Mulkerin Associates Inc.

Multi-function, Multi-mode Digital Avionics Relevant Standards and Working Groups Survey Report

to

NASA GRC

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MMDA Standards and Working Groups Survey Report

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EXECUTIVE SUMMARY

NASA's Glenn Research Center (GRC) plans to develop and demonstrate the flexible capabilities of multi-function, multi-mode digital avionics (MMDA) for civil aviation applications such as communications, navigation and surveillance. To achieve that objective, GRC tasked Mulkerin Associates Inc. (MAI) to conduct a survey of relevant standards and working groups.

GRC intends to use the survey results to identify organizations with which GRC will interact. The purpose of the interaction is to ensure that the avionics and software developed under the Advanced Communications, Navigation and Surveillance Architectures and System Technologies (ACAST) project complies with the standards that will provide a path to eventual certification. The capability to get an avionics product certified is essential for commercial fielding of the product, which will yield a benefit to the users of the National Airspace System.

An Example of MMDA – The Joint Tactical Radio System (JTRS)

The Department of Defense's Joint Tactical Radio System (JTRS) program is developing software-defined radios for ground and airborne usage. The airborne variety is an MMDA. The Software Communications Architecture (SCA) is a key concept that is significantly impacting military MMDA products.

The SCA provides a framework that supports an industrial resource-based and component-based approach to build versatile radio sets, each offering several configurations. Some of the waveform related Application Program Interfaces (APIs) are specified in the Object Management Group's (OMG's) SCA API supplement document. The SCA model is not platform independent and is intimately embedded with Common Object Request Broker Architecture (CORBA). It is worth noticing that the SCA concepts and even the CORBA Component Model (CCM) concepts gracefully match the Open Systems Interconnection (OSI) ones in several ways.

The SCA for JTRS is shown in Figure ES-1. As can be seen, CORBA is a key component of the architecture.

Standards Bodies

The body of the report contains a description of each of the avionics-related standards bodies in the survey. The description covers its purpose and lists the aviation related technical committees. It also provides information on acquiring copies of their standards.

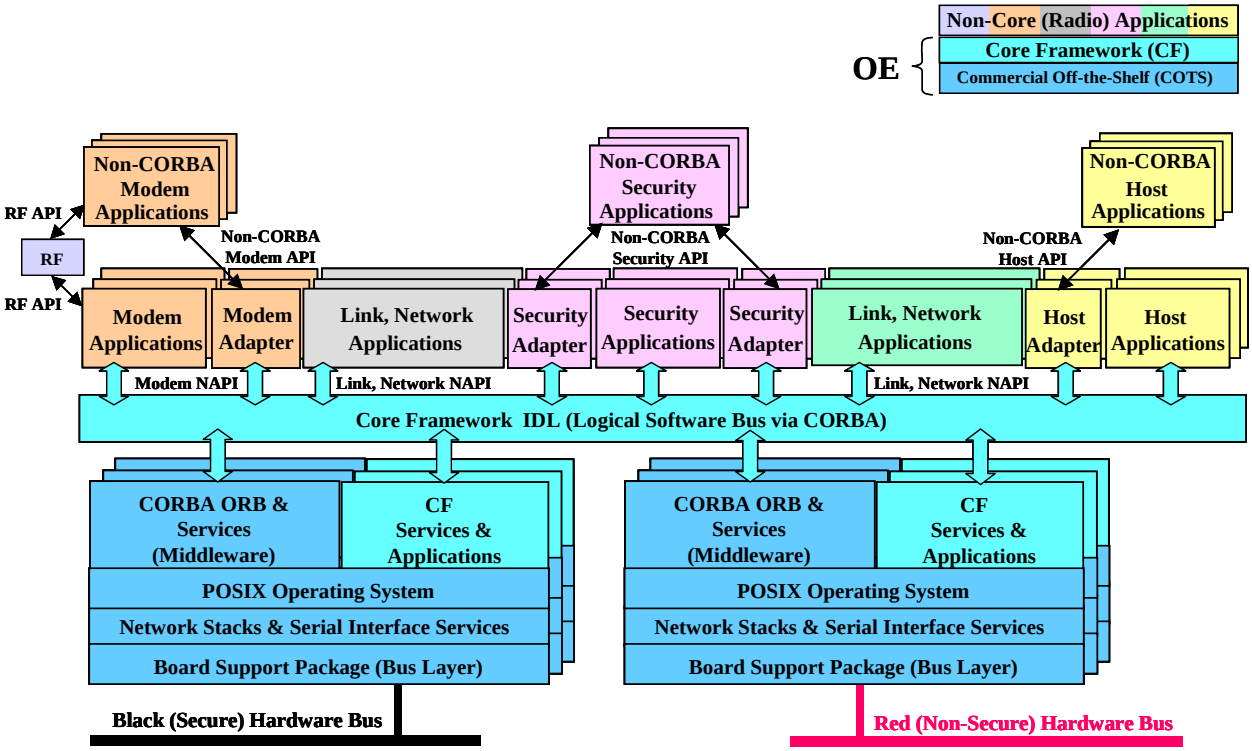

Figure ES-1. Software Communications Architecture for JTRS

The report contains detailed information about 17 committees within six organizations. The information provided for each includes:

- A description of the committee
- The committees charter or goals
- The standards it has developed. Only standards that are considered current are covered.
- The status of its on-going activities
- The applicability of the committee to the ACAST project
- Points of contact

A summarized focus for each committee is contained in Table ES-1

Table ES-1. MMDA-related Standards Committees

Organization	Committee	Standards Focus
RTCA	SC-200 – Modular Avionics	Modular avionics
RTCA	Potential Special Committee on Software Certification	Certification criteria for software
AEEC	Systems Architecture and Interfaces Subcommittee	Airborne electronic equipment (including avionics) used in commercial, military and business aviation

Table ES-1. MMDA-related Standards Committees

Organization	Committee	Standards Focus
AEEC	Application/Executive (APEX) Working Group	General-purpose APplication/EXecutive interface between an avionics computer OS and the application software
AEEC	ARINC 629 Users Group	Multi-transmitter data bus: transfer of digital data between avionics system elements using multiple access, bi-directional protocol
AEEC	Cockpit Display Systems Interfaces Working Group	Cockpit display system capabilities and interfaces between cockpit display systems and other related aircraft systems
AEEC	Joint GPS/XLS Subcommittee	Avionics that use the signal-in-space provided by Global Navigation Satellite Systems (GNSS) for aircraft navigation
AEEC	Surveillance Working Group	Integration of similar surveillance and Airborne Collision Avoidance System/Air Traffic Control (ACAS/ATC) systems
AEEC	Middle and Related Services Platform Task Force	Object-oriented and message-oriented request broker technology and pervasive services for the multiple middleware platforms. CORBA related capabilities.
OMG	Real-time, Embedded, and Specialized Systems Platform Task Force	OMG technologies that apply across domains for real-time, embedded, and related specialized kinds of systems.
OMG	Software-Based Communications Domain Task Force	Software technology targeted for software-defined communication devices.
OMG	Transportation Domain Task Force	OMG concepts and products to support a worldwide ATC standard infrastructure.
SAE	Aircraft Instruments, Committee A-4	Mechanical, electromechanical, and electronic cockpit instrumentation for civil aircraft, with emphasis on minimum performance standards intended for reference in the FAA Technical Standard Orders (TSO).
SAE	Aircraft Systems & Systems Integration, Committee AS-1	Stores interface, validation requirements, systems integration, mission store validation plans and media terminal design. System test requirements, architecture, security and 1553 data bus standards.
SAE	Embedded Computing Systems, Committee AS-2	Philosophy, requirements, definitions, and user issues associated with embedded computing systems.
AIAA	Software Systems Technical Committee	Aerospace software development, productivity, reliability, maintainability, cost, and effectiveness.
IEEE	Portable Applications Standards Committee (PASC)	Application service interfaces - most notably those in the **P**ortable **O**perating **S**ystem **I**nterface (POSIX) family.

Recommendations

The material in the report should be analyzed by GRC to determine the standards bodies and committees with which they should participate. The analysis and recommendations below are intended to help GRC's decision process.

Each of the committees is listed in Table ES-2 and a recommended level of involvement assigned. The levels assigned are high, medium and low. The levels are assigned based upon the applicability of the committee to an MMDA project, the level of applicability, and the activity level of the committee. A general description of the criteria used follows:

- High Level of Involvement: The committee is addressing technologies and procedures that are state-of-the-art and directly impact MMDA product design. The committee is active and GRC's participation could have an impact on the composition of the standards.

- Medium Level of Involvement: The committee is addressing more stable technologies that can either directly or indirectly impact the design of MMDA products. The committee is active and GRC's participation could have some impact on the standards.

- Low Level of Involvement: The committee is addressing basic technologies and GRC probably would not have an impact on the standards. An example is the POSIX standard. A dormant committee, or one that will soon terminate, falls in this category. The ARINC 629 Users Group and AIAA Software Systems Technical Committee are examples of dormant committees. RTCA's Modular Avionics committee (SC-200) was ranked low because its work should be completed by October 2004, after which the committee will probably be dissolved.

Table ES-2. Recommended GRC Involvement Ranking

Involvement	Priority	Committee
H	1	OMG: Software-Based Communications Domain Task Force
H	2	OMG: Middle and Related Services Platform Task Force
H	3	OMG: Real-time, Embedded, and Specialized Systems Platform Task Force
H	4	AEEC: Application/Executive (APEX) Working Group
H	5	AEEC: Surveillance Working Group
H	6	AEEC: Systems Architecture and Interfaces Subcommittee
M	7	SAE: Aircraft Systems & Systems Integration, Committee AS-1
M	8	SAE: Embedded Computing Systems, Committee AS-2
M	9	AEEC: Joint GPS/XLS Subcommittee
M	10	RTCA: Potential Special Committee on Software Certification
L	11	AEEC: Cockpit Display Systems Interfaces Working Group
L	12	SAE: Aircraft Instruments, Committee A-4
L	13	OMG: Transportation Domain Task Force
L	14	IEEE: Portable Applications Standards Committee (PASC)
L	15	RTCA: SC-200 – Modular Avionics
L	16	AEEC: ARINC 629 Users Group
L	17	AIAA: Software Systems Technical Committee

1. INTRODUCTION

NASA's Glenn Research Center (GRC) plans to develop and demonstrate the flexible capabilities of multi-function, multi-mode digital avionics (MMDA) for civil aviation applications such as communications, navigation and surveillance. To achieve that objective GRC requires a survey of relevant standards and working groups. GRC issued a task order to Mulkerin Associates Inc. (MAI) to conduct the survey. Strategic Aeronautics Inc supported MAI in conducting the survey and preparing this report.

For the purposes of this task, the term, "multi-function" refers to multiple communications, navigation and/or surveillance functions that can be performed by avionics either sequentially or simultaneously (e.g., VHF Digital Link (VDL) communications, Global Positioning System (GPS)-based navigation, and/or Automatic Dependent Surveillance Broadcast (ADS-B) transmissions). "Multi-mode" refers to the capability to perform sequentially, two or more operational modes of a given communications, navigation or surveillance function (e.g., communications via either VHF analog voice mode or VDL Mode 2). "Digital avionics" refers to onboard aircraft electronics hardware and software that are either software defined or re-configurable for multiple functions and/or modes of operation.

The current and planned avionics and associated technologies to be assessed under this task apply to a wide range of aircraft classes including commercial carrier and cargo transport aircraft, business jets, general aviation, and military aircraft.

GRC's intent is to use the assessments performed under this task to identify the role NASA can uniquely assume to help:

- Leverage and advance the state of the art in avionics technology
- Reduce the cost, size and power consumption of commercial avionics
- Improve the flexibility and capability of avionics to interoperate with existing and future international standards
- Reduce the time and cost to initially certify and potentially re-certify aircraft with software-defined avionics in the future.

Specifically, GRC intends to use the results from this task to identify those organizations with which GRC will interact. The purpose of the interaction is to ensure that the avionics and software developed under the Advanced Communications, Navigation and Surveillance Architectures and System Technologies (ACAST) project complies with the standards that will provide a path to eventual certification. The capability to get an avionics product certified is essential for commercial fielding of the product, which will yield a benefit to the users of the National Airspace System.

1.1. Scope

This report identifies and summarizes the goals and status of existing and planned standards and working groups relevant to MMDA, software-defined and/or software reconfigurable avionics capabilities, technologies, and/or certification methodologies. This survey includes the following information:

- The identification of the standard or working group and the sponsoring organization(s)
- Contact information for one or more key individuals
- Electronic copies and/or website references for selected existing and emerging standards
- A summary of the goals and applicability for the standard or working group activities
- A summary of the status of the existing or emerging standards

Our focus is on identifying active committees since GRC intends to participate with the ones that will have the most impact on the MMDA products developed under ACAST. However, we have provided information on some existing but dormant committees that dealt in a relevant area. These are committees that have not been disestablished, have not met in some time, but could meet again if the need arises.

1.2. An Example of MMDA – The Joint Tactical Radio System (JTRS)

The Department of Defense's Joint Tactical Radio System (JTRS) program is developing software defined radios for ground and airborne usage. The airborne variety is an MMDA. A key concept in developing JTRS is the definition and implementation of the Software Communications Architecture (SCA).

The SCA is today the most significant manifestation and realization of the Software Defined Radio concept. As a matter of fact, the SCA has already been adopted on significant projects. The SCA provides a framework that supports an industrial resource-based and component-based approach to build versatile radio sets, each offering several configurations. Furthermore, some of the waveform related Application Program Interfaces (APIs) are specified in the Object Management Groups SCA API supplement document. This document, together with radio management and control-related facilities in the SCA specification provides a basis for this submission. However, it must be recognized that the SCA is more focused on management and control facilities than to provide radio business services for waveforms developers and the API supplement is far from being complete.

Also, the SCA model is not platform independent and is intimately embedded with Common Object Request Broker Architecture (CORBA). It is worth noticing that the SCA concepts and even the CORBA Component Model (CCM) concepts gracefully match the Open Systems Interconnection (OSI) ones in several ways:

- The OSI Service Access Point can be mapped upon the SCA and CCM Port concept.

- The Application Service Elements can be mapped upon the SCA and CCM Interfaces concept

- SCA packet and payload concepts in the waveform supplement maps to a Packet Data Unit (PDU) and a Service Data Unit (SDU) in the OSI model

- There is also a many-to-many relationship between the component concept in SCA and layer concept in the OSI model in the sense that a single layer may be comprised of multiple components, or a single component may be deployed as a part of a waveform layer. Both SCA components and OSI waveform layering together with Service Access Points (SAPs) provide functional boundaries and standard access to waveform facilities.

The SCA for JTRS is shown in Figure 1. As can be seen, CORBA is a key component of the architecture.

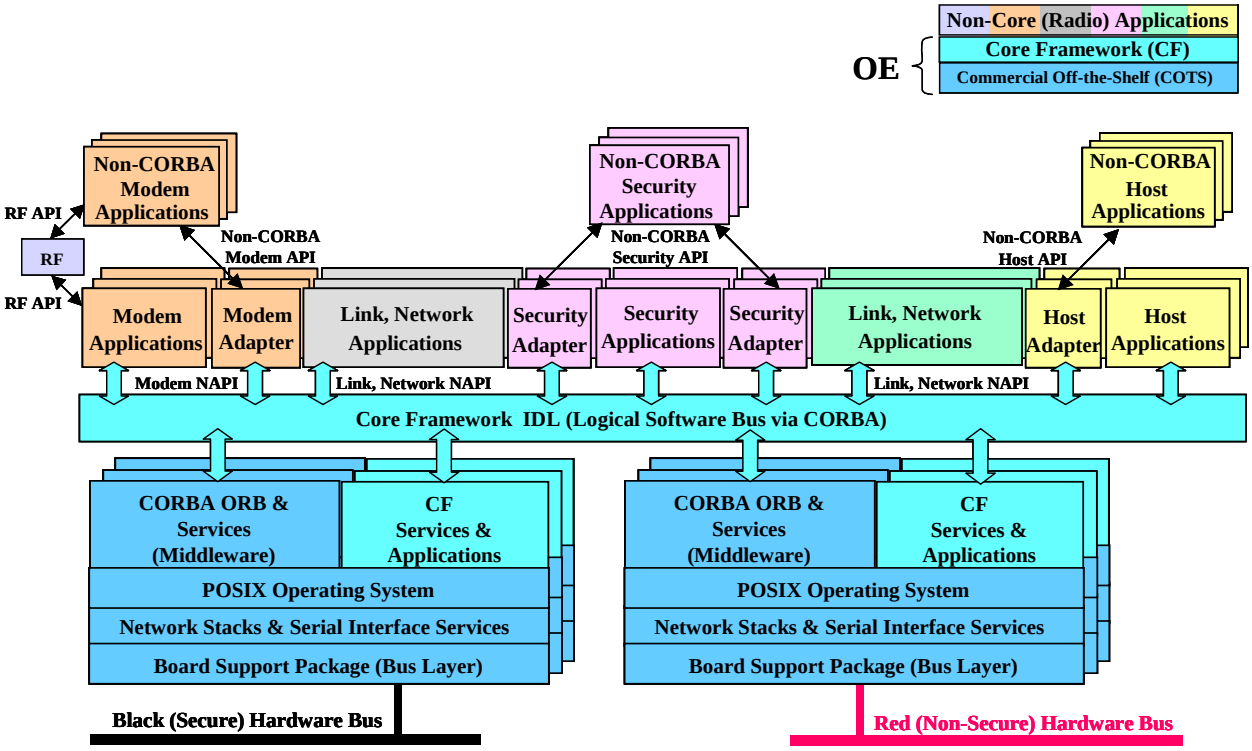

Figure 1. Software Communications Architecture for JTRS

While JTRS is focused on resolving interoperability issues and providing enhanced communications capability for Department of Defense radio systems, the JTRS approach -- particularly the Software Communications Architecture -- offers a solution to interoperability problems in many other arenas. JTRS could prove particularly beneficial to civil aviation. JTRS has the potential to provide general aviation users with a low-cost, SCA-compliant capability for air and surface transmission of position, weather, traffic conditions, etc. with parameters akin to the capabilities to be provided by the Universal Access Transceiver.

As can be seen in Table 1, there are waveforms being developed for JTRS that would apply to commercial and general aviation. They include:

- ATC HF Data Link
- VHF for ATC (8.33 KHz)
- VHF AM
- ATC VHF Data Link

Table 1. JTRS Waveforms

WAVEFORM	FREQ. BAND	BANDWIDTH	DATA RATES
***SINCGARS ESIP w/MIL-STD 188-220**	30-88 MHz	25 KHz	16 Kbps
***HAVE QUICK II**	225-400 MHz	25 KHz	16 Kbps
***UHF DAMA SATCOM (MIL-STD-188-181/182/183 Compliant)**	225-400 MHz	5 and 25 KHz	75, 300, 600 bps; 1.2, 2.4, 4.8, 9.6, 16, 19.2, 28.8, 32, 38.4, 48, 56, 64Kbps
***Enhanced Position Location Reporting System (EPLRS)**	420-450 MHz	3 MHz	57 Kbps VHSIC SIP 114 Kbps VECP
***Wideband Networking Waveform (WNW) (new, modified or existing waveform)**	Government or Vendor Developed	Government or Vendor Developed	Government or Vendor Developed
UHF DAMA SATCOM (MIL-STD-188-184 Compliant	225-400 MHz	5 and 25 KHz	TBD
HF Independent Side Band (ISB) w/ Automatic Link Establishment (ALE)	2-30 MHz	3 -12 KHz	4.8/9.6 Kbps
HF Single Side Band (SSB) w/Automatic Link Establishment (ALE)	2-30 MHz	3 KHz	2.4/9.6 Kbps
Link 11	2-30 MHz and 225-400 MHz	3 KHz and 25 KHz	2.25 Kbps
STANAG 5066 (HF)	2-30 MHz	3 KHz	9.6 Kbps
STANAG 4529	2-30 MHz	1.24 KHz	1.8 Kbps
ATC HF Data Link	2-30 MHz	3 KHz	300,600,1200,1800 Bps
VHF FM	30-88 MHz	25 KHz	16 Kbps
VHF for ATC (replaces 25 KHz spacing)	112-137 MHz	8.33 KHz	TBD
VHF AM	118-156 MHz	25 KHz	16 Kbps
VHF FM Public Service (APCO 25) (Land Mobile Radio)	138-150.8 MHz and 162-174 MHz	6.5, 12.5,25 KHz	16 Kbps
ATC VHF Data Link	112-137 MHz	25 KHz	31.5 Kbps
UHF AM/FM PSK LOS	225-400 MHz	25 KHz	16 Kbps
STANAG 4231 (UHF SATCOM)	225-400 MHz	TBD	TBD
Link 4A	225-400 MHz	25 KHz	5 Kbps
Link 11B	225-400 MHz	25 KHz	0.6, 1.2, 2.4 Kbps
Integrated Broadcast Service Module (IBS-M)	225-400 MHz	5 and 25 KHz	19.2 Kbps (tunable 2.4, 4.8, 9.6, 19.2)
SATURN	225-400 MHz	25 KHz	TBD
UHF FM Public Service APCO 25(Land Mobile Radio)	380-420 MHz	5 and 12.5 KHz	25 KHz: 16 Kbps
Link 16	960-1215 MHz	3 MHz	118/236 Kbps w/FEC
STANAG 4193 Mode S Level 4/5	1030/1090 MHz	3.5 MHz/3 MHz	TBD
Digital Wideband Transmission System (DWTS)	1350-1850 MHz	125 KHz	144,256,288,512,1024, 1544,2048 Kbps
Soldier Radio	1.75 - 1.85 GHz	25 KHz	16 Kbps
COBRA	340-400 MHz	TBP	TBP
MUOS	240-320 MHz	5 MHz, 25 MHz	2.4, 9.6, 16, 32 Kbps
Cellular Radio	TBD	TBD	TBD
Link 22	3-30 MHz and 225-400 MHz	TBD	TBD
Mobile Satellite Service (MSS)	1.61 - 2 GHz	TBD	2.4 - 9.6 Kbps

1.3. Document Organization

Following this introductory section, Section 2 provides a discussion of the organizations and their committees that are involved with MMDA, software defined and software re-configurable avionics plus certification methodologies for MMDA. Section 3 presents recommendations – in priority order – of those standards groups and committees with which NASA GRC may wish to be more closely involved. Section 4 includes the standards that the MAI team suggests be considered when writing MMDA related development contracts. Finally, Appendix A presents a listing of acronyms.

2. STANDARDS BODIES

This section provides detailed information for the working groups and subcommittees identified in the survey whose work deals directly with MMDA, software-defined and/or software reconfigurable avionics capabilities, MMDA technologies and MMDA certification methodologies. The sponsoring organizations are described and the committees of interest are discussed in detail. The relevant information concerning the committees includes:

- General description of the committee -- history and purpose
- Charter or goals of the committee
- Discussion of the standard(s) the committee is currently developing or revising
- Development status of the standard being developed or revised. The target publication date is provided if known.
- Website references for selected existing and emerging standards
- The applicability for the standard to ACAST's MMDA projects
- Points of contact for one or more key individuals

2.1. RTCA

RTCA, Inc. is a private, not-for-profit corporation that develops consensus-based recommendations regarding communications, navigation, surveillance, and air traffic management (CNS/ATM) system issues. RTCA functions as a Federal Advisory Committee. Its recommendations are used by the Federal Aviation Administration (FAA) as the basis for policy, program, and regulatory decisions and by the private sector as the basis for development, investment and other business decisions.

Organized in 1935 as the Radio Technical Commission for Aeronautics, RTCA today includes roughly 250 government, industry and academic organizations from the United States and around the world. Member organizations represent all facets of the aviation community, including government organizations, airlines, airspace user and airport associations, labor unions, plus aviation service and equipment suppliers. A sampling of its domestic membership includes the Federal Aviation Administration, Air Line Pilots Association, Air Transport Association of America, Aircraft Owners and Pilots Association, ARINC Incorporated, The Boeing Company, Department of Commerce, Department of Defense, GARMIN International, Honeywell International, Inc., The Johns Hopkins University, Lockheed Martin, MIT Lincoln Laboratory, MITRE/CAASD, NASA, National Business Aviation Association, Raytheon, Mulkerin Associates Inc. and Strategic Aeronautics, Inc.

Because RTCA interests are international in scope, many non-U.S. government and business organizations also belong to RTCA. It is currently supported by approximately 60 International

Associates such as Airservices Australia, Airways Corporation of New Zealand, the Chinese Aeronautical Radio Electronics Research Institute (CARERI), EUROCONTROL, NAV Canada, Pilatus Aircraft Limited, Smiths Industries, Society of Japanese Aerospace Companies, Thales Avionics Limited, the United Kingdom Civil Aviation Authority and many more.

RTCA has proven to be an excellent means for developing government/industry consensus on contemporary CNS/ATM issues. RTCA documents are considered by the FAA as the basis for, and a means of compliance with Technical Standard Orders (TSOs) and other regulatory documents.

2.1.1. Organization

Task Forces

Occasionally, RTCA is asked by the Administrator of the Federal Aviation Administration to develop industry consensus on a broad gauged strategic issue. Examples of Task Force issues include Global Navigation Satellite System (GNSS) Transition and Implementation Strategy, Transition to Digital Communications, Free Flight Implementation and Certification.

