REQUIREMENTS SPECIFICATION
FOR AVIONICS COMPUTER RESOURCE (ACR)

RTCA DO-255
June 20, 2000

Prepared by
SC-182

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Foreword

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X 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

X 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.

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Prepared by RTCA SC-182 / EUROCAE WG-48

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1. Introduction

As the aviation industry moves to embrace implementation techniques developed for the computer industry, relationships between avionics equipment and operational function are changing. Software has become a principal medium for implementing the operational function. The airplane appliance has become a computer platform which executes the software program. Technology turnover in computer and electronic industry is short compared with the lifetime of an aircraft. Open system concepts allow the application software and the computer platform to be developed and evolve independently. During aircraft installation the software and computer platform components are integrated into a system which provides the desired operational capability.

These Requirements Specifications for the Avionics Computer Resource (ACR) are intended to facilitate certification efficiency and economy of scale of the computer platform. The functionality is that of a general purpose computing resource. As a resource for hosting application software, these parameters are a consistent set of computation services, the performance of those services, a robust partition environment, quantity and capacity of resources.

Certain attributes, valuable to a high integrity computing platform suitable for aviation application, are prescribed. However, specific values for performance, quantity, and capacity that would quickly become obsolete are left for the ACR manufacturer to specify. This specification requires the preparation of a data sheet that enumerates the relevant aspects of the resource being provided. This provides for scalability and allows this specification to be stable over time.

To comply with this Requirements Specification, the ACR manufacturer is obligated to prepare a data sheet which conveys performance, capability and capacity in a consistent manner. Qualification of the ACR design assures that the necessary attributes are implemented and that the performance declared in the data sheet over a foreseeable range of environmental conditions is achieved. Compliance with this Requirements Specification demonstrates equipment operation and performance prior to installation on an aircraft.

1.1 Purpose and Scope

This document contains the Requirements Specification for an Avionics Computer Resource (ACR). The ACR provides shared computation resources, core software and signal conditioning necessary to interface with a variety of aircraft systems. The ACR provides a highly adaptable computer environment for a variety of software applications. By complying with the requirements specified by this specification, the ACR and the software applications may be independently developed. Together the ACR and installed software applications perform one or more aircraft functions.

The aircraft functions can be hosted on multiple ACR platforms that can be provided by multiple vendors. Compliance with this Requirements Specification ensures a complete specification of the Application Programming Interface (API) provided by the ACR, its

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capacity and capability, and its performance. Based on this ACR specification, application software may be independently developed.

This document is intended to assist manufacturers, software application developers and installers in achieving an ACR and installed software applications which will perform their intended functions satisfactorily under all conditions normally encountered in routine aeronautical operations.

This document stipulates that the ACR manufacturer provides a suite of tests and analyses to assure the operation, performance and capacity of the ACR. Although specific test procedures are not included, assurance objectives are established for each ACR attribute.

In developing an ACR as specified by the requirements in this Requirements Specification, the ACR manufacturer is required to specify the environment required to develop the ACR. Whether the ACR manufacturer specifies, recommends, or supplies a development environment for application software developers is a decision between the ACR manufacturer and prospective software application developers, and should be documented as part of the software application approval process rather than under this specification. The ACR manufacturer is also obligated to specify the integration and configuration tools and environment necessary such that requirements for the addition or deletion of applications to the ACR will be adhered to at the time they are integrated.

1.2 Technical Concept

The concept of "open system" architecture is adapted from the general computer industry to the aviation electronics industry by this Requirements Specification. The open system architecture features a defined API which:

- Allows independent development of the hardware computing platform and the software application;
- Promotes re-use of the software application on multiple aircraft models;
- Reduces the certification effort of follow-on approvals;
- Enhances "economy of scale" of both the computer platform and software application programs;
- Facilitates technology upgrades.

1.2.1 Application of the Open System Concept

The open system concept is expected to mitigate follow-on certification costs such that an operator can economically achieve a common operational capability across a fleet of mixed aircraft types, and frequently upgraded functional capability.

The open system concept facilitates evolutionary growth in operational capability after initial installation with an ACR platform. To have the ACR recognized as such, the ACR manufacturer is obligated to provide detailed characteristics, captured in the ACR data sheet that promotes an open architecture and ensures portability. Robust partitioning features of the ACR ensure isolation of the applications from one another and from the ACR platform.

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