



ICAO

International Civil Aviation Organization

**Twenty Sixth Meeting of the Communications/
Navigation and Surveillance Sub-group (CNS SG/26) of
APANPIRG**

Video Teleconference, 05 – 09 September 2022

Agenda Item 6: Navigation

6.4 Other navigation related issues

**ITU CIRCULAR LETTER CR/488 ON PREVENTION OF
INTERFERENCE TO GNSS**

(Presented by the Secretariat)

SUMMARY

This paper shares information about the Circular Letter CR/488 issued by the International Telecommunication Union (ITU) on prevention of interference to GNSS, for actions by the States.

1. INTRODUCTION

1.1 The Council at the ninth meeting of its 220th Session on 22 June 2020, agreed with the proposal of the 40th Session of the Assembly (24 September - 4 October 2019) for Communications, Navigation, and Surveillance (CNS) systems resilience and mitigation of harmful interference to global navigation satellite system (GNSS).

1.2 An ICAO State Letter Ref.: AN 7/5-20/89, Subject: *Strengthening of communications, navigation, and surveillance (CNS) systems resilience and mitigation of interference to global navigation satellite system (GNSS)* was circulated to States on 28 August 2020, and proposed required action by States on the aforementioned issues.

1.3 Recently, the ITU issued the Circular Letter CR/488 dated 8 July 2022, Subject: *Prevention of harmful interference to Radio Navigation Satellite Service Receivers in the 1559 – 1610 MHz frequency band.*

1.4 This paper shares brief information about the issue, the circular CR/488, and necessary action taken.

2 DISCUSSION

2.1 Following its initial report to the 2019 World Radiocommunication Conference, the Radiocommunication Bureau of International Telecommunication Union (ITU) has been informed of a

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significant number of cases of harmful interference to the radio navigation satellite service (RNSS) in the 1 559 – 1 610 MHz frequency band affecting receivers onboard aircrafts and causing degradation or total loss of the service for passenger, cargo and humanitarian flights. In some cases, this has also led to misleading information provided by RNSS receivers to pilots.

2.2 At its 89th meeting in March 2022, the ITU Radio Regulations Board (RRB) considered the situation and instructed the Bureau to issue a circular letter to the Member States to disseminate its decisions and other background information about the prevention of harmful interference to RNSS receivers.

2.3 With great concern about the increasing number and range of impact of such harmful interference on safety-of-life radiocommunication services used for the navigation of aircraft, the ITU issued the Circular Letter CR/488 with subject of *Prevention of harmful interference to Radio Navigation Satellite Service Receivers in the 1559 – 1610 MHz frequency band* on 8 July 2022. The circular is provided in **Appendix A** to this paper.

2.4 The circular not only expresses the ITU's concern with the increasing impact of harmful interference to aircraft safety services, but also also calls ITU Member States to comply with the relevant ITU provisions on prevention of harmful interference; recommends additional measures on prevention and mitigation of harmful interference to GNSS (based on ICAO State letter Ref.: AN 7/5-20/89); and includes a list of relevant ITU-R reference documents.

2.5 The letter represented a significant step by ITU. While it is unlikely that it will have an immediate impact on day-to-day operations, it is legitimate to hope that, by formally reiterating the existing ITU provisions and voicing ITU concerns to States, the letter will contribute to strengthen national radio regulatory administrations' commitment to prevention and removal of interference to GNSS, and make them more responsive to interference reports from civil aviation users. The letter is also expected to help sensitize national radio regulatory authorities to the issue and make them more responsive to civil aviation concerns.

2.6 Consequently, the ICAO Regional Office issued the State Letter Ref.: T 8/5.10 : AP099/22 (CNS) dated 21 July 2022, Subject *Prevention of harmful interference to Radio Navigation Satellite Service Receivers in the 1559 – 1610 MHz frequency band*, which is provided in **Appendix B**, to share the above mentioned information with operators, service providers, and all stakeholders, sensitize the national radio regulatory Authority to the risk encountered by the civil aviation, and encourage States/Administrations to take actions to address this critical issue as appropriate.

3. ACTION BY THE MEETING

3.1 The meeting is invited to

- a) note the information contained in this paper;
- b) discuss any relevant matter as appropriate.



