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**International Association for the Advancement of Space Safety**
POTENTIAL ABUSES TO THE ITU RADIO REGULATIONS: THE LICENSING OF SMALL SATELLITES

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ABSTRACT

This article examines potential abuses to the ITU Radio Regulations by administrations and small satellites operators when it comes to frequency allocation. More specifically, it introduces the problematic nature of Article 4.4 of the Regulations and its potential misuse. This is being demonstrated by the example of the FCC’s public notice for guidance on obtaining license for small satellites, which is in derogation of the Treaty, and the effects it has on the telecommunications world. The article also discusses possible solutions and measures that can be adopted to remedy the problem and stop any further abuse of the Regulations.

“We do not want to police you; we are not the police. That is not our job. We want only to follow the rules to preserve the use of the resource.”

Attila Matas speaking on behalf of ITU at the ITU’s Symposium and Workshop on Small Satellite Regulation in Prague, 2-4 March 2015.

1. INTRODUCTION

The rate of increase of small satellites being launched into outer space is impressing. Their relatively low cost makes them available to many. Launching a satellite into outer space is no longer the privilege of big companies or States. However, even small satellites need to communicate with their operator. For this reason they are being built with a radio transmitter which operates using a specific frequency band. The allocation of frequency bands is carried out by the International Telecommunications Union (ITU).

One of the legal instruments of the ITU is the Radio Regulations [1] which is a legally binding Treaty to all Member States of the organisation. When assigning frequencies to stations, each administration must ensure compliance with the Regulations. However, Article 4.4 gives the power to Member States to derogate from the Radio Regulations and assign frequencies to services that are not provided for such services by the Treaty. The term ‘derogation’ refers to the partial repeal or abolishing of a law, as by a subsequent act which limits its scope or impairs its utility and force [2]. This power should only be exercised in certain cases and with the condition that no harmful interference will be created to services of other States.

In March 2013, the administration of the United States issued a public notice in which they provide guidance on the licensing of small satellites. That notice refers to available frequencies for small satellites which do not comply with the provisions of the Radio Regulations. The US may seem to have the power to derogate under Article 4.4; however, they cannot guarantee the absence of harmful interference in the case of small satellites. Following the notice, manufacturers and retailers of small satellites in different countries started using the frequency bands provided by the US administration. This creates many risks for harmful interference in services using these bands and which comply with the Regulations.

The article begins by introducing the role of the ITU and the relevant international legal framework. Next, the Radio Regulations and the derogation power under Article 4.4 are being examined. The problem originated by the aforementioned notice is then being analysed, before looking at possible solutions to remedy the situation.

2. THE INTERNATIONAL TELECOMMUNICATION UNION

2.1 The ITU’s Role

The ITU is a specialised agency of the United Nations and is based in Geneva. The Union is responsible for international frequency allocations, worldwide telecommunications standards and telecommunication development activities [3]. While in general recognising the sovereign right of each state over its telecommunication [4], the ITU is concerned with maintenance and extension of cooperation with regard to the use of telecommunication on the international plane [5]. In addition, it also promotes the development and efficient operation of telecommunication facilities, in order to improve the efficiency of telecommunication services, their usefulness, and their general availability to the public [6].
The Union is divided into three sectors. The Radiocommunication Sector (ITU-R) is committed to ensuring “the rational, equitable, efficient and economical use of the radio-frequency spectrum by all radiocommunication services” [7]. One of the strategic goals of the ITU-R is to ensure interference-free operation of radiocommunication systems by implementing the Radio Regulations and regional agreements, as well as updating these instruments in an efficient and timely manner through the processes of world and regional radiocommunication conferences.” ITU-R manages the detailed coordination and recording procedures for space systems and earth stations. Its main role is to process and publish data, and to carry out the examination of frequency assignment notices submitted by administrations for inclusion in the formal coordination procedures or recording in the Master International Frequency Register (MIFR) [8]. This coordination procedure incorporates two basic principles of the corpus iuris spatialis (the body of space law): State responsibility for any activity of its nationals in outer space [9]; and registration procedure which the State must follow in order to place an object into outer space [10].

2.2 The ITU Instruments

The International Telecommunication Convention [11] was signed in Nairobi on November 6, 1982. The Union split the Convention into a permanent Constitution and a Convention open to revision at Plenipotentiary Conferences, allowing for a more stable declaration of principles and regulations while retaining the ability to adjust to the changing telecommunications climate [12].

