International Telecommunication Union

ITU-R

Radiocommunication Sector of ITU

Recommendation ITU-R M.2067-0
(02/2015)

Technical characteristics and protection criteria for Wireless Avionics Intra-Communication systems

M Series

Mobile, radiodetermination, amateur and related satellite services

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Note: *This ITU-R Recommendation was approved in English under the procedure detailed in Resolution ITU-R 1.*

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RECOMMENDATION ITU-R M.2067-0

Technical characteristics and protection criteria for Wireless Avionics Intra-Communication systems

(2014)

Scope

This Recommendation provides the technical and operational characteristics of, and protection criteria for wireless avionics intra-communication (WAIC) systems. These characteristics are intended for use when assessing the compatibility of WAIC systems with other services.

Keywords

Aeronautical, avionics, aircraft, protection criteria

Abbreviations/Glossary

SARPs: Standards and recommended practices

WAIC: Wireless avionics intra-communication; radiocommunication between two or more aircraft stations located on a single aircraft; supporting the safe operation of the aircraft.

Related ITU Recommendations, Reports

Report ITU-R M.2283

The ITU Radiocommunication Assembly,

considering

a) that the future generation of aircraft is being designed to enhance efficiency, reliability and safety, as well as to be more environmentally friendly;

b) that wireless avionics intra-communication (WAIC) systems provide radiocommunication between two or more points integrated into or installed on a single aircraft;

c) that WAIC systems do not provide radiocommunication between an aircraft and the ground, another aircraft or a satellite;

d) that WAIC systems must operate in a manner to ensure the safe operation of an aircraft;

e) that WAIC systems operate during all phases of flight, including on the ground;

f) that aircraft equipped with WAIC systems operate worldwide and cross national borders;

g) that WAIC signals will be attenuated by the aircraft fuselage,

recognizing

a) that the International Civil Aviation Organization develops standards and recommended practices for civil aviation;

b) that Annex 10 to the Convention on International Civil Aviation contains standards and recommended practices for aeronautical radionavigation and radiocommunication systems used by civil aviation,

noting

that WAIC is defined as radiocommunication between two or more aircraft stations located on a single aircraft; supporting the safe operation of the aircraft,

recommends

that the technical and operational characteristics and protection criteria for WAIC systems as described in the Annex should be used for sharing and compatibility studies.

Annex

Technical characteristics and protection criteria for wireless avionics intra-communication systems

1 Wireless avionics intra-communication systems

Wireless Avionics Intra-Communication (WAIC) systems offer aircraft designers and operators opportunities to improve flight safety and operational efficiency while reducing costs and enhancing efficiency and reliability.

WAIC systems utilize radiocommunication between two or more stations on a single aircraft; consisting of on-board networks supporting the aircraft's safe operation. WAIC transmissions may not be limited to the interior of the aircraft structure, and will not provide communications between an aircraft and the ground, another aircraft or satellite.

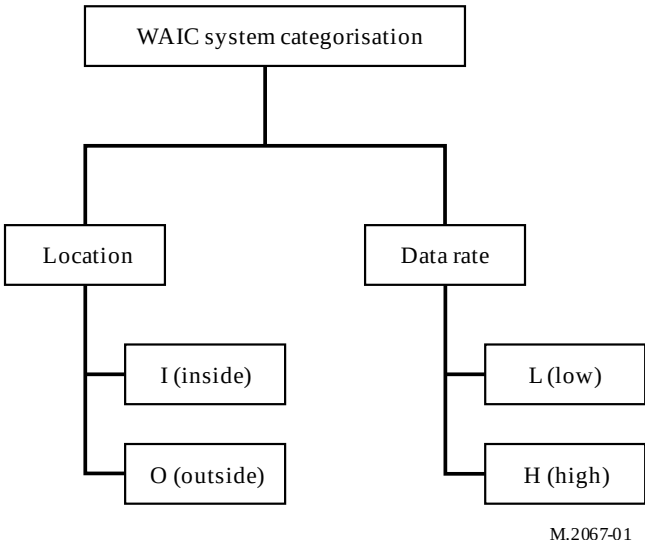
WAIC systems support data and voice communications limited to the safe, reliable and efficient operation of an aircraft. Safety-related video surveillance applications may also include communications systems used by the crew for the safe operation of the aircraft. They are not intended to provide communications with consumer devices brought onboard the aircraft by passengers or for in-flight entertainment applications. Rather, they are assumed to be part of the aircraft's exclusive network.

2 Wireless avionics intra-communication systems categorization

In discussing the requirements and performance of WAIC systems, it is useful to categorize these systems according to two characteristics: data rate (high and low) and installation location of the WAIC systems' transmit antennas (inside and outside the fuselage).

FIGURE 1

Wireless avionics intra-communication system categorization



2.1 Categorization process description

2.1.1 System data rate categorization

WAIC applications can be categorized into two broad categories corresponding to application data rate requirements. The following definitions are used for this purpose: low (L) data rate applications have data rates less than 10 kbit/s, and high (H) data rate applications have data rates above 10 kbit/s. These categorizations are signified by "L" and "H", respectively. Low and high data rate WAIC systems have different technical characteristics (see § 3).

2.1.2 System location categorization

The installation location of a WAIC transmitter has an impact on the amount of RF energy radiated from the aircraft. Therefore, WAIC systems that are enclosed by the airplane structure, such as the fuselage or wing are categorized as inside (I). Those applications that are not enclosed are categorized as outside (O).

2.1.3 System categories

WAIC applications can be characterized by XY following the previous definitions. The parameter X represents the data rate (H, L), and the parameter Y represents the location (I, O). For example, a typical category is LI, representing an application with low data rate requirements, and located internal to the aircraft structure.

3 Wireless avionics intra-communication system characteristics

Table 1 summarizes the typical technical characteristics of WAIC systems. In general, two types of systems are envisaged which are tailored to the requirements of (a) low data rate and often energy limited WAIC applications such as autonomous sensors and (b) high data rate applications with less restrictions regarding energy consumption. These system types are referred to as low data rate (L) and high data rate (H) systems, respectively.

TABLE 1

Technical characteristics for low and high data rate wireless avionics intra-communications systems

	Low data rate system	High data rate system	Units
Transmitter			
Number and location of simultaneously active transmitters per channel	1	1	–
Transmitter antenna gain	0	0	dBi
Max. transmission power[2]	10	50	mW
3 dB emission bandwidth	2.6	16.6	MHz
20 dB emission bandwidth	6	22	MHz
40 dB emission bandwidth	12	60	MHz
Receiver			
Receiver antenna gain[1]	0	0	dBi
Receiver IF-bandwidth	2.6	20	MHz
Receiver noise figure	10	10	dB
Required signal-to-noise ratio	9	14	dB
Receiver sensitivity	–91	–77	dBm
Protection criterion (*I*/*S*)	–9	–14	dB
Min. out of band interference rejection	–10	–10	dB
Front end overload protection level[3]	–30	–30	dBm
Maximum distance between outside WAIC transmitter and receiver[2]	15	15	metre

[1] Directive antennas with gains larger than 0 dBi in the mainbeam direction and consequential negative gains outside the main beam may be applied. In these cases, the antenna main beams are pointed towards the center of the aircraft. This will enable the reduction of the overall emissions of the aircraft.

[2] These values are technical upper limits. Lower values are generally possible at the cost of cell size and increased number of required cells to appropriately cover the aircraft.

[3] Incident interference power must be below –30 dBm across the entire allocated frequency range to maintain sufficient linearity of operation