Steering Committees

Some Task Forces have led to formation of Steering Committees created to guide implementation of Task Force recommendations. The Free Flight Steering Committee is a currently ongoing activity with a primary mission of furthering the objectives of Task Force 3, Free Flight Implementation. The Steering Committee's charter calls for the committee to assist in implementing the FAA's Operational Evolution Plan (OEP) as its primary focus.

Program Management Committee

The most frequent requests are for RTCA to establish a committee to recommend Minimum Operational Performance Standards (MOPS) or appropriate technical guidance documents. When these requests are received, RTCA's Program Management Committee (PMC) discusses the topic and, based on consensus, initiates Special Committee (SC) action.

Special Committees

Essentially all RTCA products are developed by issue-oriented Special Committees staffed by volunteers. As with all Federal Advisory Committee activities, Special Committee meetings are publicly announced and open to participation by anyone with an interest in the topic under consideration. During Special Committee meetings, volunteers from government and industry explore the operational and technical ramifications of the selected topic and develop consensus recommendations. These recommendations are then presented to the RTCA Program Management Committee, which either approves the Special Committee report or directs additional Special Committee work. Approved recommendations are published and made available for sale to members and to the public.

Easy access to updates on committee activities and related subjects is available on the RTCA web site and in the Digest, which is published every two months.

Membership

NASA is a member of RTCA. The address for organizations to apply for membership is:

RTCA, Inc.
Attn: Membership Services
1828 L Street, NW, Suite 805
Washington, DC 20036

2.1.2. Current Standards

The documents currently available from RTCA are shown in Table 2.

Table 2. RTCA Current Documents

DO #	Document
289	Minimum Aviation System Performance Standards (MASPS) for Aircraft Surveillance Applications (ASA)
288	Next Generation Air/Ground Communication System (NEXCOM) Implementation Considerations: Factors and Issues to be Considered in Planning for the Transition to Air/Ground, ICAO, VDL Mode 3 Based Integrated Voice and Data Communications in the U.S. National Airspace System (NAS)
287	Plans and Principles for the Implementation of Aeronautical Data Link System (ADLS) Edition 1. Aeronautical Telecommunications Network (ATN)
286	Minimum Aviation System Performance Standards (MASPS) for Traffic Information Service - Broadcast (TIS-B)
285	Next Generation Air/Ground Communications (NEXCOM) VDL Mode 3 Interoperability
284 Change 1	Next Generation Air/Ground Communications System (NEXCOM) Safety and Performance Requirements (SPR)
284	Next Generation Air/Ground Communication System (NEXCOM) Safety and Performance Requirements (SPR)
283A	Minimum Operational Performance Standards for Required Navigation Performance for Area Navigation
282	Minimum Operational Performance Standards for Universal Access Transceiver (UAT) Automatic Dependent Surveillance – Broadcast
281	Minimum Operational Performance Standards for Aircraft VDL Mode 2 Physical, Link and Network Layers
280	Minimum Interoperability Requirements Standard for ATN Baseline 1 (INTEROP ATN B1)
279	Next Generation Air/Ground Communications (NEXCOM) Principles of Operations VDL MODE 3

Table 2. RTCA Current Documents

DO #	Document
278	Guidelines For Communication, Navigation, Surveillance, and Air Traffic Management (CNS/ATM) Systems Software Integrity Assurance
277	Minimum Aviation System Performance Standards (MASPS) for the High Frequency Data Link Operating in the Aeronautical Mobile (Route) Service (AM(R)S)
276	User Requirements for Terrain and Obstacle Data
275	Minimum Operational Performance Standards for Integrated Night Vision Imaging System Equipment
274	Next Generation Air/Ground Communications (NEXCOM) Principles of Operation
273	Response to the Report of the RTCA Chairman's Committee on NEXCOM
272	User Requirements for Aerodrome Mapping Information
271B	Minimum Operational Performance Standards for Aircraft VDL Mode 3 Transceiver Operating in the Frequency Range 117.975 – 137.000 MHz
270	Minimum Aviation System Performance Standards (MASPS) for the Aeronautical Mobile-Satellite (R) Service (AMS(R)S) as Used in Aeronautical Data Links
269	Concepts For Services Integrating Flight Operations and Air Traffic Management Using Addressed Data Link
268	Concept of Operations, Night Vision Imaging System for Civil Operators
267	Minimum Aviation System Performance Standards (MASPS) for Flight Information Service Broadcast (FIS-B) Data Link
266	Government and Industry Guidelines and Concepts for NAS Analysis and Redesign
265	Minimum Operational Performance Standards for Aeronautical Mobile High Frequency Data Link (HFDL)
264	Guidelines for Approval of the Provision and Use of Air Traffic Services Supported by Data Communications
263	Application of Airborne Conflict Management: Detection, Prevention, & Resolution
262	Minimum Operational Performance Standards for Avionics Supporting Next Generation Satellite Systems (NGSS)
262 Change 1	Minimum Operational Performance Standards for Avionics Supporting Next Generation Satellite Systems (NGSS)
261	NAVSTAR GPS L5 Signal Specification
260A	Minimum Operational Performance Standards for 1090 MHz Automatic Dependent Surveillance – Broadcast (ADS-B) and Traffic Information Services-Broadcast (TIS-B)
259	Applications Descriptions for Initial Cockpit Display of Traffic Information (CDTI) Applications
258	Interoperability Requirements for ATS Applications Using ARINC 622 Data Communications

Table 2. RTCA Current Documents

DO #	Document
257A	Minimum Operational Performance Standards for the Depiction of Navigational Information on Electronic Maps
256	Minimum Human Factors Standards for Air Traffic Services Provided Via Data Communications Utilizing the ATN, Builds I and IA
255	Requirements Specification for Avionics Computer Resource (ACR)
254	Design Assurance Guidance for Airborne Electronic Hardware
253A	Minimum Operational Performance Standards for GPS Local Area Augmentation System Airborne Equipment
252	Minimum Interoperability Standards (MIS) for Automated Meteorological Transmission (AUTOMET)
251	U.S. National Airspace Systems (NAS) Plan for Air Traffic Services data Link (Phase 1, En Route CONUS Implementation)
250	Guiding Principles for Air Traffic Services Provided via Data Communications Utilizing the ATN, Builds I and IA
249	Development and Implementation Planning Guide for Automatic Dependent Surveillance Broadcast (ADS-B) Applications
248B	Final Annual Report For Clarification Of DO-178B “Software Considerations In Airborne Systems And Equipment Certification”
247	The Role of the Global Navigation Satellite System (GNSS) in Supporting Airport Surface Operations
246B	GNSS Based Precision Approach Local Area Augmentation System (LAAS) – Signal-in-Space Interface Control Document (ICD)
245	Minimum Aviation System Performance Standards for Local Area Augmentation System (LAAS)
244	Government/Industry Guidelines and Concept for National Airspace Analysis and Redesign
243	Guidance for Initial Implementation of Cockpit Display of Traffic Information
242A	Minimum Aviation System Performance Standards for Automatic Dependent Surveillance Broadcast (ADS-B)
241	Operational Concepts and Information Elements Required to Improve Air Traffic Management (ATM) - Aeronautical Operational Control (AOC) Ground-Ground Information Exchange to Facilitate Collaborative Decision Making.
240	Minimum Operational Performance Standards for Aeronautical Telecommunication Network (ATN) Avionics
239	Minimum Operational Performance Standards for Traffic Information Service (TIS) Data Link Communications 238 Human Engineering Guidance for Data Link Systems
237	Aeronautical Spectrum Planning for 1997 - 2010
236B	Minimum Aviation System Performance Standards: Required Navigation Performance for Area Navigation

Table 2. RTCA Current Documents

DO #	Document
235A	Assessment of Radio Frequency Interference Relevant to the GNSS
234	Minimum Performance and Installation Standards for Runway Guard Lights (RGLs)
233	Portable Electronic Devices Carried on Board Aircraft
232	Operations Concepts for Data Link Applications of Flight Information Services
231	Design Guidelines and Recommended Standards for the Implementation and Use of AMS(R)S Voice Services in a Data Link Environment
230A	Standards for Airport Security Access Control Systems
229C	Minimum Operational Performance Standards for Global Positioning System/Wide Area Augmentation System Airborne Equipment
228	Minimum Operational Performance Standards for Global Navigation Satellite Systems (GNSS) Airborne Antenna Equipment
228 Change 1	Minimum Operational Performance Standards for Global Navigation Satellite Systems (GNSS) Airborne Antenna Equipment
227	Minimum Operational Performance Standards for Lithium Batteries
226	Guidance Material for Evolving Airborne Precision Area Navigation Equipment with Emphasis on MLS
225	VHF Air-Ground Communications System Improvements Alternatives Study and Selection of Proposals for Future Action
224A	Change 2 Signal-in-Space Minimum Aviation System Performance Standards (MASPS) for Advanced VHF Digital Data Communications Including Compatibility with Digital Voice Techniques
224A	Signal-in-Space Minimum Aviation System Performance Standards (MASPS) for Advanced VHF Digital Data Communications Including Compatibility with Digital Voice Techniques.
224A Change 1	Signal-in-Space Minimum Aviation System Performance Standards (MASPS) for Advanced VHF Digital Data Communications Including Compatibility with Digital Voice Techniques
223	Minimum Operational Performance Standards for Context Management (CM) Equipment
222	Guidelines on AMS(R)S Near-Term Voice Implementation and Utilization
221	Guidance and Recommended Requirements for Airport Surface Movement
220	Minimum Operational Performance Standards (MOPS) for Airborne Weather Radar with Forward-Looking Windshear Detection Capability
220 Change 1	Minimum Operational Performance Standards (MOPS) for Airborne Weather Radar with Forward-Looking Windshear Detection Capability
219	Minimum Operational Performance Standards for ATC Two-Way Data Link Communications
218B	Minimum Operational Performance Standards for the Mode S Airborne Data Link Processor
217	Minimum Aviation System Performance Standards DGNSS Instrument Approach System: Special Category 1 (SCAT-1) Revised to include Change 1.

Table 2. RTCA Current Documents

DO #	Document
217 Change 2	Minimum Aviation System Performance Standards DGNSS Instrument Approach System: Special Category 1 (SCAT-1)
217 Change 1	Minimum Aviation System Performance Standards DGNSS Instrument Approach System: Special Category 1 (SCAT-1)
216	Minimum General Specification for Ground-Based Electronic Equipment
215A	Guidance on Aeronautical Mobile Satellite Service (AMSS) End-to-End System Performance
215A Change 1	Guidance on Aeronautical Mobile Satellite Service (AMSS) End-to-End System Performance
214	Audio Systems Characteristics and Minimum Operational Performance Standards for Aircraft Audio Systems and Equipment Systems and Equipment
213	Minimum Operational Performance Standards for Nose-Mounted Radomes
213 Change 1	Minimum Operational Performance Standards for Nose-Mounted Radomes
212	Minimum Operational Performance Standards for Airborne Automatic Dependent Surveillance (ADS) Equipment
211	User Requirements for Future Airport and Terminal Area Communications, Navigation and Surveillance
210D	Minimum Operational Performance Standards (MOPS) for Geosynchronous Orbit Aeronautical Mobile Satellite Services (AMSS) Avionics
210D Change 1	Minimum Operational Performance Standards (MOPS) for Geosynchronous Orbit Aeronautical Mobile Satellite Services (AMSS) Avionics
210D Change 2	Minimum Operational Performance Standards (MOPS) for Geosynchronous Orbit Aeronautical Mobile Satellite Services (AMSS) Avionics
209	Minimum Operational Performance Standards for Devices that Prevent Blocked Channels Used in Two-Way Radio Communications Due to Simultaneous Transmissions
208	Minimum Operational Performance Standards for Airborne Supplemental Navigation Equipment Using Global Positioning System (GPS)
208 Change 1	Minimum Operational Performance Standards for Airborne Supplemental Navigation Equipment Using Global Positioning System (GPS)
207	Minimum Operational Performance Standards for Devices that Prevent Blocked Channels Used in Two-Way Radio Communications Due to Unintentional Transmissions Minimum Aviation System Performance Standards for Radiodetermination Satellite Service (RDSS)
204	Minimum Operational Performance Standards for 406 MHz Emergency Locator Transmitters (ELT)
204 Change 1	Minimum Operational Performance Standards for 406 MHz Emergency Locator Transmitters (ELT)

Table 2. RTCA Current Documents

DO #	Document
204 Change 2	Minimum Operational Performance Standards for 406 MHz Emergency Locator Transmitters (ELT)
204 Change 3	Minimum Operational Performance Standards for 406 MHz Emergency Locator Transmitters (ELT)
202	Report of Special Committee 159 on Minimum Aviation System Performance Standards (MASPS) for Global Positioning System (GPS)
201A	Standards for Aeronautical Information
200A	Standards for Processing Aeronautical Data
199	Potential Interference to Aircraft Electronic Equipment from Devices Carried Aboard (Vol I)
199	Potential Interference to Aircraft Electronic Equipment from Devices Carried Aboard (Vol II)
197A	Minimum Operational Performance Standards for an Active Traffic Alert and Collision Avoidance System I (Active TCAS I)
197A Change 1	Minimum Operational Performance Standards for an Active Traffic Alert and Collision Avoidance System I (Active TCAS I)
196	Minimum Operational Performance Standards for Airborne VOR Receiving Equipment Operating within the Radio Frequency Range of 108-117.95 Megahertz
195	Minimum Operational Performance Standards for Airborne ILS Localizer Receiving Equipment Operating within the Radio Frequency Range of 108-112 Megahertz
194	Minimum Operational Performance Standards for Airborne Area Navigation Equipment Using Loran-C Inputs
193	User Requirements for Future Communications, Navigation, and Surveillance Systems, Including Space Technology Applications
192	Minimum Operational Performance Standards for Airborne ILS Glide Slope Receiving Equipment Operating Within the Radio Frequency Range of 328.6-335.4 Megahertz
191	Minimum Operational Performance Standards for Airborne Thunderstorm Detection Equipment
190	Minimum Operational Performance Standards for Airborne Area Navigation Equipment Using Omega/VLF Inputs
189	Minimum Operational Performance Standards for Airborne Distance Measuring Equipment (DME) Operating within the Radio Frequency Range of 960-1215 MHz
188	Emergency Locator Transmitter (ELT) Batteries Guidance and Recommendations
187	Minimum Operational Performance Standards for Airborne Area Navigation Equipment Using Multi-Sensor Inputs
186A	Minimum Operational Performance Standards for Airborne Radio Communications Equipment Operating within the Radio Frequency Range 117.975-137.000 MHz; Includes Change 1

Table 2. RTCA Current Documents

DO #	Document
186A Change 1	Minimum Operational Performance Standards for Airborne Radio Communications Equipment Operating within the Radio Frequency Range 117.975-137.000 MHz
186A Change 2	Minimum Operational Performance Standards for Airborne Radio Communications Equipment Operating within the Radio Frequency Range 117.975 - 137.000 MHz
185A	Minimum Operational Performance Standards for Traffic Alert and Collision Avoidance System II (TCAS II) Airborne Equipment
184	Traffic Alert and Collision Avoidance System (TCAS) I Functional Guidelines
183	Minimum Operational Performance Standards for Emergency Locator Transmitters-Automatic Fixed-ELT (AF), Automatic Portable-ELT (AP), Automatic Deployable-ELT (AD), Survival-ELT (S) Operating on 121.5 and 243.0 Megahertz
182	Emergency Locator Transmitter (ELT) Equipment Installation and Performance
181C ERRATA	Minimum Operational Performance Standards for Air Traffic Control Radar Beacon System/Mode Select (ATCRBS/Mode S) Airborne Equipment (ERRATA)
181C	Minimum Operational Performance Standards for Air Traffic Control Radar Beacon System/Mode Select (ATCRBS/Mode S) Airborne Equipment
181C Change 1	Minimum Operational Performance Standards For Air Traffic Control Radar Beacon System/Mode Select (ATCRBS/Mode S) Airborne Equipment
180A	Minimum Operational Performance Standards for Airborne Area Navigation Equipment Using a Single Collocated VOR/DME Sensor Input
179	Minimum Operational Performance Standards for Automatic Direction Finding (ADF) Equipment
178B	Software Considerations in Airborne Systems and Equipment Certification
177	Minimum Operational Performance Standards for Microwave Landing System (MLS) Airborne Receiving Equipment
176	FM Broadcast Interference Related to Airborne ILS, VOR and VHF Communications
175, 222	Minimum Operational Performance Standards for Ground-Based Automated Weather Observation Equipment
174	Minimum Operational Performance Standards for Optional Equipment Which Displays Non-Radar-Derived Data on Weather and Ground Mapping Radar Indicators
173	Minimum Operational Performance Standards for Airborne Weather and Ground Mapping Pulsed Radars
172	Minimum Operational Performance Standards for Airborne Radar Approach and Beacon Systems for Helicopters
171	Recommendations on Policies and Procedures for Off-the-Shelf Electronic Test Equipment Acquisition and Support
169	VHF Air-Ground Communication Technology and Spectrum Utilization
167	Airborne Electronics and Electrical Equipment Reliability

Table 2. RTCA Current Documents

DO #	Document
166	Microwave Landing System (MLS) Implementation (Vol I)
166	Microwave Landing System (MLS) Implementation (Vol II)
165	Initial Report on Civil Aviation Frequency Spectrum Requirements-1980- 2000
164A	Minimum Performance Standards-Airborne Omega Receiving Equipment
163	Minimum Performance Standards-Airborne HF Radio Communications Transmitting and Receiving Equipment Operating Within the Radio-Frequency Range of 1.5 to 30 Megahertz
162	Report on Air-Ground Communications-Operational Considerations for 1980 and Beyond
161A	Minimum Performance Standards-Airborne Ground Proximity Warning Equipment
160D	Environmental Conditions and Test Procedures for Airborne Equipment
160D Change 1	Environmental Conditions and Test Procedures for Airborne Equipment
160D Change 2	Environmental Conditions and Test Procedures for Airborne Equipment
160D Change 3	Environmental Conditions and Test Procedures for Airborne Equipment
158	Minimum Performance Standards-Airborne Doppler Radar Navigation Equipment
155	Minimum Performance Standards-Airborne Low-Range Radar Altimeters
154	Recommended Basic Characteristics for Airborne Radio Homing and Alerting Equipment for Use With Emergency Locator Transmitters (ELTs)
152	Minimum Operational Characteristics-Vertical Guidance Equipment Used in Airborne Volumetric Navigational Systems
148	A New Guidance System for Approach and Landing (Vol I)
148	A New Guidance System for Approach and Landing (Vol II)
144	Minimum Operational Characteristics-Airborne ATC Transponder Systems
143	Minimum Performance Standards-Airborne Radio Marker Receiving Equipment Operating on 75 MHz
136	Universal Air-Ground Digital Communication System Standards
127	Standard Procedure for the Measurement of the Radio-Frequency Radiation From Aviation Radio Receivers Operating Within the Radio-Frequency Range of 30-890 Megacycles
117	Standard Adjustment Criteria for Airborne Localizer and Glide Slope Receivers
088	Altimetry
062	Calibration Procedures-Test Standard Omni-Bearing Selectors and Omni-Bearing Selector Test Sets
056	VOR Test Signals
052	Calibration Procedures for Signal Generators used in the Testing of VOR and ILS Receivers

Table 2. RTCA Current Documents

DO #	Document
	Recommendations Regarding the Concept of Equipage and Mandated versus Voluntary Considerations
	National Airspace System Concept of Operations and Vision for the Future of Aviation
	RTCA Task Force 4 Certification
	RTCA Task Force 1 Report on Global Navigation Satellite System (GNSS) Transition and Implementation Strategy
	RTCA Task Force 2 Report on the Transition to Digital Communications
	RTCA Task Force 3 Interim Report on Free Flight Implementation
	Final Report of RTCA Task Force 3 Free Flight Implementation
	Report of the RTCA Board of Directors' Select Committee on Free Flight
	Portable Hand-Held GPS Receivers-What You Should Know
	The Authority of Agreement-A History of RTCA
	Free Flight Action Plan
	Free Flight Action Plan Update 1
	Free Flight Action Plan Update 2
	Government/Industry Operational Concept for the Evolution of Free Flight, Edition 2 Government/Industry Operational Concept for the Evolution of Free Flight - Addendum 1: Free Flight Phase 1 Limited Deployment of Select Capabilities (URET, TMA (SC), pFAST, CPDLC, CDM, SMA)
	Government/Industry Operational Concept for the Evolution of Free Flight - Addendum 2: Candidate Recommendations on Near Term Procedural Enhancements, 1998 - 2002
	Government/Industry Operational Concept for the Evolution of Free Flight - Addendum 3: Surveillance
	Government/Industry Operational Concept for the Evolution of Free Flight - Addendum 3.1: Roadmap for Surveillance Modernization
	National Airspace System Concept of Operations
	National Airspace System Concept of Operations - Addendum 4: Free Flight Phase 2 Future Flight Data Collection Committee Final Report
	Certification Steering Committee Final Report
	SYMPOSIUM PROCEEDINGS, 2002 The New Aviation Environment: Safety, Security and Efficiency
	SYMPOSIUM PROCEEDINGS, 2003 - Modernizing Air Traffic Management in Today's Environment...Why, How and When
	SYMPOSIUM PROCEEDINGS, 2004 - Implementing a "Performance-Based" National Airspace System

Table 2. RTCA Current Documents

DO #	Document
	SYMPOSIUM PROCEEDINGS, 2000 - ATC Modernization – Achieving New Operational Capabilities (and it's more than equipment)
	SYMPOSIUM PROCEEDINGS, 1999 - Modernization: Aviation's Challenge and Opportunity for the New Millennium
	SYMPOSIUM PROCEEDINGS, 1998 - Operations, Certification, & Standards: Cornerstones for the Future
	SYMPOSIUM PROCEEDINGS, 1996 - Working Together to Deliver Free Flight
	SYMPOSIUM PROCEEDINGS, 1995 - International Cooperation and Standards—Keys to Enhancing the Capacity, Efficiency, and Safety of Air Transportation
	SYMPOSIUM PROCEEDINGS, 1994 - Implementing Air Traffic Management through Government/Industry Partnerships—Accomplishments, Challenges, and Opportunities
	SYMPOSIUM PROCEEDINGS, 1993 - Implementing Air Traffic Management—A Systems Approach for the 21st Century

2.1.3. Document Acquisition

Members and non-members can purchase published documents through the RTCA Online Store The On-Line Store permits RTCA Members to download electronic documents at no charge and place orders for hardcopy documents at a 60% discount. The On-line store is located at:

http://www.rtca.org/onlinecart/

2.1.4. RTCA Committees

The RTCA committees are shown in Table 3. Of these, SC-200, Modular Avionics, is working on MMDA related standards.

Table 3. RTCA Committees

Committees
SC-202 Portable Electronic Devices
SC-201 Aeronautical Operational Control (AOC) Message Hazard Mitigation (AMHM)
SC-200, Modular Avionics
SC-197, Rechargeable and Starting Batteries
SC-196, Night Vision Goggles
SC-195, Flight Information Services Communications (FISC)
SC-193, Terrain and Airport Data Bases

Table 3. RTCA Committees

Committees
SC-189, Air Traffic Services Safety and Interoperability Requirements (ATS SIR)
SC-186, Automatic Dependent Surveillance - Broadcast (ADS-B)
SC-172, VHF Air-Ground Communication
SC-159, Global Positioning System (GPS)
SC-147, Traffic Alert And Collision Avoidance (TCAS)
SC-135, Environmental Testing (DO-160D)
RTCA PMC, Program Management Committee
RTCA Free Flight Steering Committee
RTCA Free Flight Select Committee

2.1.5. SC-200 – Modular Avionics

RTCA SC-200 is a joint committee with EUROCAE WG-60 formed to develop standards for modular avionics. Modular avionics are shared, interoperable hardware and software resources that provide services to host applications performing aircraft-related functions. This committee has been established to develop recommended guidance for regulatory approval of the platform and supporting components. SC-200 will propose means to approve the modular avionics platform independent of the operational application and propose a method for transferring certification credit between stakeholders. The committee's document will include guidance for partitioning and resource management, fault management, safety and security, flight operations and maintenance, environmental qualification, configuration management, and assurance.

EUROCAE WG-60's focus is the development of guidance material to define the safety, performance and interoperability requirements for modular avionics to support aircraft systems, and to qualify related modular avionics systems. Today, EUROCAE documents are considered by Joint Aviation Authorities as means of compliance to Joint Technical Standard Orders and other regulatory documents.

EUROCAE has extended its activity from airborne equipment to complex CNS/ATM systems including their ground segment. The related documentation is also considered by Eurocontrol and by the European Commission. The main European administrations, aircraft manufacturers, equipment manufacturers and service providers are members of EUROCAE, and they actively participate in the Working Groups that prepare these documents.

2.1.5.1. Committee Charter or Goals

A committee charter in RTCA is called the "Terms of Reference". SC-200 Terms of Reference are:

The special committee should develop a work program, with schedule and milestones, to accomplish the following terms of reference:

A. Propose, document and deliver means to support the certification (or approval) of modular avionics, systems integration, and hosted applications, including considerations for installation and continued airworthiness in all categories and classes of aircraft. Note: In this context, modular avionics is considered to be a shared set of flexible, reusable, and interoperable hardware and software resources that create a platform that provides services, designed and verified to a defined set of safety and performance requirements, to host applications performing aircraft-related functions.

B. Define and document the key characteristics of modular avionics.

C. Identify specific modular avionics issues in current regulatory materials and industry practices, and make recommendations to the document sponsor.

