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**Minimum Operational Performance Standards  
(MOPS) for Airborne Supplemental Navigation  
Equipment Using Global Positioning System  
(GPS)**

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## FOREWORD

This document was prepared by RTCA Special Committee 159. It was approved by the RTCA Executive Committee on July 12, 1991.

RTCA is an association of aeronautical organizations of the United States from both government and industry. Dedicated to the advancement of aeronautics, RTCA seeks sound technical solutions to problems involving the application of electronics and telecommunications to aeronautical operations. Its objective is the resolution of such problems by mutual agreement of its member organizations. The findings of RTCA are in the nature of recommendations to all organizations concerned. 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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# TABLE OF CONTENTS

	<u>Page</u>
FOREWORD .....	i
TABLE OF CONTENTS .....	iii
1.0 PURPOSE AND SCOPE .....	1
1.1 Introduction .....	1
1.2 System Characteristics .....	2
1.2.1 Waypoint Definition .....	2
1.2.2 Course Selection .....	3
1.2.2.1 TO-FROM Equipment .....	3
1.2.2.2 TO-TO Equipment .....	3
1.2.3 Path Computation .....	4
1.2.4 Coordinate Systems .....	4
1.2.5 Satellite Selection .....	4
1.2.6 Lateral and Vertical Steering Outputs .....	5
1.2.7 GPS Signal Characteristics .....	5
1.2.8 GPS Latitude/Longitude Sensors .....	5
1.3 Intended Use and Operational Environment .....	5
1.3.1 Area Navigation in the Present ATC System .....	5
1.3.2 Historical Considerations .....	9
1.3.3 Route Width Consideration .....	10
1.3.3.1 General .....	10
1.3.3.2 Approach .....	10
1.3.3.3 Terminal .....	10
1.3.3.4 Federal Airways .....	10
1.3.3.5 Jet Route .....	10
1.3.3.6 RNAV Route .....	10
1.3.3.7 Oceanic Route .....	12
1.3.4 Postulated Air Traffic Control Environment .....	12
1.3.5 Operational Environment Assumptions .....	13
1.3.6 Oceanic Operation .....	13
1.3.7 Time and Velocity .....	14
1.4 Error Budgets .....	14
1.4.1 VOR/DME Error Budget .....	14
1.4.2 GPS Error Budget .....	14

	<u>Page</u>
1.4.2.1	TO-FROM Course Computation Effects . . . . . 18
1.4.2.2	North Reference Effects . . . . . 18
1.4.3	Error Budget - VNAV . . . . . 18
1.5	System Integrity . . . . . 19
1.5.1	General Concepts of GPS Integrity . . . . . 19
1.5.2	Receiver Autonomous Integrity Monitoring (RAIM) . . . . . 19
1.5.3	GPS Integrity Channel (GIC) . . . . . 20
1.6	Test Considerations . . . . . 20
1.6.1	Accuracy Testing . . . . . 20
1.6.2	Test Procedures . . . . . 20
1.6.2.1	Environmental Tests . . . . . 20
1.6.2.2	Bench Tests . . . . . 21
1.6.2.3	Installed Tests . . . . . 21
1.6.2.4	Operational Tests . . . . . 21
1.7	Integrated Systems . . . . . 21
1.7.1	Hybrid Inertial Systems . . . . . 21
1.7.2	Multi-Sensor RNAV System . . . . . 22
2.0	EQUIPMENT PERFORMANCE REQUIREMENTS AND TEST PROCEDURES . . . . . 23
2.1	General Requirements . . . . . 23
2.1.1	Airworthiness . . . . . 23
2.1.2	General Performance . . . . . 23
2.1.3	Fire Resistance . . . . . 23
2.1.4	Operation of Controls . . . . . 23
2.1.5	Accessibility of Controls . . . . . 23
2.1.6	Sensor Interfaces . . . . . 23
2.1.7	Control/Display Capability . . . . . 23
2.1.8	Control/Display Readability . . . . . 24
2.1.9	Effects of Test . . . . . 24
2.1.10	Maneuver Anticipation . . . . . 24
2.1.11	Update Rate . . . . . 24
2.2	2D RNAV Functional and Accuracy Requirements - Standard Conditions . . . . . 24
2.2.1	Equipment Functional Requirements . . . . . 24
2.2.1.1	Cross-Track Deviation . . . . . 24

