International Telecommunication Union

ITU-R

Radiocommunication Sector of ITU

Report ITU-R M.2171
(12/2009)

Characteristics of unmanned aircraft systems and spectrum requirements to support their safe operation in non-segregated airspace

M Series

Mobile, radiodetermination, amateur and related satellites services

International Telecommunication Union

Foreword

The role of the Radiocommunication Sector is to ensure the rational, equitable, efficient and economical use of the radio-frequency spectrum by all radiocommunication services, including satellite services, and carry out studies without limit of frequency range on the basis of which Recommendations are adopted.

The regulatory and policy functions of the Radiocommunication Sector are performed by World and Regional Radiocommunication Conferences and Radiocommunication Assemblies supported by Study Groups.

Policy on Intellectual Property Right (IPR)

ITU-R policy on IPR is described in the Common Patent Policy for ITU-T/ITU-R/ISO/IEC referenced in Annex 1 of Resolution ITU-R 1. Forms to be used for the submission of patent statements and licensing declarations by patent holders are available from http://www.itu.int/ITU-R/go/patents/en where the Guidelines for Implementation of the Common Patent Policy for ITU-T/ITU-R/ISO/IEC and the ITU-R patent information database can also be found.

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P	Radiowave propagation
RA	Radio astronomy
RS	Remote sensing systems
S	Fixed-satellite service
SA	Space applications and meteorology
SF	Frequency sharing and coordination between fixed-satellite and fixed service systems
SM	Spectrum management

***Note**: This ITU-R Report was approved in English by the Study Group under the procedure detailed in Resolution ITU-R 1.*

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Executive summary

This report is based on two independently developed methodologies in the relevant annexes. These methodologies, even though based on different approaches, provide comparable estimated spectrum requirements.

The methodologies estimating the total spectrum requirements in this report addressed terrestrial and satellite requirements in a separate manner. Deployment of unmanned aircraft systems (UAS) will require access to both terrestrial and satellite spectrum.

The maximum amount of spectrum required for UAS are:

– 34 MHz for terrestrial systems,

– 56 MHz for satellite systems.

1 Introduction and scope

A significant increase in the application of UAS is anticipated over the next decade and beyond. Seamless flight of unmanned aircraft (UA) within conventional air traffic is becoming vital for the further development of UA missions and markets.

The key issue for UAS proponents is to reassure aviation authorities that UA flight within civilian air traffic will:

– integrate seamlessly into current air traffic control (ATC) procedures;

– maintain safety-of-flight levels.

This will influence the corresponding spectrum requirements and the quality of spectrum needed to satisfy these requirements.

Communications are key in UAS systems due to the remote nature of human presence. Safety-of-flight is the driving factor when the seamless flight of UAS within civilian air traffic is at stake. In the end, safe operation of UAS relies on communications which represents a critical step in enabling UAS operations in non-segregated airspaces. The different types of communications addressed in this report are explained below.

All the information given in this paper is only used to determine the spectrum requirements provided in § 5 and is not relevant for operational purposes.

This report is based on two independently developed methodologies in the relevant annexes. These methodologies, even though based on different approaches, provide comparable estimated spectrum requirements.