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| U.S. Radiocommunications SectorFact Sheet |
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| **Document Title:** WORKING DOCUMENT TOWARDS A FRAMEWORK FOR REVISIONS TO RESOLUTION 155 IN SUPPORT OF STUDIES UNDER WRC-23 AGENDA ITEM 1.8 |
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| **Purpose/Objective:** The purpose of this contribution is to develop a framework for revision of Resolution 155 (Rev.WRC-19) using Resolution 169 (WRC-19) as a basis.  |
| **Abstract:** Under Resolution 171 (WRC-19) for WRC-23 Agenda Item 1.8, WP 5B is required to complete, in time for WRC-23, relevant studies of the regulatory aspects in relation to the implementation of Resolution 155 (Rev.WRC-19). It is also required to review Resolution 155 (Rev.WRC-19) taking into account the results of those studies. This contribution considers a framework for revision of Resolution 155 using the recently adopted Resolution 169 (WRC-19) for ESIMS as a framework. |

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| **Radiocommunication Study Groups** |  |
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# 1 Introduction

WRC-19 adopted Resolution **169** for provisions that apply to Earth Stations in Motion (ESIMs) in the frequency bands 17.7-19.7 GHz and 27.5-29.5 GHz. While the operations for the control and non-payload communications of unmanned aircraft systems being studied under WRC-23 agenda item 1.8 are in different frequency bands than those for which Resolution **169** applies, the framework used by ESIMs in that resolution could be applied to Earth Stations on Unmanned Aircraft for protecting similar radiocommunication services. As a result, the United States introduces the use of Resolution **169** as the basis for studying possible revisions to Resolution **155**. The United States also introduces the term ESUA for Earth Stations on board Unmanned Aircraft within these proposed provisions to further align with the term ESIMs used within Resolution **169**.

# 2 Proposals

The United States proposes that WP 5B consider the attached framework as a possible approach for modifying Resolution **155 (Rev.WRC-19)**.

**Attachments:** 1

RESOLUTION 155 (REV.WRC-23)

Regulatory provisions related to earth stations on board unmanned aircraft which operate with geostationary-satellite networks in the fixed-satellite service in certain frequency bands not subject to a Plan of Appendices 30, 30A and 30B for the control and non-payload communications of unmanned aircraft systems in non-segregated airspaces\*

The World Radiocommunication Conference (XXX, 2023),

considering

*Editor’s Note*: This section to be reviewed in a future contribution and to include clarity on terminology

*a)* that …;

*b)* that …;

*c)* that …;

*d)* that …,

recognizing

*Editor’s Note*: This section to be reviewed in a future contribution. *Recognizing* *b)* is referenced in *resolves* 1.1.3 and 6 and to be considered in this contribution.

*a)* that …;

*b)* that, for cases of incomplete coordination under No. **9.7** of the GSO FSS network with assignments to be used by ESUAs, the operation of ESUAs on those assignments in the frequency bands referred to in *resolves* 1 needs to be in accordance with the provisions of No. **11.42** with respect to any recorded frequency assignment which was the basis of the unfavourable finding under No. **11.38**;

*c)* that ….;

*d)* that …,

resolves

1 that, for any Earth station on board UA (ESUA) communicating with a GSO FSS space station within the frequency bands 10.95-11.2 GHz (space-to-Earth), 11.45-11.7 GHz (space-to-Earth), 11.7-12.2 GHz (space-to-Earth) in Region 2, 12.2-12.5 GHz (space-to-Earth) in Region 3, 12.5-12.75 GHz (space-to-Earth) in Regions 1 and 3 and 19.7-20.2 GHz (space-to-Earth), and in the frequency bands 14-14.47 GHz (Earth-to-space) and 29.5-30.0 GHz (Earth-to-space), or parts thereof, the following conditions shall apply:

1.1 with respect to space services in the frequency bands referred to in *resolves* 1, ESUAs shall comply with the following conditions:

1.1.1 with respect to satellite networks or systems of other administrations, the ESUA characteristics shall remain within the envelope characteristics of typical earth stations associated with the satellite network with which the ESUAs communicate;

