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**Aerospace — Standards for electronic
instruments and systems**

**Aéronautique et espace — Normes
d'instruments et de systèmes électroniques**



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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The main task of ISO technical committees is to prepare International Standards. In exceptional circumstances a technical committee may propose the publication of a technical report of one of the following types:

- type 1, when the necessary support within the technical committee cannot be obtained for the publication of an International Standard, despite repeated efforts;
- type 2, when the subject is still under technical development requiring wider exposure;
- type 3, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example).

Technical reports are accepted for publication directly by ISO Council. Technical reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

ISO/TR 10201, which is a technical report of type 3, was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*.

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Avant-propos

L'ISO (Organisation internationale de normalisation) est une fédération mondiale d'organismes nationaux de normalisation (comités membres de l'ISO). L'élaboration des Normes internationales est en général confiée aux comités techniques de l'ISO. Chaque comité membre intéressé par une étude a le droit de faire partie du comité technique créé à cet effet. Les organisations internationales, gouvernementales et non gouvernementales, en liaison avec l'ISO participent également aux travaux. L'ISO collabore étroitement avec la Commission électrotechnique internationale (CEI) en ce qui concerne la normalisation électrotechnique.

La tâche principale des comités techniques de l'ISO est d'élaborer les Normes internationales. Exceptionnellement, un comité technique peut proposer la publication d'un rapport technique de l'un des types suivants:

- type 1: lorsque, en dépit de maints efforts au sein d'un comité technique, l'accord requis ne peut être réalisé en faveur de la publication d'une Norme internationale;
- type 2: lorsque le sujet en question est encore en cours de développement technique et requiert une plus grande expérience;
- type 3: lorsqu'un comité technique a réuni des données de nature différente de celles qui sont normalement publiées comme Normes internationales (ceci pouvant comprendre des informations sur l'état de la technique, par exemple).

La publication des rapports techniques dépend directement de l'acceptation du Conseil de l'ISO. Les rapports techniques des types 1 et 2 font l'objet d'un nouvel examen trois ans au plus tard après leur publication afin de décider éventuellement de leur transformation en Normes internationales. Les rapports techniques du type 3 ne doivent pas nécessairement être révisés avant que les données fournies ne soient plus jugées valables ou utiles.

L'ISO/TR 10201, rapport technique du type 3, a été élaboré par le comité technique ISO/TC 20, *Aéronautique et espace*.

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Aerospace — Standards for electronic instruments and systems

Introduction

ISO/TC 20, *Aircraft and space vehicles*, established Working Group 2 to evaluate the status and future needs for standards in the field of aerospace electronic instruments and systems. One of the first tasks of WG 2 was to develop a comprehensive list of standards currently being used by countries which manufacture, operate, or regulate the operation and manufacture of aerospace products. This list can then serve as a basis for identifying voids and future needs for standards.

The list provided has been repeatedly circulated to TC 20 members and liaison organizations to obtain the most complete and current information, as well as an indication of how widely these standards are being applied.

Responses indicate that these standards have wide recognition and application by a majority of the countries most actively involved in the manufacture and operation of aircraft. TC 20 has also coordinated with international, regional and national standards bodies which are active in developing widely recognized avionics standards.

The list is divided into four categories:

- 1) Communications systems
- 2) Navigation and guidance systems
- 3) Flight management systems, cockpit controls/displays and instruments
- 4) Miscellaneous and general applications.

Each category comprises a list of the appropriate standards developed and issued by the various organizations.

The list is as complete and accurate as possible at this time. It is recognized, however, that this information will change. TC 20 therefore intends to update the list every eighteen months before the TC 20 plenary meetings.

Aéronautique et espace — Normes d'instruments et de systèmes électroniques

Introduction

Le comité technique ISO/TC 20, *Aéronautique et espace*, a créé un groupe de travail 2 pour dresser un état de la normalisation actuelle et des besoins futurs en matière d'instrumentation et de systèmes électroniques pour l'aéronautique et l'espace. L'une des premières tâches du GT 2 a été d'établir une liste complète des normes actuellement utilisées par les pays fabriquant ou exploitant les produits aéronautiques, ou réglementant leur fabrication et leur exploitation. Cette liste peut servir de base dans l'identification des manques et des besoins futurs en matière de normes.

La liste établie a été diffusée plusieurs fois aux membres du TC 20 et aux organismes avec lesquels ce comité entretient une liaison, de façon à la compléter et à la mettre à jour, d'une part, et à connaître également dans quelle mesure les normes sont mises en application, d'autre part.