	<u>Page</u>
2.2.1.1.1	Numeric Display Information . . . . . 24
2.2.1.1.2	Non-Numeric Display Information . . . . . 25
2.2.1.2	Waypoint Distance Display . . . . . 25
2.2.1.3	TO-FROM Indication . . . . . 25
2.2.1.4	Flight Path Selection . . . . . 26
2.2.1.5	Waypoint Entry . . . . . 26
2.2.1.6	Waypoint Storage . . . . . 26
2.2.1.7	Waypoint or Leg Sequencing . . . . . 27
2.2.1.8	Position Display . . . . . 27
2.2.1.9	Input Data Observation . . . . . 27
2.2.1.10	Failure/Status Indications . . . . . 27
2.2.1.11	Satellite Selection and Indication . . . . . 29
2.2.1.12	Equipment Computational Response Time After Waypoint Entry . . . . . 29
2.2.1.13	Integrity Alarm for GPS Receivers . . . . . 29
2.2.1.13.1	General Integrity Requirements . . . . . 29
2.2.1.13.2	Annunciation of Integrity Alarm . . . . . 29
2.2.1.13.3	RAIM Implementation . . . . . 30
2.2.1.13.4	GIC/RAIM Implementation . . . . . 30
2.2.1.13.5	RAIM in Conjunction With Other Navigational Sensors (Hybrid Integrity Systems) . . . . . 30
2.2.2	2D Accuracy Requirements (95% probability) . . . . . 30
2.2.3	Signal Processing Requirements . . . . . 31
2.2.3.1	Sensitivity and Dynamic Range . . . . . 31
2.2.3.2	Continuous Wave Interference (CWI) . . . . . 31
2.2.3.3	Acquisition Time . . . . . 31
2.2.3.4	Dynamic Tracking . . . . . 31
2.3	(VNAV) Functional and Accuracy Requirements - Standard Conditions . . . . . 33
2.3.1	Equipment Functional Requirements . . . . . 33
2.3.1.1	Waypoint Altitude . . . . . 33
2.3.1.2	Vertical Path Deviation . . . . . 33
2.3.1.3	Vertical Profile . . . . . 34
2.3.2	VNAV Accuracy Requirements . . . . . 34
2.4	Equipment Performance - Environmental Conditions . . . . . 35
2.4.1	Temperature and Altitude Tests (DO-160C, Section 4.0) . . . . . 35
2.4.1.1	Low Operating Temperature Test . . . . . 35
2.4.1.2	High Short-Time Operating Temperature Test . . . . . 36