The provisions of both the Constitution and the Convention are further complemented by those of the Administrative Regulations; the International Telecommunication Regulations, [13] and the Radio Regulations. They regulate the use of telecommunications and together with the Constitution and the Convention have the status of intergovernmental treaties that are legally binding on all Member States. They set the objectives of the Union and define the rights and obligations of the signatory parties.

Article 1 of the Constitution provides that the Union shall “[...] effect allocation of bands of the radio-frequency spectrum, the allotment of radio-frequencies and the registration of radio frequency assignments and, for space services, of any associated orbital position in the geostationary-satellite orbit or of any associated characteristics of satellites in other orbits, in order to avoid harmful interference between radio stations of different countries.” [14]

In the same context, Article 45 of the Convention adds that all stations “[...] must be established and operated in such a manner as not to cause harmful interference to the radio services... 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.” [15]

Any frequency assignment that is successfully coordinated and recorded in the MIFR is internationally recognised and protected [16]. This right also comes with the obligation on behalf of the Member States to take immediate action to eliminate any source that causes harmful interference [17].

It is clear from the above that the prevention of harmful interference lies on the core of the Union’s purposes and goals. The next section introduces how this goal is threatened by the non-compliance of small satellite operators with the Regulations and their non-application by State agencies.

3. THE RADIO REGULATIONS

The Radio Regulations is an intergovernmental treaty text that complements the Constitution and Convention of ITU. Covering both legal and technical issues, the Radio Regulations serve as an instrument for the optimal international management of the radio spectrum. The Radio Regulations define, inter alia, the allocation of different frequency bands to different radio services; the mandatory technical parameters to be observed by radio stations, especially transmitters; and procedures for the coordination (ensuring technical compatibility) and notification (formal recording and protection in the MIFR) of frequency assignments made to radio stations by administrations.

3.1 The Derogation Power under Article 4.4

The drafters of the original text of the Radio Regulations saw fit to create an exemption clause on the provisions that would allow administrations of Member States to give authorisation for a station to use a radio frequency in derogation of the Radio Regulations. Specifically, Article 4.4 reads:

“Administrations of the Member States shall not assign to a station any frequency in derogation of either the Table of Frequency Allocations in this Chapter or the other provisions of these Regulations, except on the express condition that such a station, when using such a frequency assignment, shall not cause harmful interference to, and shall not claim protection from harmful interference caused by, a station operating in accordance with the
provisions of the Constitution, the Convention and these Regulations.” [18]

It is not difficult to understand why the drafters of the Radio Regulations decided to include such a provision in the text. First of all, political reasons were demanding it. The Union was founded on the sovereignty principle – “[...] fully recognizing the sovereign right of each State to regulate its telecommunication […]” [19]. Article 6 (1) of the Constitution limits the binding force of the Constitution, the Convention and the Regulations. It states that “Member States are bound to abide by the provisions of this Constitution, the Convention and the Administrative Regulations in all telecommunication offices and stations which engage in international services or which are capable of causing harmful interference to radio services of other countries.” [20] In other words, States have the power to adopt their own telecommunication regulations within their territory as long as they do not interfere with radio services of other States. The insertion of Article 4.4 in the Radio Regulations reconfirms this right in respect to radiocommunication. It is important to note, once again, that the absence of harmful interference to the services of other States is a prerequisite for the exercise of this right.

There are also practical reasons behind the adoption of Article 4.4. There are exceptional circumstances that absolute compliance with the Radio Regulations and the Table of Frequency Allocations (hereinafter Table) may not be possible, or may even be a hurdle in respect to certain activities. One example could be the launching of a satellite. During the short period of the launching, it would be justified for an administration to license the use of a frequency in derogation of the Regulations in order to ensure the successful completion of such a hazardous activity, as long as it does not have the potential to cause harmful interference to services of other States. Another example can be the use of a frequency in derogation of the Radio Regulations for deep space communications, which requires a lot of power. It is important to remember, however, that for those activities there is no international recognition and no protection from harmful interference [21].

3.2 Article 4.4 in Practice

What the drafters of the Regulations did not expect was the extent of the misuse of Article 4.4 today. On March 15, 2013, the Federal Communications Commission (FCC) [22] released a public notice providing guidance on obtaining licenses for non-Federal small satellites (such as pico-satellites, nano-satellites and cubesats) which are used for amateur and experimental purposes [23].