Les réponses indiquent que ces normes sont bien connues et bien utilisées par une majorité des pays les plus activement impliqués dans la fabrication et l'exploitation des aéronefs. Le TC 20 a également coordonné ses travaux avec ceux des organismes internationaux, régionaux et nationaux s'occupant activement de la mise au point de normes d'électronique aérospatiale.

La liste est divisée en quatre catégories:

- 1) Systèmes de communication
- 2) Systèmes de navigation et de guidage
- 3) Systèmes de gestion de vol, commandes et consoles de visualisation au poste de pilotage et instrumentation
- 4) Divers et applications générales

Chaque catégorie comprend une liste des normes appropriées élaborées et publiées par les différents organismes.

La liste est aussi complète et aussi précise que possible à la date d'aujourd'hui. L'information ne cessant toutefois d'évoluer, le TC 20 a donc prévu de remettre la liste à jour dix-huit mois avant chaque réunion plénière du comité technique.

1 Communications systems Systèmes de communication

1.1 FAA

TSO-C57	Aircraft Headsets and Speakers
TSO-C58	Aircraft Microphones
TSO-C31c	High Frequency (HF) Radio Communication Transmitting Equipment operating with the radio frequency of 1.5 to 30 megacycles
TSO-C32c	High Frequency (HF) Radio Communication Receiving Equipment operating within the radio frequency range of 1.5 to 30 megacycles
TSO-C37b	VHF Radio Communications Transmitting Equipment operating within the radio frequency range of 118-136 megacycles
TSO-C38b	VHF Radio Communications Receiving Equipment operating within the radio frequency range of 118-136 megacycles
TSO-C50c	Audio Selector Panels and Amplifiers
TSO-C59	Airborne Selective Calling Equipment (for air carrier aircraft)
TSO-C91	Emergency Locator Transmitters

1.2 ARINC (AEEC)

412-64	Audio Systems
538B	Hand-Held Microphone
559A-2	Mark 2 Airborne HF/SSB
560	Airborne Passenger Address Amplifier
566A-7	Mark 3 VHF Transceiver
596-4	Mark 2 Airborne Selcal System
597-3	ARINC Communications Addressing and Reporting System
714-5	Airborne Selcal System
715-3	Airborne Passenger Address
716-5-83	Airborne VHF Communications Transceiver
719-5	HF Single Sideband System
724-6	Mark 2 ARINC Communications Addressing and Reporting System
724A	Mark 2 ARINC Communications Addressing and Reporting System
740	Multiple Input Cockpit Printer

1.3 RTCA

DO-136-68	Universal Air-Ground Digital Communication System Standards
DO-163-76	Minimum Performance Standards — Airborne High Frequency Radio Communications Transmitting and Receiving Equipment operating within the radio frequency of 1.5 to 30 megahertz
DO-169-79	VHF Air-Ground Communication Technology and Spectrum Utilization
DO-170-80	Audio Systems Characteristics and Minimum Performance Standards Aircraft Microphones (except carbon), Aircraft Headsets and Speakers, Aircraft Audio Selector Panels and Amplifiers
DO-186-84	Minimum Operational Performance Standards for Airborne Radio Communications Equipment operating within the radio frequency range of 117.975-137.000 MHz

1.4 EUROCAE

- 1/WG4/65 MPS for Radio Survival Beacons Functioning on VHF
- ED-18 Audio Systems Characteristics and MPS for Aircraft Microphones
- ED-23A MPS for Airborne VHF Communications Equipment operating in the frequency range 117.975-137.000 MHz
- ED-25 MPS for Experimental AEROSAT L-Band Avionics

1.5 SAE**1.6 IEEE****1.7 ICAO**

- 1 Annex 10 — Aeronautical Telecommunications, 1985, Amendments 1-65
- 2 Volume I, Part 1 — Equipment and Systems; Part 2 — Radio Frequencies
- 3 Volume II — Communications Procedures