Radiocommunication Bureau (BR)

Circular Letter
CR/488

8 July 2022

To Administrations of Member States of the ITU

Subject: **Prevention of harmful interference to Radio Navigation Satellite Service Receivers in the 1559 – 1610 MHz frequency band**

Following its initial report to the 2019 World Radiocommunication Conference, the Radiocommunication Bureau has been informed of a significant number of cases of harmful interference to the radionavigation-satellite service (RNSS) in the 1 559 – 1 610 MHz frequency band affecting receivers onboard aircrafts and causing degradation or total loss of the service for passenger, cargo and humanitarian flights. In some cases, this has also led to misleading information provided by RNSS receivers to pilots. Based on in-flight monitoring of air transport category aircraft GNSS receivers by one major aircraft manufacturer, 10 843 radio-frequency interference events were detected globally in 2021. The majority of these events occurred in the Middle East region, but several events were also detected in the European, North American and Asian regions.

The Bureau has noted with great concern the increasing number and range of impact of such harmful interference on safety-of-life radiocommunication services used for the navigation of aircraft (see No. **4.10¹**). In accordance with RR No. **13.2**, the Bureau reported such cases to the Radio Regulations Board (RRB), together with its recommendations.

At its 89th meeting in March 2022, the ITU Radio Regulations Board (RRB) considered the situation and instructed the Bureau to issue a circular letter to the Member States to disseminate its decisions and other background information about the prevention of harmful interference to RNSS receivers.

Following this instruction, the Bureau has prepared the present circular letter. It summarizes the RRB's decisions on the issue, formulates recommendations concerning mitigation of harmful interference to the radionavigation-satellite service and provides the list of the relevant ITU-R reference documents.

¹ “Member States recognize that the safety aspects of radionavigation and other safety services require special measures to ensure their freedom from harmful interference; it is necessary therefore to take this factor into account in the assignment and use of frequencies.”

The relevant decisions of the 89th RRB meeting

In accordance with No. 13.2, the Board decided to request Member States to ensure that their operating agencies complied with the applicable provisions of the ITU legal instruments, as emphasized below:

- *“All stations, whatever their purpose, must be established and operated in such a manner as not to cause harmful interference to the radio services or communications of other Member States or of recognized operating agencies, or of other duly authorized operating agencies which carry on a radio service, and which operate in accordance with the provisions of the Radio Regulations.”* (Article 45 of the ITU Constitution)

- *“to take the steps required to prevent the transmission or circulation of false or deceptive distress, urgency, safety or identification signals, and to collaborate in locating and identifying stations under their jurisdiction transmitting such signals.”* (Article 47 of the ITU Constitution)

- *“1 Member States retain their entire freedom with regard to military radio installations.
2 Nevertheless, these installations must, so far as possible, observe statutory provisions relative to giving assistance in case of distress and to the measures to be taken to prevent harmful interference, and the provisions of the Administrative Regulations concerning the types of emission and the frequencies to be used, according to the nature of the service performed by such installations.*

- *3 Moreover, when these installations take part in the service of public correspondence or other services governed by the Administrative Regulations, they must, in general, comply with the regulatory provisions for the conduct of such services.”* (Article 48 of the ITU Constitution)

- *“Recognizing that transmissions on distress and safety frequencies and frequencies used for the safety and regularity of flight (see Article 31 and Appendix 27) require absolute international protection and that the elimination of harmful interference to such transmissions is imperative, administrations undertake to act immediately when their attention is drawn to any such harmful interference.”* (RR No. **15.28**)

The Board further decided to request Member States to continue to exercise their utmost goodwill and mutual assistance in the application of the provisions of Article 45 of the Constitution and of Section VI of Article **15** of the Radio Regulations.

Recommendations on prevention and mitigation of harmful interference to RNSS

With respect to unnecessary transmissions, which represent one of the important sources of interference to RNSS, the Bureau would like to point out that the use of devices commonly referred as “GNSS jammers” or any other illegal interfering equipment, which may cause harmful interference to aircraft, are prohibited by provision No. **15.1** of the Radio Regulations:

15.1 § 1 All stations are forbidden to carry out unnecessary transmissions, or the transmission of superfluous signals, or the transmission of false or misleading signals, or the transmission of signals without identification (except as provided for in Article 19).

In addition, the administrations are encouraged to consider the following additional measures to address this critical issue:

- a) reinforcing navigation systems resilience to interference;
- b) increasing collaboration between radio regulatory and enforcement authorities;
- c) reinforcing civil-military coordination to address interference risks associated with RNSS testing and conflict zones;
- d) increasing coordination between aviation, military and radio-regulatory authorities;
- e) retaining essential conventional navigation infrastructure for contingency support in case of RNSS outages, and developing mitigation techniques for loss of services.

The above measures were decided by the International Civil Aviation Organization (ICAO) at its 40th Assembly in October 2019 and disseminated by ICAO State Letter AN 7/5-20/89 dated 28 August 2020.