D. Propose and document means for the stand-alone approval of modular avionics separate from the applications.

E. Propose and document means for transfer and reuse of an accepted process, data, product, demonstration and qualification.

F. Create guidance to address the following safety and performance issues (at a minimum):

1. Partitioning & resource management
2. Fault management & health monitoring
3. Safety and security
4. Flight operations, installation, instructions for continued airworthiness, and maintenance
5. Environmental qualification
6. Configuration management
7. Design/development assurance (e.g., verification, processes, life cycles, etc.)

G. Coordinate joint committee products with certification authorities (via Certification Authority Software Team and other appropriate groups) and build upon existing materials.

H. Support certification authorities to concurrently create implementation documents [e.g., Technical Standard Order (TSO), Advisory Circular (AC), Advisory Material Joint (AMJ)].

I. Establish close working relationships with appropriate groups.

SC-200 and WG-60 to aim to provide Guidance Document DO-XXX/ED-YYY by March 2004.

2.1.5.2. Standard

SC-200/WG-60 has yet to produce a document. The current title for the document they are developing is Design Guidance and Certification Considerations for Integrated Modular Avionics (IMA). The document is currently structured in six sections and four appendices:

1) Introduction
2) Integrated Modular Avionics Overview
3) Design and Integration Considerations
4) Safety Assessment
5) Certification Considerations
6) Considerations for Airworthiness
   A) Glossary
   B) Acronyms and Abbreviations
   C) System Examples
   D) Objectives

2.1.5.3. Status

The Terms of Reference states that a guidance document should be published by March 2004. That date obviously has been extended. A draft of the document has been written and submitted to committee members for comments. The committee expects the document to be ready for the Final Review And Comment (FRAC) process following the next meeting in Paris at EUROCAE, May 11-14. If all goes well the final document should be published by October 2004.

A discussion with the RTCA staff person for this committee indicated that SC-200 probably will end with the publication of Design Guidance and Certification Considerations for Integrated Modular Avionics (IMA), DO-XXX/ED-YYY.

2.1.5.4. Applicability to ACAST

SC-200/WG-60's work is applicable to NASA's ACAST Project in that it will develop a standard to support the certification (or approval) of modular avionics, systems integration, and hosted applications, including considerations for installation and continued airworthiness in all categories and classes of aircraft. The standard will provide a path to certification for modular avionics developed under the ACAST project.

2.1.5.5. Points of Contact

The Co-Chairmen are:

- Chairman of RTCA SC-200: Cary Spitzer

AvioniCon

- Chairman of EUROCAE WG-60: Rene Eveleens
  National Aerospace Laboratory

The Secretary is:

- John Lewis
  FAA/AIR-120

The RTCA staff member is:

- Rudy Ruana
  (202) 833-9339 (Voice)
  (202) 833-9434 (Fax)
  rruana@rtca.org

2.1.6. Potential Special Committee on Software Certification

RTCA is considering establishing a new SC to revise DO-178B, Software Considerations in Airborne Systems and Equipment Certification. The FAA has determined that the certification process could be improved by an update to DO-178. The RTCA PMC is currently determining if industry concurs. The SC will be established only if industry is willing to support it. That determination has yet to be made. The establishment of the SC will not happen for at least another three or four months. It is thought that many of the people who participated in SC-200 would participate on the new SC.

Such a committee would be of interest to GRC because it would revise the certification standard for software avionics. Adhering to the principles in the standard would permit ACAST developed avionics to have a path to certification.

2.2. Airlines Electronic Engineering Committee

The Airlines Electronic Engineering Committee (AEEC) is an international body of airline representatives that leads the development of technical standards for airborne electronic equipment-including avionics and in-flight entertainment equipment-used in commercial, military, and business aviation. Similar to the RTCA PMC, the 26 member AEEC determines if new or revised standards are required, and assign the effort to one or more all-volunteer subcommittees.

The AEEC establishes consensus-based, voluntary form, fit, function, and interface standards that are published under the ARINC brand. ARINC Standards are the ubiquitous set of specifications employed by the air transport avionics equipment and aircraft manufacturers worldwide. Through the AEEC, avionics installed in more than 10,000 aircraft around the world are based on these form, fit, function, and interface standards. Over 5,000 engineers and

scientists representing nearly 500 organizations participate in the development of ARINC Standards.

There are three categories of ARINC Standards: ARINC Characteristics, ARINC Specifications, and ARINC Reports.

To be more specific, the followings are the three classes of ARINC Standards along with their description:

- ARINC Characteristics - Define the form, fit, function, and interfaces of avionics equipment. There are two series of ARINC Characteristics. The ARINC 700 series defines digital avionics. Older, analog avionics are defined in the ARINC 500 series.

- ARINC Specifications - Principally used to define either the physical packaging or mounting of avionics equipment, data communication standards, or a high-level computer language.

- ARINC Reports - Provide guidelines or general information found by the airlines to be good practices, often related to avionics maintenance and support.

Note: ARINC Specifications and ARINC Reports related to digital avionics are included in the ARINC 600 series, while those related to older, analog avionics are contained in the ARINC 400 series.

The working documents of the AEEC subcommittees are called “Project Papers”, and carry the same numbering convention as the eventual standard. For example, fictitious “Project Paper 629x” would be a working draft of the 24th update to ARINC 629, and fictitious “Project Paper 799” would be a working draft of the to-be-published ARINC 799.

2.2.1. Current Documents

400 Series ARINC Specifications and Reports provide a design foundation for equipment specified per the ARINC 700 and 500 Series. They include guidelines for installation, wiring, data buses, databases, and general guidance. The list of current 400 Series documents is shown in Table 4.

Table 4. Current AEEC Series 400 Documents

Item	Description
404A	404A Air Transport Equipment Cases and Racking
404B-1	404B-1 Connectors, Electrical, Rack and Panel, Rectangular, Rear Release Crimp Contacts
407-1	407-1 ARINC Synchro System Manual (Combined issue of Report 407 and 407-1, "ARINC Synchro Signal Practices")
408A	408A Air Transport Indicator Cases and Mounting

Table 4. Current AEEC Series 400 Documents

Item	Description
413A	413A Guidance for Aircraft Electrical Power Utilization and Transient Protection
419-3	419-3 Digital Data System Compendium
421	421 Guidance for Standard Subdivision of ATA Spec 100 Numbering System for Avionics
422	422 Guidance for Modification Status Indicators and Avionics Service Bulletins
424-16	424-16 Navigation System Data Base
428	428 Considerations for Avionics Network Design
429P1-16	429P1-16 Mark 33 Digital Information Transfer System (DITS) - Part 1 - Functional Description, Electrical Interface, Label Assignments and Word Formats
429P2-15	429P2-15 Mark 33 Digital Information Transfer System (DITS) - Part 2 - Discrete Word Data Standards
429P3-18	429P3-18 Mark 33 Digital Information Transfer System (DITS) - Part 3 - File Data Transfer Techniques
431	431 No Fault Found - A Case Study
432	432 Training Requirements for Flight Training Equipment Support Personnel
433	433 Standard Measurements for Flight Simulator Quality
434	Flight Simulator Customer Support
453	453** (DRAFT) - Very High Speed (VHS) Bus
485P1	485P1 Cabin Equipment Interfaces, Part 1, Head End Equipment Protocol
485P2	485P2 Cabin Equipment Interfaces (CEI), Part 2, Physical Layer - In-Seat Protocol

500 Series ARINC Characteristics define older analog avionics equipment still used widely on the B-727, DC-9, and DC-10, as well as -on early models of B-737, B-747, and A-300 aircraft. The list of current 500 Series documents is shown in Table 5.

Table 5. Current AEEC Series 500 Documents

Item	Description
535A	535A Lightweight Headset and Boom Microphone
538B-1	538B-1 Hand-Held Microphone
542A	542A Digital Flight Data Recorder
561-11	561-11 Air Transport Inertial Navigation System (INS)
562	562 Terrain Awareness and Warning System (TAWS) - Analog
566A-9	566A-9 Mark 3 VHF Communications Transceiver
569	569 Heading and Attitude Sensor (HAS)

Table 5. Current AEEC Series 500 Documents

Item	Description
573-7	573-7 Aircraft Integrated Data System Mark 2 (AIDS Mark 2)
574	574 Passenger Announcement, Entertainment and Service Multiplex System (PAX)
577-1	577-1 Audible Warning System
578-4	578-4 Airborne ILS Receiver
579-2	579-2 Airborne VOR Receiver
585-2	585-2 Electronic Chronometer System
591	591 Quick Access Recorder for AIDS System (QAR)
594-4	594-4 Ground Proximity Warning System
595	595 Barometric Altitude Rate Computer (BARC)
596-4	596-4 Mark 2 Airborne SELCAL System

600 Series ARINC Specifications and Reports define enabling technologies that provide a design foundation for equipment specified per the ARINC 700 Series of digital avionics systems. Among the topics covered by Specifications are data link protocols. The list of current 600 Series documents is shown in Table 6.

Table 6. Current AEEC Series 600 Documents

Item	Description
600-13	600-13 Air Transport Avionics Equipment Interfaces
601	601 Control/Display Interfaces
602A-2	602A-2 Test Equipment Guidance
603-1	603-1 Airborne Computer Data Loader
604-1	604-1 Guidance for Design and Use of Built-In Test Equipment (BITE)
605	605 Users Guide for ARINC 616 Avionics Subset of ATLAS Language
606-1	606-1 Guidance for Electrostatic Sensitive Device Utilization and Protection
607-3	607-3 Design Guidance for Avionics Equipment
608A	608A Design Guidance for Avionics Test Equipment, Part 1 - System Definition
609	609 Design Guidance for Aircraft Electrical Power Systems
610-1	610-1 Guidance for Design and Integration of Aircraft Avionics Equipment in Simulators
610A-1	610A-1 Guidance for Use of Avionics Equipment and Software in Simulators
610B	610B Guidance for Use of Avionics Equipment and Software in Simulators
611-1	611-1 Guidance for the Design and Installation of Fuel Quantity Systems

Table 6. Current AEEC Series 600 Documents

Item	Description
612	612 BITE Glossary
613	613 Guidance for Using the Ada Programming Language in Avionics Systems
614	614 Standard Firmware Loader for Avionics Shops
615-4	615-4 Airborne Computer High Speed Data Loader
615A-2	615A-2 Software Data Loader Using Ethernet Interface
616-3	616-3 Avionics Subset of ATLAS Language
618-5	618-5 Air-Ground Character-Oriented Protocol Specification
619-1	619-1 ACARS Protocols for Avionics End Systems
620-4	620-4 Data Link Ground System Standard and Interface Specification
622-4	622-4 ATS Data Link Applications Over ACARS Air-Ground Network
623-2	623-2 Character-Oriented Air Traffic Service (ATS) Applications
624-1	624-1 Design Guidance for Onboard Maintenance System
625-1	625-1 Quality Management Process for Test Procedure Generation
626-3	626-3 - Standard ATLAS Language for Modular Test
627-2	627-2 Programmers Guide for SMART TM Systems Using ARINC 626 ATLAS
628P0	628 Part 0 - Cabin Equipment Interfaces, Part 0, Cabin Management and Entertainment System - Overview
628P1-3	628 Part 1-3 Cabin Equipment Interfaces (CEI), Part 1, Cabin Management and Entertainment System Peripherals
628P2-3	628P2-3 Cabin Equipment Interfaces (CEI), Part 2, Cabin Management and Entertainment System - Seat Interfaces
628P3-1	628 Part 3-1 Cabin Equipment Interfaces (CEI), Part 3, Cabin Management and Entertainment System, In-Flight Entertainment System to Aircraft
628P4A-2	628P4A-2 Cabin Equipment Interfaces, Part 4A, Cabin Management and Entertainment System, Cabin Distribution System - Daisy Chain
628P4B	628 Part 4B - Cabin Equipment Interfaces (CEI), Part 4B, Cabin Management and Entertainment System - Cabin Distribution System (CDS) - "Star Wiring"
628P5	628 Part 5 Cabin Equipment Interfaces (CEI) Part 5 Parts Selection, Wire Design and Installation Guidelines
628P6	628 Part 6 Cabin Equipment Interfaces (CEI) Part 6 Fiber Optic Cable Assembly General Specification
628P7	628 Part 7 - Cabin Equipment Interfaces (CEI), Part 7, Cabin Management and Entertainment Systems - Cabin Equipment Cooling General Specification
628P8	628 Part 8 - Cabin Equipment Interfaces, Part 8, In-Flight Entertainment (IFE) Equipment Standard Availability Measurement Guidelines

Table 6. Current AEEC Series 600 Documents

Item	Description
628P9	628P9 Cabin Equipment Interfaces, Part 9, Cabin Information Network (CIN) Specification
629P1-5	629 Part 1-5 - Multi-Transmitter Data Bus, Part 1-Technical Description
629P2-2	629 Part 2-2 Multi-Transmitter Data Bus, Part 2-Application Guide
631-3	631-3 VHF Digital Link Implementation Provisions Functional Description
632	632 Gate-Aircraft Terminal Environment Link (Gatelink) Ground Side
634	634 HF Data Link System Design Guidance Material
635-4	635-4 HF Data Link Protocols
636	636 Onboard Local Area Network (OLAN)
637P1-1	637P1-1 Aeronautical Telecommunications Network (ATN) Implementation Provisions, Part 1, Protocols and Services
638	638 OSI Upper Layer Specification
640	640 Resolution of Inservice Anomalies through ASAPP
644	644 Portable Maintenance Access Terminal (PMAT)
644A	644A Portable Multi-Purpose Access Terminal (PMAT)
646	646 Ethernet Local Area Network (ELAN)
650	650 Integrated Modular Avionics Packaging and Interfaces
651-1	651-1 Design Guidance for Integrated Modular Avionics
652	652 Guidance for Avionics Software Management
653-1	653-1 Avionics Application Software Standard Interface
654	654 Environmental Design Guidelines for Integrated Modular Avionics
655	655 Remote Data Concentrator (RDC) Generic Description
656	656 Avionics Interface Definition for Flight Management and Communications Management Functions
659	659 Backplane Data Bus
660	660 CNS/ATM Avionics, Functional Allocation and Recommended Architectures
660A	660A CNS/ATM Avionics, Functional Allocation and Recommended Architectures
661-1	661-1 Cockpit Display System Interfaces to User Systems
662	662 Strategies to Address Electronic Component Obsolescence in Commercial Aircraft
663	663 Data Requirements for Avionics Component Maintenance
664P1	664P1 Aircraft Data Network, Part 1, Systems Concepts and Overview
664P2	664P2 Aircraft Data Networks, Part 2, Ethernet Physical and Data-Link Layer Specification
664P3	664P3 - Aircraft Data Network, Part 3, Internet Based Protocols and Services

Table 6. Current AEEC Series 600 Documents

Item	Description
664P4	664P4 - Aircraft Data Network, Part 4, Internet Based Address Structures and Assigned Numbers
665-2	665-2 Loadable Software Standards
666	666 - Electronic Distribution of Software
667	667 - Guidance for the Management of Field Loadable Software
668	668 Guidance for Tool and Test Equipment (TTE) Equivalency

700 Series ARINC Characteristics define digital avionics systems and equipment installed on current-model production aircraft. They include detailed definitions of form, fit, function, and interface. The list of current 700 Series documents is shown in Table 7.

Table 7. Current AEEC Series 700 Documents

Item	Description
701-1	701-1 Flight Control Computer System (FCCS)
702-6	702-6 Flight Management Computer System (FMCS)
702A-1	702A-1 Advanced Flight Management Computer System
703-2	703-2 Thrust Control Computer System (TCCS)
704-7	704-7 Inertial Reference System (IRS)
704A	704A Inertial Reference System (IRS)
705-5	705-5 Attitude and Heading Reference System (AHRS)
706-4	706-4 Mark 5 Subsonic Air Data System (ADS)
707-6	707-6 Radio Altimeter (RALT)
708-6	708-6 Airborne Weather Radar (WXR)
708A-3	708A-3 Airborne Weather Radar with Forward Looking Windshear Detection Capability
709-8	709-8 Airborne Distance Measuring Equipment (DME)
709A-1	709A-1 Precision Airborne Distance Measuring Equipment (DME/P)
710-10	710-10 Mark 2 Airborne ILS Receiver
711-10	711-10 Mark 2 Airborne VOR ILS Receiver
712-7	712-7 Airborne ADF System
714-6	714-6 Mark 3 Airborne SELCAL System
715-3	715-3 Airborne Passenger Address Amplifier (PA AMP)
716-11	716-11 Airborne VHF Communications Transceiver
717-10	717-10 Flight Data Acquisition and Recording System

Table 7. Current AEEC Series 700 Documents

Item	Description
718-4	718-4 Mark 3 Air Traffic Control Transponder (ATCRBS/MODE S)
718A-1	718A-1 Mark 4 Air Traffic Control Transponder (ATCRBS/Mode S)
719-5	719-5 Airborne HF/SSB System
720-1	720-1 Digital Frequency/Function Selection for Airborne Electronic Equipment
722	722 Projection Video System (PVS)
723-3	723-3 Ground Proximity Warning System (GPWS)
724-9	724-9 Mark 2 Aircraft Communications Addressing and Reporting System (ACARS)
724B-5	724B-5 Aircraft Communications Addressing Reporting System (ACARS)
725-2	725-2 Electronic Flight Instruments (EFI)
726-1	726-1 Flight Warning Computer System (FWCS)
727-1	727-1 Airborne Microwave Landing System
728	728 Avionics Refrigeration Cooling System (ARCS)
729-1	729-1 Analog and Discrete Data Converter System (ADDCS)
731-3	731-3 Electronic Chronometer
732-1	732-1 Mark 2 Airborne Passenger Audio Entertainment Tape Reproducer
735-2	735-2 Traffic Alert and Collision Avoidance System (TCAS)
735A-1	735A-1 Mark 2 Traffic Alert and Collision Avoidance System (TCAS)
737-1	737-1 On-Board Weight and Balance System
738-3	738-3 Air Data and Inertial Reference System (ADIRS)
738A-1	738A-1 Air Data and Inertial Reference System (ADIRS)
739-1	739-1 Multi-Purpose Control and Display Unit (MCDU)
739A-1	739A-1 Multi-Purpose Control and Display Unit (MCDU)
740-1	740-1 Multiple-Input Cockpit Printer
741P1-10	741P1-10 Aviation Satellite Communication System, Part 1, Aircraft Installation Provisions
741P2-7	741P2-7 Aviation Satellite Communication System, Part 2, System Design and Equipment Functional Description
742	742 Design Guidance for Windshear Warning and Guidance Equipment Language
743	743 Airborne Global Positioning System Receiver
743A-4	743A-4 Global Navigation Satellite System (GNSS) Sensor
744	744 Full-Format Printer
744A-1	744A-1 Full-Format Printer with Graphics Capability
745-2	745-2 Automatic Dependent Surveillance (ADS)

Table 7. Current AEEC Series 700 Documents

Item	Description
746-4	746-4 Cabin Communications System (CCS)
747-2	747-2 Flight Data Recorder
750-3	750-3 VHF Data Radio (VDR)
751	751 Gate-Aircraft Terminal Environment Link (Gatelink) - Aircraft Side
752-1	752-1 Terrestrial Flight Telephone System (TFTS) Airborne Radio Subsystem
753-3	753-3 HF Data Link System
755-2	755-2 Multi-Mode Receiver (MMR) - Digital
756-3	756-3 GNSS Navigation and Landing Unit (GNLU)
757-3	757-3 Cockpit Voice Recorder (CVR)
758-1	758-1 Communications Management Unit (CMU) Mark 2
760-1	760-1 GNSS Navigation Unit (GNU)
761-2	761-2 Second Generation Aviation Satellite Communication System, Aircraft Installation Provisions
762-1	762-1 Terrain Awareness and Warning System (TAWS)
763-2	763-2 Network Server System
765	765 Ethernet Switch Unit (ESU)
777	777 Recorder Independent Power Supply

2.2.2. Document Acquisition

The ARINC standard documents can be purchased online through the ARINC Store at:

https://www.arinc.com/cf/store/index.cfm

Example

ARINC 653-1 is currently available for charge (PDF or paper format) on the web at the ARINC store: http://www.arinc.com/aeec/standards/index.html. Go to “Buy ARINC Standards”, then select 600 Series.

2.2.3. AEEC Committees

The ARINC AEEC Committees are shown in Table 8.

Table 8. AEEC Committees

Committee	Related Documents
Air-Ground Communications System	635, 741Px, 761
Aircraft Data Network (ADN) Working Group	664Px
Aircraft Network and File Server (ANFS)	765
Application/Executive (APEX) Working Group	653
ARINC 429 Maintenance	429P1
ARINC 629 Users Group	629
Cabin Equipment Interfaces (CEI)	485, 628Px, 765
Cockpit Display System (CDS) Interfaces Working Group	661
Cabin Training Devices (CTD)	435
Data Link (DLK) Systems	618, 619, 620, 622, 623, 631, 637, 716, 758
Data Link Users Forum/Workshop	Proceedings
Digital Flight Data Recorder (DFDR)	757, 767
Electrostatic Discharge and Soldering (ESDS) Working Group	6XX
Fiber Optics Working Group (FOWG)	6xx, xx1, xx2, xx3 and xx4
Flight Recorder Electronic Documentation (FRED)	647
Future Concepts for Maintenance	Associated Groups
Future Concepts for Simulators	Associated Groups
Joint GPS/XLS Subcommittee	755, 756
Heads-Up Display (HUD)	764
Manufacturers' Code Assignments	Software Data Loader's ARINC 665
Materials, Processes and Parts (MPP)	6xx MPP
Navigation Data Base (NDB)	424
New Installation Concepts (NIC)	600
Seat Integration Working Group (SIWG)	485, 628Px
Simulator Maintainability and Reliability	TBD
Software Data Loader (SDL)	TBD
Surveillance Working Group	768
Systems Architecture and Interfaces (SAI) Subcommittee	TARs
Traffic Information File (TIF)	
Transponder (XPDR)	718, 718A

The AEEC subgroups that are mostly directly applicable to the ACAST project are described in the following subparagraphs. They include:

- Systems Architecture and Interfaces Subcommittee
- Application/Executive (APEX) Working Group
- ARINC 629 Users Group
- Cockpit Display Systems Interfaces Working Group
- Joint GPS/XLS Subcommittee
- Surveillance Working Group

2.2.4. Systems Architecture and Interfaces Subcommittee

The Systems Architecture and Interfaces (SAI) Subcommittee addresses the communications, navigation and surveillance equipment on commercial aircraft. It is focused on the system definition, engineering, and integration of advanced electronic and information management technologies and the related equipment interfaces onboard aircraft. The SAI Subcommittee coordinates the development of standards with selected AEEC Subcommittees and Working Groups.

2.2.4.1. Committee Charter or Goals

The goal of the SAI Subcommittee is to enable airlines and aircraft operators to cooperate and provide technical leadership in the system definition, engineering, and integration of advanced electronic and information management technologies and the related equipment interfaces onboard aircraft. Current areas of interest include:

- CNS/ATM system architectures
- Enhanced surveillance techniques (e.g., ADS-B or similar)
- VHF communications alternatives
- Integrated modular avionics onboard the aircraft

The SAI Subcommittee is currently working on projects in three areas:

- Advanced Communications Architectures
- Advanced Surveillance Architectures
- Advanced Aircraft Architectures

Project: Advanced Communications Architectures

The scope of the Advanced Communications Architectures project is to assess communications initiatives to include recommendations for VHF, specifically integrate voice and data, including investigation of VHF Digital Link Mode 3 (VDL-3) and VDL-4 from the perspective of the airline technical community. The primary technical issues being addressed include VDL-3 tuning, VDL-3 recording, acquisition of International Civil Aviation Organization (ICAO) 24-bit

address and VDL-3 modes of operation. Integration of VHF communications equipment, including 8.33 KHz and 25 KHz AM voice, VDL-2, VDL-3 and VDL-4 transceivers.

The benefit of this SAI initiative is that the airline technical point of view is clearly articulated in the numerous forums where advanced communication issues are being considered. Communications equipment is expensive to replace on a fleet-wide basis and so the choices for next generation capabilities must be made carefully so that the selection process need not be repeated for many years.

Project: Advanced Surveillance Architectures

The scope of the Advanced Surveillance Architectures project includes assessment and development of recommendations concerning surveillance initiatives that are aimed at increased flight deck situational awareness through the identification of desired equipment standards. Advanced surveillance initiatives and ADS-B may involve the use of the Mode S transponder or other physical medium. FAA and Eurocontrol are preparing a link analysis and associated recommendations for ADS-B. Airline recommendations are necessary to ensure that the airplane architecture uses these media in the most cost-effective manner.

Other advanced surveillance architectures under consideration are:

- A Traffic Surveillance Unit (TSU) in an integrated L-Band platform is one method to enable the growth needed to accommodate advanced surveillance functions. The SAI had identified benefits associated with the integration of TCAS, Mode S Transponder and Distance Measuring Equipment (DME) functions in the near-term. Alternative architectures will be considered.

- An Integrated surveillance platform for the Airbus A380 is being evaluated. The architecture includes L-Band equipment plus terrain and weather surveillance. Airbus had requested standards for such equipment, though alternative architectures may be viable, and could provide extended growth for the future.

The benefit of the Advanced Surveillance Architecture initiative is that the airline technical point of view is clearly articulated in the numerous forums where advanced surveillance issues are being considered. It is expected that a standard approach to advanced surveillance will be defined that provides for planned growth while minimizing the number of equipment changes to implement advanced capabilities to meet changing requirements.

