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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 19, 2013

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- 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.

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## TABLE OF CONTENTS

<b>1. PURPOSE AND SCOPE .....</b>	<b>1</b>
<b>1.1 Introduction.....</b>	<b>1</b>
<b>1.2 System Overview.....</b>	<b>2</b>
1.2.1 Position Estimation .....	2
1.2.2 Path Definition .....	4
1.2.3 Path Steering .....	4
1.2.4 User Interface.....	5
1.2.5 Navigation System Controls and Features .....	5
<b>1.3 Operational Goals and Applications .....</b>	<b>5</b>
1.3.1 Path Definition .....	5
1.3.2 Containment Methodology .....	5
1.3.3 Contribution to Increased Capacity.....	6
1.3.4 User-Preferred Trajectories and Trajectory Based Operations .....	6
<b>1.4 Required Navigation Performance (RNP).....</b>	<b>6</b>
1.4.1 Area Navigation .....	6
1.4.2 PBN and RNP Concept.....	6
1.4.3 Application of the Term RNP .....	7
1.4.4 Navigation Accuracy.....	7
1.4.5 Vertical Navigation (VNAV).....	8
<b>1.5 Assumptions .....</b>	<b>8</b>
1.5.1 Navigation Infrastructure .....	8
1.5.2 Defining Airspace .....	8
1.5.3 Navigation Error .....	9
1.5.4 Navigation Data .....	9
1.5.5 Reference Earth Model .....	9
1.5.6 Desired Path.....	9
1.5.7 Transitions Between Legs.....	10
1.5.8 Datalink Considerations.....	11
1.5.9 Polar Navigation .....	11
1.5.10 Dispatch Assessment .....	11
<b>1.6 Verification Procedures.....</b>	<b>11</b>
<b>1.7 Definitions.....</b>	<b>11</b>
1.7.1 Required Navigation Performance.....	11
1.7.2 Error Terms .....	12
1.7.3 Lateral Containment Concept .....	14
1.7.4 Vertical Performance.....	17

<b>2. SYSTEM PERFORMANCE REQUIREMENTS .....</b>	<b>19</b>
<b>2.1 Accuracy .....</b>	<b>19</b>
2.1.1 RNP.....	19
2.1.2 VNAV .....	19
<b>2.2 Containment Integrity .....</b>	<b>21</b>
2.2.1 RNP RNAV.....	21
2.2.2 VNAV .....	21
<b>2.3 Containment Continuity.....</b>	<b>21</b>
2.3.1 RNP RNAV.....	21
2.3.2 VNAV .....	22
<b>2.4 Estimated Time of Arrival .....</b>	<b>22</b>
<b>2.5 Time of Arrival Control .....</b>	<b>22</b>
<b>2.6 Lateral Control Performance .....</b>	<b>22</b>
<b>2.7 Speed Control Performance.....</b>	<b>23</b>
<b>3. FUNCTIONAL REQUIREMENTS .....</b>	<b>25</b>
<b>3.1 Position Estimation Requirements .....</b>	<b>25</b>
3.1.1 Estimate of Position .....	25
3.1.2 Estimate of Position Uncertainty (EPU) .....	25
3.1.3 Containment Radius.....	25
3.1.4 Position Estimation Effects on System Compliance .....	26
<b>3.2 Path Definition Requirements .....</b>	<b>26</b>
3.2.1 Flight Path Legs Developed from the Navigation Database .....	27
3.2.2 Flight Path Legs Developed from User-Defined Data .....	27
3.2.3 Leg Definition.....	28
3.2.4 Special Operations .....	32
3.2.5 Error Terms .....	36
3.2.6 Applicable RNP .....	43
3.2.7 Prohibited Leg Types .....	44
3.2.8 Vertical Path Definition .....	44
<b>3.3 Path Steering Requirements .....</b>	<b>52</b>
3.3.1 RNP RNAV.....	52
3.3.2 VNAV .....	53
3.3.3 Continuous Lateral Path Steering.....	53
<b>3.4 Estimated Time of Arrival .....</b>	<b>53</b>
3.4.1 Equipment Requirements .....	53
3.4.2 Operational Considerations .....	53
<b>3.5 Time of Arrival Control .....</b>	<b>53</b>
3.5.1 Equipment Requirements .....	53

<b>3.6</b>	<b>User Interface Requirements</b>	<b>54</b>
3.6.1	General	54
3.6.2	Displays and Controls	54
<b>3.7</b>	<b>System Features and Capabilities</b>	<b>55</b>
3.7.1	Initialization Capability	55
3.7.2	Path Selection	56
3.7.3	Navigation Source (Navaid) Selection	62
3.7.4	Path Steering	62
3.7.5	Displays/Status	63
3.7.6	Alerting	68
3.7.7	Estimated Time of Arrival	69
3.7.8	Time of Arrival Control	69
<b>3.8</b>	<b>Navigation Database Requirements</b>	<b>70</b>
3.8.1	Content	70
3.8.2	Access	70
3.8.3	Database Standard	70
<b>3.9</b>	<b>Datalink Interface</b>	<b>70</b>
<b>3.10</b>	<b>Navigation Display Interface</b>	<b>70</b>
<b>4.</b>	<b>NAVIGATION SYSTEM PERFORMANCE EVALUATION</b>	<b>73</b>
<b>4.1</b>	<b>General</b>	<b>73</b>
4.1.1	Certification and Process Basis	73
4.1.2	Navigation Accuracy and Containment Compliance	73
<b>4.2</b>	<b>Performance Accuracy Compliance</b>	<b>76</b>
4.2.1	Lateral Performance	76
4.2.2	Vertical Performance	77
<b>4.3</b>	<b>General Containment Compliance</b>	<b>77</b>
4.3.1	Containment Integrity	77
4.3.2	Containment Continuity	78
<b>4.4</b>	<b>Containment Integrity and Continuity Evaluation</b>	<b>78</b>
4.4.1	System Development Evaluation and System Monitoring	78
4.4.2	Failure Analysis Description	80
<b>5.</b>	<b>MEMBERSHIP</b>	<b>85</b>