Relevant ITU-R reference documents

In order to get an overview of the usage and protection requirements of systems operating in the radionavigation-satellite service, administrations may consult the following ITU-R Recommendations and Reports:

- [Recommendation ITU-R M.1787-4 – Description of systems and networks in the radionavigation-satellite service \(space-to-Earth and space-to-space\) and technical characteristics of transmitting space stations operating in the bands 1 164-1 215 MHz, 1 215-1 300 MHz and 1 559-1 610 MHz](#)
- [Recommendation ITU-R M.1901-3 – Guidance on ITU-R Recommendations related to systems and networks in the radionavigation-satellite service operating in the frequency bands 1 164-1 215 MHz, 1 215-1 300 MHz, 1 559-1 610 MHz, 5 000-5 010 MHz and 5 010-5 030 MHz](#)
- [Recommendation ITU-R M.1903-1 – Characteristics and protection criteria for receiving earth stations in the radionavigation-satellite service \(space-to-Earth\) and receivers in the aeronautical radionavigation service operating in the band 1 559-1 610 MHz](#)
- [Report ITU-R M.2458-0 – Radionavigation-satellite service applications in the 1 164-1 215 MHz, 1 215-1 300 MHz and 1 559-1 610 MHz frequency bands](#)

The Bureau thanks Administrations for disseminating this information among their different operating agencies to raise awareness of the situation and to remind them of their obligation to prevent any harmful interference in accordance with ITU's Legal Instruments.



Mario Maniewicz
Director

Distribution:

- Administrations of ITU Member States
- Members of the Radio Regulations Board



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гражданской
авиации

منظمة الطيران
المدني الدولي

国际民用
航空组织

Ref.: T 8/5.10 : AP099/22 (CNS)

21 July 2022

Subject: Prevention of harmful interference to Radio
Navigation Satellite Service Receivers in the
1559 – 1610 MHz frequency band

Action Required:

- 1) Note the information contained in the ITU RB Circular Letter CR/488;
- 2) Note the information contained in the ICAO State Letter Ref.: AN 7/5-20/89; and
- 3) Take actions as appropriate.

Dear Sir/Madam,

I wish to draw your attention to the prevention of harmful interference to Radio Navigation Satellite Service Receivers in the 1559 – 1610 MHz frequency band.

The Radiocommunication Bureau (RB) of International Telecommunication Union (ITU) has been informed of a significant number of cases of harmful interference to the radio navigation satellite service (RNSS) in the 1559 – 1610 MHz frequency band affecting receivers onboard aircrafts, causing degradation or total loss of the service for passenger, cargo and humanitarian flights, and leading to misleading information provided by RNSS receivers to pilots in some cases. Based on in-flight monitoring of air transport category aircraft global navigation satellite system (GNSS) receivers by one major aircraft manufacturer, 10843 radio-frequency interference events were detected globally in 2021. The majority of these events occurred in the Middle East region, but several events were also detected in the European, North American, and Asian regions.

With great concern about the increasing number and range of impact of such harmful interference on safety-of-life radiocommunication services used for the navigation of aircraft, the ITU RB issued the Circular Letter CR/488 with the subject of *Prevention of harmful interference to Radio Navigation Satellite Service Receivers in the 1559 – 1610 MHz frequency band* on 8th July 2022 which is provided in **Attachment A**.

The Circular Letter also highlighted the recommendations and measures on prevention and mitigation of harmful interference to GNSS agreed by the International Civil Aviation Organization (ICAO) at 40th Assembly in October 2019 and disseminated by ICAO State Letter Ref.: AN 7/5-20/89 dated 28th August 2020 with Subject of *Strengthening of communications, navigation, and surveillance (CNS) systems resilience and mitigation of interference to global navigation satellite system (GNSS)* provided in **Attachment B**.

Your State/Administration is strongly encouraged to share above mentioned information with operators, service providers and all stakeholders, sensitize the national radio regulatory Authority to the risk encountered by the civil aviation, and take actions to address this critical issue as appropriate.

Accept, Sir/Madam, the assurances of my highest consideration.