Project: Advanced Aircraft Architectures

The scope of the Advanced Aircraft Architectures project is to coordinate with selected AEEC Subcommittees and Working Groups and to provide feedback as required to foster an airline-driven, technically sound, cost-effective, and integrated approach to incorporate advanced electronic and information technology on board aircraft. AEEC groups of particular interest include Aircraft Data Network, APEX Software Interface, Cockpit Displays, Head-Up Displays, Navigation Data Base, Software Loading, and Traffic Info File.

The benefit of the Advanced Aircraft Architectures initiative is that a systems engineering perspective of a range of AEEC-sponsored activities will lead to coordinated development with a minimum of overlap and duplication of effort.

2.2.4.2. Standard

The SAI Subcommittee coordinates the development of standards with other AEEC organizations. It does not develop any standards on its own. However, the Subcommittee does develop Technology Assessment Reports (TARs).

2.2.4.3. Status

The SAI Subcommittee last met in December 2003. Significant events from that meeting include:

- Deutsche Flugsicherung (DFS Germany) provided a new Aeronautical Information Circular (AIC) for 24-bit Mode S address and aircraft flight ID.
- The SAI Subcommittee recommended a working group activity to revise ARINC 702A, Advanced Flight Management Computer System, to include aircraft trajectory intent data necessary for ADS-B. Airbus and Boeing plan to include this capability on FMC equipment installed on their new airplane models.
- Traffic computer functions were allocated to ARINC 735A TCAS equipment. This would include traffic surveillance functions, ADS-B, traffic data fusion, and an external Sensor Traffic Information File (S-TIF) interface.
- The SAI Subcommittee recommended formation of a Security working group in mid-2004 to develop a better understanding of aircraft information security and electronic methods of protection. The SAI Subcommittee offered to plan the activity and coordinate the effort.
- TTTech proposed Time Triggered Protocol (TTP) as an industry standard. They were invited to scope the effort and determine the level of interest from airline and avionics community.
- Honeywell presented a digital audio distribution method for the airplane communication, navigation, interphone and other voice services. Airlines and airframe manufacturers expressed the desire to move forward with standards in this area.

The next SAI Subcommittee meeting is scheduled for April 2004.

The Subcommittee also has a draft Technical Assessment Report (TAR) for Multi-function Antennas available on the web at:

http://www.arinc.com/aeec/draft_documents/01-195.pdf

2.2.4.4. Applicability to ACAST

Participating in SAI Subcommittee activities would keep ACAST MMDA product developers current on new standards being developed within the AEEC. It would also provide a venue for the investigation of incorporating new concepts into the AEEC standards.

2.2.4.5. Points of Contact

The Chairman of the SAI Subcommittee is:

- Robert Semar
  United Airlines

The AEEC staff member is:

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2.2.5. Application/Executive (APEX) Working Group

The Application/Executive (APEX) Working Group is responsible for the development of ARINC Specification 653, Application Software Standard Interface. The primary objective of this Specification is to define a general-purpose APEX (APplication/EXecutive) interface between the Operating System (O/S) of an avionics computer resource and the application software. ARINC 653 specifies the baseline operating environment for application software used within Integrated Modular Avionics (IMA) and traditional ARINC 700-series avionics.

2.2.5.1. Committee Charter or Goals

The objective of the APEX WG is to update ARINC 653, Application Software Standard Interface, for traditional avionics and integrated modular avionics. Detailed software interfaces will be coordinated with other activities within industry, namely RTCA SC-200 and EUROCAE WG-60 on Modular Avionics.

2.2.5.2. Standard

The primary objective of ARINC Specification 653, Application Software Standard Interface is to define a general-purpose APEX (APplication/EXecutive) interface between the Operating System (O/S) of an avionics computer resource and the application software. ARINC 653 includes the interface requirements between the application software and the O/S and the list of

services that allow the application software to control the scheduling, communication, and status information of its internal processing elements.

ARINC 653 defines the data exchanged statically (via configuration) or dynamically (via services) as well as the behavior of services provided by the O/S and used by the application. It is not the intent of the specification to dictate implementation requirements on either the hardware or software of the system, nor is it intended to drive certain system-level requirements within the system that follows this standard.

The majority of ARINC 653 describes the runtime environment for embedded avionics software. The list of services identifies the minimum functionality provided to the application software, and is therefore the industry standard interface. It is intended for this interface to be as generic as possible, since an interface with too much complexity or too many system-specific features is normally not accepted over a variety of systems. The software specifications of the APEX interface are High-Order Language (HOL) independent, allowing systems using different compilers and languages to follow this interface.

ARINC 653 is intended to complement ARINC Report 651, Design Guidance for Integrated Modular Avionics. ARINC 653 specifies the baseline operating environment for application software used within Integrated Modular Avionics (IMA) and traditional ARINC 700-series avionics.

2.2.5.3. Status

The original standard, ARINC 653, was released in 1997. Draft 3 of Supplement 1 to this standard was completed July 15, 2003. It is available at:

http://www.arinc.com/aeec/draft_documents/03-116.pdf.

Supplement 1 (ARINC 653-1) was published on October 16, 2003.

The APEX WG has initiated development of Supplement 2. The goals of Supplement 2 are:

- Expand ARINC 653 to include new capabilities
- Continue to provide support for safety critical systems
- Upward compatibility for applications developed with ARINC 653-1
- Review and apply APIs developed originally for other O/S
- Consider development of new APIs for standard avionics buses and interfaces (e.g., ARINC 661 Cockpit Display System)
- Consider inputs from software application developers

The goal is to publish Supplement 2 in June 2005.

2.2.5.4. Applicability to ACAST

Avionics suppliers, airframe manufacturers and airlines benefit from the publication of ARINC 653. Avionics suppliers will be able to develop application software and O/S concurrently. Airframe manufacturers can add new functions and capabilities with minimal impact on O/S. Airlines have growth options provided by avionics supplier Type Certificate (TC) or Supplemental Type Certificate (STC) holder.

ARINC 653 is applicable to NASA's ACAST Project in that it establishes a standard for the interface between the operating system and application software used in software-defined avionics.

2.2.5.5. Points of Contact

The Co-Chairmen of the APEX WG are:

- Peter Anders
  Airbus

- Gordon Putsche
  Boeing

The AEEC staff member is:

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2.2.6. ARINC 629 Users Group

ARINC 629 Users Group is a forum that promotes the use of the data bus standard, ARINC 629, Multi-Transmitter Data Bus, and specifically Part 2 of ARINC 629, the Application Guide. ARINC 629 is the standard for transfer of digital data between avionics system elements using multiple access, bi-directional protocol.

2.2.6.1. Committee Charter or Goals

ARINC 629 Users Group is a forum that promotes the use of the data bus standard, ARINC 629, Multi-Transmitter Data Bus, and specifically Part 2 of ARINC 629, the Application Guide. It meets on "as need basis" to develop ARINC 629 application notes that enable manufacturers to develop products that are compatible with ARINC Specification 629.

2.2.6.2. Standard

ARINC 629, Multi-Transmitter Data Bus, is the standard for transfer of digital data between avionics system elements using multiple access, bi-directional protocol. The standard was developed to provide an efficient data distribution system, which would result in a reduction in the amount of airplane wiring and equipment interfaces. Due to component cost and system complexity, this standard is employed almost exclusively by the air transport community. The general aviation community employs the more economical ARINC 429, RS 232, and RS 422 protocols.

2.2.6.3. Status

The ARINC 629 Users Group is still chartered but has not been active since 2001.

2.2.6.4. Applicability to ACAST

ARINC 629 is applicable to NASA's ACAST Project in that it establishes a data bus standard that could apply to MMDA equipment.

2.2.6.5. Points of Contact

The AEEC staff member is:

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  (410) 266-4113 (Voice)
  (410) 266-2047 (Fax)
  Paul.Prisaznuk@arinc.com

2.2.7. Cockpit Display Systems Interfaces Working Group

The goal of the Cockpit Display (CDS) Interfaces Working Group is to define cockpit display system capabilities and the interfaces between the cockpit display systems and other related aircraft systems (e.g., sensors, flight control). The results of the CDS WG initiatives will support the airline industry in the cost-effective implementation of advanced operational concepts (e.g., airborne separation assurance) that will increase aviation safety, capacity, and efficiency.

This project will provide airlines with a standardized avionics interface to the cockpit display system. By having a standardized interface, development of advanced avionics can be completed concurrently with the development of cockpit display systems. Furthermore, standardized interfaces will enable airlines to upgrade avionics to provide additional functionality without requiring changes to the CDS. Finally, a standardized CDS will aid in flight crew training and reduce the training requirement when implementing new functionality.

2.2.7.1. Committee Charter or Goals

The objective of the CDS Working Group is to update ARINC 661, Cockpit Display Systems Interfaces to User Systems.

2.2.7.2. Standard

ARINC 661 defines necessary interfaces to Cockpit Display Systems (CDS) used in all types of aircraft installations starting with the Airbus A380 airplane. The CDS provides graphical and interactive services to user applications within the flight deck environment. When combined with data from user applications, it displays graphical images to the flight deck crew. The standard emphasizes the need for independence between aircraft systems and the CDS. The standard also defines interfaces between the CDS and the aircraft systems, including the interface between the avionics equipment and display system graphics generators.

This supplement to standard 661 will provide airlines with a standardized avionics interface to the cockpit display system. By having a standardized interface, development of advanced avionics can be completed concurrently with the development of cockpit display systems. Furthermore, standardized interfaces will enable airlines to upgrade avionics to provide additional functionality without requiring changes to the CDS. Finally, a standardized CDS hardware suite will aid in flight crew performance and reduce the training requirement when implementing new functionality.

2.2.7.3. Status

The CDS Working Group has initiated development of Supplement 2 to enhance and expand the interface protocol defined in ARINC Specification 661, Cockpit Display System Interface to User System to incorporate additional features including:

- Critical Parameter Monitoring
- MapGrid widget
- MapSource widget
- Filled Polygon for Windshear and Turbulence widget
- Common Bitmap/ Video widget (External Source)
- MapVert_widget
- Vertical display line arc and circle segments
- Addition of state diagrams for interactive objects
- Symbol definition language
- Additional capabilities

Symbol Graphical Definition (SGD) will be included in Supplement 2 to ARINC 661 as a method to create complex symbology. Extensible Markup Language (XML) was supported for the encoding ARINC 661 definition files. The XML file would be used for CDS development and simulation.

This project emphasizes the need for standardized communication between the CDS and user applications – an approach that is expected to facilitate the development of standardized subsystems that can easily interface with the CDS.

The draft of Supplement 2 will be reviewed by the CDS Working Group in late June – early July 2004 in Seattle at the next scheduled WG meeting. The goal is to goal is to publish Supplement 2 in 2004.

2.2.7.4. Applicability to ACAST

The CDS Working Group's work is to establish standardized interfaces for the CDS. The attendant benefits are the development of advanced avionics developed more concurrently with the development of CDS systems, plus airlines can upgrade avionics to provide additional functionality without requiring changes to the CDS. Standardizing the CDS interface should enable ACAST MMDA developers to achieve a shorter development timeline, plus provide interoperability with multiple, CDS compliant displays.

2.2.7.5. Point of Contact

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2.2.8. Joint GPS/XLS Subcommittee

The Joint GPS/XLS Subcommittee was formed to develop a standard(s) for avionics that use the signal-in-space provided by the Global Navigation Satellite Systems (GNSS) for aircraft navigation. These include standards for the use of Ground Based Augmentation Systems (GBAS) and Satellite Based Augmentation Systems (SBAS) to complete precision approach and landing operations.

2.2.8.1. Committee Charter or Goals

The goal of the joint GPS/XLS Subcommittee is to develop ARINC Standards for avionics that use the signal-in-space provided by the Global Navigation Satellite Systems (GNSS) for aircraft navigation. The scope of the current project is to update the Multi-Mode Receiver (MMR) and Global Navigation and Landing Unit (GNLU) standards (i.e., ARINC Characteristic 755 and ARINC Characteristic 756) to provide flight path deviation guidance to the aircraft during final approach and landing phase of navigation using GNSS to Category I minima.

2.2.8.2. Standard

ARINC 755 Supplement 2, Multi-Mode Receiver (MMR) - Digital, describes the characteristics of a radio/processor capable of receiving Instrumented Landing System (ILS), Microwave Landing System (MLS) and Global Navigation Satellite System (GNSS) source inputs. The desired operational capability of the equipment, standards necessary to ensure interchangeability, form factor and pin assignments are included. The MMR provides flight path deviation guidance to the aircraft during final approach and landing phases of flight. Supplement 2 was published in January 2001.

Note: Draft 3 of Supplement 3 to this standard was completed July 2003 and is available at:

http://www.arinc.com/aeec/draft_documents/03-089.pdf

ARINC 756 Supplement 3, GNSS Navigation and Landing Unit (GNLU), describes the function of the GNLU, capable of providing en route/terminal navigation, non-precision approach, and precision approach capabilities. The GNLS consists of a GNLU, associated controls and displays, antenna, and interfaces to other aircraft systems. Supplement 3 was published in February 2004.

2.2.8.3. Status

The Joint GPS/XLS Subcommittee has completed Supplement 3 of ARINC 756. It met in December 2003 to continue the development of draft Supplement 3 to ARINC Characteristic 755, Multi-Mode Receiver (MMR). The updates to ARINC 755, Supplement 3 include:

- Standards for maximum time to switch modes
- A revised time delay for warning generation
- A revised formula for MLS Vertical Deviation Output Sensitivity
- Auxiliary Data Word Transmission
- A clear delineation when the MMR should enter Standby mode.
- Text was added explaining how the MMR should continue to output the mode/channel number selection
- Late Runway Approach Change

Comments and inputs reviewed during the meeting were incorporated into Draft 4 of Supplement 3. Draft 4 of Supplement 3 to ARINC 755 will be submitted for final industry review and comment. If no adverse comments are received the draft will be submitted for AEEC adoption consideration.

No further meetings of the Joint GPS/XLS Subcommittee were scheduled. The Subcommittee is considered inactive until sufficient material is gathered to warrant another meeting.

2.2.8.4. Applicability to ACAST

The Joint GPS/XLS Subcommittee deals with the standards for multi-mode avionics, particularly as it applies to navigation. The work of this Subcommittee should provide guidance to be considered in the development of MMDA products that include a navigation function.

Since the Subcommittee has essentially finished its current tasking, there will be no meetings in the near term. However, the Subcommittee could be a venue for addressing ACAST specific topics that would apply to MMDA products that would perform MMR and GNLU functions. This would be subject to industry's willingness to participate.

2.2.8.5. Points of Contact

The Chairman of the Joint GPS/XLS Subcommittee is:

- Karl Josephs
  United Airlines

The AEEC staff member is:

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2.2.9. Surveillance Working Group

The Surveillance Working Group is developing an Integrated Surveillance System (ISS) standard (ARINC Characteristic 768). The standard is for aircraft in a Communications, Navigation and Surveillance/Air Traffic Management (CNS/ATM) operating environment. The Surveillance WG will define example system architectures and the related equipment interfaces. This involves close coordination with states regulatory community. ADS-B equipment necessary to support advanced surveillance initiatives will be defined. This may involve the use of the Mode S transponder and/or other physical medium. Architecture and interfaces for ISS configurations, include traffic, terrain, weather and a global alert management function, with associated outputs for mode annunciation, display, etc, and provisions for future growth as ADS-B capability.

2.2.9.1. Committee Charter or Goals

The primary goal of the Surveillance Working Group is to simplify aircraft installations and reduce life cycle costs through integration, as well as providing meaningful operational benefits.

Another goal is to establish an enabling platform for future surveillance capabilities such as the Automatic Dependent Surveillance System Broadcast (ADS-B).

The intent of ARINC 768 is to maximize the functional integration of similar surveillance and Airborne Collision Avoidance System/Air Traffic Control (ACAS/ATC) systems. To the extent practical, manufacturers should envisage growth provisions for integrated surveillance processing functions.

2.2.9.2. Standard

ARINC 768 (currently in draft form) defines standards for an Integrated Surveillance System (ISS) that may be configured to suit a wide variety of aircraft installations. The ISS may include components and modules to perform multiple surveillance functions:

- Traffic Alert and Collision Avoidance system (ACAS)
- Air Traffic Control Transponder (ATCRBS/Mode S)
- Weather Radar (WXR)
- Terrain Awareness and Warning System (TAWS)

ARINC 768 takes a building block approach. It contains several configurations with different combinations of functions. The standard defines various configurations and establishes interchangeability standards for them. The ISS unit is specifically designed for installation in digital (ARINC 429 or ARINC 664 Ethernet) commercial transport type aircraft, with primary applicability to the future aircraft and derivatives of the current generation production aircraft.

ARINC 768 provides standards for:

- Form factor
- Connector pin allocation
- Interwiring
- Interfaces

2.2.9.3. Status

At the January 2004 meeting, the Surveillance Working Group reviewed Draft 1 of Project Paper 768, Integrated Surveillance System (ISS). Though ISS is intended primarily for new airplane installations, Project Paper 768 would not preclude the installation of ISS by retrofit.

Four ISS configurations would support a variety of airplane installations (some combination of TCAS, transponder, weather radar/proximity warning system, and TAWS). Surveillance functions include traffic surveillance, traffic data fusion, terrain awareness and weather radar with forward-looking windshear detection.

For new aircraft, the Surveillance Working Group will develop a standardized control panel interface using an ARINC 429 bi-directional bus pair. For retrofit, the Surveillance WG

recommends use of the existing ACAS/ATC control panels and existing WXR control panels defined by ARINC 718A and ARINC 708A respectively.

Draft 1 of Project Paper 768, Integrated Surveillance System (ISS), dated 16 December 2003, is available on the web at:

http://www.arinc.com/aeec/draft_documents/768d1.pdf

2.2.9.4. Applicability to ACAST

The work products of this Working Group provide guidance on integrating multiple surveillance systems into a single avionics set. This guidance should be applicable in the development of MMDA products.

2.2.9.5. Points of Contact

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2.3. Object Management Group

The Joint Tactical Radio System (JTRS) is based upon the Software Communications Architecture (SCA). The SCA defines standard interfaces that allow waveform applications to run on multiple hardware sets. The SCA defines a Core Framework (providing a standard operating environment) that must be implemented on every hardware set. Interoperability among radio sets is enhanced because the same waveform software can be easily ported to all radio sets.

Standardization is the key and two activities are on-going to assure that the SCA is widely accepted as the programmable radio system definition standard. The JTRS Joint Program Office (JPO) has been working closely with the Software Defined Radio Forum (SDRF) to involve their expertise in the development of the SCA. The SDRF is not a standards body itself. However, the group adopted the SCA as a body of work mature enough to move out to a formal standards body, in this case the Object Management Group (OMG). This occurred in 2000 when the SCA was at version 1.0. Since then, the Software Defined Radio Forum and the OMG have developed a formal liaison relationship to help further the standardization of the SCA.

OMG Mission

The OMG was formed to create a component-based software marketplace by accelerating the introduction of standardized object software. The organization's charter includes the

establishment of industry guidelines and detailed object management specifications to provide a common framework for application development. Conformance to these specifications will make it possible to develop a heterogeneous computing environment across all major hardware platforms and operating systems. Implementations of OMG specifications can be found on many operating systems across the world today.

The OMG's series of specifications detail the necessary standard interfaces for Distributed Object Computing. Its widely popular Internet protocol IIOP (Internet Inter-ORB Protocol) is being used as the infrastructure for hundreds of technology companies. OMG specifications are used worldwide to develop and deploy distributed applications for vertical markets, including manufacturing, finance, telecommunications, electronic commerce, real-time systems and health care.

The OMG defines object management as software development that models the real world through representation of "objects." These objects are the encapsulation of the attributes, relationships and methods of software identifiable program components. A key benefit of an object-oriented system is its ability to expand in functionality by extending existing components and adding new objects to the system. Object management results in faster application development, easier maintenance, enormous scalability and reusable software.

2.3.1. Organization

Founded in April 1989 by 11 companies, the Object Management Group™ (OMG™) began independent operations as a not-for-profit corporation. Through the OMG's commitment to developing technically excellent, commercially viable and vendor independent specifications for the software industry, the consortium now includes approximately 800 members. The OMG is moving forward in establishing the Model Driven Architecture ™ as the "Architecture of Choice for a Connected World" ™ through its worldwide standard specifications including CORBA ®, CORBA/IIOP™, the UML™, XMI™, MOF™, Object Services, Internet Facilities and Domain Interface specifications.

2.3.2. Structure

The OMG is structured into three major bodies, the Platform Technology Committee (PTC), the Domain Technology Committee (DTC) and the Architecture Board. The consistency and technical integrity of work produced in the PTC and DTC is managed by an overarching Architectural Board. Within the Technology Committees and Architectural Board rest all of the Task Forces, Special Interest Groups (SIGs), and Working Groups that drive the technology adoption process of the OMG. The subcommittees and SIGs directly managed by the Architecture Board are shown in Table 9. Those of the Domain Technology Committee in Table 10 and the Platform Technology Committee in Table 11

Table 9. Architecture Board Subgroups

Liaison Architecture Board Subcommittee
Object and Reference Model AB Subcommittee
Model Driven Architecture Users Architecture Board Special Interest Group
Open Collaboration Services Initiative Architecture Board Special Interest Group

Table 10. Domain Technology Committee Subgroups

Business Enterprise Integration DTF
Consultation, Command, Control, Communications and Intelligence (C4I) DTF
Finance DTF
Geospatial and Imagery Value Added Services DTF
Healthcare DTF
Life Sciences Research DTF
Manufacturing Technology and Industrial Systems DTF
Software-Based Communications DTF
Space DTF
Transportation DTF
eGovernment DSIG
Super Distributed Objects DSIG
Systems Engineering DSIG
Federated Charging and Rating Facility FTF
GIOP Tunneling over Bluetooth FTF
Historical Data Access from Industrial Systems (HDAIS) FTF
Notification-JMS Interworking FTF
SDO for PIM and PSM FTF
XML Telemetric and Command Data Exchange (XTCE) FTF
CAD Services 1.2 RTF
Data Access from Industrial Systems (DAIS) 1.1 RTF
Distributed Simulation 2.1 RTF
Macromolecular Structure RTF
Surveillance Manager RTF
Telecom Wireless CORBA RTF

Table 10. Domain Technology Committee Subgroups

Telecom Wireless CORBA 1.1 RTF

Table 11. Platform Technology Committee Subgroups

Product Standard Definition Platform Subcommittee
Analysis and Design PTF
Middleware and Related Services PTF
Real-time, Embedded, and Specialized Systems PTF
Agent PSIG
Architecture-Driven Modernization PSIG
Information and Security Assurance PSIG
Japan PSIG
Korea PSIG
Model Integrated Computing (MIC) PSIG
Ontology PSIG
Telecommunications PSIG
CORBA Firewall Traversal FTF
CWM Metadata Interchange Patterns FTF
Data Distribution Service FTF
Data Parallel FTF
Deployment and Configuration FTF
Dynamic Scheduling FTF
Extensible Frameworks FTF
GIOP SCTP Mapping FTF
Human Understandable Textual Notation (HUTN) FTF
Lightweight CCM FTF
Lightweight Services FTF
MOF 2.0 XMI FTF
Online Upgrades FTF
UML 2.0 Infrastructure and MOF 2.0 Core FTF
UML 2.0 Diagram Interchange FTF
UML 2.0 OCL FTF

Table 11. Platform Technology Committee Subgroups

UML 2.0 Superstructure FTF
UML Profile for CCM FTF
UML Profile for Testing FTF
WSDL-SOAP to CORBA Interworking FTF
Ada Mapping (2003) RTF
CORBA Component Model (CCM) 1.2 RTF
CORBA Core (2003) RTF
C++ Mapping (2003) RTF
IDL to Java Mapping (2003) RTF
Java to IDL Mapping (2003) RTF
Lightweight Log RTF
Smart Transducers RTF
SPEM (2003) RTF
UML Profile for EAI RTF
UML Profile for Scheduling RTF
WSDL-CORBA RTF

There are three major methods of influencing the OMG process, in addition to the impact of general review, commentary and open discussion. The first is the ability to vote on work items or adoptions in the Task Forces that are ultimately reviewed and voted on at the Technology Committee level. The second is the ability to vote on work items or adoptions at one or both of the Technology Committee levels. The third is the ability to actually submit technology for adoption at one or both of the Technology Committee levels. Membership fees are based on these levels of influence.

2.3.3. Standards Process

It is difficult to understand the following material with some knowledge of the OMG process for developing standards. The process for initiating, developing, and approving a standard is described in The OMG Hitchhiker's Guide, which is available at http://www.omg.org/cgi-bin/doc?hh. Excerpts are cited below.

The OMG is responsible for providing solutions to industry problems. A Request for Proposals (RFP) is a statement of industry need and an invitation to the software supplier community to provide a solution, based upon requirements stated within. The process of identifying need is a culmination of experience within an OMG technical group (be it a Task Force, a Special Interest Group or a Subcommittee) and solicitation of industry recommendation. While the RFP is not prescriptive in the sense of dictating how the solution is presented, it does provide guidelines –

requirements – that again are derived from the sources noted above. The RFP is an explicit request to OMG Members to submit proposals for technology evaluation against the requirements stated in the RFP and adoption of those proposals.