1.8 ISO

2 Navigation and guidance systems
Systèmes de navigation et de guidage

2.1 FAA

- TSO-C34d ILS Glide Slope Receiving Equipment
- TSO-C35d Airborne Radio Marker Receiving Equipment
- TSO-C36c Airborne ILS Localizer Receiving Equipment
- TSO-C40a VOR Radio Receiving Equipment operating within the radio frequency range of 108-118 megacycles (for air carrier aircraft)
- TSO-C41c Airborne Radio Receiving and Direction Finding Equipment
- TSO-C60 Airborne Loran A Receiving Equipment operating within the radio frequency range of 1800-2000 kilocycles (for air carrier aircraft)
- TSO-C63b Airborne Weather Radar Equipment
- TSO-C65 Airborne Doppler Radar Ground Speed and/or Drift Angle Measuring Equipment (for air carrier aircraft)
- TSO-C66b Airborne Distance Measuring Equipment (for air carrier aircraft)
- TSO-C67 Airborne Radar Altimeter Equipment (for air carrier aircraft)
- TSO-C68 Airborne Automatic Dead Reckoning Computer Equipment utilizing aircraft heading and doppler-obtained ground speed and drift angle data (for air carrier aircraft)
- TSO-C74c Airborne ATC Transponder Equipment
- TSO-C87 Airborne Low Range Radio Altimeter
- TSO-C88 Automatic Pressure Altitude Digitizer Equipment
- TSO-C92b Ground Proximity Warning Glide Slope Deviation Alerting Equipment
- TSO-C93 Airborne Interim Standard Microwave Landing System Converter Equipment

TSO-C94	Airborne Omega Receiving Equipment
TSO-C104	MLS Airborne Receiving Equipment
TSO-C106	Air Data Computer Minimum Performance Standard

2.2 ARINC (AEEC)

424-7-85	Navigation System Data Base
537-57	High Range Pulse Altimeter
552A-72	Radio Altimeter
561-11-75	Air Transport Inertial Navigation System — INS
568-5-76	Mark 3 Airborne Distance Measuring Equipment
569-60	Heading and Attitude Sensor (HAS)
570-68	Airborne ADF System Mark 3
571-2-74	Inertial Sensor System (ISS)
572-1-71	Mark 2 Air Traffic Control Transponder
575-3-71	Mark 3 Subsonic Air Data System (Digital) DADS
576-69	Mark 4 Subsonic Air Data System (All Digital Outputs) DADS
577-1-75	Audible Warning System
578-3-74	Airborne ILS Receiver
579-1-71	Airborne VOR Receiver
580-76	Mark 1 Omega Navigation System
581-70	Mark 1 Air Transport Area Navigation System
582-5-74	Mark 2 Air Transport Area Navigation System
587-4-73	Air Transport Time Frequency Collision Avoidance System
594-3-79	Ground Proximity Warning System
595-75	Barometric Altitude Rate Computer
599-77	Mark 2 Omega Navigation System
603-81	Airborne Computer Data Loader
704-3-81	Inertial Reference System
705-1-80	Attitude and Heading Reference System
706-3-82	Mark 5 Subsonic Air Data System
707-5-84	Radio Altimeter
708-4-84	Airborne Weather Radar
709-5-82	Mark 5 Airborne Distance Measuring Equipment
709A-87	Mark 6 Airborne Precision Distance Measuring Equipment (DME)
710-8-85	Mark 2 Airborne ILS Receiver
711-6-83	Mark 2 Airborne VOR Receiver
712-6-85	Airborne ADF System

718-3-81	Mark 3 Traffic Control Transponder (ATCRBD/DABS)
723-1-81	Ground Proximity Warning System
727-1-87	Airborne MLS Receiver, Part 1, Aircraft Installation Provisions
730-3-82	Airborne Separation Assurance System
738-86	Air Data and Inertial Reference System (ADIRS)
741-87	Aviation Satellite System, Part 1, Aircraft Installation Standards