	<u>Page</u>	
2.4.1.3	High Operating Temperature Test . . . . .	36
2.4.1.4	In-Flight Loss of Cooling Test (When Required) . . . . .	36
2.4.1.5	Altitude Test . . . . .	37
2.4.1.6	Decompression Test (When Required) . . . . .	37
2.4.1.7	Overpressure Test (When Required) . . . . .	37
2.4.2	Temperature Variation Test (DO-160C, Section 5.0) . . . . .	37
2.4.3	Humidity Test (DO-160C, Section 6.0) . . . . .	38
2.4.4	Shock Tests (DO-160C, Section 7.0) . . . . .	38
2.4.4.1	Operational Shocks . . . . .	38
2.4.4.2	Crash Safety Shocks . . . . .	38
2.4.5	Vibration Test (DO-160C, Section 8.0) . . . . .	39
2.4.6	Explosion Proofness Test (DO-160C, Section 9.0) (When Required) . . . . .	39
2.4.7	Waterproofness Tests (DO-160C, Section 10.0) . . . . .	39
2.4.7.1	Drip Proof Test (When Required) . . . . .	39
2.4.7.2	Spray Proof Test (When Required) . . . . .	39
2.4.7.3	Continuous Stream Proof Test (When Required) . . . . .	40
2.4.8	Fluids Susceptibility Tests (DO-160C, Section 11.0) . . . . .	40
2.4.8.1	Spray Test (When Required) . . . . .	40
2.4.8.2	Immersion Test (When Required) . . . . .	40
2.4.9	Sand and Dust Test (DO-160C, Section 12.0) (When Required) . . . . .	41
2.4.10	Fungus Resistance Test (DO-160C, Section 13.0) (When Required) . . . . .	41
2.4.11	Salt Spray Test (DO-160C, Section 14.0) (When Required) . . . . .	42
2.4.12	Magnetic Effect Test (DO-160C, Section 15.0) . . . . .	42
2.4.13	Power Input Tests (DO-160C, Section 16.0) . . . . .	42
2.4.13.1	Normal Operating Conditions . . . . .	42
2.4.13.2	Abnormal Operating Conditions . . . . .	42
2.4.14	Voltage Spike Conducted Test (DO-160C, Section 17.0) . . . . .	43
2.4.14.1	Category A Requirements (If Applicable) . . . . .	43
2.4.14.2	Category B Requirements (If Applicable) . . . . .	43
2.4.15	Audio Frequency Conducted Susceptibility Test (DO-160C, Section 18.0) . . . . .	44
2.4.16	Induced Signal Susceptibility Test (DO-160C, Section 19.0) . . . . .	44
2.4.17	Radio Frequency Susceptibility Test (Radiated and Conducted) (DO-160C, Section 20.0) (When Required) . . . . .	44
2.4.18	Emission of Radio Frequency Energy Test (DO-160C, Section 21.0) (When Required) . . . . .	44
2.4.19	Lightning Induced Transient Susceptibility (DO-160C, Section 22.0) (When Required) . . . . .	44



	<u>Page</u>
3.2.1.1	Cross-Track Deviation Display . . . . . 73
3.2.1.2	Vertical Path Deviation Display . . . . . 74
3.2.1.3	Lateral Maneuver Anticipation . . . . . 74
3.2.1.4	Automatic Lateral Change . . . . . 74
3.2.1.5	Direct-To Function . . . . . 74
3.2.1.6	Vertical Maneuver Anticipation . . . . . 77
3.2.1.7	Automatic Altitude Change . . . . . 77
3.2.1.8	Display of Selected Waypoint . . . . . 77
3.2.2	Installed Accuracy . . . . . 77
3.2.2.1	Background . . . . . 77
3.2.2.2	Equipment Performance . . . . . 77
3.3	Conditions of Test . . . . . 77
3.3.1	Power Input . . . . . 79
3.3.2	Associated Equipment or Systems . . . . . 79
3.3.3	Environment . . . . . 79
3.3.4	Adjustment of Equipment . . . . . 79
3.3.5	Warm-Up Period . . . . . 79
3.4	Test Procedures for Installed Equipment Performance . . . . . 79
3.4.1	Ground Test Procedures . . . . . 79
3.4.1.1	Conformity Inspection . . . . . 79
3.4.1.2	Equipment Function . . . . . 80
3.4.1.3	Interference Effects . . . . . 80
3.4.1.4	Power Supply Fluctuations . . . . . 80
3.4.1.5	Equipment Accessibility . . . . . 80
3.4.2	Flight Test Procedures . . . . . 80
3.4.2.1	Displayed Data Readability . . . . . 80
3.4.2.2	Interference Effects . . . . . 80
3.4.2.3	Flight Demonstration . . . . . 80
3.4.2.4	Simulator Demonstration . . . . . 81
4.0	OPERATIONAL CHARACTERISTICS . . . . . 83
4.1	Required Operational Characteristics . . . . . 83
4.1.1	Power Input . . . . . 83
4.1.2	Navigation Displays . . . . . 83
4.1.3	Navigation Controls . . . . . 83
4.1.4	System Operational Integrity . . . . . 83
4.1.5	Equipment Operation Limitations . . . . . 83