Responses to a RFP are expected to be expressed in any combination of a Platform Independent Model (PIM), one (or more) Platform Specific Model (PSM), and associated information specifying how the PIM maps to the PSM(s). This information may take the form of an algorithm, instructions captured in prose, or some appropriate combination thereof. The technology that is being proposed for standardization must be ready for standardization; i.e., it is already deployed and in use. The OMG discourages issuance of RFPs that request the initiation of some research project.

Once a problem has been identified, a RFP is drafted, voted upon at the Task Force level (RFPs are initiated at the Task Force level), approved by the Architecture Board and passed to the Task Force's parent Technology Committee for issuance. The adoption process typically takes a period of 12-15 months from issuance of a RFP to adoption of a specification, although that can vary depending of such factors as scope and complexity.

Before a RFP can be crafted, one more extremely important task must be accomplished: verifying that suppliers exist that are willing to respond to the RFP and to commit to building its implementation. This effort should not be interpreted as soliciting commitment but rather assessing interest within a particular supplier community. Its intent is to avoid the embarrassment of "sending out invitations and no one coming to the party".

Once a RFP is issued, the process of soliciting submissions begins in earnest. Solicitation is accomplished by such means as advertising, issuance of press releases, verbal communication, direct mailings and other actions. The budgetary limitations of OMG and its members notwithstanding, solicitation activity has as its goals bringing the RFP to the attention of as wide and representative a section of the industry as possible (including non-members) and generating the most technically valuable and diverse response.

Any Contributing, Domain or Platform Member of the OMG in good standing may propose specifications for adoption by OMG in response to a RFP. Any OMG Member intending to respond to an RFP, whether individually or jointly with other members, must submit a Letter of Intent (LOI) to respond to the OMG by a date specified in the RFP. This date, which must be explicitly stated in the RFP, is recommended as 30 days before the Initial Submission date. Submissions from companies that have not provided Letters of Intent will not be considered by the OMG. Furthermore, if a company withdraws its LOI or subsequent response at any stage then it cannot subsequently re-enter that RFP process. The Letter of Intent is presented to the OMG Business Committee so that it may examine the proposal under its commercial availability criteria.

Several years ago, OMG decided to submit the majority of its specifications to ISO to become ISO standards using either ISO JTC1's PAS process or ISO's Fast-Track. For a specification from OMG to become an ISO standard, it is highly desirable that it be in a format closely approximating the ISO format.

The sponsoring Task Force is required to evaluate how well the proposed submission(s) satisfy the mandatory (and optional) requirements stated in a RFP. Beyond using the evaluation criteria stated in the RFP, the Task Force is left to its own devices on how best to proceed with submission evaluations.

Based upon the recommendation of the work group performing the evaluation, the Task Force takes a vote on whether or not to recommend the submission for adoption. Only those members identified on the closed Voting List may vote. A recommendation to adopt is based upon a simple majority. In the event there is only one submission under consideration, then the vote determines whether or not the Task Force wishes to recommend it for adoption. In the event there is more than one submission under consideration, then the Task Force must consider which, if any, it wishes to recommend for adoption.

The recommendation to the Board of Directors of proposed specifications requires affirmative votes from two-thirds (2/3) of the eligible voting members that cast a non-abstaining vote in an electronic poll. Eligible voting members are defined as Contributing and Domain-level Members for Domain Technology Committee technology and Contributing and Platform-level Members for Platform Technology Committee technology. Voting is initiated during within the appropriate Technology Committee during its plenary meeting. It usually takes 10-14 weeks to close a pending technology adoption vote.

The OMG Business Committee (BC) is tasked with evaluating the business aspects of a submission. Among other things, they ensure that a submission is commercially viable and that an implementation will, in fact, be forthcoming. The BC also ensures that sufficient rights are granted that allow the specification to be freely available and that derivative works may be undertaken. In other words, they are chartered to ensure that the OMG does not produce shelfware.

Adoption by the Board of Directors of a specification (whether a completely new specification, or an enhancement to an existing specification) marks the end of the technology adoption process. The next step in the life of the specification is a finalization phase, possibly followed by one or more revision phases. These activities are performed by the Finalization and Revision Task Forces. A Finalization Task Force (FTF) is responsible for drafting the changes that turn an Adopted Specification into Available Specification. A Revision Task Force (RTF) produces new, minor revisions to Available Specifications. A RTF may make minor technical changes. Generally, significant technical changes will require a new RFP.

2.3.4. Work in Progress

The OMG Technology Committees work in progress is shown in Tables 12 and 13. Table 12 describes the Platform Technology Committee activities while Table 13 describes those of the Domain Technology Committee.

Table 12. Platform Technology Committee

Task Force	Document	Status
Architecture Driven Modernization (ADM)	ADM Knowledge Discovery RFP	Letters of Intent deadline has passed
Analysis and Design (A&D)	MOF 2.0 Facility/Obj Lifecycle RFP	Voting List deadline has passed
	MOF 2.0 IDL RFP	The FAX Vote has completed
	MOF 2.0 Query/View/Transf. RFP	Revised submission deadline has passed
	MOF 2.0 Versioning RFP	Initial submission deadline has passed
	Ontology Definition Metamod.RFP	Voting List deadline has passed
	Reusable Asset Spec. RFC	FAX Vote is underway
	UML for System Engineering RFP	Initial submission deadline has passed
Middleware And Related Services (MARS)	Load Distribution RFP	Letters of Intent deadline has passed
	QoS for CORBA Components RFP	Voting List deadline has passed
	SECP RFP	Voting List deadline has passed
	Streams for CORBA Comp. RFP	Voting List deadline has passed
	UML for Voice Based Apps. RFP	RFP has been issued; responses pending
	Web Services (WSEC) RFP	Voting List deadline has passed
Real-time, Embedded, and Specialized Systems (RTESS)	CORBA Control Systems RFI	RFI Response Deadline has passed
	GNS Client Services RFP	Letters of Intent deadline has passed
	High-Assurance ORB RFP	RFP has been issued; responses pending
	High Performance Enablers RFP	Revised submission deadline has passed
	Model-level Testing/Debug RFP	Voting List deadline has passed
	Power Conservation Service RFP	RFP has been issued; responses pending
	Reliable Ordered Multicast RFP	Voting List deadline has passed
	RT Notification RFP	Revised submission deadline has passed
	UML for QoS & Fault Tolerance	The FAX Vote has completed
PTC Finalization and Revision Task Forces	Ada 2003 RTF	RTF Comment deadline has passed
	Components 1.2 RTF	Voting List deadline has passed
	CORBA Firewall Traversal FTF	FTF Comment deadline has passed
	Core 2004 RTF	Available Specification
	C++ 2003 RTF	RTF Comment deadline has passed
	Data Distribution Service FTF	FTF Comment deadline has passed
	Deployment FTF	FTF Comment deadline has passed
	Dynamic Scheduling FTF	FTF Report deadline has passed

Table 12. Platform Technology Committee

Task Force	Document	Status
	Extensible Frameworks FTF	Publication deadline has passed
	GIOP SCTP FTF	FTF Report deadline has passed
	HUTN FTF	The FAX Vote has completed
	IDL to Java 2004 RTF	Voting List deadline has passed
	Java to IDL 2004 RTF	Voting List deadline has passed
	Lightweight CCM 2003 FTF	FTF Comment deadline has passed
	Lightweight Log RTF	Voting List deadline has passed
	Lightweight Services FTF	Publication deadline has passed
	MOF 2.0 XMI FTF	Interim Report deadline has passed
	MOF2-UML2 Infrastructure FTF	Interim Report deadline has passed
	OCL 2.0 FTF	FTF Comment deadline has passed
	SPEM 2003 RTF	RTF Comment deadline has passed
	UML2 Diagram Interchange FTF	Interim Report deadline has passed
	UML 2.0 Superstructure FTF	Interim Report deadline has passed
	UML for EAI RTF	RTF Comment deadline has passed
	UML Profile for CCM FTF	Publication deadline has passed
	UML Profile for Scheduling RTF	The FAX Vote has completed
	UML Testing Profile FTF	FTF Comment deadline has passed
	WSDL-CORBA RTF	Voting List deadline has passed

Table 13. Domain Technology Committee

Task Force	Document	Status
Business Enterprise Integration (BEI)	BPRI RFP	Voting List deadline has passed
	Business Proc Def Metamod RFP	Voting List deadline has passed
	Bus Semantics of Bus Rules RFP	Voting List deadline has passed
	Prod. Rule Representation RFP	RFP has been issued; responses pending
	Software Portfolio Mgmt. RFP	Voting List deadline has passed
Consultation, Command, Control, Communications, and Intelligence (C4I)	Generic Sonar Interface RFP	Voting List deadline has passed
	Inf. Exchange Data Model RFI	RFI has been issued; responses pending
	Policy Management Services RFI	RFI Response Deadline has passed
	Trusted Information Exchange RFI	RFI Response Deadline has passed
Finance Domain Task Force	AR/AP Facility RFP	Letters of Intent deadline has passed

Table 13. Domain Technology Committee

Task Force	Document	Status
	Product & Agreement Mgmt. RFP	Initial submission deadline has passed
	Sensitive Data Management RFP	Voting List deadline has passed
Life Sciences Research	Biochemical Pathways RFP	RFP has been issued; responses pending
	Chemical Structure RFP	Voting List deadline has passed
	Compound Collections RFP	Letters of Intent deadline has passed
	Gene Expression Query Serv. RFP	RFP has been issued; responses pending
	Life Science Analysis Engine RFP	Letters of Intent deadline has passed
	Life Sciences Identifiers RFP	The FAX Vote has completed
	SNP RFP	Voting List deadline has passed
Manufacturing Technology and Industrial Systems (ManTIS)	CAD Services V 2.0 RFP	Letters of Intent deadline has passed
	Product Lifecycle Mgmt. RFP	Voting List deadline has passed
	SPEDA RFI	RFI Response Deadline has passed
Software Based Communications	PIM & PSM for SWRADIO RFP	Voting List deadline has passed
Space	Monitor/Control Data Access RFP	Initial submission deadline has passed
DTC Finalization and Revision	CAD Services V 1.2 RTF	RTF Comment deadline has passed
	DAIS 1.1 RTF	Voting List deadline has passed
	Federated Charging/Rating FTF	FTF Report deadline has passed
	Gene Expression 2004 RTF	Voting List deadline has passed
	HDAIS FTF	Voting List deadline has passed
	Life Sciences Identifiers FTF	Final Adopted Specification deadline has passed
	Macromolecular Structure RTF	RTF Comment deadline has passed
	Notification/JMS Interworking FTF	The FAX Vote has completed
	SDO PIM and PSM FTF	FTF Comment deadline has passed
	Surveillance Manager RTF	RTF Revision deadline has passed
	XTCE FTF	FTF Comment deadline has passed
	Knowledge Based Engineering RFI	RFI Response Deadline has passed

Location

The OMG is headquartered in Needham, MA, USA with a subsidiary in Japan. The OMG has international marketing offices in Bahrain, Brazil, Germany, India and the UK, along with a government representative in Washington, D.C.

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2.3.5. Current Documents

The list of current OMG documents is shown in Table 14.

Table 14. Current OMG Documents

Specification Category	Topical Area / Domain	Current Version	Document #
OMG Modeling Specifications			
Common Warehouse Metamodel (CWM™)	data warehousing, modeling	1.1	formal/2003-03-02 1.0
Common Warehouse Metamodel (CWM™) Metadata Interchange Patterns (MIPS)	data warehousing, modeling	1.0	formal/2004-03-25
Meta-Object Facility (MOF™)	modeling	2.0 finalization	ptc/2004-01-13
MOF 2.0 XMI	modeling	1.0 finalization	ptc/2004-01-12
Software Process Engineering Metamodel (SPEM)	modeling	1.0	formal/2002-11-14
Unified Modeling Language™ (UML™)	modeling	2.0 finalization	
- Infrastructure			ptc/2004-01-13
- Superstructure			ptc/2004-01-11
- Diagram Interchange			ptc/2003-09-11
- OCL			ptc/2003-10-14
UML Human-Usable Textual Notation (HUTN)	modeling	1.0 finalization	ptc/2004-01-10
UML™ Profile for CORBA®	modeling	1.0	formal/2002-04-01
UML™ Profile for Enterprise Application Integration (EAI)	modeling	1.0	formal/2004-03-26
UML™ Profile for Enterprise Distributed Object Computing (EDOC)	modeling	1.0	formal/2002-04-01..07

Table 14. Current OMG Documents

Specification Category	Topical Area / Domain	Current Version	Document #
UML™ Profile for Schedulability, Performance and Time	modeling	1.0	formal/2003-09-01
UML™ Testing Profile	modeling	1.0 finalization	ptc/2003-08-03
XML Metadata Interchange (XMI®)	modeling (XML DTDs)	1.2	formal/2002-01-01
	modeling (XML Schema)	2.0	formal/2003-05-02
CORBA/IIOP Specifications			
Common Object Request Broker Architecture (CORBA/IIOP)	middleware	3.0.2	formal/2002-12-02
Common Secure Interoperability (CSIv2)	security, middleware	3.0.2	Chapter 24 of CORBA/IIOP 3.0.2
CORBA Component Model	middleware, components	3.0	formal/2002-06-65
CORBA-FTAM/FTP Interworking	middleware	1.0	formal/2002-03-13
CORBA / TC Interworking and SCCP-Inter ORB Protocol	middleware	1.0	formal/2001-01-01
CORBA-WSDL/SOAP Interworking	middleware	1.0	formal/2003-11-02
Deployment and Configuration of Component-based Distributed Applications	middleware	1.0 finalization	ptc/2003-07-02
Fault Tolerance	middleware	3.0.2	Chapter 23 of CORBA/IIOP 3.0.2
Firewall Traversal	middleware	1.0 finalization	ptc/2003-01-13
GIOP SCTP	middleware, telecommunications	1.0 finalization	ptc/2003-08-20
GIOP Tunneling over Bluetooth	telecommunications	1.0 finalization	dtc/2003-05-06
Interworking between CORBA and TMN Systems	middleware, telecommunications	1.0	formal/2000-08-01
Online Upgrades	middleware	1.0 finalization	ptc/2003-03-03
Wireless Access & Terminal Mobility in CORBA (Telecom Wireless)	middleware, telecommunications	1.1	formal/2004-04-02
WSDL/SOAP-CORBA Interworking	middleware	1.0	formal/2004-04-01
CORBA Security Specifications			

Table 14. Current OMG Documents

Specification Category	Topical Area / Domain	Current Version	Document #
Authorization Token Layer Acquisition Service (ATLAS)	security, middleware	1.0	formal/2002-10-01
Common Secure Interoperability (CSIv2)	(see CORBA/IIOP Specifications)		
Security Service	(see CORBAservices Specifications)		
Resource Access Decision Facility	(see OMG Domain Specifications)		
IDL / Language Mapping Specifications			
Ada	software development	1.2	formal/2001-10-42
C	software development	1.0	formal/99-07-35
C++	software development	1.1	formal/2003-06-03
COBOL	software development	1.0	formal/99-07-47
CORBA Scripting Language	software development	1.1	formal/2003-02-01
IDL to Java	software development	1.2	formal/2002-08-05
Java to IDL	software development	1.3	formal/2003-09-04
Lisp	software development	1.0	formal/2000-06-02
PL/1	software development	1.0	formal/2002-09-05
Python	software development	1.2	formal/2002-11-05
Smalltalk	software development	1.0	formal/99-07-65
XML	software development	1.1	formal/2003-04-01
Specialized CORBA Specifications			
Data Distribution	real-time, middleware	1.0 finalization	ptc/2003-07-07

Table 14. Current OMG Documents

Specification Category	Topical Area / Domain	Current Version	Document #
Data Parallel Processing	real-time, middleware	1.0 finalization	ptc/2003-03-05
Lightweight Logging Service	real-time, middleware, telecommunications	1.0	formal/2003-11-03
Lightweight Services	(see CORBAservices Specifications)		
Minimum CORBA	real-time, middleware	1.0	formal/2002-08-01
Online Upgrades	(see CORBA/IIOP Specifications)		
Real-Time CORBA (Dynamic Scheduling)	real-time, middleware	1.0 finalization	ptc/2002-09-14
Real-Time CORBA (Static Scheduling)	real-time, middleware	1.1	formal/2002-08-02
Unreliable Multicast	real-time, middleware	1.0 finalization	ptc/2003-01-11
CORBA Embedded Intelligence Specifications			
Smart Transducers	real-time, embedded systems	1.0	formal/2003-01-01
CORBAservices Specifications			
Additional Structuring Mechanisms for the OTS	transaction mgmnt, middleware	1.0	formal/2002-09-03
Collection Service	collection mgmnt, middleware	1.0.1	formal/2002-08-03
Concurrency Service	object consistency, middleware	1.0	formal/2000-06-14
Enhanced View of Time	time mgmnt, middleware	1.1	formal/2002-05-07
Event Service	event mgmnt, middleware	1.1	formal/2001-03-01
Externalization Service	object state mgmnt, middleware	1.0	formal/2000-06-16
Licensing Service	software licensing, middleware	1.0	formal/2000-06-17
Life Cycle Service	object life cycle mgmnt, middleware	1.2	formal/2002-09-01

Table 14. Current OMG Documents

Specification Category	Topical Area / Domain	Current Version	Document #
Lightweight Services	event mgmnt, time mgmnt, object location mgmnt, middleware	1.0 finalization	realtime/2003-10-03
Management of Event Domains	event mgmnt, middleware	1.0	formal/2001-06-03
Naming Service	object location mgmnt, middleware	1.2	formal/2002-09-02
Notification Service	event mgmnt, middleware	1.0.1	formal/2002-08-04
Notification / JMS Interworking	event mgmnt, middleware	1.0 finalization	dtc/2003-06-01
Persistent State Service	object persistence, middleware	2.0	formal/2002-09-06
Property Service	object properties, middleware	1.0	formal/2000-06-22
Query Service	collection mgmnt, middleware	1.0	formal/2000-06-23
Relationship Service	object relationships, middleware	1.0	formal/2000-06-24
Security Service	security, middleware	1.8	formal/2002-03-11
Telecoms Log Service	telecommunications	1.1.2	formal/2003-06-01
Time Service	time mgmnt, middleware	1.1	formal/2002-05-06
Trading Object Service	object location mgmnt, middleware	1.0	formal/2000-06-27
Transaction Service	transaction mgmnt, middleware	1.4	formal/2003-09-02
CORBAfacilities Specifications			
Internationalization and Time	software development	1.0	formal/2000-01-01
Mobile Agent Facility	software development	1.0	formal/2000-01-02
OMG Domain Specifications			
Air Traffic Control	transportation	1.0	formal/2000-05-01
Audio / Visual Streams	telecommunications	1.0	formal/2000-01-03
Bibliographic Query Service	life sciences research	1.0	formal/2002-05-03

Table 14. Current OMG Documents

Specification Category	Topical Area / Domain	Current Version	Document #
Biomolecular Sequence Analysis (BSA)	life sciences research	1.0	formal/2001-06-08
Clinical Observations Access Service (COAS)	healthcare	1.0	formal/2001-04-06
Computer Aided Design (CAD) Services	manufacturing & utilities	1.1	formal/2003-03-63
Currency	finance	1.0	formal/2000-06-29
Data Acquisition from Industrial Systems (DAIS)	manufacturing & utilities	1.0	formal/2002-11-07
Distributed Simulation Systems	simulation	2.0	formal/2002-11-11
Federated Charging	telecommunications	1.0 finalization	dtc/2003-01-01
General Ledger	finance	1.0	formal/2001-02-67
Gene Expression	life sciences research	1.1	formal/2003-10-01
Genomic Maps	life sciences research	1.0	formal/2002-02-01
Historical Data Acquisition from Industrial Systems (HDAIS)	manufacturing & utilities	1.0 finalization	dtc/2003-02-01
Laboratory Equipment Control Interface Specification (LECIS)	life sciences research	1.0	formal/2003-03-19
Lexicon Query Service	healthcare	1.0	formal/2000-06-31
Life Sciences Identifiers	life sciences research	1.0 finalization	lifesci/2003-12-02
Macromolecular Structure	life sciences research	1.0	formal/2002-05-01
Management of Event Domains	telecommunications	1.0	formal/2001-06-03
Negotiation Facility	electronic commerce	1.0	formal/2002-03-14
Organizational Structure (OSF)	cross-domain	1.0 finalization	dtc/2001-09-04
Party Management Facility	finance	1.0	formal/2001-02-68
Person Identification Service (PIDS)	healthcare	1.1	formal/2001-04-04
PIM and PSM for SDO	cross-domain	1.0 finalization	dtc/2003-04-02
Product Data Management (PDM) Enablers	manufacturing & utilities	1.3	formal/2000-11-11
Public Key Infrastructure (PKI)	Electronic commerce, security	1.0	formal/2002-09-04
Resource Access Decision (RAD)	healthcare, security	1.0	formal/2001-04-01

Table 14. Current OMG Documents

Specification Category	Topical Area / Domain	Current Version	Document #
Surveillance User Interface (Surveillance Manager)	transportation	1.0	formal/2003-03-62
Task and Session	cross-domain	1.0	formal/2000-05-03
Telecom Service & Access Subscription (TSAS)	telecommunications	1.0	formal/2002-12-01
Telemetry and Telecommand Data (XTCE)	space	1.0 finalization	dtc/2003-05-07
Utility Management Systems (UMS) Data Access Facility	utility management	2.0	formal/2002-11-08
Workflow Management Facility	cross-domain	1.2	formal/2002-05-02

2.3.6. Document Access

All OMG specifications may be downloaded free of charge. The website for accessing the documents is:

http://www.omg.org/technology/documents/spec_catalog.htm

The OMG subgroups that are mostly directly applicable to the ACAST project are described in the following subparagraphs. They include:

- Middle and Related Services Platform Task Force
- Software-Based Communications Domain Task Force
- Real-time, Embedded, and Specialized Systems Platform Task Force
- Transportation Domain Task Force

2.3.7. Middle and Related Services Platform Task Force

The Middleware and Related Services (MARS) Platform Task Force (PTF) was formed to adopt infrastructure and services standards in the Model Driven Architecture (MDA). The MARS PTF will standardize object-oriented and message-oriented request broker technology and pervasive services for the multiple middleware platforms supported by the MDA. The MARS PTF replaced the Object Request Broker and Object Services PTF, whose scope was restricted to CORBA.

2.3.7.1. Committee Charter or Goals

The charter of the Middleware and Related Services PTF is to solicit, evaluate, and select specifications for recommendation to the Platform Technology Committee for adoption by OMG in the areas of:

- Request Broker Technology - including but not limited to Object Request Brokers (CORBA), Message-Oriented Brokers and other technologies that are the target implementation contexts for Platform Independent Services and their Mappings.

- General purpose Pervasive Services that are either:

  – Fundamental for developing useful distributed applications
  – Provide a universal basis for Application Integration and Information Integration, or
  – Support higher-level facilities and frameworks

- Mappings for such Pervasive Services to specific middleware platforms, and reference mappings from generic PIM constructs to platform-specific constructs and protocol rules.

- Supporting Technologies for Application Integration, Information Integration, and Collaboration

2.3.7.2. Standard

All OMG specifications may be downloaded free of charge. The website for accessing the documents is:

http://www.omg.org/technology/documents/spec_catalog.htm

2.3.7.3. Status

OMG presents the tasks that a PTF has undertaken in a tabular roadmap format. The current work of the Middleware and Related Services PTF is shown Table 15.