1.1.2 that ESUAs shall be designed and operated so as to be able to operate with interference caused by other satellite networks resulting from application of Articles **9** and **11** andthe use of ESUAs shall not cause more interference and shall not claim more protection than for typical earth stations in this GSO FSS network;

*Editor’s Note*: *Resolves* 1.1.2 merges with *resolves* 12 in RES155 (Rev.WRC-19)

1.1.3 the notifying administration of the GSO FSS network with which the ESUAs communicate shall ensure that the operation of ESUAs complies with the coordination agreements for the frequency assignments of the typical earth station of this GSO FSS network obtained under the relevant provisions of the Radio Regulations, taking into account *recognizing b)* above;

1.1*.*4 for the implementation of *resolves*1.1.1 above, the notifying administration for the GSO FSS network with which the ESUAs communicate shall, in accordance with this Resolution, send to the Radiocommunication Bureau (BR) the relevant Appendix **4** notification information related to the characteristics of the ESUAs intended to communicate with that GSO FSS network, together with the commitment that the ESUA operation shall be in conformity with the Radio Regulations, including this Resolution;

1.1.5 upon receipt of the notification information referred to in *resolves*1.1.4 above, BR shall examine it with respect to the provisions referred to in *resolves*1.1.1 above and publish the result of such examination in the International Frequency Information Circular (BR IFIC);

*Editor’s Note*: *Resolves* 1.1.4 and 1.1.5 address Resolves 4 of Resolution 155 (Rev.WRC-19)

1.1.6 for the protection of non-GSO FSS systems operating in the frequency bands 14-14.47 GHz and 29.5-30 GHz, ESUAs communicating with GSO FSS networks shall comply with the provisions contained in Annex 2 to this Resolution;

1.2 with respect to terrestrial services in the frequency bands referred to in *resolves* 1, ESUAs shall comply with the following conditions:

1.2.1 receiving ESUAs in the frequency bands 10.95-11.2 GHz, 11.45-11.7 GHz, 11.7-12.1 GHz (Region 2), 12.1-12.2 GHz (on the territory of the country listed in No. **5.489**), 12.2-12.5 GHz (Region 3), 12.5-12.75 GHz (on the territory of the countries listed in No. **5.494** and in Region 3) shall be designed and operated so as to be able to accept the interference and not claim protection from terrestrial services to which the frequency band is allocated and operating in accordance with the Radio Regulations without complaints under Article **15**;

*Editor’s Note*: *Resolves* 1.2.1 also incorporates *resolves* 11 in RES155 (Rev.WRC-19)

1.2.2 transmitting ESUAs in the frequency bands 14.0-14.3 GHz (on the territory of countries listed in No. **5.505**), 14.25-14.3 GHz (on the territory of countries listed in No. **5.508**), 14.3-14.4 GHz (Regions 1 and 3), and 14.4-14.47 GHz shall not cause harmful interference, unless otherwise agreed between the administrations concerned, to terrestrial services to which the frequency band is allocated and operating in accordance with the Radio Regulations, and Annex 3 to this Resolution shall apply;

*Editor’s Note*: *Resolves* 1.2.2 applies the language from *resolves* 14 of RES155 (rev.WRC-19)

1.2.3 that, should an administration authorizing ESUAs agree to pfd levels higher than the limits contained Annex 3 within the territory under its jurisdiction, such agreement shall not affect other countries that are not party to that agreement;

*Editor’s Note*: *Resolves* 1.2.3 copied from *further resolves* of Resolution 169 (WRC-19)

1.2.4 the provisions in this Resolution, including Annex 3, set the conditions for the purpose of protecting terrestrial services from harmful interference from ESUAs in neighbouring countries in the frequency bands 14.0-14.3 GHz (on the territory of countries listed in No. **5.505**), 14.25-14.3 GHz (on the territory of countries listed in No. **5.508**), 14.3-14.4 GHz (Regions 1 and 3), and 14.4-14.47 GHz;

