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

TCAS I Functional Guidelines

RTCA DO-184
May 13, 1983

Prepared by:
SC-147

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 147 of the Radio Technical Commission for Aeronautics. It was approved by RTCA on May 13, 1983.

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. RTCA is not an official agency of the United States Government and 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
1.0 PURPOSE AND SCOPE	1
1.1 Introduction	1
1.2 Definition	1
1.3 Minimum Requirements	1
1.4 Additional Capabilities for the Proximity Warning Function	2
1.5 Applications	2
1.6 References	3
1.7 Description of TCAS I Elements	3
1.7.1 Proximity Warning	3
1.7.1.1 Passive Threshold Detection	4
1.7.1.2 Passive Time of Arrival (TOA) Detection	4
1.7.1.3 Active Detection	5
1.7.1.4 Altitude Filtering	5
1.7.1.5 Display of Intruder Bearing	6
1.7.2 Surveillance Function	6
1.7.3 Cross-Link Function	6
1.7.4 Display	7
2.0 ACTIVE TCAS I MINIMUM PERFORMANCE REQUIREMENTS FOR ELECTROMAGNETIC COMPATIBILITY	9
2.1 General	9
2.2 Federal Communications Commission Rules	9
2.3 Minimum Standards for Electromagnetic Compatibility	9
2.3.1 Definition of Conditions	9
2.3.2 Mode S Transponder Characteristics	9
2.3.3 TCAS I Transmitter Characteristics	10

Page

2.3.3.1 Transmission Frequency 10
2.3.3.2 RF Peak Output Power 10
2.3.3.3 Unwanted Output Power 10
2.3.3.4 Interrogation Rate 10
2.3.3.5 Rate-Power Product Limit 10
2.3.3.6 Mode C Interrogation Spectrum 11
2.3.3.7 TCAS I Transmitter Pulse Characteristics ... 11

2.3.4 Suppression 11

2.4 Equipment Test Procedures 13

2.4.1 Definitions of Terms and Conditions of Test 13
2.4.2 Test Equipment Capabilities 14
2.4.3 Detailed Test Procedures 16

2.4.3.1 Frequency 16
2.4.3.2 Peak Power 16
2.4.3.3 Transmitted Signal Characteristics 19
2.4.3.4 Transmitted RF Spectrum 19
2.4.3.5 Unwanted Output Power 20
2.4.3.6 Own Transponder Suppression 20
2.4.3.7 TCAS to Mode S Transponder Interference 24

FIGURE 2-1 12
FIGURE 2-2 15
FIGURE 2-3 17
FIGURE 2-4 18
FIGURE 2-5 21
FIGURE 2-6 22
FIGURE 2-7 23

MEMBERSHIP 25

APPENDIX A CROSS-LINK ADVISORIES

1.0 PURPOSE AND SCOPE

1.1 Introduction

This document contains functional guidelines for the surveillance, proximity warning and cross-link elements of the Traffic Alert and Collision Avoidance System (TCAS) I. TCAS I is primarily intended for use in general aviation aircraft. Section 1.0 provides a functional description of TCAS I including operational applications.

1.2 Definition

A TCAS I-equipped aircraft can receive limited alert and advisory information about aircraft in its vicinity. TCAS I also participates in cross-link communication with TCAS II-equipped aircraft.

TCAS I operates by listening for aircraft transponder transmissions (replies). The replies detected may have been unsolicited transmissions from Mode S transponders (squitters); replies elicited by ground station or TCAS II interrogations (passive TCAS I); or replies resulting from low-power interrogations from TCAS I (active TCAS I).

Additionally, TCAS I receives traffic advisory information from TCAS II aircraft. If an intruding aircraft is equipped with TCAS II, and if that TCAS II determines that a collision hazard exists, it will transmit advisory information to TCAS I which includes bearing (if available), range and relative altitude of the TCAS II aircraft with respect to the TCAS I aircraft.

As an option, TCAS I can be designed to provide an indication of the transmitting transponder's bearing.

1.3 Minimum Requirements

As a minimum, TCAS I should have the following capabilities for surveillance and collision avoidance:

a. Surveillance Function

(1) An integral transponder capable of operating on Modes A, C, and S.

(2) Compatible automatic pressure altitude reporting equipment.