Table 15. Middleware and Related Services PTF Roadmap

Technology	Description	Business Benefits	Status
C Mapping Revision	This RFP solicits proposals for an IDL-to-C mapping for CORBA that addresses these problems.	The IDL-to-C mapping as currently published dates back to 1999 and does not provide a mapping for a number of important features of CORBA 2.4.2. This RFP updates C Language Mapping to a more recent CORBA release.	Revised Submission due at November 2002 meeting

Table 15. Middleware and Related Services PTF Roadmap

Technology	Description	Business Benefits	Status
CORBA Security V2.0	This RFP seeks to standardize a set of CORBA interfaces that instantiate a security model about authentication, privileges, and delegation. The interfaces sought will handle the complexity and govern the use of the CSIv2 protocol.	Will provide standard CORBA interfaces for security, creating portable CORBA security-aware applications. (The current CORBA security specification does not yield portable security-aware applications.)	Drafting stage; may issue RFP at November 2002 meeting
CORBA to WSDL-SOAP Interworking	This RFP solicits proposals for specification translation rules and interaction translation mechanisms that enable the following: To make existing OMG IDL-defined CORBA object interface instances accessible as WSDL-defined service ports bound to HTTP/SOAP	The innate qualities of CORBA's architectural design can be deployed to extend CORBA's reach to new domains, in this case Web Services. This RFP aims to: extend the sphere of CORBA object access to include SOAP/HTTP, by standardizing the fashion in which	Revised Submission due at November 2002 meeting
Data Distribution	This RFP solicits proposals for an MDA specification describing the application-visible interface and behavior of a Data-Distribution Service (DDS) that supports a Data-Centric Publish-Subscribe (DCPS) for real-time systems and offers optionally a Data Lo	Support many real-time applications in which the communication pattern is often modeled as a pure data-centric exchange where applications publish (supply or stream) "data" which is then available to the remote applications that are interested in it.	Revised Submission due at January 2003 meeting
Deployment and Configuration of Components	This RFP solicits proposals for (meta)models, notations and facilities to realize a comprehensive automated deployment and configuration support for component-based distributed applications.	At present, modeling of configuration properties and deployment requirements of component-based distributed applications as well as the modeling of elements and properties of software and hardware infrastructures onto which the applications are to be depl	Revised Submission due at January 2003 meeting

Table 15. Middleware and Related Services PTF Roadmap

Technology	Description	Business Benefits	Status
Extensible Frameworks	The objective of this RFP is to establish a framework for plugging in transports with sufficient predictability, improving suitability for realtime systems.	Standard IIOP is insufficient for most real-time domains. While GIOP is adequate for real-time systems, the use of GIOP coupled with TCP/IP (i.e., IIOP) is not sufficiently predictable for most real-time systems. This RFP seeks to resolve this issue.	Revised Submission due at November 2002 meeting
GIOP / Stream Control Transmission Protocol (SCTP) Protocol Mapping	This RFP solicits proposals for a mapping of GIOP onto Stream Control Transmission Protocol (SCTP) as specified in the IETF RFC 2960. Proposals may also specify an interoperability bridge between the IIOP and the proposed Inter-ORB Protocol (IOP).	In the 3GPP (3rd Generation Partnership Project) specifications, ORB technology is adopted in the management plane. The 3GPP Working Group on Network Management has defined the management interfaces to be CORBA interfaces. In order to apply ORB also in the	Revised Submission due at January 2003 meeting
Java Message Service (JMS) Notification	This RFP solicits proposals to enable interworking between two asynchronous publish-subscribe communications: the OMG's Notification Service and the Java Message Service (JMS), contained within the Java 2 Enterprise Edition (J2EE) standards.	Permits CORBA and Java objects (including EJB's) to communicate with each other asynchronously.	Revised Submission due at November 2002 meeting
Load Balancing and Monitoring	This RFP solicits proposals to extend CORBA functionality to conveniently and efficiently support load balancing and monitoring in CORBA-based environments and for CORBA-based applications.	These extensions will bridge the gap between CORBA and other application methodologies for distributed and high performance computing that require these characteristics (load balancing and monitoring) and are currently not based on CORBA.	Revised Submission due at November 2002 meeting

Table 15. Middleware and Related Services PTF Roadmap

Technology	Description	Business Benefits	Status
Mapping EDOC to J2EE	This RFP solicits proposals for codifying the best practice of application architecture to middleware design as a set of transformation rules alternatives for mapping EDOC's Enterprise Collaboration Architecture (ECA) to J2EE.	ECA is a middleware platform independent representation of entities, events, B2B collaborations and business process definitions, most, if not all, of which can be implemented using J2EE. This RFP will provide a normative approach to deploying ECA models	Drafting stage; may issue RFP at November 2002 meeting
Online Upgrade	This RFP solicits proposals for standard OMG interfaces and mechanisms to provide online upgrade capabilities for CORBA object implementations.	Many large complex systems and many small embedded systems are expected to provide a long lifetime of service. It must be possible to upgrade and evolve these systems by replacing individual software and hardware components without taking these systems out	ADOPTED; in finalization
Reliable Ordered Multicast	contact MARS PTF	contact MARS PTF	Drafting stage; may issue RFP at November 2002 meeting
Security Protocol (SECP) 1.1	This RFP solicits proposals for the following: Platform Independent Specification, which is a specification of the SECP protocol message formats and state machine that is independent of the underlying transport protocol. Platform Specific Specification	SECP is the current protocol used in SECIOP, which is a security protocol currently defined in the OMG security service[SEC]. The protocol is versatile in that it can multiplex security contexts over a single connection. Since SECP is a multiplexing proto	Initial Submission due at March 2003 meeting

Table 15. Middleware and Related Services PTF Roadmap

Technology	Description	Business Benefits	Status
UML Profile for CCM	This RFP solicits proposals for a UML profile that facilitates representation of concepts that are needed to represent a CORBA Component PSM.	This will result in significant benefits to the CCM user community and the users of MDA in general: The CCM is extended by graphical modeling support for the concepts defined in the CCM metamodel; MDA development environments can target different up-to-date	Initial Submission due at January 2003 meeting
WSDL-SOAP to CORBA Interworking	This RFP solicits proposals for specification translation rules and interaction translation mechanisms which enable the following: To make WSDL-defined web-based services, with ports bound to HTTP/SOAP, accessible to CORBA clients, as OMG IDL-defined Object	The innate qualities of CORBA's architectural design can be deployed to extend CORBA's reach to new domains, in this case Web Services. This RFP aims to both: • Allow CORBA based clients (with all their language bindings already implemented by their Orbs)	Revised Submission due at January 2003 meeting
Web Services for Enterprise Collaboration (WSEC)	This RFP provides for a two-way mapping between the Component Collaboration Architecture (CCA) portion of ECA and WSDL such that enterprise collaborations described in CCA can be implemented with WSDL, XML Schema and Soap. It also describes how existing W	Enables high-level and business focused collaborations to be automatically and deterministically mapped to web services infrastructures. Also allows existing services to be made part of new CCA collaborations.	Initial Submission due at November 2002 meeting

2.3.7.4. Applicability to ACAST

The work products from the Middleware and Related Services PTF's activities are standard object-oriented and message-oriented request broker technology and pervasive services for the multiple middleware platforms which can be applied to ACAST developed MMDA products.

2.3.7.5. Points of Contact

The Co-Chairmen are:

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2.3.8. Real-time, Embedded, and Specialized Systems Platform Task Force

The mission of the Real Time, Embedded and Specialized Systems (RTESS) PTF is to adapt and extend OMG technologies that apply across domains for real-time, embedded and related specialized kinds of systems. Systems that come under the RTESS have one or more of the following characteristics:

- Real-time
- Embedded
- Fault tolerant
- Highly available
- High-performance
- Safety-critical

Thus, the RTESS works to extend specifications for CORBA, Common Object Services (COS), UML Profiles, Platform-Independent Models (PIMs) and other standards that satisfy the needs of these systems.

In some cases, the RTESS develops new standards for specialized systems where no current baseline specifications exist. The real-time and embedded systems group has been active in the OMG since 1995 and was elevated from a Special Interest Group to a Task Force in April 2002.

As needed, the RTESS collaborates with other TFs and SIGs. For example, the Data Distribution Service for Real-Time Systems specification was the culmination of a coordinated RTESS/MARS effort and was then issued from MARS. Similarly, the Lightweight Logging Service was the product of a coordinated effort of the RTESS, SWR DSIG and the Telecoms DTF (and was then issued by RTESS).

During 2003, RTESS had a number of submissions that experienced multiple revisions, but they are expected to reach adoption in the next year:

- Lightweight CCM and Lightweight Services, both suitable for Software Radios and similar embedded systems; Reliable Ordered Multicast Services; Real-time Notification Services
- A UML Profile for Modeling QoS and Fault Tolerance
- Mechanisms for mapping Real-time CORBA to Real-time Java (two mechanisms: one for Sun's real-time extensions to the Java language and one for the J-Consortium's real-time extensions to the Java language).

2.3.8.1. Committee Charter or Goals

The Real-time, Embedded, and Specialized Systems Platform Task Force focuses on adaptations and extensions of OMG technologies that apply across domains for real-time, embedded, and related specialized kinds of systems. Examples include systems that have one or more of the following characteristics: real-time, embedded, fault tolerant, highly available, high performance, and safety critical.

RTESS extends specifications for Platform Independent Models (PIMs), the Unified Modeling Language (UML), the Common Object Request Broker Architecture (CORBA), Common Object Services (COS), and other standards that fall into the OMG purview. RTESS develops new standards for specialized systems where no current baseline specifications exist. This effort promotes the use of OMG technologies in these markets.

For technology areas that overlap with other OMG Task Forces, RTESS coordinates with the appropriate OMG subgroups and the Architecture Board to determine where the work will be accomplished.

2.3.8.2. Standard

All OMG specifications may be downloaded free of charge. The website for accessing the documents is:

http://www.omg.org/technology/documents/spec_catalog.htm

2.3.8.3. Status

The current work of the Real-time, Embedded and Specialized Systems PTF Roadmap is shown Tables 16 and 17.

Table 16. Real-time, Embedded and Specialized Systems PTF Roadmap - Part 1

Item	Status	Task Force	Tokyo April	Orlando June	Helsinki September	Wash DC November
Adopted Technologies						
Minimum CORBA 2.1	Adopted					
Real-time CORBA 1.0	Adopted					
Enhanced Views of Time	Adopted					
Dynamic Scheduling / Real-time 2.0	Adopted					
UML Profiles for Schedulability, Timing, and Performance	Adopted					
Fault Tolerance using Replication	Adopted					
Unreliable Multicast	Adopted					
Data Parallel CORBA	Adopted					
Additional Structuring Mechanisms for Transactions	Adopted					
Smart Transducers	Adopted					
Work In-process						
Load Balancing	In Process	MARS	Revised	Revised		
Extensible Transport Framework	In Process	MARS	Revised	Revised		
Data Distribution	In Process	MARS	Initial	Update Report	Revised	
Online upgrades of replicas	In Process	MARS		Revised		
RT Notification	In Process	MARS		Revised		
UML Profiles for FTol, QoS	In Process	ADTF			Initial	
RT CORE - RT CORBA synthesis (J Consortium)	In Process	MARS		Initial		
RTSJ - RT CORBA synthesis (Java Community)	In Process	MARS		Initial		

Table 17. Real-time, Embedded and Specialized Systems PTF Roadmap - Part 2

Item	Task Force
General	
Common Object Group Manager, as needed	MARS
UML for complex systems, as needed	ADTF
Additional support for online updates	MARS
Data Flow for UML, as needed	ADTF
Embedded	
Minimum CORBA	MARS
Minimum Services / Minimizers	MARS
Components lite / RT components / CCM	MARS
Connectionless protocols, as needed	MARS
Other embedded protocols (e.g., FireWire)	MARS
1553B Protocol mapping	MARS
Real-time	
QoS for XML	MARS
Temporal Reasoning	MARS
RT Security (following Open Group resolution)	MARS
RT / Open Nested Transactions	MARS
Real-time Testing	ADTF
Real-time Web Services	MARS
PIMs for Real-time Systems	ADTF
Getting Time into the core	MARS
Additional Sched Disciplines	MARS
Real-time configuration and deployment	MARS
Timing Diagrams for UML	ADTF
Fault Tolerance	
Reliable Ordered Multicast	MARS
Update FTOL for Common Group Mgr	MARS
RT Fault Tolerance, as needed	MARS
FTOL replica interoperability protocol	MARS
High Performance	
High Performance Enablers	MARS

Table 17. Real-time, Embedded and Specialized Systems PTF Roadmap - Part 2

Item	Task Force
Content Label-based messaging	MARS
Safety Critical	
IEEE-Scan-like Test Interfaces	MARS
UML-Hazard Tool Integration	Xport
Safety Critical Systems Support	Xport

2.3.8.4. Applicability to ACAST

The work products from the Real-time, Embedded, and Specialized Systems PTF's activities apply to ACAST in that MMDA products will perform real-time processing and contain embedded components. In addition, the MMDA products developed under ACAST must be fault tolerant and highly available because they will be involved with safety critical applications.

2.3.8.5. Points of Contact

The Co-Chairmen are:

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2.3.9. Software-Based Communications Domain Task Force

The Software-Based Communications Domain Task Force (DTF) was chartered during the OMG meeting that occurred in Anaheim, CA during 2-5 Feb 04. The Software Based Communications

DTF will standardize the architecture of software-defined radios used in military, telecommunications and other areas.

The Software-Based Communications DTF was previously a Special Interest Group (SIG) called the Software Radio Domain SIG. It had been chartered to promote technology aspects related to software-defined communication technology within the OMG. Experience with the previous specification development out of the Software Radio Domain SIG showed however, that the technology addressed by this group is fairly distinct within the OMG, with little overlap by other taskforces. This warranted the conversion of the Software Radio Domain SIG into the Software-Based Communications Domain Task Force. The promotion to Task Force state allows the group to exercise full responsibility on the ongoing specification work, which will benefit the consistency of the specification suite.

2.3.9.1. Committee Charter or Goals

The Software-Based Communication Domain Task Force mission is the development of specifications supporting the development, deployment, operation and maintenance of software technology targeted for software-defined communication devices. Primary goals in this context are:

- Promotion of Unified Modeling Language (UML) and model driven development technology in the software-defined radio field
- Development of specifications to improve interoperability and exchangeability of software-defined communication components
- Collaboration with other OMG taskforces on related or overlapping technology specifications
- Broaden previous Domain SIG charter with new related technologies; e.g., Cognitive Radio, Streaming Components, Digital IF, Spectrum Management, etc.
- Promotion of OMG specifications within the Software Radio community
- Maintain liaison with stakeholders of software-defined communication technology outside the OMG

The goals of the Software-Based Communications DTF are to work with other OMG groups where appropriate to:

- Provide a standard means, by which software radio-based applications are developed, deployed, and managed.
- Provide the capability for reconfiguration of radio networks, services, access nodes, and terminals.

- Provide a standard platform-independent architecture to support software radio-based applications.
- Promote the development of standard radio-based services for use by applications.
- Promote the development of standard radio-based interface definitions for use in application development.
- Promote, as required, the infrastructure and interface definitions needed to support:
  - Transparent security solutions
  - Safety critical solutions
  - Fault tolerant solutions
  - Real-time and embedded solutions
  - Ensure compatibility and consistency of resultant specifications related to software radios.

2.3.9.2. Standard

The Software Radio Domain SIG developed the Platform Independent Model (PIM), as well as, the CORBA Platform Specific Model (PSMs) along with its Interface Definition Language (IDL) specified interfaces of services. The standard is known as: Specification for PIM and PSM for SWRADIO Components.

All OMG specifications may be downloaded free of charge. The website for accessing the documents is:

http://www.omg.org/technology/documents/spec_catalog.htm

2.3.9.3. Status

The Software-Based Communications DTF continues the work of the Software Radio Domain SIG. A draft of the Specification for PIM and PSM for SWRADIO Components was complete submitted by the Software Radio Domain SIG for review in Jan 04.

2.3.9.4. Applicability to ACAST

The Software-Based Communications DTF's work is applicable to NASA's ACAST Project in that it will develop specifications supporting the development, deployment, operation and maintenance of software technology targeted for software-defined communication devices. The DTF's work products should be considered when developing modular avionics for the ACAST project.

2.3.9.5. Points of Contact

The Co-Chairmen are:

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2.3.10. Transportation Domain Task Force

The Transportation DTF was formed to promote the development and use of OMG specifications and technologies in the transportation industry. Part of that industry includes the Air Traffic Control system.

The Transportation DTF's vision includes using the OMG concepts and products to support a worldwide ATC standard infrastructure. Digital technology is transforming business and social structures. Without common standards and solid technology platforms, it will not turn it into reality for ATC. OMG, Model Driven Architecture (MDA) and CORBA are good candidates to bring together ATC actors from industry, universities and research institutes to create tomorrow's architectures, standards and technology platforms. Sharing a clear vision of how to develop the ATC software intensive systems that will shape our future.

2.3.10.1. Committee Charter or Goals

The mission of the Transportation DTF is to:

- Promote the development and use of transportation and transportation related systems that incorporate OMG specifications and technologies.

- Establish a global forum for the free exchange of distributed object systems development ideas amongst the various members of the transportation community and its partners.

- Establish a series of distributed object or component specifications based upon a Transportation Object Model that allow participation of system components constructed by different sources to interoperate in completing various transportation business domain scenarios.

2.3.10.2. Standard

The Transportation DTF published the Air Traffic Control Specification in May 2000. The standard is available at http://www.omg.org/docs/formal/00-05-01.pdf. All OMG specifications may be downloaded free of charge. The website for accessing the documents is:

http://www.omg.org/technology/documents/spec_catalog.htm

2.3.10.3. Status

The Transportation DTF roadmap (Table 18) indicates that there are a number of surveillance related areas for which standards have been requested. If the DTF decides that a specification is needed, a Request for Proposal (RFP) will be issued and a group will undertake the development of the specification.

Table 18. Transportation Domain Task Force Roadmap

Action Item	Description	Business Benefits	Status
Flight data processing: flight data to decision support tools	Anticipated arrival times, route, other flight data made available to flow management applications	en Route (USA) is considering use of this for future en route use.	RFP under discussion.
Flight data processing: flight manager	Processing of flight data, conformance between flight and surveillance data, trajectory prediction interface	en Route (USA) is considering use of this for future en route use.	RFP under discussion.
Flight data processing: conflict manager	Processing of flight data, conformance among flight routes and airspace data.	en Route (USA) is considering use of this for future en route use.	RFP under discussion.
Flight data processing: arrival manager	Processing of flight data, scheduling and spacing of arrival flights, runway assignment.	en Route (USA) is considering use of this for future en route use.	RFP under discussion.
Flight data processing: correlation manager	Processing of flight data.	en Route (USA) is considering use of this for future en route use.	RFP under discussion.

Table 18. Transportation Domain Task Force Roadmap

Action Item	Description	Business Benefits	Status
Interfacility communication	Exchange of data between facilities. A good example of non-ATC specific processing for which many vendors would have solutions.	en Route (USA) is considering use of this for future en route use.	RFP under discussion.
Datalink communication	Radio telecommunications: an application of real-time, resource (I.e., bandwidth and time) constrained processing, whereby messages of varying urgency and varying importance are delivered between ground control and cockpit.	en Route (USA) is considering use of this for future en route use.	RFP under discussion.
Recording, replay and analysis	Database, real-time: ground system use (not cockpit flight data recorder) for controller screen replay, recording of significant events, ability to recreate situations for subsequent review, 50 ms jitter, maximum.	en Route (USA) is considering use of this for future en route use.	RFP under discussion.

2.3.10.4. Applicability to ACAST

The ATC related work products from the Transportation DTF's activities should be considered when developing MMDA products for ACAST.

2.3.10.5. Points of Contact

The Co-Chairmen are:

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- For Rail
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2.4. Society of Automotive Engineers

The Society of Automotive Engineers (SAE) has more than 84,000 members - engineers, business executives, educators, and students from more than 97 countries - who share information and exchange ideas for advancing the engineering of mobility systems. SAE is a one-stop resource for standards development, events, and technical information and expertise used in designing, building, maintaining, and operating self-propelled vehicles for use on land or sea, in air or space.

SAE, through the voluntary work of more than 7,000 committee members and participants, maintains over 8,300 technical standards and related documents. From use to development to funding, successful aerospace and ground vehicle companies are fully engaged in SAE Technical Standards.

SAE Aerospace Standards are used extensively by the military services as well as by the private sector. Over 2,300 SAE Aerospace Material Specifications, covering a vast array of material and processes, are available to the aerospace engineer. Combine these with 2,100 more documents on a wide variety of subjects makes SAE the world's largest producer of non-government aerospace standards.

SAE Aerospace Liaisons

SAE maintains liaisons with a number of organizations to fully coordinate its standards, as well as to avoid duplication. Particular effort is made to exchange information with the Aerospace Industries Association (AIA), Airlines Electronic Engineering Committee (ARINC/AEEC), the General Aviation Manufacturers Association (GAMA), the Air Transport Association (ATA), the Radio Technical Commission for Aeronautics (RTCA), European Organization for Civil Aviation Equipment (EUROCAE), European Association of Aerospace Equipment Manufacturers (AECMA), International Air Transport Association (IATA), Federal Aviation Administration (FAA), Department of Defense(DoD), Joint Aviation Authorities (JAA), American Welding Society (AWS), and Transport Canada.

SAE in International Aerospace Standards

SAE is the administrator of the U.S. Technical Advisory Group (TAG) to ISO Technical Committee 20 - Aircraft and Space Vehicles, and is the International Secretariat for two of its subcommittees:

- ISO/TC20/SC9 - Air Cargo and Ground Equipment
- ISO/TC20/SC10 - Aerospace Fluid systems and Components

Many SAE air and space committees interface with ISO and provide the majority of the U.S. delegates to their ISO counterpart committees.

2.4.1. Document Access

SAE standards can be ordered, for a fee, on-line at http://www.sae.org.

2.4.2. SAE Aviation Related Organization

The aviation related divisions and subcommittees are shown in Table 19.

Table 19. Society of Automotive Engineers - Aviation Related Organization

Division/Subcommittee	
Aerospace General Projects Division	
	Air Cargo and Aircraft Ground Equipment, Committee AGE2
	Aerospace Behavioral Engineering Technology, Committee G-10
	Safety Assessment for Airborne Systems and Equipment, Committee S-18
	Aircraft Ground Deicing, Committee G-12
	Human Modeling Technology and Standards, Committee G-13
	American Aerospace Quality Group (AAQG), Committee G-14
	Committee G-15, Airport Snow & Ice Control Equipment
Aircraft Division	
	Aircraft Instruments, Committee A-4
	Aerospace Landing Gear Systems Committee, Committee A-5
	Aircraft Oxygen Equipment, Committee A-10
	Aircraft Lighting, Committee A-20
	Aircraft Noise, Committee A-21
	Aircraft Environmental Systems, Committee AC-9
	Aircraft Icing Technology, Sub-Committee AC-9C
	Flight Deck and Handling Qualities Standards for Aircraft, Committee S-7
	Cabin Safety Provisions, Committee S-9
	Airframe Control Bearings Group, Committee ACBG
	Aircraft Seats, Committee SEAT
Aerospace Electronics & Electrical Systems Division	
	Lightning Committee, AE-2
	Electromagnetic Environmental Effects (E3), Committee AE-4

Table 19. Society of Automotive Engineers - Aviation Related Organization

Division/Subcommittee	
	Aerospace Electrical Power and Equipment, Committee AE-7
	Aerospace Electrical/Electronic Distribution Systems, Committee AE-8
	Electrical Wiring and Fiber Optic Interconnect Systems Installation Subcommittee AE-8A
	Protective Devices Subcommittee, AE-8B1
	Switches Subcommittee, AE-8B2
	Relays Subcommittee, AE-8B3
	Connectors Subcommittee, AE-8C1
	Terminating Devices Subcommittee, AE-8C2
	Wire and Cable Subcommittee, AE-8D
Aerospace Mechanical & Fluid Systems Division	
	Aerospace Actuation, Control, and Fluid Power Systems, Committee A-6
	Aerospace Fuel, Oil and Oxidizer Systems, Committee AE-5
	Aerospace Fittings, Couplings, Hose and Tubing Assemblies, Committee G-3
Aerospace Avionic Systems Division	
	Aircraft Systems & Systems Integration, AS-1
	Embedded Computing Systems, AS-2
	Fibre Optics and Applied Photonics, AS-3
Aerospace Propulsion Division	
	Engine Accessory Installations Committee AE-1
	Starting Systems and Auxiliary Power, Committee AE-6
	General Standards for Aerospace and Propulsion Systems, Committee E-25
	Propulsion Ignition Systems, Committee E-30
	Aircraft Exhaust Emission Measurements Committee E-31
	Engine Conditioning Monitoring Committee E-32
	In-Flight Propulsion Measurement Committee E-33
	Propulsion Economics for Acquisition and Ownership, Committee E-35
	Electronic Engine Controls, Committee E-36
	Aerospace Propulsion Systems Support Equipment, Committee EG-1
	Helicopter Powerplant, Committee S-12
	Engine Performance Presentation for Electronic Digital Computers, Committee S-15
	Turbine Engine Inlet Flow Distortion, Committee S-16

Table 19. Society of Automotive Engineers - Aviation Related Organization

Division/Subcommittee	
Aerospace Materials Division	
	Metals Group
	Processes, Committee B
	Aluminum, Magnesium, Copper, Committee D
	Carbon and Low Alloy Steels, Committee E
	Corrosion and Heat Resistant Alloys, Committee F
	Titanium and Refractory Alloys, Committee G
	Aerospace Metals Engineering Committee, AMEC
Non-Destructive Testing Group, Committee K	
	Non-Metals Group
	Elastomers, Committee CE
	Organic Coatings, Committee G-8
	Sealants, Committee G-9
	Aircraft Maintenance Chemicals and Materials, Committee J
	Polymers and Composites, Committee P
	Commercial Aircraft Composite Repair Committee, CACRC
	Greases, Committee M

The SAE subgroups that are mostly directly applicable to the ACAST project are described in the following subparagraphs. They include:

- Aircraft Instruments, Committee A-4
- Aircraft Systems & System Integration, AS-1
- Embedded Computing Systems, AS-2

2.4.3. Aircraft Instruments, Committee A-4

The Aircraft Instruments Committee is within the Aircraft Division of the SAE standards organization. The committee deals with mechanical, electromechanical, and electronic cockpit instrumentation standards applicable to all civil aircraft.

2.4.3.1. Committee Charter or Goals

The SAE A-4 Aircraft Instruments Committee and Sub-Committees have the responsibility for mechanical, electromechanical, and electronic cockpit instrumentation standards applicable to all

civil aircraft, with emphasis on minimum performance standards intended for reference in the FAA Technical Standard Orders (TSO).

2.4.3.2. Standard

The current documents developed by the Aircraft Instruments Committee are listed in Table 20.

