RTCA, Inc.
1828 L Street, NW, Suite 805
Washington, D.C. 20036-5133 USA

Certification Guidance for Installation of Non-Essential, Non-Required Aircraft Cabin Systems & Equipment

RTCA/DO-313
October 2, 2008

Prepared by: SC-210
© 2008, RTCA, Inc.

Copies of this document may be obtained from

RTCA, Inc.

Telephone: 202-833-9339
Facsimile: 202-833-9434
Internet: www.rtca.org

Please visit the RTCA Online Store for document pricing and ordering information.

FORWARD

This document was prepared by RTCA Special Committee 210 (SC-210). It was approved by the RTCA Program Management Committee (PMC) on October 2, 2008.

RTCA, Inc. is a not-for-profit corporation formed to advance the art and science of aviation and aviation electronic systems for the benefit of the public. The organization functions as a Federal Advisory Committee and develops consensus based recommendations on contemporary aviation issues. RTCA's objectives include but are not limited to:

- Coalescing aviation system user and provider technical requirements in a manner that helps government and industry meet their mutual objectives and responsibilities;

- Analyzing and recommending solutions to the system technical issues that aviation faces as it continues to pursue increased safety, system capacity and efficiency;

- 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.

The organization's recommendations are often used as the basis for government and private sector decisions as well as the foundation for many Federal Aviation Administration Technical Standard Orders.

This document contains procedures for Electromagnetic Compatibility (EMC) ground and flight testing of Cabin Systems & Equipment (CS&E) in Appendix C. It also contains guidelines for certification and installation of Commercial Off The Shelf (COTS) equipment in Appendix D. Additional flammability guidance is provided in Appendix E.

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.

This Page Intentionally Left Blank

EXECUTIVE SUMMARY

The United States Federal Aviation Administration (FAA) requested that RTCA, Inc. form a special committee to develop installation and certification guidance for Cabin Systems and Equipment (CS&E) on board civil aircraft. This guidance will standardize and streamline the installation and compliance demonstration process.

Special Committee SC-210 was formed to create this guidance document and included representatives from avionics manufacturers, aircraft manufacturers, airlines, aircraft operators, flight attendant associations, regulatory agencies, and related industry associations.

This document includes three Normative Appendices, Appendix C, Appendix D, and Appendix E, which contain additional requirements not covered in the main body.

1 INTRODUCTION

This document provides certification guidance on how to meet the airworthiness requirements for the installation of non-essential, non-required aircraft CS&E and in doing so enable a standardized approach across equipment manufacturers and installers. The information contained herein is applicable to installation methodologies of aircraft CS&E approved under Title 14 of the Code of Federal Regulations (14 CFR) parts 23, 25, 27 and 29. Both aerospace manufactured equipment and commercial off the shelf (COTS) equipment is considered.

2 CERTIFICATION OF CS&E

CS&E installations may be approved through Type or Supplemental Type Certificates (or amendments thereto), Field Approval, or 8110-3 supported FAA Form 337.

3 ACCEPTABLE MEANS OF COMPLIANCE

A failure of CS&E to "perform as intended" must not adversely affect the safety of the aircraft or its occupants, or the proper functioning of equipment and systems that are required by the design and operating rules. This must be confirmed through a system safety assessment. General items that must be considered to ensure the airworthiness of the CS&E installation include:

- Software
- Complex Electronic Hardware
- Environmental Requirements
- Electrical Requirements
- Equipment and System Wiring
- Equipment Grounding and Bonding
- Flammability
- Ventilation
- Structural and Stress Certification
- Crashworthiness and Structural Integrity
- Electromagnetic Compatibility
- Markings and Placards

4 OTHER CERTIFICATION CONSIDERATIONS

Some items that may pertain to the specific CS&E installations include:

- Lithium Batteries
- Glass in the Cabin
- Wireless Radio Frequency (RF) Cabin Systems Electromagnetic Compatibility
- Configuration Control and Conformity
- Approval of In-seat Video Systems
- System Security Considerations
- Instructions for Continued Airworthiness
- Airplane/Rotorcraft Flight Manual

Appendix C ELECTROMAGNETIC COMPATIBILITY GROUND TEST/FLIGHT TEST PROCEDURES FOR INSTALLED CS&E EQUIPMENT

Compliance with RTCA/DO-160 Section 21 does not guarantee that installed CS&E will not interfere with other essential or critical aircraft systems. On-aircraft Electromagnetic Compatibility (EMC) testing must be performed on-ground, and sometimes in-air, to ensure non-interference with other aircraft systems.

Appendix D GUIDELINES FOR CERTIFICATION AND INSTALLATION OF COMMERCIAL OFF THE SHELF (COTS) EQUIPMENT

COTS equipment is defined as a part or product that is designed and/or intended for use in the consumer market. Additional requirements must be met to ensure that the installation of COTS equipment on an aircraft will provide an acceptable level of safety.