An ‘amateur service’ is defined by Article 1.56 of the Radio Regulations as “A radiocommunication service for the purpose of self-training, intercommunication and technical investigations carried out by amateurs, that is, by duly authorized persons interested in radio technique solely with a personal aim and without pecuniary interest.” [24]

As the FCC notice is relevant to small satellites, it refers to ‘amateur-satellite service’ which is defined as “a radiocommunication service using space stations on earth satellites for the same purposes as those of the amateur service.” [25] It is clear from the two definitions that amateur services should not be used for commercial purposes.

Indeed, the FCC guidance reconfirms this provision prohibiting “communications in which the station licensee or control operator has a pecuniary interest, including communications on behalf of an employer….”. Section 97 (c) of the FCC’s Part 97 rules [26] provides the available frequencies for amateur-satellite service, which are all in conformity with the Table and the Radio Regulations.

Regarding the experimental purposes, the FCC notice refers to the 145-148 MHz, 420-450 MHz, 902-928 MHz (ISM), and 2.390-2.450 GHz bands as ‘common frequencies authorized for small satellite operations to date’. With this statement, the FCC effectively legalizes the use of the above frequencies for experimental purposes by small satellites operators. However, as it will be explained below, this statement is in derogation of the Radio Regulations in its whole.

The Radio Regulations do not define an ‘experimental service’. They only define an ‘experimental station’ which is “a station utilizing radio waves in experiments with a view to the development of science or technique.” [27] Different services can serve ‘experimental purposes’. For example, a ‘fixed service’ [28] can serve ‘experimental purposes’ if it is used for the development of science or technique. The same can be true for a ‘fixed-satellite service’ [29]. For this reason Article 5 of the Radio Regulations does not provide any mention of ‘experimental service’ within the Table. Nevertheless, the definition of ‘experimental station’ “does not include amateur stations” [30]. In other words, an ‘amateur service’ cannot serve ‘experimental purposes’.

Looking at the Table of the Radio Regulations and the bands that the FCC guidance refers to as common bands of allocation for experimental purposes, it becomes clear that the FCC equates the ‘amateur service’ with ‘experimental purposes’. According to the Table, the 144-146 MHz band is allocated to amateur-satellite service in Region 2 [31] on a primary basis [32]. The 2400-2450 band (part of the 2.390–2.450 GHz band, as provided by the
FCC) is also allocated to amateur-satellite service in the US “subject to not causing harmful interference to other services operating in accordance with the Table” [33]. All of the remaining bands are, *inter alia*, allocated to amateur service in Region 2 (most of them on a secondary basis). The FCC’s intentional, or not, misinterpretation of the Table is apparent.

Even if an ‘amateur service’ could serve ‘experimental purposes’, according to the Radio Regulations and the aforementioned definitions ‘amateur service’ and ‘amateur-satellite service’ are different. Whilst the latter refers specifically to satellite service, the first only refers for terrestrial service. This can be concluded by the mere existence of a separate definition for the ‘amateur-satellite service’. But, it is also provided by Article 1.19 of the Radio Regulations, which clearly states that “in these Regulations, unless otherwise stated, any radiocommunication service relates to terrestrial radiocommunication.” [34] Thus, the definition of the ‘amateur service’ under Article 1.56 of the Radio Regulations should be read as “a terrestrial [emphasis added] radiocommunication service for the purpose of self-training…”

An even bigger problem, however, originated by the publication of the FCC notice is the reference to ‘ISM’ applications within brackets after the 902-928 MHz band. Industrial, scientific and medical (ISM) applications are defined as the “operation of equipment or appliances designed to generate and use locally radio frequency energy for industrial, scientific, medical, domestic or similar purposes, excluding applications in the field of telecommunications.” [35] Indeed, following Article 5.150, the 902-928 MHz band is also allocated to ISM applications in Region 2 [36]. Nevertheless, their definition is indicative of two facts. Firstly, their use is very restrictive; they are designed for local and terrestrial use only (examples of ISM applications are the microwave ovens and medical diathermy machines). Clearly, application on small satellites does not fall under the definition. Secondly, they are not applicable to the telecommunication field.

By putting ‘ISM’ after the band, the US agency implies that ISM applications can serve experimental purposes, and that ISM applications are available to satellite services (at least on that particular band). The derogation from the Radio Regulations is too manifest.

