

RADIO TECHNICAL COMMISSION FOR AERONAUTICS
1717 H Street, N. W., Suite 655
Washington, D. C. 20006

MINIMUM OPERATIONAL PERFORMANCE STANDARDS
FOR
GROUND BASED AUTOMATED
WEATHER OBSERVATION EQUIPMENT

RTCA/DO-175
January 23, 1981

Prepared by:
SC-143

① A

Copies of this document may be obtained from

RTCA Secretariat
Suite 655
1717 H Street, N.W.
Washington, D. C. 20006
(202) 296-0484

\$16.00 per copy

(50% Discount to RTCA Members & International Associates)

NOTE: All orders for RTCA documents shall be accompanied by payment to include shipping and handling fees. These documents will be sent First Class or Priority Mail in the United States, Canada and Mexico. Shipments to other countries will be by International AO Mail. The fee to be added to the basic cost of each document or volume is \$3.00 for delivery in the United States, Canada and Mexico, and \$6.00 for other countries. Members and International Associates are entitled to a 50% discount on documents, but the full shipping and handling fee is required for each document ordered. Please remit in U. S. funds directly to RTCA.

F O R E W O R D

This document was prepared by Special Committee 143 of the Radio Technical Commission for Aeronautics (RTCA). It was approved by RTCA on January 23, 1981.

It should be noted here that certain elements of the ground based automated weather equipment are not defined in great detail (i.e. specific requirements/test procedures). Development of equipment to measure phenomena such as visibility, sky condition and thunderstorms is still in the embryonic stages and precise definition and quantification is beyond the current state of the art.

The RTCA Executive Committee elected to approve this report in the hope that it will serve as a benchmark for future development activities in automated weather sensing equipment.

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. 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 government organization or agency having statutory jurisdiction over any matters to which the recommendations relate.

THIS PAGE INTENTIONALLY LEFT BLANK

This prints



TABLE OF CONTENTS

	<u>Page</u>
<u>FOREWORD</u>	i
1.0 <u>PURPOSE AND SCOPE</u>	1
1.1 Introduction	1
1.2 System Overview	3
1.3 Operational Applications	4
1.4 Operational Goals	4
1.4.1 General	4
1.4.2 Airplanes	5
1.4.3 Helicopters	5
1.5 Assumptions	6
1.5.1 Sensors	6
1.6 Test Procedures	6
1.6.1 Environmental Tests	7
1.6.2 Bench Tests	7
1.6.3 Installed System Tests	7
1.6.4 Operational Tests	7
1.7 Definitions of Terms	8
1.7.1 Automated Weather Observation Equipment	8
1.7.2 Calm Winds	8
1.7.3 Density Altitude	8
1.7.4 Light and Variable Winds	8
1.7.5 Wind Gusts (Wind Variations)	8
1.7.6 Visibility	8
1.7.7 Runway Visual Range (RVR)	8
1.7.8 Runway Visual Value (RVV)	8
2.0 <u>AUTOMATED WEATHER OBSERVATION EQUIPMENT</u> <u>PERFORMANCE REQUIREMENTS</u>	9
2.1 General Requirements	9
2.1.1 General Performance	9
2.1.2 Federal Communications Commission Rules	9
2.1.3 Failure Warning and Error Indications	9