1.2.5 for the application of Annex 3 as referred to in *resolves* 1.2.2 and 1.2.4 above, BR shall examine the characteristics of ESUAs with respect to the conformity with the power flux-density (pfd) limits on the Earth’s surface specified in Annex 3 and publish the results of such examination in the BR IFIC;

*Editor’s Note*: Implementation of *resolves* 1.2.5 is currently under study within WP4A. See *instructs the Director of the Radiocommunication Bureau* 3 and *invites the ITU Radiocommunication Sector* of Resolution 169 (WRC-19)

1.2.6 the notifying administration for the GSO FSS network with which the ESUAs communicate shall send to BR a commitment that, upon receiving a report of harmful interference, the notifying administration for the GSO FSS network with which the ESUAs communicate shall follow the procedures in *resolves* 4;

1.3 that, in order to protect the radio astronomy service in the frequency band 14.47-14.5 GHz, administrations operating ESUAs in accordance with this Resolution in the frequency band 14-14.47 GHz within line-of-sight of radio astronomy stations are urged to take all practicable steps to ensure that the emissions from the ESUA in the frequency band 14.47-14.5 GHz do not exceed the levels and percentage of data loss given in the most recent versions of Recommendations ITU-R RA.769 and ITU-R RA.1513;

*Editor’s Note*: *Resolves* 1.3 is taken from *resolves* 17 of RES155 (Rev.WRC-19)

2 that ESUAs are an application of the primary Fixed-Satellite Service and separate from regulatory provisions that apply to Earth Stations in Motion (ESIM);

2.1 that the use of assignments of an FSS satellite network for UAS CNPC links shall not constrain other FSS satellite networks during the application of the provisions of Articles **9** and **11** norresult in additional coordination constraints on terrestrial services under Articles **9** and **11**;

*Editor’s Note*: *Resolves* 2.1 taken from *resolves* 9 and 10 in RES155 (Rev.WRC-19)

2.2 that ESUA using station class UG may communicate with the space station of a geostationary FSS satellite network operating in the frequency bands listed in *resolves* 1 above;

*Editor’s Note*: *Resolves* 2.2 taken from *resolves* 2 in RES155 (Rev.WRC-19) and updated with station class UG “Earth station on board unmanned aircraft communicating with a space station of a geostationary-satellite network in the fixed-satellite service for UAS CNPC links in accordance with resolves 1 of RES-155”

3 that, in order to ensure safety-of-flight operation of UAS, administrations responsible for operating UAS CNPC links shall:

*Editor’s Note*: *Resolves* 3 taken from *resolves* 13 in RES155 (Rev.WRC-19)

3.1 ensure that the use of UAS CNPC links be in accordance with the international standards and recommended practices (SARPs) consistent with Article 37 of the Convention on International Civil Aviation;

3.2 take the required measures, consistent with No. **4.10,** to ensure freedom from harmful interference to earth stations on board UA operated in accordance with this Resolution;

3.3 act immediately when their attention is drawn to any such harmful interference, as freedom from harmful interference to UAS CNPC links is imperative to ensure their safe operation, taking into account *resolves* 1.2.1;

3.4 use assignments associated with the FSS networks for UAS CNPC links (see Figure 1 in Annex 1), including assignments to space stations, specific or typical earth stations and ESUA (see *resolves* 2.2), that have been successfully coordinated under Article **9** (including provisions identified in *resolves* 1.1.4 and 1.1.5) and recorded in the Master International Frequency Register (MIFR) with a favourable finding under Article **11,** including Nos. **11.31, 11.32** or **11.32A** where applicable, and except those assignments that have not successfully completed coordination procedures under No. **11.32** by applying Appendix **5** § 6.d.i;

3.5 ensure that real-time interference monitoring, estimation and prediction of interference risks and planning solutions for potential interference scenarios are addressed by FSS operators and UAS operators with guidance from aviation authorities;

4 that in case of harmful interference caused by any type of ESUA:

4.1 the administration of the country in which the ESUA is authorized shall cooperate with an investigation on the matter and provide, to the extent of its ability, any required information on the operation of the ESUA and a point of contact to provide such information;