Following the publication of the FCC notice, a US-based company, ‘Radiobro Corporation’ [37], started the manufacturing of radio transceivers for small satellites which emit on the 902-928 MHz (ISM) band. Another company based in the UK, ‘Alba Orbital Ltd’ [38], manufactures small satellites and makes them available for purchase through their website in every country in the world. Alba Orbital is being supplied with radio transceivers from Radiobro and incorporates them into the small satellites.

The mere fact that the 902-928 MHz band is being used for ISM applications on satellite telecommunications is in derogation of Article 5 and the Radio Regulations. In addition to that, the UK is located within Region 1 [39]. According to the Table, ISM applications are not allocated to the 902-928 MHz band in that Region, which makes the derogation from the Radio Regulations and the potential for harmful interference even greater.

Thus, the problem with Alba Orbital is that they try to establish their product into using frequency bands that are not available for such application. They are in derogation of Article 5 of the Radio Regulations. The Table exists to ensure the least possible interference to the telecommunications world. If there is no remediation of the problem as soon as possible, it is highly likely that more manufacturers and more operators will start using that band. The result will be a great risk of harmful interference and a repeated interruption of radiocommunication services operating in accordance with the Regulations.

As seen above, this problem originated from the FCC notice. Following the Constitution of the Union, the FCC has the right to regulate the telecommunications within US territory as they wish, as long as they do not risk causing harmful interference to the services of other States [40]. The fact is, however, that they cannot guarantee the absence of risk in this occasion. The emission area of a small satellite is huge and it is certain that they will interfere (at least to some extent) with services of neighboring countries like Mexico and Canada. In other words the FCC has an obligation under the ITU Constitution to not adopt such provisions, and abide by the Regulations.

The above example of the FCC notice is a clear demonstration of the misuse of Article 4.4 of the Radio Regulations today. The exemption under this article should be used for exceptional cases and for short periods; definitely not for commercial application. The FCC notice created a precedent of a gross derogation from the Regulations. This is yet to become a big problem, but if there are no efforts to tackle it, it has the potential to become a huge one in the near future. The next section introduces some possible solutions to this situation.

4. REMEDYING THE PROBLEM

4.1. The ITU’s Extent of Power

As an intergovernmental organization there is not much the ITU can do to force the FCC to retreat the notice. As it is not a supranational organization, sanctions are
out of the question. Although Member States are bound by the ITU legal instruments, in the application of their rules the ITU relies on the good faith of its Members. Article 6 of the Constitution provides that “the Member States are bound to abide by the provisions of this Constitution, the Convention and the Administrative Regulations […]” [41]. Article 15 Section 4 adds that “It is essential that Member States exercise the utmost goodwill and mutual assistance in the application of the provisions of Article 45 of the Constitution and of this Section to the settlement of problems of harmful interference.” [42]

The provisions regarding the settlement of disputes are set out in Article 56 of the ITU Constitution and require that disputes are to be settled “[…] by negotiation, through diplomatic channels, or according to procedures established by bilateral or multilateral treaties concluded between them for the settlement of international disputes […]” [43], thus, placing particular emphasis on methods agreed upon outside the ITU system. In case that no settlement is achieved, the ITU Convention provides for an arbitration procedure available to members that are party to the dispute [44]. Further, an ‘Optional Protocol on the Compulsory Settlement of Disputes […]’ exists [45], applicable only to those members that are parties to that Protocol. Nevertheless, it is worth mentioning that the Optional Protocol on the Compulsory Settlement of Disputes has never been invoked.

What then makes Member States, and even the telecommunication industry abide by the Union’s rules? One might call it “necessity” [46] or use the more eloquent words of one scholar who stated that the whole system of international telecommunication that is enshrined in the ITU ‘‘essentially depends upon states recognizing the effects of failure […] to behave in a responsible manner.’’ [47]

It is not too difficult to imagine the problems and potential chaos a failure to comply with standards and rules set up by the ITU and its experts would inevitably lead to. Restrained by the laws of physics, not by the laws of politics, cooperation is vital and unavoidable [48]. Given the complex physical nature of radiocommunication, cooperation among all members of the ITU is needed in order to prevent harmful interference and enable all to benefit from this technology. Interference by just one member would inevitably affect others and last but not least the offender state itself, as, due to physics, its use of the global network would be interfered with as well [49].

4.2. Raising Awareness

In order to correct, or at least prevent any further derogation from the Radio Regulations in respect to the small satellites and the frequency bands they use, the ITU needs to educate administrations, manufactures and operators about these issues. A greater degree of awareness is vital for the continuing successful and efficient use of radiocommunication services.