Appendix E ADDITIONAL FLAMMABILITY CRITERIA

Installed equipment must meet the flammability requirements of 14 CFR part 25, Appendix F. When testing is required, the test method will depend upon the equipment type. Flammability guidance is provided for:

- Food Preparation Appliances
- Passenger Convenience Appliances
- Non-metallic and/or Vented Cases

TABLE OF CONTENTS

1 INTRODUCTION 1
1.1 Purpose and Scope 1
1.2 Applicable Certification Methods 1
1.3 Applicable Cabin Systems and Equipment 2
2 CERTIFICATION OF CS&E 5
2.1 General 5
2.2 Certification of CS&E by the TC Holder or under STC 6
2.3 Certification of CS&E by Field Approval Using FAA Form 337 6
2.4 Certification of CS&E by 8110-3 Supported FAA Form 337 6
3 ACCEPTABLE MEANS OF COMPLIANCE 7
3.1 Equipment Function and Installation 7
3.2 System Safety Assessment 8
3.3 Software 8
3.4 Complex Electronic Hardware 9
3.5 Environmental Requirements 9
3.6 CS&E Design Considerations – Electrical Requirements 9
3.7 Equipment and System Wiring Considerations 10
3.8 Equipment Grounding and Bonding 12
3.9 Flammability 12
3.10 Ventilation 13
3.11 Structural and Stress Certification 14
3.12 Crashworthiness and Structural Integrity 14
3.13 Electromagnetic Compatibility 14
3.14 Markings and Placards 15
4 OTHER CERTIFICATION CONSIDERATIONS 17
4.1 Lithium Batteries 17
4.2 Glass in the Cabin 17
4.3 Wireless RF Cabin Systems Electromagnetic Compatibility 18
4.4 Configuration Control and Conformity 19
4.5 Approval of In-seat Video Systems 21
4.6 System Security Considerations 22
4.7 Instructions for Continued Airworthiness (ICA) 23
4.8 Airplane/Rotorcraft Flight Manual 23
5 MEMBERSHIP 25

APPENDIX A RELATED REGULATIONS AND DOCUMENTS A-1
A.1 Regulations A-1
A.2 Guidance Documents A-1
A.3 Orders A-2
A.4 Technical Standard Orders A-3
A.5 Industry Documents A-3
APPENDIX B TERMS AND DEFINITIONS B-1
B.1 Terms B-1
B.2 Acronyms B-3
APPENDIX C ELECTROMAGNETIC COMPATIBILITY GROUND TEST/FLIGHT TEST GUIDELINES FOR INSTALLED CS&E EQUIPMENT C-1
C.1 EMC Ground Test – Back Door Coupling Evaluation C-1
C.2 EMC Ground Test – Front Door Coupling Evaluation C-2
C.3 Aircraft Flight Test C-3
C.4 Acceptance Criteria C-3
APPENDIX D GUIDELINES FOR CERTIFICATION AND INSTALLATION OF COMMERCIAL OFF THE SHELF EQUIPMENT D-1
D.1 Purpose D-1
D.2 Applicability D-1
D.3 Regulatory Material D-1
D.3.1 14 CFR Part 23 ..... D-2
D.3.2 14 CFR Part 25 ..... D-2
D.3.3 14 CFR Part 27 ..... D-2
D.3.3 14 CFR Part 29 ..... D-3
D.3.4 Orders D-3
D.4 Related Material D-3
D.4.1 Advisory Circulars D-3
D.4.2 Industry Documents D-4
D.5 Background D-4
D.6 Acceptable Means of Compliance D-5
D.6.1 General D-5
D.6.1.1 Certification Plans D-5
D.6.1.2 Data Packages D-5
D.6.1.3 Compliance Matrix for Each COTS Equipment Installed D-6
D.6.1.4 System Safety Assessment D-6
D.6.2 Flammability D-6

D.6.3 Additional Considerations D-6
D.6.3.1 Equipment Cooling D-6
D.6.3.2 Crashworthiness and Structural Integrity D-7
D.6.4 Electromagnetic Compatibility (EMC) Tests D-7
D.6.5 Electrical D-7
D.6.5.1 Installation – General D-8
D.6.5.2 Equipment Function D-8
D.6.5.3 Power Isolation D-8
D.6.5.4 Equipment Wiring D-8
D.6.5.5 Equipment Circuit Breakers D-8
D.6.5.6 Alternating Current Equipment Grounding and Bonding D-9
D.6.5.7 Equipment Control and Power Removal D-9
D.6.5.8 Electrical Load Analysis D-9
D.6.5.9 Installation Instructions – Wiring D-9
D.6.5.10 Lithium Batteries D-9
D.6.6 Aircraft/Rotorcraft Flight Manual D-9
D.6.7 Instructions for Continued Airworthiness (ICA) D-9
Attachment 1 Acknowledgement D-11
Attachment 2 VCR part 25 Installation System Safety Assessment Example D-12
Attachment 3 Electrical Harmonic Distortion Test D-16
Attachment 4 Use of NRTL Test Data and/or Certification D-18
APPENDIX E ADDITIONAL FLAMMABILITY CRITERIA E-1

LIST OF TABLES

Table 1-1 Cabin Systems Functions and Equipment 2

LIST OF FIGURES

Figure 4-1 Abuse Load Application Diagram For Glass Equipment 18

This Page Intentionally Left Blank

1 INTRODUCTION

1.1 Purpose and Scope

a. This document provides certification guidance on meeting the airworthiness requirements for the installation of aircraft cabin systems and associated equipment. It does not cover specific installations on specific aircraft in support of particular certification projects. Installation specific concerns should be considered when using this guidance material.