Tao Ma
Regional Director

Enclosures:

Attachment A – ITU RB Circular Letter CR/488

Attachment B – ICAO State Letter Ref.: AN 7/5-20/89



Radiocommunication Bureau (BR)

Circular Letter
CR/488

8 July 2022

To Administrations of Member States of the ITU

Subject: **Prevention of harmful interference to Radio Navigation Satellite Service Receivers in the 1559 – 1610 MHz frequency band**

Following its initial report to the 2019 World Radiocommunication Conference, the Radiocommunication Bureau has been informed of a significant number of cases of harmful interference to the radionavigation-satellite service (RNSS) in the 1 559 – 1 610 MHz frequency band affecting receivers onboard aircrafts and causing degradation or total loss of the service for passenger, cargo and humanitarian flights. In some cases, this has also led to misleading information provided by RNSS receivers to pilots. Based on in-flight monitoring of air transport category aircraft GNSS receivers by one major aircraft manufacturer, 10 843 radio-frequency interference events were detected globally in 2021. The majority of these events occurred in the Middle East region, but several events were also detected in the European, North American and Asian regions.

The Bureau has noted with great concern the increasing number and range of impact of such harmful interference on safety-of-life radiocommunication services used for the navigation of aircraft (see No. **4.10¹**). In accordance with RR No. **13.2**, the Bureau reported such cases to the Radio Regulations Board (RRB), together with its recommendations.

At its 89th meeting in March 2022, the ITU Radio Regulations Board (RRB) considered the situation and instructed the Bureau to issue a circular letter to the Member States to disseminate its decisions and other background information about the prevention of harmful interference to RNSS receivers.

Following this instruction, the Bureau has prepared the present circular letter. It summarizes the RRB's decisions on the issue, formulates recommendations concerning mitigation of harmful interference to the radionavigation-satellite service and provides the list of the relevant ITU-R reference documents.

¹ “Member States recognize that the safety aspects of radionavigation and other safety services require special measures to ensure their freedom from harmful interference; it is necessary therefore to take this factor into account in the assignment and use of frequencies.”

The relevant decisions of the 89th RRB meeting

In accordance with No. 13.2, the Board decided to request Member States to ensure that their operating agencies complied with the applicable provisions of the ITU legal instruments, as emphasized below:

- *“All stations, whatever their purpose, must be established and operated in such a manner as not to cause harmful interference to the radio services or communications of other Member States or of recognized operating agencies, or of other duly authorized operating agencies which carry on a radio service, and which operate in accordance with the provisions of the Radio Regulations.”* (Article 45 of the ITU Constitution)

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- *3 Moreover, when these installations take part in the service of public correspondence or other services governed by the Administrative Regulations, they must, in general, comply with the regulatory provisions for the conduct of such services.”* (Article 48 of the ITU Constitution)

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The Board further decided to request Member States to continue to exercise their utmost goodwill and mutual assistance in the application of the provisions of Article 45 of the Constitution and of Section VI of Article **15** of the Radio Regulations.

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In addition, the administrations are encouraged to consider the following additional measures to address this critical issue:

- a) reinforcing navigation systems resilience to interference;
- b) increasing collaboration between radio regulatory and enforcement authorities;
- c) reinforcing civil-military coordination to address interference risks associated with RNSS testing and conflict zones;
- d) increasing coordination between aviation, military and radio-regulatory authorities;
- e) retaining essential conventional navigation infrastructure for contingency support in case of RNSS outages, and developing mitigation techniques for loss of services.

The above measures were decided by the International Civil Aviation Organization (ICAO) at its 40th Assembly in October 2019 and disseminated by ICAO State Letter AN 7/5-20/89 dated 28 August 2020.

Relevant ITU-R reference documents

In order to get an overview of the usage and protection requirements of systems operating in the radionavigation-satellite service, administrations may consult the following ITU-R Recommendations and Reports:

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Mario Maniewicz
Director

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航空组织

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Ref.: AN 7/5-20/89

28 August 2020

Subject: Strengthening of communications, navigation, and surveillance (CNS) systems resilience and mitigation of interference to global navigation satellite system (GNSS)

Action required: Note the criticality of the issue and the importance of action by States to address it by making use of the ICAO guidance provided in Doc 9849, *Global Navigation Satellite System (GNSS) Manual* and by taking any other measures as appropriate

Sir/Madam,

1. I have the honour to inform you that the Council, at the ninth meeting of its 220th Session on 22 June 2020, agreed with the proposal to bring to the attention of States the actions agreed by the 40th Session of the Assembly (24 September – 4 October 2019) with regard to communications, navigation, and surveillance (CNS) systems resilience and mitigation of harmful interference to global navigation satellite system (GNSS).

