RTCA
1828 L Street, NW, Suite 805
Washington, DC 20036

Minimum Operational Performance Standards for Optional Equipment which Displays Non-Radar Derived Data on Weather and Ground Mapping Radar Indicators

RTCA DO-174
March 20, 1981

Prepared by:
SC-133

Copies of this document may be obtained from

RTCA, Incorporated
1828 L Street, NW, Suite 805
Washington, D.C. 20036-5133 U.S.A.

Telephone: 202-833-9339
Facsimile: 202-833-9434

Internet: www.rtca.org

Please contact RTCA for price and ordering information.

F O R E W O R D

This document was prepared by Special Committee 133 of the Radio Technical Commission for Aeronautics (RTCA). It was approved by RTCA on March 20, 1981.

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 concerned organizations.

The findings of RTCA are in the nature of recommendations to all organizations concerned. As RTCA is not an official agency of the Government of the United States, its recommendations may not be regarded as statements of official government policy unless so enunciated by the Federal government organization or agency having statutory jurisdiction over any matters to which the recommendations relate.

TABLE OF CONTENTS

		Page
	FOREWORD	i
	TABLE OF CONTENTS	iii
1.0	PURPOSE AND SCOPE	1
	1.1 Introduction	1
	1.2 Operational Considerations	2
	1.3 Test Procedures	2
	1.3.1 Environmental Tests	3
	1.3.2 Bench Tests	3
	1.3.3 Installed System Tests	3
	1.3.4 Operational Tests	4
	1.4 Definitions	4
2.0	OPTIONAL EQUIPMENT REQUIREMENTS	5
	2.1 General Requirements	5
	2.1.1 Airworthiness	5
	2.1.2 Intended Function	5
	2.1.3 Federal Communications Commission	5
	2.1.4 Operation of Controls	5
	2.1.5 Accessibility of Controls	5
	2.1.6 Effects of Test	5
	2.1.7 Fire Protection	6
	2.2 Equipment Performance - Standard Conditions	6
	2.2.1 Mode Selection	6
	2.2.2 Simultaneous Data Display	6
	2.2.3 Cycle to Cycle Symbol Stability	6
	2.2.4 Update Rate	6
	2.2.5 Refresh Rate	6
	2.2.6 Graphic Display	7
	2.2.7 Alphanumeric Display	7
	2.3 Equipment Performance - Environmental Conditions	9
	2.3.1 Temperature and Altitude Tests	9
	2.3.2 Temperature Variation Test	10

2.3.3 Humidity Test 10
2.3.4 Shock Tests 10
2.3.5 Vibration Tests 11
2.3.6 Explosion Test 11
2.3.7 Waterproofness (Drip Proof) Test 11
2.3.8 Fluids Susceptibility Tests 12
2.3.9 Sand and Dust Test 12
2.3.10 Fungus Resistance Test 12
2.3.11 Salt Spray Test 13
2.3.12 Magnetic Effect Test 13
2.3.13 Power Input Tests 13
2.3.14 Voltage Spike Conducted Test 14
2.3.15 Audio Frequency Conducted Susceptibility Test 14
2.3.16 Induced Signal Susceptibility Test 15
2.3.17 Radio Frequency Susceptibility Test (Radiated and Conducted) 15
2.3.18 Emission of Radio Frequency Energy Test 15

2.4 Equipment Test Procedures 17

2.4.1 Definitions of Terms and Conditions of Test 17
2.4.2 Detailed Test Procedures 18

FIGURE 1 19

3.0 INSTALLED EQUIPMENT PERFORMANCE 25

3.1 Test Conditions 25

3.1.1 Power Input 25
3.1.2 Associated Equipment 25
3.1.3 Environment 25
3.1.4 Adjustment of Equipment 25
3.1.5 Warm-up Period 25

3.2 Equipment Installation 25

3.2.1 Equipment Function 25
3.2.2 Equipment Accessibility 25
3.2.3 Interference Effects 26
3.2.4 Failure Protection 26

3.3 Installed Equipment Performance Requirements 26

3.3.1 General Auxiliary Equipment Performance Requirements 26
3.3.2 Readability 26

3.4 Test Procedures for Installed Equipment Performance 27

3.4.1 Conformity Inspection 27
3.4.2 Ground Test Procedures 27
3.4.3 Flight Test Procedures 28

4.0 OPERATIONAL CHARACTERISTICS 29

4.1 Required Operational Characteristics 29

4.1.1 Power Input 29
4.1.2 Equipment Operating Modes 29

4.2 Test Procedures for Operational Characteristics 29

4.2.1 Power Input 29
4.2.2 Equipment Operating Modes 29

MEMBERSHIP 31

1.0 PURPOSE AND SCOPE

1.1 Introduction

This document sets forth minimum operational performance standards for optional equipment which displays non-radar derived data on weather and ground mapping radar indicators. Incorporated within these standards are system characteristics that should be of value to users, designers, manufacturers and installers. These characteristics are intended to accord with requirements of various users. The optional equipment as defined in this standard can provide graphic and/or alpha-numeric data. This equipment is not intended to be a flight instrument, but rather a supplement to aid the flight crew in correlation of numerous data sources.

Section 1.0 of this document is intended to provide 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 133, and is the basis for the standards stated in Sections 2.0 through 4.0. Definitions 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 the 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 all conditions normally encountered in routine operations.

It is recognized that any regulatory application of this document in whole, or in part, is the sole responsibility of appropriate governmental agencies.

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

The word "equipment" as used herein includes all components or units necessary (as determined by the manufacturer or installer) for the equipment to properly perform its function.

In the establishment of the optional equipment standards, the inclusion of color was not considered to be a minimum requirement for the radar display element on which the non-radar derived data is being displayed. However, it was recognized that the state of the art of both technology and product development is such that many radar displays may, either now or in the future, include color capability. In this regard, for those equipments that do provide color displays, it was considered critical in RTCA/DO-173, "Minimum Operational Performance Standards for Airborne Weather and Ground Mapping Pulsed Radars," that the color characteristics of the radar-derived data be precisely defined with attendant minimum performance requirements and test procedures for verification of performance. Appendix A to DO-173 covers this situation. Additional colors may be used to display non-radar derived, nonflight-critical information. The selection and specification of colors used for this purpose do not require minimum performance standards. Care should be taken, however, to ensure that when nonradar derived data is displayed concurrently with radar-derived data, either the choice of display colors or the juxtaposition of display elements does not result in any degradation in display interpretation or discrimination between each type of data.

1.2 Operational Considerations

Typical applications include but are not limited to:

a. The use of such equipment to display navigation-related information.

b. The storage of frequently used information in a manner which allows rapid retrieval, thus reducing flight crew workload.

The equipment must be of sufficient content and accuracy so as to display useful information on the weather radar indicator. When displayed with radar-derived data, the auxiliary information shall not degrade displayed radar information.