   This guidance includes compliance methodologies to be employed in installation and certification of Cabin Systems and Equipment (CS&E). These methodologies can be applied to any non-essential, non-required systems and equipment in the cabin. They are based on the technology as it currently exists and cannot anticipate future developments. As new technology is introduced and new hazards identified, this document may need to be updated.

b. RTCA Special Committee 210 (SC-210) developed this guidance for the installation approval of CS&E to enable a standardized approach across equipment manufacturers and installers. It was developed with input from the aviation industry for the consideration of civil aviation authorities with the intention of addressing the following segments of the industry:

   - Equipment manufacturers
   - Aircraft manufacturers
   - Component suppliers
   - Aircraft operators
   - System Integrators
   - Modification centers

c. This guidance is not mandatory and does not constitute a regulation. It is intended to give the industry an acceptable means, but not the only means, of showing compliance with Title 14 of the Code of Federal Regulations (14 CFR) applicable to aircraft CS&E installations.

d. This document covers the regulations, industry specifications, and guidance material in existence as of the date of publication.

e. The term "aircraft", ~~is~~ as used herein, refers to both airplanes and rotorcraft, unless specific differentiation is required.

f. The convention of listing Federal Aviation Authority (FAA) and industry documents by their base number (e.g., RTCA/DO-160 rather than RTCA/DO-160F) will be used, and the latest revision level is implied, unless a specific revision level is cited.

1.2 Applicable Certification Methods

This guidance applies to installations of aircraft CS&E approved under 14 CFR parts 23, 25, 27 and 29, for:

- Type Certification (TC),
- Amended Type Certification (ATC),

© 2008 RTCA, Inc

- Supplemental Type Certification (STC),
- Amended Supplemental Type Certification (ASTC),
- FAA Field Approval,
- 8110-3 Supported FAA Form 337

1.3 Applicable Cabin Systems and Equipment

a. This guidance applies to non-essential, non-required CS&E that are installed in the aircraft, examples of which are listed below in Table 1-1. It does not cover Portable Electronic Devices (PEDs) – see RTCA/DO-294 and RTCA/DO-307 for additional information pertaining to PEDs. The list below should not be considered all inclusive.

Table 1-1 Cabin Systems, Functions and Equipment

Attendant Call*
Audio / Video Source Equipment (CD, DVD, VCR, XM Radio)
Audio Distribution (not including PA)
Cabin and Galley General Lighting
Cabin and Galley General Lighting Control (non-emergency)
Cabin Call Lights and Chimes
Cabin Intercom*
Cabin Data-link Systems (air-ground / satellite)
Cabin Telephone Systems
Cabin Temperature Control
Control Panel Displays and Switches (for Cabin Systems)
Decompression Over-Ride*
Direct Broadcast Satellite TV receiving systems
Entertainment Camera Systems
Galley Equipment
IR and RF Remote Controls
Lavatory Equipment
Public Address (PA) Override*
PA System*
Passenger Briefing Systems*
Passenger Flight Information Systems
Passenger Control Unit (PCU)
PED Dock / Interface
Power Supply Systems for PEDs
Powered Seats
Satellite Radio And Weather (for cabin use only)
Video Distribution
Video Entertainment Displays / Monitors
Window Shades
Wired and Wireless Network Systems

*****Depending on regulations, this cabin system, function, or equipment may not be classified as non-essential, non-required equipment. See the Type Certificate Data Sheet (TCDS) for the subject aircraft. Any required functionality must be compliant with existing regulations, be subject to separate certification, and is outside the scope of this guidance.

© 2008 RTCA, Inc.

b. This guidance addresses two types of CS&E:

1. Commercial Off The Shelf (COTS) equipment.

   Equipment that is not specifically designed and manufactured for use in aircraft, but is purchased by an aircraft operator / modifier for use in a particular aircraft system. This equipment is available for purchase by the general public and typically carries a label from a Nationally Recognized Testing Laboratory (NRTL), the most common one being Underwriters Laboratory (UL). Examples of COTS equipment include digital video disc (DVD) players, videocassette recorders (VCRs), facsimile machines, stereo amplifiers, stereo speakers, and video displays. See Appendix D for additional information pertaining to COTS equipment.

2. Aerospace Component Manufactured Equipment:

   Equipment that is specifically designed and manufactured for use in aircraft. This equipment is normally qualified against certain environmental categories of RTCA/DO-160 and may provide functions such as those listed in Table 1-1.

© 2008 RTCA, Inc