	<u>Page</u>
4.2 Test Procedures for Operational Characteristics .....	83
4.2.1 Power Input .....	83
4.2.2 Navigation Displays .....	83
4.2.3 Navigation Controls .....	84
4.2.4 System Operational Readiness .....	84
 MEMBERSHIP .....	 85

## FIGURES

Figure 1-1 Vertical Clearance Boundaries (Typical) .....	8
Figure 1-2 Approach Route Widths .....	11
 Figure 2-1 Signal Rejection .....	 32
Figure 2-2 Reference Test Setup .....	48
Figure 2-3 Waypoint or Leg Manipulation Test .....	51
Figure 2-4 Vertical Path for Single Waypoint/Descent Angle .....	68
Figure 2-5 Vertical Path for Dual Waypoints with Associated Altitudes .....	69
 Figure 3-1 "Corner Cut" Turn Expansion for Maneuver Anticipation Test .....	 75
Figure 3-2 Direct-To Function .....	76
Figure 3-3 Vertical Maneuver Anticipation .....	78

## TABLES

Table 1-1 Summary of Representative Vertical Guidance Error Budget .....	7
Table 1-2 Cross-Track RNAV Accuracy Requirements .....	9
Table 1-3a GPS Position Determination with Selective Available Error Budget .....	15
Table 1-3b GPS RNAV Error Budget .....	15
Table 1-3c GPS System User Error for Manual Flight .....	17
Table 1-3d GPS System Use Error for Coupled Automatic Flight Control .....	17
 Table 2-1 GPS Position Integrity Performance Requirements .....	 28
Table 2-2 GPS RNAV 2D Accuracy Requirements .....	31
Table 2-3 Minimum Accuracy Requirements for Vertical Guidance Equipment Employed in Airborne Vertical Navigation Systems .....	34
Table 2-4 Test Cross Reference Table .....	49
Table 2-5 Acquisition Under Combined Conditions .....	60
Table 2-6 Cross-Track Deviation Test .....	63
Table 2-7 VNAV Static Tests - Single Waypoint Plus Ascent/Descent Angle .....	65
Table 2-8 VNAV Static Tests - Dual Waypoints With Associated Altitudes .....	66
Table 2-9 VNAV Dynamic Tests - Single Waypoint Plus Ascent/Descent Angle .....	70
Table 2-10 VNAV Dynamic Tests - Dual Waypoints Plus Associated Altitudes .....	71

APPENDIX A	Definitions of Terms
APPENDIX B	Great Circle Computations
APPENDIX C	Implementing Epoch Year Magnetic Variation Values
APPENDIX D	Postulated Area Navigation Operational Environment Definition
APPENDIX E	Navigation System Errors
APPENDIX F	Least-Squares Residuals RAIM Method
APPENDIX G	GPS Integrity Channel (GIC)
APPENDIX H	Acceptable Procedural Techniques for Lateral Maneuver Anticipation
APPENDIX I	Orbital Parameters
APPENDIX J	Future Applications

## 1.0 PURPOSE AND SCOPE

### 1.1 Introduction

This document contains minimum operational performance standards for airborne supplementary navigation equipment (2D and 3D) using GPS inputs. An airborne supplemental navigation system can be used as a primary navigation reference in an aircraft when an approved and operational sole means navigation system is available. Incorporated within these standards are equipment characteristics that should be useful to users, designers, manufacturers and installers of the equipment. This document defines 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 thereof.

Section 1.0 of this document provides information and assumptions needed to understand the rationale for equipment characteristics and requirements stated in the remaining sections. It describes typical equipment applications and operational goals and forms the basis for the standards stated in Sections 2.0 through 4.0. Comments pertaining to VOR/DME have been included for explanatory and tutorial purposes. Definitions are provided in Appendix A.

Section 2.0 contains the minimum operational 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.

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 perform properly its intended function. For example, the airborne area navigation "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 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.