Table 20. Current Aircraft Instrument Committee Specifications

Document	Title	Date/Status
AIR1075A	Barometry for Altimeter Calibration	9/1/1996 Revised
AIR1093A	Numeral, Letter and Symbol Dimensions for Aircraft Instrument Displays	5/2/2002 Revised
AIR1608A	Estimation of Total Error in Altimetry	5/2/2002 Revised
AIR818D	Aircraft Instrument and Instrument System Standards: Wording, Terminology, Phraseology, and Environmental and Design Standards For	7/1/2001 Revised
AIR975A	Maintenance of Pitot-Static Systems of Transport Aircraft	9/1/1996 Revised
ARP1061A	Altitude Alerting Devices and Systems	4/1/1999 Revised
ARP175	Temperature Measurement, Well Insert Type	5/1/1991 Reaffirmed
ARP1874	Design Objectives for CRT Displays for Part 25 (Transport) Aircraft	5/1/1993 Reaffirmed
ARP416A	Directional Indicating System (Turbine Powered)	10/1/2001 Revised
ARP419A	Automatic Pilot Installations	10/1/2001 Revised
ARP426A	Compass System Installations	7/1/2001 Revised
ARP4266	Hole Contour, Fluid Passage, Tube Fitting	1/6/2002 Reaffirmed
ARP427A	Pressure Ratio Instruments	7/1/2001 Revised
ARP4277	Placard and Marking Standards for Operation of Inflatable Slides and Slide/Rafts	5/8/1991 Issued
ARP433A	Liquid Oxygen Quantity Instruments	9/1/2001 Revised
ARP435	Overspeed Warning Instrument (Turbine Powered Subsonic Aircraft)	7/1/2001 Reaffirmed

Table 20. Current Aircraft Instrument Committee Specifications

Document	Title	Date/Status
ARP461B	Synchros	8/1/1990 Reaffirmed
ARP4754	Certification Considerations for Highly-Integrated Or Complex Aircraft Systems	1996-11-01 Issued
ARP4761	Guidelines and Methods for Conducting the Safety Assessment Process on Civil Airborne Systems and Equipment	1996-12-01 Issued
ARP5287	Optical Measurement Procedures for Airborne Head-Up Display (HUD)	3/1/1999 Issued
ARP667	Precision Motor Tachometer Generator	8/1/1990 Reaffirmed
ARP727	Rate Gyro Assembly Configuration	8/1/2001 Reaffirmed
ARP794A	Airstream Deviation Instrument (Adi)	7/1/2001 Revised
ARP920A	Design and Installation of Pitot-Static Systems for Transport Aircraft	10/19/1996 Revised
ARP921A	Flight Test Procedures for Static Pressure Systems Installed in Subsonic Transport Aircraft	9/1/1996 Revised
AS1104	Single-Degree-Of-Freedom Spring-Restrained Rate Gyros	10/1/2001 Reaffirmed
AS1162	Attitude Instruments, Pitch and Roll	7/1/2001 Reaffirmed
AS14114	Gyroscope, Displacement, Roll and Pitch (Hard Mounted)	3/1/1999 Issued
AS1426/2	Standard Galley System Specification Appendix II 20.0 Data Requirements and Procedures	5/1/1991 Reaffirmed
AS17983	Compass, Magnetic, Pilot Standby	7/1/1999 Issued
AS196	Thermo-Sensitive Element (Iron Constant)	7/1/2001 Reaffirmed
AS22145	Accelerometer Group, Counting (Ms25447 and Ms25448)	7/1/1999 Issued
AS234	Thermo-Sensitive Element (Resistance Bulb Type)	7/1/2001 Reaffirmed
AS23479	Indicator, Pressure, 1 1/2-Inch, Integrally Lighted	5/1/1999 Issued
AS236	Adapter, Thermo-Sensitive Element	7/1/2001 Reaffirmed

Table 20. Current Aircraft Instrument Committee Specifications

Document	Title	Date/Status
AS390	Pilot Or Pitot-Static Pressure Tubes, Electrically Heated (Turbine Powered Subsonic Aircraft)	7/1/2001 Reaffirmed
AS396B	Bank and Pitch Instruments (Indicating Stabilized Type) (Gyroscopic Horizon, Attitude Gyro)	7/1/2001 Reaffirmed
AS397A	Direction Instrument, Non-Magnetic, Stabilized Type (Directional Gyro)	7/1/2001 Reaffirmed
AS398B	Direction Instrument, Magnetic, Non-Stabilized Type (Magnetic Compass)	7/1/2001 Revised
AS399A	Direction Instrument, Magnetic, (Stabilized Type)	7/1/2001 Reaffirmed
AS400B	Cargo Compartment Fire Detection Instruments (Reciprocating Engine Powered Aircraft)	7/1/2001 Revised
AS402B	Automatic Pilots	7/1/2001 Revised
AS404C	Electric Tachometer: Magnetic Drag (Indicator and Generator)	7/1/2001 Revised
AS405C	Fuel and Oil Quantity Instruments	7/1/2001 Revised
AS406	Flight Directors (Turbine-Powered Subsonic Aircraft)	7/1/2001 Reaffirmed
AS407C	Fuel Flowmeters	7/1/2001 Revised
AS408C	Pressure Instruments - Fuel, Oil, and Hydraulic (Reciprocating Engine Powered Aircraft)	7/1/2001 Revised
AS411B	Manifold Pressure Indicating Instruments	11/14/2001 Reaffirmed
AS412B	Carbon Monoxide Detector Instruments	7/1/2001 Revised
AS413B	Temperature Indicator	7/1/2001 Reaffirmed
AS417A	Air Data Computer, Mps	7/1/2001 Reaffirmed
AS418A	Maximum Allowable Airspeed Instruments (Reciprocating Engine Powered Aircraft)	7/1/2001 Reaffirmed
AS420B	Flight Directors (Reciprocating Engine Powered Aircraft)	7/1/2001 Reaffirmed
AS428	Exhaust Gas Temperature Instruments	7/1/2001 Reaffirmed

Table 20. Current Aircraft Instrument Committee Specifications

Document	Title	Date/Status
AS429	Rate of Climb (Vertical Speed) Indicator, Pressure Actuated (Turbine Powered Subsonic Aircraft)	7/1/2001 Reaffirmed
AS430	Powerplant Fire Detection Instruments - Thermal and Flame Contact Types (Turbine)	7/1/2001 Reaffirmed
AS431B	True Mass Fuel Flow Instruments	9/1/1996 Revised
AS432B	Tachometer Instruments (Indicator and Generator)	9/1/1996 Revised
AS436	Mach Meters (Turbine Powered Subsonic Aircraft)	7/1/2001 Reaffirmed
AS437A	Maximum-Allowable-Airspeed Instruments (Turbine Powered Subsonic Aircraft)	9/1/1996 Revised
AS439A	Stall Warning Instrument (Turbine Powered Subsonic Aircraft)	10/1/2001 Revised
AS440A	Automatic Pilots (Turbine Powered Subsonic Aircraft)	9/1/1996 Revised
AS443A	Compass, Magnetic, Non-Stabilized Type (For Turbine-Powered Subsonic Aircraft)	9/1/1996 Revised
AS445	Fuel and Oil Quantity Instruments (Turbine Powered Subsonic Aircraft)	8/1/2001 Reaffirmed
AS446	Cargo Compartment Fire Detection Instruments (Turbine Powered Subsonic Aircraft)	7/1/2001 Reaffirmed
AS5604	Compass; Magnetic, Pilot Standby	4/1/1999 Issued
AS5813	Tube - Pitot, Electrically Heated	2/1/1998 Issued
AS5823A	Card-Compass Correction	4/1/1998 Revised
AS791	Remote Served Air Data Instruments for Subsonic Aircraft	7/1/2001 Reaffirmed
AS793A	Total Temperature Measuring Instruments (Turbine Powered Subsonic Aircraft)	7/1/2001 Revised
AS8001	Bank and Pitch Instruments	5/1/1991 Reaffirmed
AS8002A	Air Data Computer - Minimum Performance Standard	9/1/1996 Revised
AS8003	Minimum Performance Standard for Automatic Pressure Altitude Reporting Code Generating Equipment	5/1/1991 Reaffirmed

Table 20. Current Aircraft Instrument Committee Specifications

Document	Title	Date/Status
AS8004	Minimum Performance Standard for Turn and Slip Instrument	5/1/1991 Reaffirmed
AS8005A	Minimum Performance Standard Temperature Instruments	9/1/1996 Revised
AS8006	Minimum Performance Standard for Pitot and Pitot-Static Tubes	5/1/1993 Reaffirmed
AS8007	Minimum Safe Performance Overspeed Warning Instruments	5/1/1991 Reaffirmed
AS8008	Flight Director Equipment	5/1/1991 Reaffirmed
AS8009A	Pressure Altimeter Systems	10/29/1996 Revised
AS8013A	Minimum Performance Standard for Direction Instrument, Magnetic (Gyroscopically Stabilized)	9/1/1996 Revised
AS8014	Minimum Performance Standard, Stall Warning Equipment	9/8/1986 Issued
AS8016A	Vertical Velocity Instrument (Rate-Of-Climb)	9/1/1996 Revised
AS8018A	Minimum Performance Standard for Mach Meters	9/1/1996 Revised
AS8019A	Airspeed Instruments	9/1/1996 Revised
AS8021	Minimum Performance Standards for Direction Instrument, Non-Magnetic (Gyroscopically Stabilized)	5/1/1991 Reaffirmed
AS8028	Powerplant Fire Detection Instruments, Thermal & Flame Contact Types (Reciprocating and Turbine Engine Powered Aircraft)	5/1/1991 Reaffirmed
AS8029	Minimum Performance Standard for Fuel and Oil Quantity Indicating System Components	5/1/1993 Reaffirmed
AS8034	Minimum Performance Standard for Airborne Multipurpose Electronic Displays	5/1/1993 Reaffirmed
AS8036	Cargo Compartment Fire Detection Instruments	5/1/1991 Reaffirmed
AS8039A	Minimum Performance Standard General Aviation Flight Recorder	2/13/2002 Revised
AS8042	Manifold Pressure Instruments	5/1/1991 Reaffirmed
AS8045	Minimum Performance Standard for Underwater Locating Devices (Acoustic) (Self-Powered)	5/1/1993 Reaffirmed

Table 20. Current Aircraft Instrument Committee Specifications

Document	Title	Date/Status
AS8046	Minimum Performance Standard Angle of Attack Equipment	1/24/1992 Issued
AS855	Minimum Performance Standard for Automatic Pressure Altitude Digitizer Equipment	7/1/2001 Reaffirmed
AS942A	Pressure Altimeter System, Minimum Safe Performance Standard	9/1/1996 Revised

2.4.3.3. Status

The document that the committee is currently working on is AS8034A, Minimum Performance Standard for Airborne Multipurpose Electronic Displays.

2.4.3.4. Applicability to ACAST

The mechanical, electromechanical, and electronic cockpit instrumentation standards developed by the Aircraft Instruments Committee should be considered when designing MMDA products.

2.4.3.5. Points of Contact

The points of contact are:

- Aircraft Division Chair
  Kirke Comstock
  United Airlines (Retired)

- Staff Engineer
  Frank Bokulich
  (724) 772-7516
  fbokulich@sae.org

- SAE Aerospace Standards Specialist
  Maureen Lemankiewicz
  (724) 772-7147
  mlemank@sae.org

2.4.4. Aircraft Systems & Systems Integration, Committee AS-1

The Aircraft Systems & Systems Integration Committee, AS-1 is part of the Aerospace Avionic Systems Division. The committee has three subcommittees. They are the:

- Avionic Networks Subcommittee (AS-1A)
- Aircraft-Store Integration Subcommittee (AS-1B)
- Avionic Subsystems Subcommittee (AS-1C).

2.4.4.1. Committee Charter or Goals

The Aircraft Systems & Systems Integration Committee, Committee AS-1, reviews and develops specifications for stores interface, validation requirements, systems integration, mission store validation plans and media terminal design. It also addresses system test requirements, architecture, security and 1553 data bus standards.

2.4.4.2. Standard

Recent standards from the Aircraft Systems and Systems Integration Committee are shown in Table 21.

Table 21. Aircraft Systems & Systems Integration Recent Standards

Document	Title	Date/Status
AIR5532	Generic Aircraft-Store Interface Framework (GASIF)	2003-06-06 Issued
AIR4271	Handbook of System Data Communications	2002-01-06 Reaffirmed
AIR4288	Linear Token Passing Multiplex Data Bus Users Handbook	2002-01-06 Reaffirmed
AIR4886	Statement on Requirements for Real-Time Communication Protocols (RTCP)	2002-01-06 Reaffirmed
AS4290	Validation Test Plan for AS4074 Linear Token Passing Multiplex Data Bus	2002-01-06 Reaffirmed
AIR4289	Handbook for the SAE AS4075 High Speed Ring Bus Standard	2002-01-06 Reaffirmed
ARD50008	Logical Address Allocation and Recommendations	2002-01-06 Reaffirmed
AS4074/1	Type F-1 Fiber Optic Media Interface Characteristics	2001-10-01 Reaffirmed
AS4074/3	Type E-1 Electrical Media Interface Characteristics	2001-10-01 Reaffirmed
AS4074/2	Type F-2 Fiber Optic Media Interface Characteristics	2001-10-01 Reaffirmed
AIR5428	Utility System Characterization, An Overview	2000-09-01 Issued

2.4.4.3. Status

Work in progress for the Aircraft Systems & Systems Integration Committee is shown in Table 22.

Table 22. Standards in Development

Document	Title
AIR4013B	Multiplex Data Bus Networks for Mil-Std-1760 Stores
AIR4474	Interconnect Networks – Terms And Definitions
AIR5591	Use of Installed AS15531 Data Bus Networks at Over-Clocked Bit Rates
AIR5610	Enhanced Bit Rate Digital Time Division Command/Response Multiplex Data Bus 10 Megabit/sec Network Configuration
AIR5788	CLAR Truth Data Generator Interface Control
AS47642	Validation Methods for Mil-Std-1760C Aircraft Station Interfaces
AS5609	Aircraft/Store Common Interface Control Document Format Standard

2.4.4.4. Applicability to ACAST

The security and 1553 data bus standards might be applicable to MMDA products.

2.4.4.5. Points of Contact

The points of contact are:

- Aerospace Avionic Systems Division Chair
  Doug Gregory
  General Dynamics Corporation

- Staff Engineer
  Frank Bokulich
  (724) 772-7516
  fbokulich@sae.org

- SAE Aerospace Standards Specialist
  Becky Lemon
  lemon@sae.org

2.4.5. Embedded Computing Systems, Committee AS-2

The Embedded Computing Systems Committee, AS-2 is part of the Aerospace Avionic Systems Division. The committee has three subcommittees. They are the:

- Generic Open Architecture Subcommittee (AS-2A)
- Operating System Application Program Interface Subcommittee (AS-2B)
- Avionics Architecture Description Language Subcommittee (AS-2C).

2.4.5.1. Committee Charter or Goals

The Embedded Computing Systems Committee, AS-2, addresses the philosophy, requirements, definitions, and user issues associated with embedded computing systems. This includes open architecture instruction set architectures (ISAs) implementation technologies, standards and verification, internal interfaces and partitioning, software support systems and tools, fault tolerance, security, and multi-processor concepts.

2.4.5.2. Standard

Recent standards from the Embedded Computing Systems Committee are shown in Table 23.

Table 23. Recent Embedded Computing Systems Committee Standards

Document	Title	Date/Status
AIR5315	Overview and Rationale for GOA Framework Standard	1998-04-01 Issued
ARD5296	Requirements for the Avionics Architecture Description Language (AADL)	2002-10-30 Issued
AS4893	Generic Open Architecture (GOA) Framework	2002-10-31 Reaffirmed

2.4.5.3. Status

Work in progress for the Embedded Computing Systems Committee is shown in Table 24.

Table 24. Work in Progress Embedded Computing Systems Committee Standards

Document	Title
AIR5314	Introduction to GOA Family of Document Set
AIR5614	Avionics Operating System Application Program Interface Requirements
AIR5616	Generic Open Architecture (GOA) Preferred Standards for Avionics Domain
AIR5617	Generic Open Architecture (GOA) Rationale and Overview of Preferred Standards for Avionics Domain
AIR5618	Generic Open Architecture (GOA) Guidance Document for Avionics Domain
ARD5441	Avionics Operating System Application Program Interface (API) Guidance Document

Table 24. Work in Progress Embedded Computing Systems Committee Standards

Document	Title
ARD5442	Avionics Operating System Application Program Interface (API)Requirements Delta Document
AS5506	Architecture Analysis and Design Language (AADL)

2.4.5.4. Applicability to ACAST

The embedded computing system standards developed by the Embedded Computing Systems Committee should impact the development of MMDA products.

2.4.5.5. Points of Contact

The points of contact are:

- Aerospace Avionic Systems Division Chair
  Doug Gregory
  General Dynamics Corporation

- Staff Engineer
  Frank Bokulich
  (724) 772-7516
  fbokulich@sae.org

- SAE Aerospace Standards Specialist
  Becky Lemon
  lemon@sae.org

2.5. American Institute of Aeronautics and Astronautics

For more than 65 years, the American Institute of Aeronautics and Astronautics (AIAA) and its predecessors, has been the principal society of the aerospace engineer and scientist. Officially formed in 1963 through a merger of the American Rocket Society (ARS) and the Institute of Aerospace Sciences (IAS), the purpose was, and still is, "to advance the arts, sciences, and technology of aeronautics and astronautics, and to promote the professionalism of those engaged in these pursuits." Both ARS and IAS brought to the relationship a long and eventful history - stretching back to 1930 and 1932, respectively - and each left its mark on the Institute. The merger combined the imaginative, opportunistic, and risk-taking desire of those rocket, missile, and space professionals with the more established, well-recognized achievers from the aviation community.

Today, with more than 31,000 members, AIAA is the world's largest professional society devoted to the progress of engineering and science in aviation, space, and defense. The Institute continues to be the principal voice, information resource, and publisher for aerospace engineers, scientists, managers, policymakers, students, and educators.

Over the past 65 years, AIAA and its predecessor organizations have published more than 350 books and 250,000 technical papers. Current publications include six journals, two magazines, more than 40 standards, an increasing number of electronic products, and a Web site.

2.5.1. AIAA Standards Program

The purpose of the AIAA Standards Program is to support the continued enhancement of aerospace industry-wide efficiency and productivity. This will be achieved by the development of engineering and technical standards documents where a need has been identified.

The AIAA Standards Program consists of the development, publication, and maintenance of engineering and technical standards and related documents. The technical scope of these standards documents covers all areas of interest to AIAA Technical Committees. This includes systems, components, materials, products, technologies, methods and practices in aerospace applications. Standards cover such topics as human factors, safety, design, testing, construction, maintenance, performance, environment, operation of aerospace devices, equipment, and systems.

There are four types of published standards documents. They are:

- Guides
- Recommended Practices
- Standards
- Special Project Reports

AIAA cooperates and coordinates with other standards bodies worldwide in the technical areas within the scope of the AIAA Standards Program.

AIAA Technical Committees

The AIAA Technical Committees are shown in Table 25.

Table 25. AIAA Technical Committees

Committee Group / Technical Committee	
Aerospace Sciences Group	
	Aerodynamic Decelerator Systems
	Astrodynamics
	Atmospheric Flight Mechanics

Table 25. AIAA Technical Committees

Committee Group / Technical Committee	
	Atmospheric & Space Environments
	Computational Fluid Dynamics
	Guidance, Navigation, & Control
	Life Sciences & Systems
Information and Logistics Group	
	Intelligence Systems
	Software Systems
Propulsion Group	
	Electric Propulsion
	Hydrogen
	Liquid Propellants
	Solid Rockets
Space Systems Group	
	Communication Satellites
	Orbital Debris
	Serviceable Spacecraft
	Space Automation & Robotics
	Space Launch Systems
	Space Operations and Support
Structures, Design, and Test Group	
	Design Engineering
	Ground Test
	Materials
	Reliability
	Space Electronics
	Structures

There is only one committee that develops MMDA related standards. It is the Software Systems Technical Committee.

2.5.2. Software Systems Technical Committee

The Software Systems Technical Committee (SSTC) was established in May 1981 to address issues associated with the software used in aerospace applications. Through technical discussions and development of "Technical Practice" documents, the SSTC seeks to benefit the aerospace software engineering community by providing a forum for technical exchange along with practical guidance and recommended techniques.

2.5.2.1. Committee Charter or Goals

The charter of the Software Systems Technical Committee is to address those issues that are most critical to aerospace software development, productivity, reliability, maintainability, cost, and effectiveness, and to provide a means through which the AIAA can provide meaningful input to proposed software standards, directives and guidelines. The SSTC provides technical assistance to other AIAA Technical Committees (TCs) and the AIAA community in general regarding software engineering issues.

2.5.2.2. Status

According to the AIAA website for this committee, the committee has not met since February 2002 and does not indicate any current or planned future meetings. The committee's latest document, "COTS Suitability", was published in April 2002.

2.5.2.3. Applicability to ACAST

This committee could be relevant to ACAST development efforts if it is revived.

2.5.2.4. Points of Contact

The Chairman of the Software Systems Technical Committee is:

- Shawn Rahmani
  Boeing Space & Communications Group
  (714) 372-9978 (Voice)
  (714) 372-0123 (Fax)
  shawn.rahmani@Boeing.com

2.6. Institute for Electrical and Electronic Engineers

The Institute for Electrical and Electronic Engineers (IEEE) Standards Association, a globally recognized standards-setting body, which develops consensus standards through an open process that brings diverse parts of an industry together. These standards set specifications and procedures to ensure that products and services perform as intended. The IEEE-SA has a portfolio of more than 870 completed standards and more than 400 standards in development.

Over 15,000 IEEE members worldwide belong to IEEE-SA and voluntarily participate in standards activities.

IEEE Portable Application Standards Committee's (PASC) P1003.21 working group, as part of the PASC Distributed Services activities, is developing standard interfaces to real-time distributed communications.

2.6.1. IEEE Committees

The committees that can be identified from the IEEE website are shown in Table 26.

Table 26. IEEE Committees

Committee Group / Committee	
Aerospace Electronics	
	Gyro and Accelerometer
Broadcast Technology	
	Video Compression (Digital) Measurement (P1486)
	Video Distribution and Processing (P205)
Components and Materials	
	Organic and Molecular Transistors and Materials (P1620)
	Nanotechnology (P1650)
Electromagnetics	
	Electromagnetic Compatibility
	Electromagnetic Fields Exposure (SCC28)
	Product Performance Safety (Wireless Handset SAR Certification)
Information Technology	
	AI-ESTATE (P1232)
	Architectural Description (P1471)
	ATLAS (Abbreviated Test Language for All Systems)
	Learning Technology (P1484)
	Delay and Power Calculation (P1481)
	Embedded Core Test (P1500)
	Floating-Point Arithmetic (P754)
	Heterogeneous InterConnect (HIC) IEEE Std. 1355-1995
	High Level Architecture (HLA) (P1516, P1516.1, P1516.2)
	High Performance Serial Bus Bridges (P1394.1)
	LAN/MAN (P802)

Table 26. IEEE Committees

Committee Group / Committee	
	Mixed-Signal Test Bus (1149.4)
	Microprocessor Standards
	Portable Applications Standards Committee
	Programmable Devices: Boundary-Scan-based In System Configuration (P1532)
	Public-Key Cryptography (P1363)
	Software Engineering Standards
	Standard Test Interface Language (P1450)
	Storage Systems (P1244, P1563)
	Test and Diagnosis for Electronic Systems (SCC20)
	VHDL - Analog and Mixed-Signal Extensions (P1076.1)
	Year 2000
Instrumentation & Measurement	
	Analog to Digital Converters (P1241)
	Automated Test Systems and Instrumentation
	Digitizing Waveform Recorders (P1057)
	Pulse Measurement and Analysis by Objective Techniques (P181)
	Wireless Transducer Interface for Sensors and Actuators (P1451.5)
Medical Device Communications	
	MIB (Medical Information Bus)
National Electrical Safety Code	
	NESC®
Portable Battery Technology	
	Rechargeable Batteries for Mobile Computers
Power Electronics	
	Electronic Power Subsystems (P1515)
	Power Electronics Module Interface (P1461)
Power & Energy	
	Arc Flash Hazard Calculations (P1584)
	Capacitors
	Custom Power (P1409)
	Distributed Resources Interconnected with Electric Power Systems (P1547)

Table 26. IEEE Committees

Committee Group / Committee	
	Electric Motors - Application in Class I Division 2 (P1349)
	Electric Power System Compatibility with Electronic Process Equipment (P1346)
	Electrical Systems in Commercial Buildings (P241)
	Electric Network Control Systems
	Emergency and Standby Power (P446)
	Energy Management in Commercial and Industrial Facilities (P739)
	Fuel Cells, Photovoltaics, Dispersed Generation and Energy Storage (SCC21)
	Industrial Applications - Textile, Fiber, & Film
	Low-Voltage Circuit Breakers used in Industrial and Commercial Power Systems (P1015)
	Maintenance, Operation, and Safety of Industrial and Commercial Power Systems (P902)
	Nuclear Power Engineering
	Power Quality - Data Interchange (P1159.3)
	Power Quality - Definitions (P1433)
	Power Quality - Event Characterization (P1159.2)
	Power Quality - Event Characterization: Data Acquisition (P1159.1)
	Power Quality - Harmonics Working Groups and Task Forces
	Power Quality - Monitoring Electric Power Quality (P1159)
	Power Quality - Standards Coordinating Committee SCC22
	Power Quality - Voltage Flicker (P1453)
	Power Quality - Voltage Sag Indices
	Power Systems - Harmonic Control (P519)
	Power Systems Engineering
	Stationary Batteries
	Substation Communication Test Scenarios (C37.115)
	Substation Automation Communications (P1525)
	Surge Protective Devices
	Synchronous Generators (C50.1X)
	Transmission & Distribution
	Transformers
Quantities, Units, and Letter Symbols	
	Letter Symbols for Units of Measurements

Table 26. IEEE Committees

Committee Group / Committee	
	International System of Units (SI)
Reliability	
	Reliability Standards
Terms and Definitions	
	IEEE Dictionary (SCC10)
Transportation Technology	
	Dedicated Short Range Communications (DSRC)
	Intelligent Transportation Systems (ITS) (SCC32)
	Motor Vehicle Event Data Recorders (MVEDRs) (P1616)
	Rail Transit Vehicle Interface
Voting System Engineering	
	Voting System Standards (SCC38)
	Voting Equipment (P1583)

There is only one committee identified in Table 26 that develops MMDA related standards. It is the Portable Applications Standards Committee.