2. The agreed actions were pursuant to proposals contained in Assembly working papers A40-WP/82, A40-WP/352 and A40-WP/188, presented respectively by Finland on behalf of the EU and its Member States¹, by Saudi Arabia and jointly by the International Federation of Air Traffic Controllers' Associations (IFATCA), the International Federation of Air Line Pilots' Associations (IFALPA) and the International Air Transport Association (IATA). The papers identified issues related to the evolution of CNS systems and the associated threats and vulnerabilities, with particular regard to satellite-based CNS systems, such as GNSS. They highlighted, in particular, the impact from harmful interference to GNSS on the safety and efficiency of aircraft and ATM operations, and identified the need to strengthen the protection of GNSS signals from harmful interference and degradation of performance through actions by States and ICAO in coordination with industry.

¹ Austria, Belgium, Bulgaria, Croatia, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom.

3. The Assembly noted the essential commonality of purpose among the three papers and agreed with the proposals contained therein (*Assembly Fortieth Session, Technical Commission Report, Doc 10137, A40-TE, 30.15* refers). The attachment to this letter compiles the proposals that are relevant for action by States. In summary, they include: reinforcing CNS system resilience to interference, preventing the use of illegal interfering devices, increasing collaboration with radio regulatory and enforcement authorities, reinforcing civil-military coordination to address interference risks associated with GNSS testing and conflict zones, increasing coordination between aviation and radio-regulatory authority and military, retaining essential conventional navigation infrastructure for contingency support in case of GNSS outages, and developing mitigation techniques for loss of services.

4. In particular, all three papers stress the importance of applying the GNSS radio frequency interference mitigation plan outlined in the ICAO *Global Navigation Satellite System (GNSS) Manual* (Doc 9849). The framework recommended to implement the mitigation plan includes a continuous three-step process, comprising threat monitoring, risk assessment and deployment of mitigation measures. Checklists of preventive and reactive measures aimed at mitigating the interference risk, as far as practicable, are also provided.

5. May I request that you note the criticality of the issue and the importance of action by States to address it by making use of the ICAO guidance provided in Doc 9849, and by taking any other measures, as appropriate.

Accept, Sir/Madam, the assurances of my highest consideration.



Fang Liu
Secretary General

Enclosure:

Actions agreed by the 40th Session of the Assembly to strengthen CNS systems resilience and mitigate interference to GNSS

**Actions agreed by the 40th Session of the Assembly
to strengthen CNS systems resilience and mitigate interference to GNSS**

From A40-WP/82, States are urged to:

- “1) transition from a CNS system-based concept towards secure CNS services, mainly based on a satellite-based infrastructure while addressing its resiliency to interference through independent minimum operational networks based on ground and/or airborne components;
- 2) apply necessary measures to avoid the commercialisation / proliferation and the use of illegal transmitters such as jammers which may impact satellite-based CNS systems;
- 3) ensure, considering that the use of radio frequency spectrum by aeronautical safety services requires special measures, close collaboration between aviation authorities, service providers, radio regulatory and spectrum enforcement authorities to ensure that this spectrum is free from harmful interference;
- 4) reinforce civil-military collaboration regarding global navigation satellite system (GNSS) testing and other activities, which may impact satellite-based CNS systems, with the air navigation services provider (ANSP) responsible for the affected airspace; and
- 5) consider, when assessing the interference risks associated with conflict zones, that the use of satellite-based CNS systems can potentially be impacted beyond that zone.”

From A40-WP/352, States are urged to:

- “1) assess the likelihood and effects of global navigation satellite system vulnerabilities in their airspace and apply, as necessary, ICAO mitigation methods;
- 2) provide effective spectrum management and protection of global navigation satellite systems (GNSS) frequencies to reduce the likelihood of unintentional interference or degradation of GNSS performance; and
- 3) cooperate for design, development and realization of Ground and on-board mitigation techniques of GNSS loss of service;”

From A40-WP/188, the Assembly is invited to:

- “a) to implement appropriate mitigation measures as contained in the *Global Navigation Satellite System (GNSS) Manual* (Doc 9849) as a matter of high priority and to report progress and any difficulties to ICAO;
- b) to recognize the unintended impact of harmful interference to civil flight operations and to exercise caution to the maximum extent possible to protect the safety of civil aircraft during military exercises and operations;
- c) to establish and ensure appropriate frequency regulations are in place and maintained to protect allocated GNSS frequencies from harmful interference in line with ITU Radio Regulations;
- d) to ensure that contingency procedures are established in coordination with air navigation service providers and airspace users and that essential conventional navigation infrastructure, such as Instrument Landing System (ILS), are retained when operationally beneficial; and
- e) to support the multi-disciplinary development of alternative positioning, navigation and timing (APNT) strategy and solutions to complement the use of GNSS in aviation in coordination with ICAO and airspace users.”