2.3 RTCA

DO-52-53	Calibration Procedures for Signal Generators used in the testing of VOR and ILS Receivers
DO-56-54	VOR Test Signals
DO-62-54	Calibration Procedures — Test Standard Omni-Bearing Selector Test Sets
DO-117-63	Standard Adjustment Criteria for Airborne Localizer and Glide Slope Receivers
DO-143-70	Minimum Performance Standards — Airborne Radio Marker Receiving Equipment Operating on 75 MHz
DO-144-70	Minimum Operational Characteristics — Airborne ATC Transponder
DO-148-70	Vol. I and II, A New Guidance System for Approach and Landing
DO-152-72	Minimum Operational Characteristics — Vertical Guidance Equipment Used in Airborne Volumetric Navigation Systems
DO-154-73	Recommended Basic Characteristics for Airborne Radio Homing and Alerting Equipment for use with Emergency Locator Transmitters (ELT)
DO-155-74	Minimum Operational Performance Standards — Airborne Low Range Radar Altimeters
DO-158-75	Minimum Performance Standards — Airborne Doppler Radar Navigation Equipment
DO-161A-76	Minimum Performance Standards — Airborne Ground Proximity Warning Equipment
DO-164A-79	Minimum Performance Standards — Airborne Omega Receiving Equipment
DO-166-77	Vol. I and II, Microwave Landing System (MLS) Implementation
DO-172-80	Minimum Operational Performance Standards for Airborne Radar Approach and Beacon Systems for Helicopters
DO-173-80	Minimum Operational Performance Standards for Airborne Weather and Ground Mapping Pulsed Radars
DO-174-81	Minimum Operational Performance Standards for Optional Equipment which displays Non-Radar Derived Data on Weather and Ground Mapping Radar Indicators
DO-177-81	Minimum Operational Performance Standards for Microwave Landings System (MLS) Airborne Receiving Equipment
DO-179-82	Minimum Operational Performance Standards for Automatic Direction Finding (ADF) Equipment
DO-180-82	Minimum Operational Performance Standards for Airborne Area Navigation Equipment using VOR/DME Reference Facility Sensor Inputs
DO-181-83	Minimum Operational Performance Standards for Air Traffic Control Radar Beacon System/Mode Select (ATCRBS/Modes) Airborne Equipment
DO-182-82	Emergency Locator Transmitter (ELT) Equipment Installation and Performance
DO-183-83	Minimum Performance Standards 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 MHz
DO-184-83	Traffic Alert and Collision Avoidance System (TCAS) I Functional Guidelines
DO-185-84	Vol. I and II, Minimum Operational Performance Standards for Traffic Alert and Collision Avoidance Systems (TCAS) Airborne Equipment

DO-187-84	Minimum Operational Performance Standards for Airborne Area Navigation Equipment using multi-sensor inputs
DO-189-85	Minimum Operational Performance Standards for Airborne Distance Measuring Equipment (DME) operating within the radio frequency range of 960-1215 MHz
DO-190-86	Minimum Operational Performance Standards for Airborne Area Navigation Equipment using Omega/VLF inputs
DO-191-86	Minimum Operational Performance Standards for Airborne Thunderstorm Detection Equipment
DO-192-86	Minimum Operational Performance Standards for Airborne ILS Glide Slope Receiving Equipment operating within the radio frequency range of 328.6-335.4 MHz
DO-194-86	Minimum Operational Performance Standards for Airborne Area Navigation Equipment using Loran-C inputs
DO-195-86	Minimum Operational Performance Standards for Airborne ILS Localizer Receiving Equipment operating within the radio frequency range of 108-112 MHz
DO-196-86	Minimum Operational Performance Standards for Airborne VOR Receiving Equipment operating within the radio frequency range of 108-117.95 MHz
DO-197-87	Minimum Operational Performance Standards for an Active Traffic Alert and Collision Avoidance System I (Active TCAS I)

2.4 EUROCAE

1/WG7/70	MPS for Airborne 75 MHz Marker Beacon Receiving Equipment
1/WG9/71	MPS for Airborne Secondary Surveillance Radar Transponder Apparatus
1/WG9/71	Amendment No. 1. Measurement Procedures to 1/WG9/71
1/WG7C/74	MPS for Airborne Doppler Radar Ground Speed and/or Drift Angle Measuring Equipment
2/WG7C/74	MPS for Airborne Automatic Dead Reckoning Computer Equipment Utilizing Aircraft Heading and Doppler-Obtained Velocity Vector Data
ED-22A	MPS for Airborne VOR Receiving Equipment
ED-26	MPS for Airborne Altitude Measuring and Coding Systems
ED-27	MOPR for Airborne Area Navigation Systems based on VOR and DME as Sensors
ED-28	MPS for Airborne Area Navigation Computing Equipment based on VOR and DME as Sensors
ED-29	MPS for Airborne Omega Navigation Equipment
ED-30	MPS for Airborne Low Range Radio (Radar) Altimeter Equipment
ED-36	MOPR for Microwave Landing System (MLS) (Airborne Receiving Equipment)
ED-38	MPS for Airborne Weather, Ground-mapping and Assisted-approach Radars (including Surface-based Transponder Beacon System Characteristics)
ED-39	MOPR for Airborne Area Navigation Systems based on Two DME as Sensors
ED-40	MPS for Airborne Computing Equipment for Area Navigation System using Two DME as Sensors
ED-43	MOPR for the SSR Transponder and the Altitude Measurement and Coding System
ED-46	MPS for Airborne ILS Receiving Equipment (Localizer)
ED-47	MPS for Airborne ILS Receiving Equipment (Glide Path)
ED-48	MPS for Airborne Distance Measuring Equipment (DME) Interrogators Operating within the frequency range of 960-1215 MHz
ED-51	MPS for Airborne Automatic Direction Finding (ADF) Equipment
ED-52	MPS for Ground Conventional and Doppler VHF Omni-Range (C VOR and D VOR) Equipment