2.6.2. Portable Applications Standards Committee (PASC)

The Portable Application Standards Committee (IEEE PASC) was formerly known as the Technical Committee on Operating Systems. PASC is chartered with defining standard application service interfaces - most notably those in the **P**ortable **O**perating **S**ystem **I**nterface (POSIX) family.

POSIX is a registered trademark of the IEEE. It is expected to be pronounced pahz-icks, as in positive, not poh-six, or other variations. The pronunciation has been published in an attempt to promulgate a standardized way of referring to a standard operating system interface. Although originated to refer to the original IEEE Std 1003.1-1988, the name POSIX more correctly refers to a family of related standards: IEEE Std 1003.*n* (where *n* is a number) and the parts of ISO/IEC 9945. The term POSIX was originally used as a synonym for IEEE Std 1003.1-1988. POSIX.1 is the preferred term for that standard. This maintained the advantages of readability of the symbol “POSIX" without being ambiguous with the POSIX family of standards. The latest version of the POSIX.1 standard is IEEE Std 1003.1, 2003 Edition. It was developed by the Austin Group (see below).

POSIX is an Operating System interface standardized by ISO/IEC, IEEE and The Open Group. POSIX is evolving into the Single UNIX Specification.

Austin Common Standards Revision Group (CSRG)

The Austin Common Standards Revision Group (CSRG) is a joint technical working group established to develop and maintain the latest version of the 1003.1 standard, which combined and revised ISO/IEC 9945-1,1996 edition, ISO/IEC 9945-2, 1993 Edition, IEEE Std 1003.1,1996 edition, IEEE Std 1003.2, 1992 edition and the appropriate parts of the Single UNIX Specification.

2.6.2.1. Committee Charter or Goals

The charter of the Portable Applications Standards Committee is to develop the POSIX family of standards.

2.6.2.2. Standard

There are a number of versions of the POSIX standard. All have the identifying number of 1003.1. The title includes Standard for Information Technology - Portable Operating System Interface (POSIX).

Document Acquisition

Many have expressed a desire to obtain electronic copies of standards or drafts. Currently, IEEE policy prohibits making such copies freely available. Electronic copies are available to those working in IEEE-sponsored or ISO-sponsored working groups for the purpose of developing or approving standards.

Both POSIX drafts and completed POSIX standards can be obtained from the either the IEEE Standards Department or from the IEEE Computer Society. The prices for these can vary depending upon the item being ordered, from which of the two organizations you order, and your membership status in that organization. IEEE standards can be ordered on line at http://shop.ieee.org/store/.

2.6.2.3. Status

1003.1-2001 is currently approved for Publication of IEEE. The IEEE and The Open Group launched on November 3, 2003 a new program to certify products to the 2003 edition of IEEE 1003.1™-2001, Standard for Information Technology - Portable Operating System Interface (POSIX), which incorporates the IEEE 1003.1 Corrigendum.

Under the *POSIX: Certified by the IEEE and The Open Group Program*, suppliers can substantiate claims of conformance to POSIX based on defined test suites so buyers gain assurance that products they specify and procure meet the standard and are warranted by the vendor to do so. POSIX certification complements certifications for other products that draw on the POSIX standard, such as those for the UNIX® system, the COE Platform and LSB™.

The POSIX certification program is a voluntary program, but is required of suppliers who wish to use the POSIX trademark. POSIX certification is open to any product meeting the conformance requirements and is not restricted to any particular operating system implementation. The program includes a product standard for each type of product that can be certified within the POSIX Certification Program. In this initial iteration of the certification program these are as follows:

- *1003.1-2003 Base Product Standard:* This is a profile product standard that comprises the mandatory functionality from IEEE Std 1003.1™, 2003 Edition. It is comprised of two component product standards.

- *1003.1™-2003 System Interfaces Product Standard*: This is a component product standard for the mandatory system interfaces and headers related functionality from IEEE Std 1003.1™ .

- *1003.1™-2003 Shell and Utilities Product Standard:* This is a component product standard for the mandatory shell and utilities related functionality from IEEE Std 1003.1™.

A product can be certified against one or more product standards and the program allows for two levels of certification: Platform Specific Certification, which applies to a single defined hardware and software environment, and Product Family Certification, which applies to all members of a binary-compatible family.

The 2003 edition of IEEE 1003.1 was developed by the Austin Group, a joint working group of the IEEE, The Open Group and ISO/IEC JTC1/SC22/WG15. It includes IEEE 1003.1-2001 and IEEE 1003.1-2001/Cor 1-2002. This edition replaces IEEE 1003.1-1996, IEEE Standard for POSIX--Part 1: System Application: Program Interface (API) [C Language], and IEEE 1003.2-1992, IEEE Standard for POSIX--Part 2. The 2003 edition is also simultaneously referred to as ISO/IEC 9945:2003 and The Open Group Technical Standard Base Specifications Issue 6.

2.6.2.4. Applicability to ACAST

It is likely that some MMDA products will use the OMG Software Communications Architecture. POSIX provides the operating system component of that architecture.

2.6.2.5. Points of Contact

Contact information for key PASC personnel is:

- Chairman: Lowell Johnson
  Unisys
  167 32nd Ave. NW
  New Brighton, MN 55112
  (651) 635-7305 (Voice)

(651) 635-7990 (Fax)
l.johnson(@)pasc.org

- Vice Chairman: Joe Gwinn
  Raytheon
  528 Boston Post Rd.
  Sudbury, MA 01776
  (978) 440-3330 (Voice)
  (978) 440-3544 (Fax)
  j.gwinn(@)pasc.org

2.7. Other Organizations

A number of other national and international organizations were reviewed for applicability in developing standards relevant to MMDA, software-defined and/or software reconfigurable avionics capabilities, technologies, and/or certification methodologies. Two organizations that might come to mind are the American National Standards Institute (ANSI) and the General Aviation Manufacturers Association (GAMA). However, a review of the charter and operation of these organizations indicated that they do not develop standards internally. A short review of each is presented below.

2.7.1. American National Standards Institute

ANSI facilitates the development of American National Standards (ANS) by accrediting the procedures of standards developing organizations (SDOs). These groups work cooperatively to develop voluntary national consensus standards. Accreditation by ANSI signifies that the procedures used by the standards body in connection with the development of American National Standards meet the Institute's essential requirements for openness, balance, consensus and due process.

ANSI is often asked about the total number of standards (and standards setting bodies) in the United States. It is estimated that in the U.S. today there are hundreds of "traditional" standards developing organizations - with the 20 largest SDOs producing 90% of the standards - and hundreds more "non-traditional" standards development bodies, such as consortia. This means that the level of U.S. participation is quite expansive as the groups themselves are comprised of individual committees made up of experts addressing the technical requirements of standards within their specific area of expertise.

At year-end 2003, about 200 of these standards developers were accredited by ANSI; there were more than 10,000 American National Standards (ANS).

2.7.2. General Aviation Manufacturers Association

GAMA is not directly applicable to ACAST as it is not a standards-making body. GAMA committees formulate policies for representation of their own business interests at standards body's committees.

While not directly applicable to ACAST, the work of some of the GAMA committees and subcommittees work might be noteworthy:

- The Technical Policy Committee (TPC) is a standing committee which serves as the authoritative organization for developing and implementing technical policies pertaining to general aviation products and components. The TPC works closely with FAA executive management to develop and implement strategic objectives related to aviation product design, certification and continued airworthiness. This committee is actively involved in FAA, Joint Aviation Authorities (JAA) and ICAO activities related to airworthiness standards, certification processes, technology, environmental issues, harmonization, as well as a broad scope of regulatory issues.

- TPC oversees a subcommittee on Avionics and forms various ad hoc committees to address specific issues. TPC representatives are senior company management personnel responsible for engineering and certification who can make strategic decisions and commit company resources on behalf of the industry.

- The Avionics and Electronic Systems Subcommittee of the Technical Policy Committee considers events and issues in all areas broadly classified as avionics and generally pertaining to equipment certification, installation, and approval. This committee works closely with the FAA, Federal Communications Commission (FCC), foreign certification authorities and RTCA in the development of regulations, policy, guidance and industry standards related to avionics and electronic systems.

3. RECOMMENDATIONS

As an ACAST subproject, the MMDA project will involve the development of avionics and software products that will yield a benefit to users of the National Airspace System. Although the products developed under the MMDA project will not go beyond the prototype stage of development, they should be developed in such a way that they have a path to being certified in the future. As a result, GRC personnel need to keep abreast of the MMDA technologies being developed and the evolving requirements to certify new products that use those technologies. Participating in relevant standards bodies is one step in the process of remaining current.

GRC's intent is to use the assessments performed under this task to identify the role NASA can uniquely assume to help:

- Leverage and advance the state of the art in avionics technology
- Reduce the cost, size and power consumption of commercial avionics
- Improve the flexibility and capability of avionics to interoperate with existing and future international standards
- Reduce the time and cost to initially certify and potentially re-certify aircraft with software-defined avionics in the future.

The material in Section 2 should be analyzed by GRC to determine the standard bodies and committees with which they should participate. The analysis and recommendations in this section is intended to help GRC's decision process.

Each of the committees is listed in a table and a recommended level of involvement assigned. The levels assigned are high, medium and low. The levels are assigned based upon the applicability of the committee to an MMDA project, the level of applicability, and the activity level of the committee. A general description of the criteria used follows:

- High Level of Involvement: The committee is addressing technologies and procedures that are state-of-the-art and directly impact MMDA product design. The committee is active and GRC's participation could have an impact on the composition of the standards.
- Medium Level of Involvement: The committee is addressing more stable technologies that can either directly or indirectly impact the design of MMDA products. The committee is active and GRC's participation could have some impact on the standards.
- Low Level of Involvement: The committee is addressing basic technologies and GRC probably would not have an impact on the standards. An example is the POSIX standard. A dormant committee, or one that will soon terminate, falls in this category. The ARINC 629 Users Group and AIAA Software Systems Technical Committee are examples of dormant committees. RTCA's Modular Avionics committee (SC-200) was ranked low

because its work should be completed by October 2004, after which the committee will probably be dissolved.

Table 27 presents the results of our analysis. It contains the recommended participation level for each committee and an overall priority estimate. The committees are organized in table in the same order is which they are presented in this report. Table 28 contains the same information, but is sorted by recommended priority.

Table 27. Recommended GRC Involvement Ranking - In Survey Presentation Order

Involvement	Priority	Committee
L	15	RTCA: SC-200 – Modular Avionics
M	10	RTCA: Potential Special Committee on Software Certification
H	6	AEEC: Systems Architecture and Interfaces Subcommittee
H	4	AEEC: Application/Executive (APEX) Working Group
L	16	AEEC: ARINC 629 Users Group
L	11	AEEC: Cockpit Display Systems Interfaces Working Group
M	9	AEEC: Joint GPS/XLS Subcommittee
H	5	AEEC: Surveillance Working Group
H	2	OMG: Middle and Related Services Platform Task Force
H	3	OMG: Real-time, Embedded, and Specialized Systems Platform Task Force
H	1	OMG: Software-Based Communications Domain Task Force
L	13	OMG: Transportation Domain Task Force
L	12	SAE: Aircraft Instruments, Committee A-4
M	7	SAE: Aircraft Systems & Systems Integration, Committee AS-1
M	8	SAE: Embedded Computing Systems, Committee AS-2
L	17	AIAA: Software Systems Technical Committee
L	14	IEEE: Portable Applications Standards Committee (PASC)

Table 28. Recommended GRC Involvement Ranking - In Priority Order

Involvement	Priority	Committee
H	1	OMG: Software-Based Communications Domain Task Force
H	2	OMG: Middle and Related Services Platform Task Force
H	3	OMG: Real-time, Embedded, and Specialized Systems Platform Task Force
H	4	AEEC: Application/Executive (APEX) Working Group
H	5	AEEC: Surveillance Working Group
H	6	AEEC: Systems Architecture and Interfaces Subcommittee
M	7	SAE: Aircraft Systems & Systems Integration, Committee AS-1
M	8	SAE: Embedded Computing Systems, Committee AS-2
M	9	AEEC: Joint GPS/XLS Subcommittee
M	10	RTCA: Potential Special Committee on Software Certification
L	11	AEEC: Cockpit Display Systems Interfaces Working Group
L	12	SAE: Aircraft Instruments, Committee A-4
L	13	OMG: Transportation Domain Task Force
L	14	IEEE: Portable Applications Standards Committee (PASC)
L	15	RTCA: SC-200 – Modular Avionics
L	16	AEEC: ARINC 629 Users Group
L	17	AIAA: Software Systems Technical Committee

4. STANDARDS SUGGESTED FOR CONSIDERATION

The standards that the MAI team suggests be considered when developing MMDA related development contracts are shown in Table 29. Since we don't know the devices that will be developed in the ACAST project, we erred on the side of inclusion when deciding what standards might be appropriate.

As was mentioned in the Introduction, the word "considered" was chosen carefully. We do not believe these standards should be mandated in a contract that covers the development of a prototype, nor that they should disproportionately steer development or limit innovation in MMDA research. Rather, these standards provide a snapshot of industry activity on current commercial systems. They should be considered by the prototype developers in that context.

Table 29. Standards Suggested for Consideration

No.	Standard
RTCA	
DO-278	Guidelines For Communication, Navigation, Surveillance, and Air Traffic Management (CNS/ATM) Systems Software Integrity Assurance
DO-264	Guidelines for Approval of the Provision and Use of Air Traffic Services Supported by Data Communications
DO-254	Design Assurance Guidance for Airborne Electronic Hardware
DO-248B	Final Annual Report For Clarification Of DO-178B "Software Considerations In Airborne Systems And Equipment Certification"
DO-178B	Software Considerations in Airborne Systems and Equipment Certification
	RTCA Task Force 4 Certification
DO-XXX / ED-YYY	Design Guidance and Certification Considerations for Integrated Modular Avionics (IMA)
AEEC	
ARINC 607-3	607-3 Design Guidance for Avionics Equipment
ARINC 629 Part 1-5	629 Part 1-5 - Multi-Transmitter Data Bus, Part 1-Technical Description
ARINC 629 Part 2-2	629 Part 2-2 Multi-Transmitter Data Bus, Part 2-Application Guide
ARINC 652	652 Guidance for Avionics Software Management
ARINC 653-1	653-1 Avionics Application Software Standard Interface
ARINC 654	654 Environmental Design Guidelines for Integrated Modular Avionics
ARINC 664P1	664P1 Aircraft Data Network, Part 1, Systems Concepts and Overview
ARINC 664P2	664P2 Aircraft Data Networks, Part 2, Ethernet Physical and Data-Link Layer Specification
ARINC 664P3	664P3 - Aircraft Data Network, Part 3, Internet Based Protocols and Services
ARINC 664P4	664P4 - Aircraft Data Network, Part 4, Internet Based Address Structures and Assigned Numbers

Table 29. Standards Suggested for Consideration

No.	Standard
ARINC 755-2	755-2 Multi-Mode Receiver (MMR) - Digital
ARINC 768	768 Integrated Surveillance System (ISS)
OMG	
formal/2002-12-02	Common Object Request Broker Architecture (CORBA/IIOP)
Chapter 24 of CORBA/IIOP 3.0.2	Common Secure Interoperability (CSIv2)
formal/2002-06-65	CORBA Component Model
formal/2002-03-13	CORBA-FTAM/FTP Interworking
formal/2001-01-01	CORBA / TC Interworking and SCCP-Inter ORB Protocol
formal/2003-11-02	CORBA-WSDL/SOAP Interworking
Chapter 23 of CORBA/IIOP 3.0.2	Fault Tolerance
ptc/2003-08-20	GIOP SCTP
formal/2000-08-01	Interworking between CORBA and TMN Systems
formal/2004-04-02	Wireless Access & Terminal Mobility in CORBA (Telecom Wireless)
formal/2004-04-01	WSDL/SOAP-CORBA Interworking
ptc/2003-07-07	Data Distribution
ptc/2003-03-05	Data Parallel Processing
ptc/2002-09-14	Real-Time CORBA (Dynamic Scheduling)
formal/2002-08-02	Real-Time CORBA (Static Scheduling)
ptc/2003-01-11	Unreliable Multicast
formal/2002-09-03	Additional Structuring Mechanisms for the OTS
formal/2002-08-03	Collection Service
formal/2000-06-14	Concurrency Service
formal/2002-05-07	Enhanced View of Time
formal/2001-03-01	Event Service
formal/2000-06-16	Externalization Service
formal/2002-09-01	Life Cycle Service
realtime/2003-10-03	Lightweight Services
formal/2001-06-03	Management of Event Domains
formal/2002-09-02	Naming Service
formal/2002-08-04	Notification Service

Table 29. Standards Suggested for Consideration

No.	Standard
dtc/2003-06-01	Notification / JMS Interworking
formal/2002-09-06	Persistent State Service
formal/2000-06-22	Property Service
formal/2000-06-23	Query Service
formal/2000-06-24	Relationship Service
formal/2002-03-11	Security Service
formal/2003-06-01	Telecoms Log Service
formal/2002-05-06	Time Service
formal/2000-06-27	Trading Object Service
formal/2003-09-02	Transaction Service
formal/2000-05-01	Air Traffic Control
formal/2003-03-62	Surveillance User Interface (Surveillance Manager)
formal/2002-12-01	Telecom Service & Access Subscription (TSAS)
	Security Protocol (SECP) 1.1: Platform Independent Specification, which is a specification of the SECP protocol message formats and state machine that is independent of the underlying transport protocol
	Specification for PIM and PSM for SWRADIO Components
SAE	
ARP4754	Certification Considerations for Highly-Integrated Or Complex Aircraft Systems
ARP4761	Guidelines and Methods for Conducting the Safety Assessment Process on Civil Airborne Systems and Equipment
AS8034A	Minimum Performance Standard for Airborne Multipurpose Electronic Displays
AIR4289	Handbook for the SAE AS4075 High Speed Ring Bus Standard
AIR5610	Enhanced Bit Rate Digital Time Division Command/Response Multiplex Data Bus 10 Megabit/sec Network Configuration
AS4893	Generic Open Architecture (GOA) Framework
AIR5614	Avionics Operating System Application Program Interface Requirements
AIR5617	Generic Open Architecture (GOA) Rationale and Overview of Preferred Standards for Avionics Domain
ARD5441	Avionics Operating System Application Program Interface (API) Guidance Document
AS5506	Architecture Analysis and Design Language (AADL)
IEEE	
1003.1-2001	Standard for Information Technology - Portable Operating System Interface (POSIX).

APPENDIX A: Acronyms

Acronym	Meaning
AADL	Avionics Architecture Description Language
AAQG	American Aerospace Quality Group
AC	Advisory Circular
ACAS	Alert and Collision Avoidance System
ACAST	Advanced Communications, Navigation and Surveillance Architectures and System Technologies
ADS-B	Automatic Dependent Surveillance – Broadcast
ADTF	Analysis and Design Task Force
AECMA	European Association of Aerospace Equipment Manufacturers
AEEC	Airlines Electronic Engineering Committee
AIA	Aerospace Industries Association
AIAA	American Institute of Aeronautics and Astronautics
AIC	Aeronautical Information Circular
AMEC	Aerospace Metals Engineering Committee
AMJ	Advisory Material Joint
ANS	American National Standards
ANSI	American National Standards Institute
APEX	Application/Executive
API	Application Program Interface
AR/AP	Accounts Receivable/Accounts Payable
ARS	American Rocket Society
ATA	Air Transport Association
ATC	Air Traffic Control
ATCRBS	Air Traffic Control Transponder
ATM	Air Traffic Management
AWS	American Welding Society
BC	Business Committee
BIU	Bus Interface Units
BPRI	Business Process Runtime Interface
CACRC	Commercial Aircraft Composite Repair Committee
CAD	Computer Aided Design
CARERI	Chinese Aeronautical Radio Electronics Research Institute
CCA	Component Collaboration Architecture
CCM	CORBA Component Model
CDS	Cockpit Display
CLAR	Common Launch Acceptability Region
CNS	Communications, Navigation and Surveillance
CORBA	Common Object Request Broker Architecture
COS	Common Object Services
COTS	Commercial Off-the-Shelf
CSRG	Common Standards Revision Group

APPENDIX A: Acronyms

Acronym	Meaning
DAIS	Data Acquisition from Industrial Systems
DDS	Data Distribution Service
DME	Distance Measuring Equipment
DoD	Department of Defense
DSIG	Domain Special Interest Group
DTC	Domain Technology Committee
DTF	Domain Task Force
EAI	Enterprise Application Integration
EDOC	Enterprise Distributed Object Computing
EUROCAE	European Organisation for Civil Aviation Equipment
FAA	Federal Aviation Administration
FMC	Flight Management Computer
FRAC	Final Review And Comment
FTF	Finalization Task Force
GASIF	Generic Aircraft-Store Interface Framework
GAMA	General Aviation Manufacturers Association
GBAS	Ground Based Augmentation Systems
GIOP	General Inter-ORB Protocol
GNLU	Global Navigation and Landing Unit
GNSS	Global Navigation Satellite System
GOA	Generic Open Architecture
GOAA	General Open Avionics Architecture
GPS	Global Positioning System
GRC	Glenn Research Center
HDAIS	Historical Data Access from Industrial Systems
HF	High frequency
HLA	High Level Architecture
HOL	High-Order Language
HUD	Head-Up Display
IAS	Institute of Aerospace Sciences
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
ICT	Information and Communication Technologies
IDL	Interface Definition Language
IEC	International Electrotechnical Commission
IEEE	Institute for Electrical and Electronic Engineers
IIOP	Internet Inter-ORB Protocol

APPENDIX A: Acronyms

Acronym	Meaning
ILS	Instrumented Landing System
IMA	Integrated Modular Avionics
ISA	Instruction Set Architecture
ISO	International Standards Organization
ISS	Integrated Surveillance System
IT	Information Technology
JAA	Joint Aviation Authorities
JPO	Joint Program Office
JTC	Joint Technical Committee
JTRS	Joint Tactical Radio System
LOI	Letter of Intent
LTPB	Linear, Token-passing, Bus
MAI	Mulkerin Associates Inc.
MARS	Middleware and Related Services
MDA	Model Driven Architecture
MLS	Microwave Landing System
MMDA	Multi-function, Multi-mode Digital Avionics
MMR	Multi-Mode Receiver
MOF	Meta-object Facility
MOPS	Minimum Operational Performance Standards
NAP	Network Architecture Philosophy
NASA	National Aeronautics & Space Administration
OEP	Operational Evolution Plan
OMG	Object Management Group
ORB	Object Request Broker
O/S	Operating System
OSI	Open Systems Interconnection
PAS	Portable Application Standards
PASC	Portable Application Standards Committee
PDU	Packet Data Unit
PIM	Platform Independent Model
PMC	Program Management Committee
POSIX	Portable Operating System Interface
PSIG	Platform Special Interest Group
PSM	Platform Specific Model
PTF	Platform Task Force
PTC	Platform Technology Committee

APPENDIX A: Acronyms

Acronym	Meaning
QoS	Quality of Service
RFP	Request for Proposal
RT	Remote Terminal
RTCA	RTCA, Inc. (formerly Radio Technical Commission for Aeronautics)
RTCP	Real-Time Communication Protocols
RTESS	Real Time, Embedded and Specialized Systems
RTF	Revision Task Force
RTMT	Real Time Model Task
SAE	Society of Automotive Engineers
SAI	Systems Architecture and Interfaces
SAP	Service Access Points
SBAS	Satellite Based Augmentation Systems
SC	Special Committee
SCA	Software Communications Architecture
SCTP	Stream Control Transmission Protocol
SDO	Standards Developing Organizations
SDU	Service Data Unit
SDRF	Software Defined Radio Forum
SGD	Symbol Graphical Definition
SIG	Special Interest Group
SOAP	Simple Object Access Protocol
SSTC	Software Systems Technical Committee
STC	Supplemental Type Certificate
S-TIF	Sensor Traffic Information File
TAG	Technical Advisory Group
TAR	Technology Assessment Reports
TAWS	Terrain Awareness and Warning System
TC	Technical Committee
TC	Type Certificate
TPC	Technical Policy Committee
TSO	Technical Standard Order
TSU	Traffic Surveillance Unit
TTP	Time Triggered Protocol
UCL	Universal Communications Language
UML	Unified Modeling Language
VDL	VHF Digital Link
VHF	Very High Frequency

APPENDIX A: Acronyms

Acronym	Meaning
WG	Working Group
WSDL	Web Services Definition/Description Language
WSEC	Web Services for Enterprise Collaboration
WXR	Weather Radar
XML	Extensible Markup Language
XTCE	XML Telemetric and Command Data Exchange