A good step towards that direction was the ITU Symposium and Workshop on Small Satellite Regulation which was held in Prague at the beginning of March. During the Symposium the delegates discussed the regulatory challenges facing the rapid development of small satellites, while recognising the importance of following the Regulations to ensure the long-term sustainability of small satellites in outer space [50].

The Union may not have any real enforcement powers, but it can use other means to ‘punish’ a non-cooperating State. It could use, for instance, the ‘name and shame’ method. Rather than being a sanction, this method is a good way to question the morality of a State. For example, at the next meeting of the Member States, the ITU could make a specific reference to the USA, presenting the issue of their non-compliance and how this endangers the interests of the other States.

4.3. Revision of the Radio Regulations

Another way of preventing further derogation from the Regulations is by the revision of the Radio Regulations. Article 4.4 could be amended to include one more sentence in the end that would read: “Where the signal emission of such a station has the potential to reach services of other States, the administration of the Member State shall follow the coordination procedure under Article 9.” With this provision it becomes clearer that the derogation power under Article 4.4 is only available for services that have no potential to reach and cause interference to other States’ services. It also empowers the ITU in cases where the station has the potential to interfere with services of other States to examine the compliance of the assignment with the Regulations during the coordination procedure.

There is also an ITU-R Study Group currently examining a possible revision of the Radio Regulations. More specifically, one of the solutions the Study Group is analyzing is the possible insertion of a separate ‘small satellite service’ within the Regulations. This would mean that specific frequency bands on the Table could be allocated to ‘small satellite service’, thus making easier to com-
ply with the Regulations. This, however, would require defining what a ‘small satellite’ is. At the moment there is no workable definition of a ‘small satellite’, and the Study Group sounded pessimistic during the Symposium in Prague. They said that, by some definitions, even the International Space Station would be classified as a small satellite. Yvon Henri, head of the ITU-R, stated: “We are really now not sure if any such special regulatory regime should be created. There is no definition of what a small satellite is and if I understand the results we have heard, maybe there will never be one.”

Nevertheless, the Study Group has roughly four more years until the 2019 World Radiocommunication Conference to present their results.Hopefully, they will come up with some suggestions that will prove helpful to the Union in relation to the small satellites regulatory issues[51].

5. CONCLUSION

The ITU’s important role in ensuring interference-free telecommunications is evident. Abiding by the Radio Regulations is not an option for the Member States, but rather a necessity in order to successfully continue enjoying the radiocommunication services. However, Article 4.4 of the Radio Regulations allows Member States to derogate from the provisions willingly. The absence of harmful interference is a prerequisite of the exercise of this power. Nevertheless, Member States and their administration can abuse this right, as the FCC did with the publication of the guidance on small satellites licensing.

The FCC notice refers to specific frequency bands as available to small satellite services which are in direct contradiction to the provisions of the Radio Regulations. Following the publication of the guidance, a US-based company started manufacturing radio transmitters which transmit in such frequencies, and selling them to a UK-based company which incorporates them into small satellites that sells them to all regions of the world. This results in more and more satellites transmitting signals in frequencies which are used by other services, potentially creating harmful interference.

It is important that the ITU continues raising awareness and providing guidance on how administrations and operators of small satellites can follow the regulations so as to ensure interference-free services and a sustainable use of outer space. The revision of the Radio Regulations should also be considered. The amendment of Article 4.4 to include more requirements and to slightly empower the ITU seems to be a good way towards remedying the problem.

6. REFERENCES


[8] id.


[14] supra note 3, Article 1, para. 11.


[16] supra note 1, No. 8.3 of Article 8.
The FCC is an independent agency of the United States government that regulates interstate radio-communication.

The notice can be found here: http://www.fcc.gov/document/guidance-obtaining-licenses-small-satellites (last accessed 12/06/2015).


Also knows as ‘PocketQube Shop’, http://www.pocketqubeshop.com/ (last accessed 12/06/2015).


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[49] id. p. 496.


Progress in space safety lies in the acceptance of safety design and engineering as an integral part of the design and implementation process for new space systems. Safety must be seen as the principle design driver of utmost importance from the outset of the design process, which is only achieved through a culture change that moves all stakeholders toward front-end loaded safety concepts. Superb quality information for engineers, programme managers, suppliers and aerospace technologists.