2.5 SAE

AS-791-66	Remote-Servoed Air Data Instruments (Turbine-Powered Subsonic Aircraft)
AS 8002-81	Air Data Computer, Minimum Performance Standard
AS-8003-74	Minimum Performance Standards for Automatic Pressure Altitude Reporting Code Generating Equipment
AS-8009-79	Pressure Altimeter Systems

2.6 IEEE

172-83	IEEE Standard Definitions of Navigation Aid Terms
173-59	Standards on Navigation Aids: Measurements
292-69	IEEE Specification Format for Single-Degree-of-Freedom Spring-Restrained Rate Gyros
293-69	IEEE Test Procedure for Single-Degree-of-Freedom Spring-Restrained Rate Gyros
337-72	IEEE Standard Specification Format Guide and Test Procedure for Linear, Single-Axis, Pendulous, Analog Torque Balance Accelerometer
517-74	Single-Degree-of-Freedom Rate-Integrating Gyros, Standard Specification
529-80	Supplement for Strapdown Applications to IEEE Standard Specification Format Guide and Test Procedure for Single-Degree-of-Freedom Rate-Integrating Gyros
647-81	IEEE Standard Specification Format Guide and Test Procedure for Single-Axis Laser Gyros

2.7 ICAO

1	Circular 139, 3rd Edition, 1983 — Aviation Use of Omega
2	Circular 165, Issue #1, 1981 — Microwave Landing System (MLS)
3	Air Navigation Plan — 11th Edition, 1981

2.8 ISO

3 Flight management systems, cockpit controls/displays and instruments **Systèmes de gestion de vol, commandes et consoles de visualisation au poste de pilotage et instrumentation**

3.1 FAA

TSO-C2c	Airspeed Indicator (Pitot Static)
TSO-C3b	Turn-and-Slip Indicator
TSO-C4c	Bank and Pitch Instruments (indicating gyro-stabilized type) (Gyroscopic horizon, attitude gyro)
TSO-C5c	Direction Instrument, non-magnetic, gyro-stabilized type (directional gyro)
TSO-C6c	Direction Instrument, magnetic (gyro-stabilized type)
TSO-C7c	Direction Instrument, magnetic, non-stabilized type (magnetic compass)
TSO-C8c	Rate of Climb Indicator, pressure actuated (vertical speed indicator)
TSO-C9c	Automatic Pilots
TSO-C10b	Aircraft Indicator, Altimeter, Pressure Actuated, Sensitive Type
TSO-C34a	Temperature Indicators

TSO-C44a	Fuel Flowmeters
TSO-C45	Manifold Pressure Indicating Instruments
TSO-C46a	Maximum Allowable Airspeed Indicator Systems
TSO-C47	Pressure Instruments — Fuel, Oil and Hydraulic
TSO-C48	Carbon Monoxide Detector Instruments
TSO-C49a	Electric Tachometer Magnetic Drag (for air carrier aircraft)
TSO-C52a	Flight Directors
TSO-C54	Stall Warning Instruments
TSO-C55	Fuel and Oil Quantity Instruments (for reciprocating engine aircraft)
TSO-C113	Airborne Multi-Purpose Electronic Displays

3.2 ARINC (AEEC)

420-1-71	Standby Attitude Indicator
577-1-75	Audible Warning System
585-2-78	Electronic Chronometer System
594-4-84	Ground Proximity Warning System
601-81	Control/Display Interfaces
701-1-83	Flight Control Computer System
702-3-82	Flight Management Computer System
703-2-83	Thrust Control Computer System
705-5-85	Attitude and Heading Reference
723-1-81	System Ground Proximity Warning System
725-2-84	Electronic Flight Instruments (EFI)
726-1-81	Flight Warning Computer System
731-2-83	Electronic Chronometer
739-86	Multi-Purpose Control and Display Unit

3.3 RTCA

3.4 EUROCAE

ED-41	MPS for Airborne Fuel Quantity Gauging Systems
ED-42	MPS for Fuel Flowmeter Systems to Aircraft Standards

3.5 SAE

AS 391C-60	Airspeed Indicator (Pitot Static) (Reciprocating Engine Powered Aircraft)
AS 392C-59	Altimeter, Pressure Actuated Sensitive Type
AS 394A-58	Rate of Climb Indicator, Pressure Actuated (Vertical Speed Indicator)
AS 396B-58	Bank and Pitch Instruments (Indicating Stabilized Type) (Gyro-Scopic Horizon, Attitude Gyro)