation System Performance Standards (MASPS) and Minimum Operational Performance Standards (MOPS).

This document contains MASPS for area navigation systems operating in an RNP environment. These standards are intended for designers, manufacturers, and installers of avionics equipment, service providers and users of these systems for world-wide operations. The MASPS provides guidance to aid in the development of airspace and operational procedures needed to obtain the benefits of improved navigation capability.

The requirements of this MASPS are intended to be consistent with the definitions of RNP developed by the ICAO PBN SG and enable PBN-based operational applications. The MASPS uses the term RNP RNAV for the aircraft system because it encompasses a more complete set of technical standards, definitions, considerations and minimum requirements than is contained in any one of the individual specifications for RNP systems in the ICAO Manual. The MASPS represents a comprehensive collection of features and capabilities that can be applied in total or as a feature set tailored to specific needs e.g. as in a single PBN navigation specification, but where the features all follow the common standard established by this MASPS.

Barometric vertical navigation (VNAV) requirements are defined for aircraft that provide this optional capability to ensure accurate and predictable vertical paths. The VNAV requirements in this document are consistent with instrument approach procedures with vertical guidance (APV). Due to the wide disparity of climb performance of different