<b>APPENDIX A: REFERENCES, GLOSSARY, ACRONYMS AND ABBREVIATIONS.....</b>	<b>A-1</b>
<b>APPENDIX B: EXAMPLE OF SYSTEM COMPLIANCE ANALYSIS.....</b>	<b>B-1</b>
<b>APPENDIX C: NAVIGATION SYSTEM REQUIREMENTS AND INFRASTRUCTURE CHARACTERISTICS .....</b>	<b>C-1</b>
<b>APPENDIX D: INTENTIONALLY LEFT BLANK.....</b>	<b>D-1</b>
<b>APPENDIX E: HOLDING PATTERN ENTRY EXAMPLE .....</b>	<b>E-1</b>
<b>APPENDIX F: CNS-ATM SYSTEM CONSIDERATIONS .....</b>	<b>F-1</b>
<b>APPENDIX G: RNP RNAV / VNAV / TOAC REQUIREMENTS CROSS REFERENCE .....</b>	<b>G-1</b>
<b>APPENDIX H: TEMPERATURE COMPENSATION .....</b>	<b>H-1</b>
<b>APPENDIX I : RNP LESS THAN 0.3 NM .....</b>	<b>I-1</b>

## Table of Figures

FIGURE 1-1	Navigation System Block Diagram .....	3
FIGURE 1-2	Lateral Components of Navigation Error Terms .....	12
FIGURE 1-3	Vertical Components of Navigation Error Terms .....	13
FIGURE 1-4	Cross-Track Containment Parameters .....	14
FIGURE 1-5	Navigation System Operational States .....	15
FIGURE 1-6	Position Estimation Performance Measures .....	16
FIGURE 1-7	Vertical Path Performance Limit .....	17
FIGURE 2-1	Illustration of VPPL Along Vertical Profile .....	20
FIGURE 3-1	Track to Fix (TF) Leg .....	28
FIGURE 3-2	Radius to Fix (RF) Leg .....	29
FIGURE 3-3	Fix to Altitude (FA) Leg .....	30
FIGURE 3-4	Direct to Fix (DF) Leg .....	31
FIGURE 3-5	Course to Fix (CF) Leg .....	31
FIGURE 3-6	Holding Pattern Definition .....	33
FIGURE 3-7	Offset Path Definition .....	36
FIGURE 3-8	Fly-By Theoretical Transition Area .....	41
FIGURE 3-9	Fixed Radius Transition .....	42
FIGURE 3-10	Descent Path Permitted by Two "WINDOW" Constraints, Two "AT" Constraints and Cruise and Altitude .....	47
FIGURE 3-11	Descent Path defined by AT constraints and a Cruise Altitude .....	49
FIGURE 3-12	Waypoint with Vertical Constraint .....	50
FIGURE 3-13	Fly-By Transition .....	50
FIGURE 4-1	System Development and Safety Assessment Processes .....	74
FIGURE 4-2	System Validation Processes .....	75
FIGURE 4-3	Top Level Navigation Fault Tree .....	82
FIGURE B-1	Single System Fault Diagram .....	B-7
FIGURE B-2	Dual System Fault Diagram .....	B-8
FIGURE E-1	Holding Entry Sectors .....	E-2
FIGURE E-2	Sector 1 Entry Procedure .....	E-2
FIGURE E-3	Sector 2 Entry Procedure .....	E-3
FIGURE E-4	Sector 3 Entry Procedure .....	E-3
FIGURE E-5	Sector 4 Entry Procedure .....	E-4

## Table of Tables

TABLE 1-1	RNP Applicability Range .....	8
TABLE 2-1	Vertical Path Performance Limit for Vertical Navigation.....	19
TABLE 3-1	Maximum Holding Airspeeds (KIAS) .....	34
TABLE 3-2	Error Terms .....	36
TABLE 3-3	Operational Applicability of Speed Restrictions .....	46
TABLE 3-4	Example of Vertical Height Loss for Fly-By .....	51
TABLE 3-5	Display/Entry Resolutions.....	55
TABLE 3-6	Non-Numeric Display Requirements .....	63
TABLE 4-1	Containment Characterization of Navigation System .....	83
TABLE B-1	Assumptions .....	B-3
TABLE B-2	Analysis Results Summary .....	B-6
TABLE C-1	Maximum VOR Ranges .....	C-2
TABLE C-2	Maximum DME Ranges.....	C-3
TABLE G-1	Requirements Cross Reference.....	G-1

## **1.0 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.

This document contains Minimum Aviation System Performance Standards (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. The MASPS uses the term RNP RNAV for the aircraft system because it encompasses a more complete set of technical standards, definitions, considerations and requirements than is contained in any one of the individual specifications in the ICAO Manual. The MASPS represents a single, 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. In addition, 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 aircraft types, this MASPS only addresses vertical path definition requirements for level flight and descent. Finally, requirements for an optional estimated time of arrival (ETA) function is defined for systems that provide these capabilities.