4.2 the administration of the country in which the ESUA is authorized and the notifying administration of the GSO FSS network with which the ESUA communicates shall, jointly or individually, as the case may be, upon receipt of a report of harmful interference, take required action to eliminate or reduce interference to an acceptable level;

5 that the administration responsible for the GSO FSS satellite network with which ESUAs communicate shall ensure that:

5.1 for the operation of ESUAs, techniques to maintain pointing accuracy with the associated GSO FSS satellite, without inadvertently tracking adjacent GSO satellites, are employed;

5.2 all necessary measures are taken so that ESUAs are subject to permanent monitoring and control by a network control and monitoring centre (NCMC) or equivalent facility in order to comply with the provisions in this Resolution, and an NCMC point of contact is available which are capable of receiving and acting to address any case of harmful interference and eliminate it as soon as practicable;

5.3 measures, when required, are taken to limit the operation of ESUAs in the territory, including territorial waters and territorial airspace, under the jurisdiction of the administrations authorizing ESUAs and over international oceanic waters;

5.4 a permanent point of contact is provided for the purpose of tracing any suspected cases of harmful interference from ESUAs and to immediately respond to requests from the focal point of the authorizing administration;

6 that the application of this Resolution does not provide regulatory status to ESUAs different from that derived from the GSO FSS network with which they communicate, taking into account the provisions referred to in this Resolution (see *recognizing b)* above);

7 that, if BR is unable to examine, in accordance with *resolves* 1.2.5 above, ESUAs with respect to conformity with the pfd limits on the Earth’s surface specified in Annex 3, the notifying administration shall send to BR a commitment that the ESUAs comply with those limits;

8 that BR shall formulate a qualified favourable finding under No. **11.31** with respect to the limits contained in Annex 3, if *resolves* 7 is applied successfully, otherwise it shall formulate an unfavourable finding,

9 that the operation of ESUAs within the territory, including territorial waters and territorial airspace, of an administration shall be carried out only if authorized by that administration and that the operation of ESUAs over international oceanic waters shall be carried out if authorized by the administration for which maintains the NCMC in *resolves* 5.2;

*Editor’s Note*: *resolves further* was moved in its entirety to *resolves* 1.2.3

instructs the Director of the Radiocommunication Bureau

*Editor’s Note*: This section to be reviewed in a future contribution

1 to …;

2 to …;

3 to …,

invites administrations

*Editor’s Note*: This section to be reviewed in a future contribution

to …,

invites the ITU Radiocommunication Sector

*Editor’s Note*: This section to be reviewed in a future contribution

to …,

instructs the Secretary-General

*Editor’s Note*: This section to be reviewed in a future contribution

to ….

ANNEX 1 TO RESOLUTION 155 (REV.WRC-23)

**UAS CNPC links**

Figure 1

Elements of UAS architecture using the FSS

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*Editor’s Note*: This annex comes from Annex 1 to Resolution 155 (REV.WRC-19). Updates change UA ES to ESUA.

Annex 2 to Resolution 155 (rev.WRC-23)

Provisions for earth stations on board unmanned aircraft to protect non-geostationary fixed-satellite service systems in the frequency bands 14-14.7 GHz and 29.5-30 GHz

*Editor’s Note*: Annex 1 from Resolution 169 is to be reviewed and incorporate appropriate modifications to apply to both the frequency bands 14-14.7 GHz and 29.5-30 GHz and be revised as Annex 2 to Resolution 155 (REV.WRC-23)

*Editor’s Note*: Annex 2 from Resolution 169 is deleted as this annex does not apply in the bands in *resolves* 1.

Annex 3 to Resolution 155 (rev.WRC-23)

Provisions for earth stations on board unmanned aircraft to protect terrestrial services in the frequency band 14-14.47 GHz

*Editor’s Note*: Annex 3 from Resolution 169 to be revised to incorporate Annex 2 of Resolution 155 (Rev.WRC-19) and make appropriate modifications