2.1.4	Operation of Controls	9
2.1.5	Rating of Components	9
2.1.6	Effects of Test	9
2.1.7	Electromagnetic Compatibility	10
2.2	Equipment Performance - Standard Conditions	10
2.2.1	Barometric Pressure Sensor(s)	10
2.2.2	Wind Speed	10
2.2.3	Wind Direction	11
2.2.4	Wind Gust	11
2.2.5	Calm or Light and Variable Wind Conditions	11
2.2.6	Visibility	11
2.2.7	Clock	11
2.2.8	Temperature and Dewpoint	11
2.2.9	Runway Visual Range (RVR)	12
2.2.10	Runway Visual Value (RVV)	12
2.2.11	Sky Condition	12
2.2.12	Precipitation	12
2.2.13	Obstructions to Vision	13
2.2.14	Thunderstorms	13
2.2.15	Density Altitude	13
2.2.16	Display	13
2.2.17	Automated Voice	13
2.2.18	External Digital Communications Interface	13
2.2.19	Start-up after Power Failure	14
2.2.20	Output Update	14
2.3	Equipment Performance - Environmental Conditions	15
2.3.1	Temperature and Elevation Tests	15
2.3.2	Temperature Variation Test	16
2.3.3	Humidity Test	16
2.3.4	Waterproofness (Drip Proof) Test	17
2.3.5	Sand and Dust Test	17
2.3.6	Salt Spray Test	17
2.3.7	Power Input Tests	17
2.3.8	Voltage Spike Conducted Tests	18
2.3.9	Induced Signal Susceptibility Test	18
TABLE 2-1	19
2.3.10	Radio Frequency Susceptibility Test (Radiated and Conducted)	20
2.3.11	Emission of Radio Frequency Energy Test	20
2.4	Equipment Test Procedures	21

2.4.1	Definitions of Terms and Conditions of Test	21
2.4.2	Sensor Test Requirements	21
2.4.3	Test Setup and Equipment for Sensor Tests	21
2.4.4	Individual Sensor Tests and Sensor Stimulation ...	22
2.4.5	Data Processing and Output Equipment Tests	24
3.0	<u>INSTALLED EQUIPMENT PERFORMANCE</u>	27
3.1	Equipment Installation	27
3.1.1	Equipment Accessibility	27
3.1.2	Display Visibility	27
3.1.3	Sensor Siting	27
3.1.4	Interference Effects	27
3.1.5	Failure Protection	27
3.1.6	Inadvertent Turn-off	27
3.1.7	Audio Output	27
3.2	Minimum Installed Equipment Performance Requirements	28
3.2.1	General Performance Requirements	28
3.3	Conditions of Test	28
3.3.1	Power Input	28
3.3.2	Related Equipment or Systems	28
3.3.3	Environment	28
3.3.4	Adjustment of Equipment	28
3.3.5	Warm-up Period	28
3.3.6	Altimeter	28
3.3.7	Wind Direction	28
3.4	Test Procedures for Installed Equipment Performance	29
3.4.1	Conformity Inspection	29
3.4.2	Installation Site Test	29
3.5	Interference Effects	29
3.5.1	Aircraft Generated Interference	29
3.5.2	Airport Equipment Generated Interference	29
3.5.3	Automated Weather Observation Equipment Generated Interference	29
4.0	<u>OPERATIONAL TESTS</u>	31
4.1	System Tests	31

4.1.1	Voice Output	31
4.1.2	Power Failure/Restart	31
4.1.3	Equipment Accuracy	31
4.1.4	Error Detection	31
4.2	Sensor Tests	31
4.2.1	Altimeter Setting	32
4.2.2	Wind Direction	32
4.2.3	Wind Speed	32
4.2.4	Cloud Height/Ceiling	32
4.2.5	Visibility	32
4.2.6	Temperature and Dewpoint	32
<u>MEMBERSHIP</u>		33
<u>LIST OF RELATED REFERENCES</u>		37

1.0 PURPOSE AND SCOPE

1.1 Introduction

This document sets forth minimum operational performance standards for ground based automated weather observation equipment. Incorporated within these standards are system characteristics that will be meaningful to users of the system as well as designers, manufacturers and installers. These characteristics are intended to be in accord with the requirements of various users, including fixed-based operators, the National Weather Service, the Federal Aviation Administration, airplane and helicopter operators, etc.

Section 1.0 of this document 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 as envisioned by the members of Special Committee 143, and is 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 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 ensure that the equipment will function safely and reliably in the expected operational environment.

Compliance with these standards by manufacturers, installers and users is recommended as a means of assuring that the equipment will satisfactorily perform its intended function(s) under all conditions normally encountered in routine operations.

Any regulatory application of this document, in whole or in part, is the sole responsibility of appropriate governmental agencies.